

附 属 資 料

1. T/R
2. Q/N
3. S/W
4. M/M
5. 主要面会者リスト
6. 現地調査経費資料
7. ローカルコンサルタントリスト
8. 主要収集資料リスト

附属資料 1. T/R

PROJECT DIGEST

1. Project Title : Master Plan & Feasibility Study for Environmental Sanitation (Human Waste & Water Disposal, and Solid Waste Management) for the city of Ujung Pandang.
 2. Project Location : Ujung Pandang
 3. Executing Agencies : Directorate General of Human Settlement, Ministry of Public Works.
 4. Objectives :
 - To prepare Master Plan and Feasibility Study of Human Waste and Waste Water disposal including on site and off site system with treatment plant. The project will cover whole central city.
 - To prepare on site system area where off site system could not be possible to implement.
 - To prepare the feasibility study, masterplan for solid waste management of the large cities that can be applied as to recommend the most suitable system.
 5. Project Description :
 - This project is considering the cost effective way and facilitating the city people for their human waste and waste water disposal.
This project is anticipated to be implemented master planning including pre engineering design work and institutional development.
 - Large cities have more complex solid waste management problems so each town has to have town feasibility study, masterplan and detailed design :

This masterplan should include five aspects of solid waste management i.e :
 - Institutional and organization
 - Financial and retribution
 - Technical operation including collection, transportation, treatment and final disposal.
 - Legal/regulation
 - Community participation.
- The project stages are :

- Preparation of solid waste management feasibility study, masterplan, and detailed design.
- Basic design for pilot plan.
- Programming the medium and short term planning.
- Implementation the medium and short term planning

6. Scope of Assistance Requested :

† Human Waste & Waste Water Disposal & Solid Waste

| | | | | |
|---------------------|-------------|---|-------------|---|
| - Expert Services : | 71 | = | 150.000.000 | ₹ |
| - Fellowships : | 246 mm | = | 105.000.000 | ₹ |
| <hr/> | | | | |
| | Sub Total I | = | 255.000.000 | ₹ |

7. Time Periods : 18 months (120 mm)

TERM OF REFERENCE (TOR)

for

Master Plan & Feasibility Study for Environmental Sanitation
(Human Waste & Wastewater Disposal, and Solid Waste Management)

in the City of Ujung Pandang

1. Background of Study

1.1. General

Ujung Pandang is the capital city of Sulawesi Province. The city consists of 11 Kecamatan covering an area of 176 km². It is undergoing a rapid urban development as the commercial and industrial center of East Indonesia.

The population of the city has grown from 0.56 million in 1971 to 0.9 million in 1989. It is expected to further increase to 1.4 million in 2010. The city was originally developed on the flood free coastal banks facing the Makassar Strait with a ground elevation of 2.0 - 3.0 m above mean sea level. However, the city has been expanding toward east to the low-lying flood prone areas of the Tallo River Basin with an elevation of 0.5-20 m above mean sea level to accommodate the ever increasing population in recent years.

Such urban developments further exacerbate the flooding and living environmental conditions of the city. As the consequence it has become necessary to improve the urban drainage and wastewater disposal systems of this fast developing city. EC

1.2. Wastewater Problems

Domestic and commercial wastes are the major water pollution sources of the city. ^{solid waste} Soiled waste is generally treated by septic tank/leaching system. However, the treatment level is not very satisfactory due to inadequate operation and maintenance, and probably as well due to some design deficiencies, of the facilities. While, the whole gray water from bathing, washing and laundry are directly discharged into the road ditches and storm water drainage channels with no treatment, and finally get disposed to the sea. The city is yet to have a sewerage system.

Water pollution of the ditches and channels in the city is

serious, especially in the old developed area with a high population density. Coastal sea water is also much polluted. Garbage dumping into the ditches and channels further worsen the water pollution problems. Groundwater quality is also severely affected due to human waste infiltration. Waterborne disease is widely prevalent among the city residents which is attributed to this poor sanitary and living environmental conditions.

The above water pollution problems will further aggravate in accordance with the population increase of the city. A master plan of wastewater disposal is very necessary to alleviate this water pollution problems thereby enhancing the living environmental conditions of the city.

1.3. Solid Waste Problem

The situation of solid waste management cities Ujung Pandang, are now behind from the satisfactory level.

2. Objective and Area of the Study

The objectives of the Study are summarized as follows :

- (i) Formulation of a master plan of urban drainage and wastewater disposal for Ujung Pandang city, targeting the year 2010.
- (ii) Identification of immediate implementation project, preparation of feasibility study of first stage implementation project and preparation of preliminary engineering design of the immediate implementation relevant facilities.
- (iii) Transfer of relevant technology to local technocrats/ engineers.

The Study Area covers the entire Ujung Pandang city area of 176 km² and its vicinity. Location of the Study Area is shown in Fig. 1.

3. Study Approach

3.1. Wastewater Disposal.

- (1) The Consultants shall prepare an integrated master plan for wastewater treatment and disposal of domestic.

commercial, institutional and industrial sources. The proposed plan shall contribute to improvement of public health and sanitation and water quality of public water courses and coastal waters.

- (2) The Consultant shall propose the master plan in conformity with the long term urban development plan of the city. The proposed plan shall be composed of an optimum combination both the on-site sanitation system and sewerage system to attain a satisfactory level of wastewater treatment with limited financial resources. The wastewater disposal system/facilities shall be designed in due consideration to cost recovery of the project and affordability of beneficiaries.
- (3) With regard to the biological wastewater treatment system, there exist various alternatives consisting of both suspended and attached growth types. The Consultants shall select the most economic and simple system to suit the local tropical climatic conditions.
- (4) The Consultants shall provide the feasibility study of first stage implementation project (engineering, financial, environmental assessment and institutional).

3.2. Cleaning of Channel

Cleaning of the existing channel will also be included in this Study. Possible major cleaning measures are control of garbage dumping into channel and flushing of channel. Flushing of S. Jongaya, S. Panampu, S. Sinrijala and other connected channels by the introduction of tidal water/river water is considered to be a viable option deserving a detailed investigation. Its feasibility shall be studied along with the related storm water drainage plans.

3.3. Sludge Treatment Plan Improvement and Development.

Based on the existing sludge treatment plan, the consultant should prepare the required improvement and development of it to accommodate future needs.

3.4. Solid Waste Management

- Preparation of solid waste management ^{master plan} feasibility study, ~~master plan~~ of study area :

- * Data collection and field investigation
- * Review of plans and reports concerned
- * Development of the consensus masterplan

Identification of specified area for implementation study

- Basic Design for pilot project :

- * Collection and analysis of New Data for the design of pilot plan facility
- † Site selection
- † Collection zoning
- * Collection and transportation system
- † Basic design of pilot plan facilities
- † Maintenance and operation plan
- † Estimation of construction cost
- † Estimation of operation and maintenance cost

- Programming the Medium and short term planning

- Implementation the medium and short term planning

4. Scope of Work

In order to achieve the objectives set out in Chapter 2 and Chapter 3, the Consultants shall perform all the necessary technical studies and field investigation including, but not limited to, the following works.

- (1) To review relevant previous studies and reports
- (2) To collect, collate, update and examine the data and information regarding :
 - 1) topographical and geological conditions
 - 2) population, land use and urban developments
 - 3) hydrological, hydraulic and water quality conditions
 - 4) surface and groundwater use
 - 5) longitudinal and cross sections of river and channel
 - 6) existing urban drainage system and facilities
 - 7) existing wastewater disposal system and facilities
 - 8) existing water supply system
 - 9) flood damages
 - 10) waterborne disease and other environmental damages
 - 11) solid waste generation and disposal
 - 12) relevant law and institution
 - 13) others
- (3) To carry out field survey and investigation such as
 - 1) up-dating of existing topographic map
 - 2) water quality of river, channel and coastal waters

- 3) groundwater table and quality
 - 4) solid waste (garbage) disposal into drains and channels
 - 5) other
- (4) To project population, land use and other relevant socio-economic conditions.
 - (5) To project pollution load generation and to simulate water pollution of the river/channel and costal waters.
 - (6) To conduct the alternative studies of wastewater disposal and clearing of channels systems
 - (7) To prepare the master plan including construction and O & M plans and its cost estimation
 - (8) To conduct the economical, financial, institutional and environmental evaluation.
 - (9) To select the urgent project
 - (10) To prepare the preliminary design of the urgent project and its cost estimation
 - (11) To prepare the O & M plan of the urgent project its cost estimation
 - (12) To prepare the institutional recommendations.

5. Implementation Program

Directorate General of Human Settlements (Cipta Karya), Ministry of Public Works shall be the organization for the conduct and coordination with other concerned agencies for the Study.

The Study will be completed within seventeen (17) months and during the course of the Study, the following reports shall be submitted by the Consultants to Cipta Karya in English. A tentative implementation schedule is shown in Fig. 2.

- (1) Inception Report (30 copies) within two (2) months after commencement of the Study.
- (2) Progress Report (30 copies) within six (6) months after commencement of the Study.
- (3) Interim Report (30 copies) within eleven (11) months after commencement of the Study.

(4) Draft Final Report (50 copies) within fifteen (15) months after commencement of the Study.

(5) Final Report (50 copies) within seventeen (17) months after commencement of the Study including Executive Summary Report (100 copies).

6. Expertise Requirement

The expertise requirement for a satisfactory completion of this Study is as follows.

| | M/N |
|--------------------------------------|-----|
| (1) Team Leader | 18 |
| (2) Hydrologist | 3 |
| (3) Facility Design Engineer | 4 |
| (4) Sanitary Engineer | 14 |
| (5) Sewerage Facility Planner | 9 |
| (6) Water Quality/Environment Expert | 6 |
| (7) Solid Waste Management Expert | 7 |
| (8) Land Use Planner | 2 |
| (9) Economist/Financial Expert | 6 |
| (10) Topographic Survey Expert | 3 |

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7. References

1) Masterplan Assainering Kota Ujung Pandang, PT. BIES International Inc., 1978.

2) Ujung Pandang IUDDP, 1995/1996.

3) Outline Plan Pembuangan Air Limbah Domestik Kotamadya Ujung Pandang, PT. Waseco Tirta, 1991.

The Application form for Japan's Development Survey

Application

Project Title : Master Plan and Feasibility Study for Environmental Sanitation, Human Waste and Waste Water Disposal, and Solid Waste Management) for the City of Ujung Pandang.

Government of Republic of Indonesia

Total Project Cost : ¥ 225,000,000

Responsible Ministry
(Ministry requesting it)

Implementing Agency
(Agency in charge of execution of the project) :

Ministry of Public Works

Directorate General at Human Settlements.

Project Description

1. Background (Please describe in detail)

(1) Current Situation of the Sector

Waste Water Disposal

Sewerage implementation ^{have} ~~has~~ just begun in Jakarta, Medan, Bandung and Cirebon (rehabilitation). Compared with water supply sector, the sewerage sector is rather new, but GOI has decided to commence sewerage implementation in some other cities for better living environment and further economic growth that is the main target in the fifth five-year plan (Repelita V) 1989/90-1993/94.

Solid Waste

- The Government of the Republic of Indonesia intends to improve the city environment and solid waste management.
- In the 5th five year Development Plan (Repelita V) Directorate General of Human Settlement, the Ministry of Public Works as an executing agency, gives a higher priority on solid waste management project and plans to expand the service coverage of solid waste collection.

- The situation of solid waste management in following cities Ujung Pandang are now far behind from the satisfactory level 50 each town has to have own masterplan of solid waste management.

(2) Problems to be solved in the sector

Waste Water Disposal

The priority of the sector is still low in spite of its importance since the benefits obtained by sewerage implementation is not fully recognized. Areas served with piped system are free from water borne disease but it is just the transference of pollutants from one place to another. It is indispensable to properly treat the collected sewage in order to achieve the better sanitary condition and living environment.

Solid Waste

Metropolitan and large cities have more complex solid waste management problems so each town has to have own feasibility study, masterplan and detailed design :

This masterplan should include five aspects of solid waste management i.e. :

- Institutional and organization
- Financial and retribution
- Technical operation including collection, transportation treatment and final disposal.
- Legal/regulation
- Community participation

The project stages are :

- Preparation of solid waste management feasibility study masterplan and detailed design.
- Basic design for pilot plan
- Programming the medium and short term planning
- Implementation the medium and short term planning

(3) Necessity and importance of Improvement in the Sector which lead to the formulation of the project

Solid Waste Management

Some cities such as Bandung, Cirebon and Jogjakarta are already served by sewerage system but the living environment there is not fully improved because of the absence of sewage treatment plant (Bandung and Cirebon will have sewage treatment plant through A and Switzerland Government Aid). It is urgently needed to commence treatment plant construction to recognize the benefits of this to raise the priority of the sector.

(4) Relations between the sector and the project

Waste Water Disposal

Since there is no sewerage system (old system) in the city where mostly people used on site sanitation system (the system is not suitable at present due to the development of the city planning), it is desired and necessary to prepare master plan and feasibility study of human waste and wastewater disposal. This request is in line with policy and strategic of the sector.

(5) Reasons why Japan's Grant Aid is requested for this particular project

Wastewater Disposal

Preparation of Master Plan and feasibility study on human waste and wastewater disposal is the best choice for the city of Ujung Pandang. We have not experience with Japan Expert to conduct the same study in other city/province and due to the limited budget of the Government of Indonesia, we have the feeling that Japan's Grant aid is the best solution.

2. Objectives and outline of the Project

(i) Objectives of the Project

(1) Short-term Objectives

Waste Water Disposal

To prepare Master plan and feasibility study of human waste and wastewater including on site system and sewerage system for the city and surrounding area. It is also requested through this study staging of implementation and construction.

Solid Waste

To prepare the feasibility study, masterplan and detailed engineering (detailed design) for solid waste management of the large cities (Ujung Pandang) the can be application so as to recommend the most suitable system.

(ii) Medium and Long-term Objectives

Waste Water Disposal

To make the government of Indonesia recognize the importance and the benefits of sewage treatment and thus to raise the priority of the sector for further economic growth reason.

(iii) Please fully describe the relations between the project and objectives, and how the project will contribute to the accomplishment of the objectives.

Waste Water Disposal

As many evidence shows that human waste and wastewater (domestic wastes) has great potential and contribution to cause pollution and worse living environment condition. To avoid such situation through this study it is expected that sources of pollution could be eliminated in proper way by introducing a very advanced system for domestic waste and industrial wastes.

(2) Outline of the Project (Please give a full description of each facility and equipment and their detailed specifications)

Waste Water Disposal

To prepare and to design :

Master plan of human waste and wastewater disposal up to the 2010 Feasibility study of the master plan up the year of 2012.

| for : Cities | Area ha | Population |
|------------------|---------|------------|
| 2. Ujung Pandang | 17,642 | 632,290 |

Solid Waste

To prepare the feasibility study, masterplan and engineering services (detail design) for solid waste management of the large cities (Ujung Pandang).

(3) Location Plan of each facility and/or Equipment

Ujung Pandang (South Sulawesi Province)

(i) Cost Estimates (please describe in detail all the premises on which the cost estimates are base)

| | Expert Service | | Fellowships | Total |
|-------------------------|----------------------|---------------------|---------------------|----------------------|
| | Expatriate | Local Expert | | |
| 1. Waste Water Disposal | Y 35,000,000 | - | Y 30,000,000 | Y 65,000,000 |
| 2. Solid Waste | Y 184,000,000 | Y 42,860,000 | - | Y 226,860,000 |
| Total | Y 219,000,000 | Y 42,860,000 | Y 30,000,000 | Y 291,860,000 |

(ii) Land Preparation

- (a) To which extent has the land been appropriated for the project ?

Local Government of Ujung Pandang

- (b) When will the appropriation of the land be completed ?

After proposed by the study, then Local Government will prepare appropriate the land.

(Please attach the laws and procedures concerning the appropriation of land)

(2) Electricity, Water Supply, Telephone, Drainage and Other Facilities

(Please describe the extent to which above mentioned incidental facilities have been prepared)

(3) Is there any information, statistic and data regarding geographical, geological, meteorological, oceanographical situations, etc.

(If any, please attach those information)

6. Improvement Plan (if any, please describe in detail the contents such a plan that will enable the Agency to handle the project effectively and efficiently)

6. List of related projects

(Please fill in below if there is a project executed by another donor country or international organization in related areas)

(1) Name of donor

JICA

(2) Project Title

Master Plan & Feasibility Study for Environmental Sanitation (Human Waste & Waste Water Disposal, Urban Drainage and Solid Waste Management) for the City of Ujung Padang.

(3) Project Outline

(4) Type of Assistance

(grant, loan, technical assistance, etc) : Technical Assistance

(5) Project Period

16 months

(6) Relations with this Project

附属資料 2. Q/N

QUESTIONNAIRE ON THE MASTER PLAN AND FEASIBILITY STUDY
ON ENVIRONMENTAL SANITATION
IN THE CITY OF UJUNG PANDANG, THE REPUBLIC OF INDONESIA

November 1993
JICA Preparatory Study Team

In response to the official request from the Government of the Republic of Indonesia (hereinafter referred to as "the Government of Indonesia"), the Government of Japan decided to implement the Master Plan and Feasibility Study on Environmental Sanitation in the City of Ujung Pandang (hereinafter referred to as "the Study"), and to send a Preparatory Study Team (hereinafter referred to as "the Preparatory Team") to Indonesia in December, 1993.

The following data and information are needed to design the Study. The Preparatory Team appreciates it greatly if PLP/CIPTA KARYA, Dinas Kebersihan Kotamadya Ujung Pandang and other agencies concerned could prepare these data, at least the list of information sources, and if they could assist the Preparatory Team to collect these information.

1. GENERAL

1-1 Background of the request:

- a. Deficiencies of the existing environmental sanitation system (human excreta, wastewater and solid waste) in Kotamadya Ujung Pandang (KUP) (technical, institutional, financial, social and environmental)
- b. Health statistics which show the urgent need for the improvement of environmental sanitation system in KUP (see 1-8)
- c. Damages caused by deficient environmental sanitation system to other urban systems such as urban drainage system
- d. Willingness of concerned organizations, especially that of KUP, to prepare and implement the environmental sanitation master plan

1-2 Indonesian side organizational structure for the conduct of the Study:

- a. Names and positions of the Steering Committee's members
- b. Names, positions and specialities of counterpart personnel

1-3 Scope of the Study:

- a. Planning period
- b. Study area
- c. Study waste
 - liquid waste: human waste, gray water, etc.
 - solid waste: household waste, commercial waste, etc.
- d. Services of Dinas Kebersihan KUP to be covered by the

Study

- e. Minimum service level to be achieved by the target year
 - f. Priority service and priority geographical area if phased improvement is required
- 1-4 Review results of Repelita V (especially those for the sanitation and solid waste sub-sectors):
- a. Strategies (Technical/Institutional/Financial/Promotional)
 - b. Investment plan (sanitation / solid waste)
 - c. Human resource development programme (sanitation / solid waste)
 - d. Public health education and communal participation programme
 - e. R&D of appropriate technologies for environmental sanitation
- 1-5 Outline of Repelita VI (especially the parts related to the sanitation and solid waste sub-sectors):
- a. Strategies (Technical/Institutional/Financial/Promotional)
 - b. Investment plan (sanitation / solid waste)
 - c. Human resource development programme (sanitation / solid waste)
 - d. Public health education and communal participation programme
 - e. R&D of appropriate technologies for environmental sanitation
- 1-6 Outline of GOI's policies of decentralization and integrated urban infrastructure development:
- a. Policies for urban development in Indonesia: Tim Koordinasi Pembangunan Perkotaan (TKPP) August 1987
 - b. Role of local government (Tk-II), provincial government (Tk-I) and central government for urban development
 - c. IUIDP Sulawesi
- 1-7 Census data 1980, 1985 and 1990 related to the Study (population, water supply, sanitation, etc.) at national level, provincial level (= South Sulawesi), kotamadya level (= Kotamadya Ujung Pandang = KUP), kecamatan level and kelurahan level including future projection of population
- 1-8 Health statistics related to the Study at national and provincial levels including historical data:
- a. Life expectancy
 - b. Infant mortality
 - c. Mortality and morbidity of excreta related diseases
- 1-9 Organization:
- a. Central government and provincial government agencies responsible for the development of urban sanitation and

- solid waste sub-sectors
- b. Administrative structure of KUP
- c. Administrative structure of Dinas Kebersihan KUP, its duties and resources (staff, equipment and facilities)
- d. Roles and responsibilities of Bappeda Tk-II, Dinas PU, BKLH, PDAM, Dinas Kesehatan, RT/RW, PKK, etc. for environmental sanitation in Ujung Pandang
- e. Government agency responsible for river water and groundwater quality monitoring in Ujung Pandang

1-10 Budget of KUP and Dinas Kebersihan KUP:

- a. Revenue and expenditure in the last five years
- b. Breakdown of revenue (subsidy, tax, user charge, etc.)
- c. Breakdown of expenditure (investment/O&M, sanitation/solid waste/other services)

1-11 Socio-economic conditions of KUP:

- a. Administrative districts (kecamatan and kelurahan) and their areas
- b. Population, household, population density and income level
- c. Present and future land use (see 1-17 d.)
- d. Types of urban development (see 1-17 i.)
- e. Infrastructure (road, port, electricity, water, etc.)
- f. Industries
- g. GRP(gross regional product) in 1980, 1985 and 1990

1-12 Physical and environmental conditions of KUP:

- a. Topography (see 1-17 b.)
- b. Geology (see 1-17 c.)
- c. Meteorological data
- d. Hydrological data of major rivers
- e. Water quality of major rivers, canals and the sea nearby
- f. Groundwater data (distribution of wells, water level, water quality)
- g. Location of environmentally vulnerable areas such as mangrove forest, coral reef, wetland, tideland, etc.
- h. Species of valuable animals and plants
- i. Location of officially protected areas such as national parks and natural parks
- j. Location of important landscape and scenery for tourism or religion

1-13 Flood and its damages in KUP:

- a. Habitual inundation area/maps (area, population, duration, depth, times, etc.)(see 1-17 g.)
- b. Flood damage due to heavy stormwater in the past
- c. Causes of flooding (rainfall, high tide, defect/shortage of facilities)
- e. Urban drainage master plan for KUP

1-14 Past ADIPURA records of KUP

1-15 Laws, regulations, standards and guidelines:

- a. Technical and administrative guidelines prepared by the central government
 - sanitation sub-sector
 - solid waste sub-sector
- b. Rules and regulations prepared by KUP and their enforcement
 - sanitation sub-sector
 - solid waste sub-sector
- c. Environmental quality standards and emission standards
 - air
 - water
 - solid waste (including hazardous waste)
 - noise
- d. AMDAL requirements for the Study (construction of sewage treatment works, septage disposal works and sanitary landfills may be proposed in the Study as the first priority project)
 - AMDAL guidelines for urban sanitation and solid waste sub-sectors
 - necessity of PIL and/or ANDAL
 - environmental components to be covered by PIL and/or ANDAL
 - reviewer of PIL/ANDAL reports

1-16 Existing and on-going studies, plans and projects for KUP:

- a. City planning
- b. Urban investment programme
- c. KIP
- d. Water supply sub-sector
- e. Sanitation sub-sector
- f. Solid waste sub-sector
- g. Drainage sub-sector
- h. Permnas housing project
- i. Related studies, plans and projects
- j. Cooperation projects implemented and to be implemented by other bilateral or multilateral aid agencies related to the requested project

1-17 Maps and aerial photography which show, among others, the following:

- a. Boundaries of KUP, kecamatans and kelurahans
- b. Topography of KUP and its surroundings
- c. Geology of KUP and its surroundings
- d. Present and planned land use of KUP
- e. Present and planned road network system with pavement condition information
- f. Present and planned water supply system
- g. Main water courses and areas subject to flooding
- h. Present and planned drainage network system
- i. Type of development

- high density kampung
- medium density kampung
- low density kampung
- kampung areas where there is only footpath access
- kampung areas where there is access for small vehicles
- formal middle/high income areas with full road access
- industrial areas
- markets and commercial centres
- major institutions
- j. Locations of strategic facilities such as the Dinas Kebersihan's central office, district offices, garages, septage treatment plants, landfills, etc.
- k. Proposed sites for future waste water treatment plants and landfills

Note: Maps should be prepared to a scale of at least 1:10,000 for planning purposes and at least 1:2,000 for project design.

1-18 Miscellaneous services:

- a. Local laboratory services for water quality analysis and solid waste analysis
- b. Local distributors of weighbridges
- c. Local consultants specialized in environmental sanitation
- d. Local consultants specialized in topographic and geological surveys

1-19 Economic, social, cultural and other special conditions to be considered in the Study, if any.

2. SANITATION SUB-SECTOR

2-1 Water demand and supply in KUP:

- a. Present water supply
 - piped water supply _____% of households
 - wells with pumps _____% of households
 - open wells _____% of households
 - others _____% of households
- b. Responsible institution for piped water supply
- c. Number of piped water supply system users classified by user type
- d. Amount of piped water consumed (annual total, monthly average/maximum, daily average/maximum, hourly average/maximum)
- e. Sources of piped water supply and intake locations
- f. Present water quality at sources
- g. Laws and regulations relevant to water quality (see 1-15 c.)
- h. User charge system

2-2 Present sanitation system in KUP:

- a. Institutional set-up of Ujung Pandang urban sanitation system (especially the roles of Kotamadya, Kecamatan, Kelurahan, RT/RW, householders, private sector and their interrelations)
 - b. Present sanitation systems and problems
 - toilet types
 - *private toilet with septic tanks and/or leaching pit _____% of households
 - *private without tank/pit _____% of households
 - *shared/public toilet _____% of households
 - *other toilet facility _____% of households
 - Number and condition of MCKs (MCK-Umum and MCK-Keluarga)
 - desludging service
 - septage treatment
 - c. Present combined drainage system and problems
- 2-3 Pilot projects carried out by GOI on innovative on-site and low cost off-site systems and their results:
- a. UASB
 - b. Johkasoos
 - c. Small bore sewer
 - d. Shallow sewer
 - e. Interceptor sewer
 - f. Others
- 2-4 Model facilities in Indonesia and their basic parameters such as area requirement, investment cost, O&M cost, pollutant removal efficiency, etc.:
- a. Oxidation pond
 - b. Septage treatment plant
 - c. Others
- 2-5 Industrial wastewater in KUP:
- a. Type and number of industries
 - b. Amount and characteristics of industrial wastewater
 - c. Present situation of industrial wastewater treatment
 - d. Laws, regulations, standards and guidelines concerning industrial wastewater (see 1-15 c.)

3. SOLID WASTE SUB-SECTOR

3-1 Present solid waste management system in KUP:

- a. Institutional set-up of Ujung Pandang municipal solid waste management system (especially the roles of Kotamadya, Kecamatan, Kelurahan, RT/RW, householders, private sector and their interrelations)
- b. Conditions and problems of present solid waste management system
 - generation of solid waste
 - composition of solid waste

- storage at source
 - collection of solid waste (method and service coverage)
 - street sweeping and public area cleansing
 - transfer station
 - transportation of solid waste
 - treatment of solid waste (composting, incineration, etc.)
 - disposal of solid waste
 - resource recovery including the activities of scavengers
 - inventory of equipment (type, capacity, year of fabrication, number, condition, etc.)
 - inventory of landfills (e.g. name, location, size, land owner, operator, daily landfilling volume, year of beginning, remaining life, conditions, etc.)
 - personnel
 - financial condition and user charge system
- c. Inventory of candidate sites for future landfilling purpose
- d. Role of private contractors and privatization policy
- e. Local industries which produce or are going to produce collection vehicles, communal and/or household storage bins, brooms, pedestrian trash baskets, etc.
- f. Public health education and communal participation
- g. Relationship/partnership between Dinas Kebersihan and scavengers

3-2 Solid waste management by RT/RW:

- a. Role of RT/RW in municipal solid waste management
- b. Handcart collection system
- collection frequency
 - capacity of handcart
 - number of workers per handcart
 - number of trips per handcart per day
 - wage of workers
 - typical trip length
- c. Monetary contribution of households to RT/RW under the concept of solid waste collection

3-3 Model institutions of municipal solid waste management in Indonesia

- a. From institutional viewpoint
- enterprise
- b. From technical viewpoint
- sanitary landfill
 - incineration
 - composting
- c. From financial viewpoint
- user charge system
- d. From social viewpoint
- community participation
 - partnership with scavenger

(Thank you very much for your cooperation)

REPLY ON
QUESTIONNIRE ON THE MASTER PLAN AND
FEASIBILITY STUDY FOR ENVIRONMENTAL
SANITATION IN THE CITY OF UJUNG PANDANG
THE REPUBLIC INDONESIA

JAKARTA, 4 DECEMBER 1993

THE CURRENT STATUS AND FUTURE PROSPECT OF SEWAGE WORKS IN INDONESIA

I. INTRODUCTION

Indonesia's National Guidelines, known as "Garis-garis Besar Haluan Negara", formulates the improvement of housing and settlements as basic human needs, which eventually will lead to clean and healthy living environment.

In line with the development of settlements, sanitation infrastructures (in general) and human waste and wastewater infrastructure (in particular) have to be improved as well. Wastewater management is by far not a simple task, for improper handling of wastewater will surely cause environmental deterioration. An example that could be mentioned is the improper discharge of sullage or grey water into the storm drainage that will eventually end up in the rivers, thus polluting rivers. River water, as we know, is consumed by the dwellers living along the banks and it is also abstracted by the water treatment plants. Water treatment plants are designed to abstract and treat a certain volume and quality of raw water in order to produce potable water of certain acceptable quality which are to be distributed to the consumers, thus should a particular plant abstracts water from a heavily polluted river then it is almost certain that the plant could not produce water which is acceptable as potable water or water of recommended quality in accordance with the design criteria.

In Indonesia, provision of treated water has made a significant improvement to cater with the rapid population growth, especially in urban areas which have reached 5% (or more than twice the rate of the national population growth), and the development of industrial estates.

On the other hand, we should be aware that, the availability of supplied water is directly related to the volume of waste water produced, and facilities to accommodate the production of waste water have not been in compliance with the necessary needs.

Densely populated cities have suffered environmental degradation due to grey water (from bathing and washing) pollution from houses and commercial premises (such as shops, restaurants and hotels), and also illegal discharge of septic tank effluents or discharge of fresh black water into the drainage systems, caused by limited space and high groundwater table.

Deterioration of environmental conditions due to lack of sanitation facilities could create chronic and acute health impacts, which in turn could affect the tourism industries as well. Preliminary observations in several cities shows that wastewater has not been properly managed yet, shown by the overflowing of wastewater to the storm drainage. The importance and necessity to facilitate wastewater with proper facilities are that wastewater could pollute the beaches and coastal environment which surely will reduce tourist visits to the area.

II. TYPES OF WASTEWATER DISPOSAL IN INDONESIA

There are two types of practised disposal system in Indonesia, i.e. on-site disposal and off-site disposal. On-site disposal, using Septic Tanks and Leaching Pits, is commonly built and used in rural and urban areas, but this method is not suitable where groundwater table is high, low permeability of the soil and high population density. And most on-site disposal facilities treats only black water (toilet waste), whereas the grey water continues to pollute the receiving waters.

Off-site disposal method which consists of a sewerage network and its treatment facility (prior to disposal to any receiving water) is more appropriate for urban areas and especially for areas of tourism potentialities. Off-site disposal method is the ultimate means of reducing pollution caused by domestic and commercial wastewater, and also industrial effluents as well (after pre-treatment to remove its hazardous constituents). A sewerage could adopt a combined (with storm drainage flow) system or a separate system (which conveys wastewater only). A combination of the two systems mentioned is available using a system which is called Connection of Sewerage and Drainage (CSD) in the Tangerang Sewerage Pilot Project area.

During the period of 1920 - 1940, the Dutch Government in Indonesia had already constructed sewerage networks for the cities of Bandung, Yogyakarta, Surakarta, Cirebon, and Medan. Sewerage systems constructed in this period use high amounts of flushing water to dilute the entering pollution load, for treatment facilities, if any, only treats a small portion of the conveyed sewage (as a demonstration facility) while the remaining flow is discharged into the nearby rivers or rice fields. The most advanced sewerage system was built in Bandung, which uses Imhoff Tank and lagoon as sewage treatment plant. Most of the sewerage networks and the treatment plants have to and will be rehabilitated, restored, and developed.

II. Sewerage

2.1. Population Coverage and Treatment Process

Since REPELITA IV, new developments and rehabilitations of conventional sewerage systems have taken place in several major cities, i.e. Medan, Bandung, Jakarta, Tangerang and Cirebon. Sewage treatment method for these systems uses biological treatment processes. Modified Activated Sludge process (Carrousel) is used in Tangerang, while others use Aerated Lagoons or Stabilization ponds. At present, Low Cost Sewerage Systems are also being taken into serious considerations such as Shallow Sewer in the town of Soreang which is being implemented.

2.1.1. Sewerage Development in Jakarta

Implementation of sewerage scheme started upon the completion of the Sewerage Master Plan for the City of Jakarta which was prepared in 1977. Following the Master Plan, a Feasibility Study was prepared for the area of Gambir and Setiabudi, and Detailed Engineering Design was prepared for Setiabudi area which is known as Jakarta Sewerage and Sanitation Project (JSSP).

A sewerage development project of pilot scale is on-going in the JSSP area serving a total of 170,000 population equivalent, and this project will be completed in 1993. Treatment plants uses aerated lagoon in Setiabudi Pond which has a capacity of 28,000 m³/day. The length of sewers is about 46,000 m and will serve around 3,700 house connections.

2.1.2. Sewerage Development in Tangerang

Sewerage development in Tangerang is known as Botabek Sewerage and Drainage Project which started in 1980 with the preparation of a General Plan for Sewerage and Drainage for an area of about 1000 Ha in Tangerang. The length of sewers is about 20,000 m and the number of house connections is 1,800 units within the service area of 42 Ha. The sewerage and sewage treatment facilities can serve a number of 15,000 population in Sukasari and Babakan Ujung. Sukasari area adopts a conventional (separate) sewerage system, whereas Babakan Ujung uses a rudimentary (semi - combined) sewerage system using CSD-pits to collect dry-weather flow of the storm drainage into the sewerage.

An activated sludge process treatment plant, Carrousel type with the capacity of 240 m³/d, treats the incoming flow prior to discharging into the receiving stream.

2.1.3. Sewerage Development in Bandung

Between 1980 - 1985, under Bandung Urban Development Project (BUDP) I sewerage had been implemented in Eastern Bandung Catchment Area serving a population of 235,000 in 1,314 Ha serving area and a part of Western Bandung with about 15,000 population served in 220 Ha serving area. During the period of this project, collected sewage is discharged directly into the streams. For construction of its treatment plant will be provided in the BUDP II.

BUDP II was initialised in 1986 and it is planned to be completed in 1993, where in this period a treatment plant (stabilisation Ponds with a total area of 85 Ha) is going to be completed. At the end of the BUDP II, 129,600 m sewers is constructed and the population served is 600,000 people.

2.1.4. Sewerage Development in Medan.

In accordance with the Sewerage Master Plan which was prepared in 1980, sewerage development in the city will serve a total population of 573,000 in the year of 2000. Implementation will be divided into 3 stages of Medan Urban Development Project (MUDP). The MUDP I, finished in 1989, laid 54,000 m of sewers and served about 45,200 people. Then, the MUDP II continues the sewerage development which will serve about 110,000 people.

2.1.5. Sewerage Development in Cirebon

Cirebon is one of the cities in Indonesia which has a sewerage system and was built in the 1920's. The total length of this sewers is 18,000 meters serving a population of 34,000 in an area of 161 Ha.

Cirebon Urban Development Project (CUDP II & III) consists of rehabilitation of the existing sewerage, provision of treatment plant (Stabilization Ponds), and develop new sewerage area.

2.1.6. Sewerage Development in Yogyakarta

The sewerage in Yogyakarta was constructed in 1936 - 1938 and consists of reticulation network and flushing system network. It is separated from the storm drainage network and operated by gravity without any pumping. The average slope of the main sewers is only 0.5% (north-south direction), which makes it necessary to flush the pipe with river water. It has recently been rehabilitated since 1987 and functions reasonably well.

This sewerage system served around 8% of population (32,000 p.e.) with covered area about 717 Ha. Moreover, the number of domestic connections and non-domestic connection are respectively 5000 units and 1250 units.

Treatment of the collected sewage is almost absent. There is only a pilot sewage treatment plant (trickling filter) constructed in 1940, with design capacity at 10 liter/second.

3. Condition of polluted river/sea :

Mostly of rivers which is passing trough the city have been polluted by domestic wastewater and industrial wastewater.

The water quality for several cities was studied for example : Jakarta, Denpasar.

Based on these studies the result of wastewater quality is thown bellow see appendix 1.

4. Relation to the water supply development

Mostly of sewerage system as constructed by the central government of Indonesia in several cities is selected based on water supply development.

5. Administration

Decentralization

For design and capital cost are issued from central government and local government has responsibility for land aquisition, O&M, institutional development.

For designing and capital cost are issued by the Central Government and the local government has responsibility

- Finance for sewerage construction will be borne by donor countries (IBRD, OECF, ADB).

- Tariff system is developed by local regulation / perda, and in several cities is combined with water bill.

Main Policy :

I. Review of Repelita V

a. Since the first fiscal year of Repelita V in 1989-1990, Sanitation project have been implemented in all provinces of Indonesia.

The target of Repelita V :

- 200 cities
- 5000 villages

Up to the end of Repelita V the total coverage cities and villages are :

- 265 cities
- 5400 villages

These project are financed through :

- Donor Agencies (OECF, IBRD, ADB)
- GOI finance

b. Actual achievement 1989-1990 ~ 1992/1993

| Name of Project | Facilities | | | |
|---|--|--|--|--|
| | 1989-1990 | 1990-1991 | 1991-1992 | 1992-1993 |
| Environmental Sanitation Project in 27 Provinces. | - Family latrine - Communal latrine | - Family latrine - Communal latrine | - Family latrine - Communal latrine | - Family latrine - Communal latrine |

c. Reason of difference between plan and result

| Plan | Result | Reason |
|---------------|--------|---|
| - 200 cities | 265 | Cities and Villages also financed through local government via IUIDP. |
| - 5000 cities | 5.400 | |

d. No revised plan for Repelita V.

2. Repelita VI (Sewerage)

a. Orientation, main objective and targets of Repelita VI.

Repelita VI is under preparation for the time being, and would be same case to sewerage sector.

In anticipation to the request of OECF mission same draft of polycies in sewerage sector will be given bellow :

I. General Target :

- To increase of environmental health
- To save and guard the invenstment of facilities
- To protect natural resorces

II. Long term Targets (PJPT) :

To increase level of services through knowledge, technical managemnet and technical supervision for wastewater facilities up to 90% of population in Indonesia where sanitation facilities is reached.

III. Short Term Targets (Repelita VI).

To increase ;eve; of services of sanitation in urban area from 50% up to 75% covered population and rural area from 40% up to 60% of population.

The indicator for reaching of these targets will be detected through decrease of infections disease infected by wastewater contamination.

b. Concrete Target of Wastewater Disposal for Repelita VI.

- Metropolitan : 7 cities
- Big cities : 13 cities
- Medium cities : 49 cities
- Small cities : 157 cities
- Rural areas : 5000 villages

Packages program consist of :

- Sewerage package : 47 cities
- Interceptor : 47 cities
- Wastewater treatment : 47 cities
- River clean program : 10 cities
- : 38 module

- sludge treatment : 104 cities
- 111 module
- Public toilet : 257
- 3252 module
- Rural module : 5000 village
- 5000 module

Total Budget : Rp 1.160.961.000.000

- Local Government : Rp 281.974.750.000 (24.29%)
- Central Government : Rp 878.968.240.000 (75.71%)
(Loan, grant, Technical assistance).

2. Sanitation :

a. Population coverage in Indonesia

a.1. Current status with historical data from the end of Repelita IV.

Based on National Strategic for human waste and wastewater disposal, total coverage of sanitation in urban areas is 37,8 %.

b. Population coverage in urban and rural area.

b.1. Current Status :

Urban areas : 50 %
Rural areas : 40 %

b.2. Reason of difference

c. Current condition of sanitation in major cities.

| No. | Name of cities | Current Condition of Sanitation | Remarks |
|-----|----------------|-------------------------------------|----------------------------------|
| 1. | Jakarta | Sanitation coverage : 61% on-site | |
| 2. | Surabaya | Sanitation coverage : 92% on-site | |
| 3. | Medan | Sanitation coverage : 45% on-site | |
| 4. | Ujung Pandang | Sanitation coverage : 40,5% on-site | |
| 5. | Yogyakarta | Sanitation coverage : 40% on-site | |
| 6. | Semarang | Sanitation coverage : 51% on-site | |
| 7. | Bandung | Sanitation coverage : 65% on-site | |
| 8. | Denpasar | Sanitation coverage : 70,1% on-site | Some hotel have sewerage system. |

d. Please see Appendix 1

e. Please see Appendix 1

Administrative Organization and Maintenance system in Sanitation Sector.

- a. In big cities, the Dinas PU Kotamadya and Department takes responsibility for wastewater disposal, but for some cities where sewerage system has already established new organization was set up. For other cities sewerage management under water supply enterprise.
- b. It is not so simple for re arrangement of local government organization. To change the Dinas in local government shall be agreed by Ministry of Home affairs.

Present Condition of sewerage system

Name of city : DKI Jakarta

1. Service area : 2010 Ha
2. served population : 170.000
3. Direct house connection : 3.681
4. Total sewer length (km) : 46.000 m
5. Wastewater regulation : Local Government Company
6. Wastewater treatment capacity : 395 (lps) = 34.128 m³/day

- Name and location : Setiabudi
- Daily wastewater flow : 28.000 m³/day
- Domestic wastewater flow :
- Pollution equivalents : -
- Industrial wastewater flow : 60 cu.m³/ha - day
7. Type of treatment plant : Aerated lagoon
 8. Treatment method : Biological process
 9. Sludge treatment process : Drying bed
 10. Industrial wastewater regulation
 11. Treatment method of industrial wastewater
 12. Water borne disease
 13. Water pollution of river, sea and ground water
- BOD = 60 mg/l. or less
- SS =

Present Condition of Sewerage System.

Name of city : Cirebon

1. Service area : 161 ha.
2. Served population : 34.000
3. Direct house connection : 6.000 HC
4. Total sewer length (km) : 18.000 m
5. Wastewater regulation : Part of the PDAM
6. Wastewater treatment capacity : 3.000 m³/day
 - Name and location : Ade Irma Stabilization Pond,
Center of the city
 - Daily wastewater flow : 3.000 m³/day
 - Domestic wastewater flow :
 - Pollution equivalents : 300 kg/day BOD₅
 - Industrial wastewater flow : 0
7. Type of treatment plant : Stabilization pond
8. Treatment method : Biological process
9. Sludge treatment process : Drying bed
10. Industrial wastewater equiv. : -
11. Treatment method of industrial
wastewater : -
12. Water borne disease

Present Condition of Sewerage System

Name of city : Yogyakarta

1. Service area : 717 ha.
 2. Served population : (32.000 p.e.)
 3. Direct house connection : 6.250 unit
 4. Total sewer length (km) : -
 5. Wastewater regulation : -
 6. Wastewater treatment capacity : 870 m³/day
- Name and location : Batul Aerated Lagoon
- Daily wastewater flow :
- Domestic wastewater flow :
- Pollution equivalents : -
- Industrial wastewater flow : -
7. Type of treatment plant : Aerated Lagoon
 8. Treatment method : Biological process
 9. Sludge treatment process : Drying bed
 10. Industrial wastewater equiv. : -
 11. Treatment method of industrial wastewater : -
 12. Water borne disease : -

Present Condition of Sewerage System

Name of city : Medan

1. Service area : -
 2. Served population : 155.000
 3. Direct house connection : 14.000
 4. Total sewer length (km) : 75.000 m
 5. Wastewater regulation : Part of the PDAM
 6. Wastewater treatment capacity : 16.000 m³/day
- Name and location : Mean Stabilization pond
- Daily wastewater flow : 11.170 m³/day
- Domestic wastewater flow : 8.910 m³/day
- Pollution equivalents : -
- Industrial wastewater flow : 2.260 m³/day (including the commercial area)
7. Type of treatment plant : Aerated Lagoon or Stabilization Pond
 8. Treatment method : Biological process
 9. Sludge treatment process : Drying bed
 10. Industrial wastewater equiv. : -
 11. Treatment method of industrial wastewater : -
 12. Water borne disease : -

Present Condition of Sewerage System

Name of city : Tangerang

- | | | |
|---|---|--|
| 1. Service area | : | 42 ha. |
| 2. Served population | : | 15.000 |
| 3. Direct house connection | : | 9.700 |
| 4. Total sewer length (km) | : | 20.000 m |
| 5. Wastewater regulation | : | Part of the PDAM Tangerang |
| 6. Wastewater treatment capacity | : | 2.250 m ³ /day |
| Name and location | : | Sukasari and Babakan Ujung dan Karawaci Baru |
| Daily wastewater flow | : | 1.650 m ³ /day |
| Domestic wastewater flow | : | |
| Pollution equivalents | : | - |
| Industrial wastewater flow | : | - |
| 7. Type of treatment plant | : | Oxidation ditch (carrousel) |
| 8. Treatment method | : | Biological process |
| 9. Sludge treatment process | : | Drying bed |
| 10. Industrial wastewater equiv. | : | - |
| 11. Treatment method of industrial wastewater | : | - |
| 12. Water borne disease | : | - |

Present Condition of Sewerage System

Name of city : Bandung

- | | | |
|--|---|----------------------------|
| 1. Service area | : | 1.314 ha. |
| 2. Served population | : | 570.000 person |
| 3. Direct house connection | : | |
| 4. Total sewer length (km) | : | 129.000 m |
| 5. Wastewater regulation | : | |
| 6. Wastewater treatment capacity | : | 70.000 m ³ /day |
| | | |
| Name and location | : | Bojongsoang Pond |
| Daily wastewater flow | : | 21.427 m ³ /day |
| Domestic wastewater flow | : | - |
| Pollution equivalents | : | - |
| Industrial wastewater flow | : | - |
| | | |
| 7. Type of treatment plant | : | Stabilization Pond |
| 8. Treatment method | : | Biological process |
| 9. Sludge treatment process | : | Drying bed |
| 10. Industrial wastewater equiv. | : | - |
| 11. Treatment method of industrial wastewater | : | - |
| 12. Water borne disease | : | - |

1. STUDY AREA

2.1. Topographic Figures

Ujung Pandang is the capital city of south Sulawesi Province, located between $119^{\circ}18'79''$ - $119^{\circ}32'31.03''$ Latitude east and $5^{\circ}3'30.18''$ - $5^{\circ}14'6.49''$ longitudinal south.

The recent status of the city is Kotamadya (Local Government Level II) consist of 11 districts (Kecamatan) and further divided into 62 Subdistricts (Kelurahan) with total area of 18,551 ha.

The administrative boundaries of Kecamatan (district) and Kelurahan are shown in fig. 1.

The land of Ujung Pandang in western area inclines toward west to eastern part from the elevation of 0 - 5 meters along of 20 km and flat area from south to east. In the eastern part elevation between 5 - 25 m above sea level.

In the low land area there are some areas where elevation below sea level, so this area suffer from flooding and formed to be swampy area (Figure 3).

2.2. Natural Condition

Average rainfall of study area is estimated to be 706 mm of where rain fall in January and February more than 50%. The driest month in August and September. Temperature vary between 22°C - 32°C and humidity is 72 - 89 %.

Table 2.2. Average Rainfall in Ujung Pandang

| MONTH | Average Rainfall in the last 5 years | | | | | | AVERAGE |
|-----------|--------------------------------------|------|------|------|------|------|---------|
| | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | |
| January | 415 | 883 | 879 | 471 | 765 | 826 | 706 |
| February | 326 | 445 | 402 | 927 | 655 | 225 | 509 |
| March | 451 | 479 | 304 | 496 | 248 | 250 | 366 |
| April | 201 | 208 | 108 | 156 | 380 | 100 | 193 |
| May | 105 | 29 | 69 | 129 | 70 | 227 | 103 |
| June | 60 | 50 | 18 | 23 | 102 | 19 | 43 |
| July | 50 | 41 | 0 | 5 | 49 | 8 | 28 |
| August | 7 | 6 | 3 | 67 | 45 | 4 | 20 |
| September | 8 | 17 | 0 | 93 | 11 | 3 | 22 |
| October | 17 | 90 | 18 | 93 | 65 | * | 56 |
| November | 320 | 240 | 90 | 428 | 170 | * | 249 |
| December | 264 | 213 | 1217 | 812 | 436 | * | 293 |

Source : Agency for Meteorology and Geophysical, Panaikang Station (Ujung Pandang)

Table 2.3. Average Rainy day in Ujung Pandang

| MONTH | Average Rainfall in the last 5 years | | | | | | AVERAGE |
|-----------|--------------------------------------|------|------|------|------|------|---------|
| | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | |
| January | 19 | 26 | 39 | 22 | 24 | 24 | 24 |
| February | 18 | 23 | 25 | 21 | 26 | 19 | 22 |
| March | 17 | 23 | 18 | 20 | 18 | 18 | 19 |
| April | 13 | 14 | 11 | 12 | 22 | 12 | 14 |
| May | 10 | 5 | 12 | 14 | 7 | 19 | 13 |
| June | 7 | 7 | 4 | 8 | 12 | 3 | 7 |
| July | 7 | 6 | 0 | 8 | 12 | 5 | 6 |
| August | 2 | 1 | 1 | 8 | 4 | 2 | 3 |
| September | 1 | 1 | 0 | 11 | 3 | 3 | 4 |
| October | 6 | 15 | 1 | 13 | 10 | * | 9 |
| November | 20 | 19 | 15 | 22 | 18 | * | 19 |
| December | 21 | 20 | 25 | 27 | 20 | * | 23 |

Source : Agency for Meteorology and Geophysical, Panaikang Station (Ujung Pandang)

The City of Ujung Pandang is drained by two rivers : Jenebrang, Tallo and other small rivers. Jenebrang river passes Kabupaten Gowa and terminated in the southern part of Ujung Pandang.

Debit of Jenebrang River is 1 - 2 m³ / sec and Tallo river is 125-200 m³/sec.

2.3. Population and land Use

The study area covering approximately 18511 ha consist of eleven (11) districts and further is divided into 62 sub districts (Kelurahan).

The administrative boundaries of Kecamatan and Kelurahan / desa of the study area are shown in fig. 1.

The study area has been undergoing a rapid population increase in the recent year. It has increased from 559.853 in 1971 to 908.565 in 1980 and 1990 are : 943.342.

The total number of population of each kecamatan is shown in table 2.

Growth rate of 2,16% per annum as stated in IUIDP concept is adopted and used for projection of population.

Population the city of Ujung Pandang is distribute regionally in 11 districts with different density pattern. The minimum density is found in districts of Biringkanya of 9 person / ha and maximum density is found in districts of Maniajang (302 person / ha).

Based on projection of population in 2010, districts of Biringkaraya will reach population density of 14 person / ha.

Districts Maniajang will be 449 person / ha.

The existing land use pattern of study area is show in table 2.4.

Table 2.4. Land Use pattern 1984.

| NO. | ITEMS | AREA | % |
|-----|-------------------------------|---------|------|
| 1. | Settlement | 2,512.5 | 13.9 |
| 2. | Trade | 333.8 | 1.8 |
| 3. | Industry | 87.9 | 0.5 |
| 4. | Institutions | | |
| | - Government | 165.4 | 0.9 |
| | - Education | 87.9 | 0.5 |
| | - Health | 17.6 | 0.1 |
| | - Social / Public | 123.0 | 0.7 |
| | - Cemetery | 87.9 | 0.5 |
| | - Store | 35.5 | 0.2 |
| | - Open Space | 105.3 | 0.3 |
| | - Road | 245.9 | 0.6 |
| | | | 1.4 |
| 5. | Agriculture | | |
| | - Paddy field / garden | 6,150.0 | 34.1 |
| | - Fishery | 2,020.6 | 11.2 |
| | - Forest | 448.8 | 2.5 |
| | - Swamp | 1,563.7 | 8.7 |
| | - River | 775.5 | 4.2 |
| 6. | Undevelop. area | 1,212.3 | 6.7 |
| 7. | Other | 2,044.4 | 11.3 |
| | KMUP (Kotamadya Ujung Pandang | 18,551 | 100 |

Source : - Master Plan City 1984
 - IUIDP Urban Investment Program Part I 1990

2.4. Economy Capability

Gross Regional Domestic Product of Ujung Pandang can be summarized below.

GRDP (Rp. billion)

| YEAR | VACIDITY RATE | CONSTANT RATE | AVERAGE ANNUAL GROWTH RATE (%) |
|---------|---------------|---------------|--------------------------------|
| 1984 | 366.42 | 253.74 | 5.35 |
| 1985 | 441.84 | 376.24 | 6.36 |
| 1986 | 511.13 | 403.49 | 7.24 |
| 1987 | 568.78 | 425.62 | 5.48 |
| 1988 | 649.59 | 454.19 | 6.71 |
| Average | | | 6.23 |

Table 2.9.

GRDP of Each District of Ujung Pandang

| DISTRICTS | GRDP | PERCENTAGE OF TOTAL | RANK |
|------------------|------------|---------------------|------|
| (1) | (2) | (3) | (4) |
| 1. Mariso | 29.235,45 | 4,50 | 10 |
| 2. Mamajang | 22.465,14 | 3,46 | 11 |
| 3. Makassar | 42.319,55 | 6,51 | 8 |
| 4. Ujung Pandang | 144.957,66 | 22,31 | 1 |
| 5. Wajo | 111.123,36 | 17,11 | 2 |
| 6. Bontoalla | 49.279,76 | 7,59 | 6 |
| 7. Tallo | 58.612,01 | 9,02 | 4 |
| 8. Ujung Tanah | 51.959,00 | 8,00 | 5 |
| 9. Panakkukang | 46.970,85 | 7,23 | 7 |
| 10. Tamalate | 62.157,27 | 9,57 | 3 |
| 11. Biringkanaya | 30.543,37 | 4,70 | 9 |
| | 549.589,42 | 100,00 | |

Source : Statistic Office of Kodya Ujung Pandang

Income Percapita of each District, 1988

| DISTRICTS | GRDP | PERCENTAGE OF TOTAL | RANK |
|---------------------|-----------|------------------------|------|
| (1) | (2) | (3) | (4) |
| 1. Mariso | 419.784 | 71,82 | 7 |
| 2. Mamajang | 228.575 | 49,37 | 11 |
| 3. Makassar | 347.477 | 59,45 | 8 |
| 4. Ujung Pandang | 2.330.744 | 398,78 | 1 |
| 5. Wajo | 1.619.331 | 277,06 | 2 |
| 6. Bontoalla | 550.773 | 94,23 | 4 |
| 7. Tallo | 466.956 | 79,89 | 6 |
| 8. Ujung Tanah | 814.427 | 139,34 | 3 |
| 9. Panakkukang | 336.086 | 57,50 | 9 |
| 10. Tamalate | 288.746 | 49,40 | 10 |
| 11. Biringkanaya | 499.912 | 85,53 | 5 |
| Kodya Ujung Pandang | 584.474 | 100,00 | X |

2.5. Drainage System.

Drainage system in Ujung Pandang is served by three (3) rivers namely :

- Jenebrang
- Tallo
- Pampang

Flooded area is usually happen in Ujung Pandang caused by several reasons :

- Heavy rainfall
- Lack of drainage capacity
- Heavy flows of Tallo and Jenebrang rivers.

Normally flooding only 3 days with depth between 0.6 M to 1 meter.

From the point of view of river water quality , it was done some tests in order to obtain figures of water quality of drains in several areas.

Below is the result of the test.

| NO. | LOCATION | POPULATION DENSITY (PERSON/HA) | BOD VALUE (Mg/L) |
|-----|--|--------------------------------|------------------|
| 1. | Perumnas Panaikang (Low cost housing area) | 32 | 70 |
| 2. | Panampu drain | 327 | 97 |
| 3. | Bontoranmu drain | 267 | 75 |
| 4. | Mangkura drain | 231 | 95 |
| 5. | Ahmad Yani Street | 222 | 122 |
| 6. | Malimongan Tua drain | 264 | 122 |
| 7. | Rappo Jawa drain | 254 | 122 |

2.6. Water Supply System

Consumption of water for daily purposes is served by three (3) water treatment.

| <u>Treatment</u> | <u>Capacity</u> |
|------------------|-----------------|
| Ratulangi | 50 L/sec |
| Panaikang | 1100 L/sec |
| Antang | 20 L/sec |
| Total | 1170 L/sec |

The source for raw water is taken from :

- Jenebrang river. Total length of the Jenebrang river is 75km with catchment area of 727 km²
- Maros river. Total length of the Maros river is 80 km with catchment area of 650 km².

The house connections of water supply is summerized below.

| <u>Items</u> | <u>Total Connections</u> |
|---------------------------|--------------------------|
| Household | 30.958 |
| Commercial (shops) | 312 |
| Canteen/Small shop | 3.285 |
| Non commercial activities | 465 |
| Private hospital | 18 |
| Public service | 1.262 |
| Special connection | 17 |
| | ----- |
| Total | 36.317 |

Besides direct connection, it was also developed other services :

| | |
|-------------------|---------|
| Water Tank | 60 unit |
| Public Hydrant | 95 unit |
| Mobile Water Tank | 13 unit |

Level of services for water supply by introducing those systems is 46% of total population of Ujung Pandang, and organized by PDAM (Water Supply Enterprise).

Existing Sanitation Facilities

The existing domestic wastewater disposals in the city of Ujung pandang are utilized the on site systems to treat toilet waste only, while the grey water water originating from wash, bath, cooking and laundry is either disposal / discharged to drains/canals / rivers without treatment or infiltrated into underground by using separate suale pit or suakaway. Sewerage system has not developed yet in Ujung Pandang.

The city generally in poor condition from the point of view sanitation and health degree also low. The area with poor condition of sanitation will develop to slum area with very densily population.
Below is table of Existing sanitation system for Ujung Pandang.

| NO. | FACILITIES | NUMBER | PERCENTAGE (%) |
|-----|-----------------------|--------|----------------|
| 1. | Private Toilet | | |
| | - Pit Latrine | 6511 | 5,4 |
| | - Pour Flush | 6889 | 5,7 |
| | - Water closet | 78649 | 65,3 |
| 2. | Public Toilet | | |
| | - MCK | 4929 | 4,1 |
| | - Family Latrine | 13130 | 10,9 |
| 3. | No Facilities (Other) | 10388 | 15 |
| | Total | 120496 | 100 |

Desludging and Treatment.

Cleansing Department of Walikotaamadya Ujung Pandang provides desludging and its subsequent transportation and disposal of leaching pit / septic tank sludge utilizing vacuum trucks and disposed to neght soil treatment located in Kelurahan Angtang Kecamatan Panakkukang, 15 km from the city (figures 2.15) the system is consist of anaerobic pond, fakultatif pond, mid aerated logoon and sludge drying bed.

The people has to pay of Rp. 15.000 of each septic tank, based on Local Regulation (PERDA) NO. 3/1990.

Cleansing Department has 2 vacuum truck with capacity of 2,5 m³ and another 2 vacum trucks has capacity of 3 mPt3Pt.

If each person will generate sludge 40L/C/year and septic tank shall be emptied every 3 years and the save factor is 2,0; so desludging rate will 0,88 m³/capita/year.

The total volume to be desludged every year become : 44183 m³/year or 147 m³/day.

By using the 4 trucks and capability of truck to operate is 3 times/day, then total volume of sludge to treatment is 33 m³/day.

CHAPTER III

Criteria Design for Technology Option.

3.1. Water borne disease

Population density in Ujung Pandang for several areas has reached 572 person/ha. Based on questionnaire data, water borne disease is found in Kecamatan Ujung Tanah and Kecamatan Pattinjalang and the most water borne diseases happened is : diarrhoe.

Figure 4.5. shown percentage of water borne disease.

3.2. Soil Permeability.

The soil condition in the study area is classified into 2 groups in terms of its infiltration capacity based on the sampling survey as shown in fig. 4.6.

3.3. Ground Water table

Ground water table depth, in the study area is shown in fig. 4.7.

3.4. Desludging and Treatment.

The total quantity of desludging of the on site sanitation system in the year 2010 is estimated to be 65.775 m³/year or 180 m³/day.

A sludge treatment plant already constructed by local government and seems to meet the estimated future desludging quantity. Hence no additional sludge treatment plants are required.

COMMITTEE FOR THE MASTER PLAN AND FEASIBILITY STUDY FOR
ENVIRONMENTAL SANITATION IN THE CITY OF UJUNG PANDANG

1. STEERING COMMITTEE

- Chairman : Director General of Human Settlements
- Vice Chairman : Head of Bappeda of South Sulawesi Province
- Secretaries : - Director of Environmental Sanitation
: - Head of Public Works Office for South Sulawesi
- Members : 1. Head of Technical Foreign Cooperation Bureau - Ministry of Public Works.
2. Head of P4L Bureau, BAPPENAS
3. Director of Foreign Fund Ministry of Finance
4. Director of Planning Development, DGHS
5. Director of Water Supply, DGHS
6. Head of Public Works of South Sulawesi Province
7. Major of Kotamadya Ujung Pandang

2. TECHNICAL COMMITTEE :

- Chairman : Director of Environmental Sanitation
- Vice Chairman : Head of Public Works for Kotamadya Ujung Pandang
- Secretaries : - Head of Sub Directorate of Human Waste and Wastewater Disposal.
: - Head of Sub Dinas Cipta Karya

- Members

1. Head of Sub Directorate fo Solid Waste
2. Head of Sub Directorate of Foreign Aid Administration, Directorate of Planning Development
3. Head of Sub Directorate Preparation of Project Evaluation, Directorate of Planning Development
4. Head of Sub Directorate of Technical Planning Drectorate of Water Supply
5. Director of Water Supply Enterprise, Kodya Ujung Pandang
6. Head of Infrastructur Development, BAPPEDA Kotamadya Ujung Pandang
7. Project Manager of Environmental Sanitation for the South Sulawesi Province

3. SOLID WASTE MANAGEMENT SECTOR

3-1. Present SWM condition in KUP (Kotamadya U. Pandang)
(summarized from IUIDP report for KUP 1990 and ADIPURA
questionnaire 1993)

a. Institutional set up for KUP :

- * KUP Cleansing Department has responsible to transport waste from TPS (temporary disposal site) to TPA (final disposal site).
- * Based on SK No. 3311/1993, Kelurahan (RT/RW) collect waste by using handcart to TPS.
- * Householders discharge their waste to bin container.
- * There is no private sector involvement.

b. Condition and problems of present SWM :

- * generation of waste : 2.95 l/inh/day.
- * composition of waste :

| No. | Component | % |
|---------|-----------|-------|
| 1. | Organic | 86,1 |
| 2. | Paper | 2,8 |
| 3. | Glass | 1,6 |
| 4. | Plastic | 4,3 |
| 5. | Metal | 3,3 |
| 6. | Wood | 0,1 |
| 7. | Cloth | 0,6 |
| 8. | Rubber | 0,4 |
| 9. | Others | 8,0 |
| Total : | | 100,0 |

source : researched by IUIDP and UNHAS, 1991

- * storage at source :

many kinds of storage are used, such as : plastic

bin, concrete box, old drums, etc. variation of storage types reduce collection efficiency.

* **collection :**

Level of services is about 46 %, especially in commercial area and high and middle income community. Collection is done door to door by using 1 m³ handcart. People living in unserved area dispose their waste to the river, drainage canal or discharge on empty land in the neighbourhood.

* **street sweeping and public area cleansing :**

Street sweeping is done by cleansing department by using brooms and forks; and some of public area (drainage canal, ditch) is served by public works department by using grass cutting machine. Coordination between both institutions is necessary.

* **Transfer station :**

No transfer station was operated in KUP.

* **Transportation :**

The amount of waste transported in KUP is about 80 m³ by using 79 units truck and mini truck/pick up which cover 37 kelurahans from totally 62 kelurahan in KUP. Especially for market waste is transported by 3 dumptruck and 1 pick up owned by UPTD Pasar dan Terminal. The main problems in transportation system are insufficient capacity of facilities and incomplete equipment maintenance program.

* **Treatment of solid waste :**

No incineration or composting activities have been done in KUP.

* **Disposal :**

Final disposal site used at present is in Kassi-Kassi, Kelurahan Tamangapa, Kecamatan Pannakkukang,

13 km from city center with total area about 10 Ha. The method of disposal applied is controlled landfill. It means the waste will be covered by cover material after 3 or 4 days operation. The final disposal is operated after Cleansing department closed old final disposal at Tanjung Bunga, Kelurahan Macini Sombala which is used since October 1989. The equipment are 2 loaders and bulldozers.

* **Resource Recovery :**

Paper and Metal are collected by scavenger in Kassi Kassi and Tanjung Bunga Disposal site. About 0.0 % from total waste collected are resource recovery material which is sold to dealer by scavenger.

* **Inventory of equipment :**

| No. | Type | Cap. | Quant. | Year |
|---------|---------------|-------|--------|------|
| 1. | Armroll Truck | 10 m3 | 1 | 1970 |
| 2. | Open truck | 10 m3 | 2 | 1970 |
| 3. | Pick Up | 3 m3 | 26 | 1981 |
| 4. | Pick Up | 4 m3 | 10 | 1983 |
| 5. | Pick Up | 3 m3 | 8 | 1986 |
| 6. | Dump Truck | 10 m3 | 12 | 1985 |
| 7. | Dump Truck | 6 m3 | 20 | 1987 |
| Total : | | | 79 | |

* **Personnel :**

Skilled personnel of Cleansing Department are limited and qualification of personnel consist of

| No. | Item | Qualification | |
|-------|----------------|---------------|---------------|
| | | Technical | non-technical |
| 1. | Gol III/IV | 23 | 12 |
| 2. | Gol II | 119 | 25 |
| 3. | Gol I | 75 | 0 |
| 4. | Daily Employee | 0 | 576 |
| Total | | 217 | 613 |

* Financial condition and user charge system :

x Rp. million

| Year | APBD Total | SWM Budget | % |
|-------|------------|------------|-----|
| 90/91 | 36.362 | 1.746 | 4,5 |
| 91/92 | 45.993 | 1.950 | 4,2 |
| 92/93 | 60.439 | 3.144 | 5,2 |

User charge is collected by Kelurahan/LKMD and the percentage of collection fee compare to operational cost can be explain as follow :

x Rp. million

| Year | Revenues | Op. Cost | % |
|-------|----------|-----------|------|
| 90/91 | 209,845 | 691,088 | 30,4 |
| 91/92 | 304,094 | 742,783 | 40,9 |
| 92/93 | 377,772 | 1.282,826 | 29,4 |

Revenue in 92/93 is calculated until Dec. 1992.

The main problems in financial aspect are :

- Revenue collection is not proportional to the need of fund for capital investment and operational assets,
- insufficient priority of fund allocation for SW
- unclear target on tariff structure preparation.

c. Inventory of candidate sites for future landfill :

Not available, there is no long term planning in SWM.

d. Role of private contractor and privatization :

N/A.

e. Local industries which produce equipment :

| No. | Equipment | Company | Remark |
|-----|-------------------|----------------|----------|
| 1. | Collection Vehic. | NV. Haji Kalla | Supplier |
| 2. | Bin Container | NV. Haji Kalla | Supplier |
| 3. | Brooms | p.m. | |
| 4. | Trash Bin | p.m. | |

f. Public health education and community participation :

Compare to last year condition, community participation in KUP at present especially in low income community to make a clean environmental become better, both in participation in collecting and paying its collection fee, but good community development pattern is not yet available and the improvement program for community participation is still necessary.

g. Regulation between Cleansing dept. and scavenger :

Cleansing Department manages scavenger activities in final disposal.

3-2. SOLID WASTE MANAGEMENT BY RT/RW

a. Role of RT/RW in municipal SWM

RT/RW is responsible for collection waste from sources to temporary disposal site by using handcart.

b. Handcart collection system

- * Collection frequency : about 2-3 times weekly.
- * Capacity of handcart : 1 m³.
- * Number of workers per handcart : 2.
- * Number of trip : 2/handcart/day.
- * Wage of worker : Rp. 50.000/month.
- * Typical trip length : 600 - 1000 m.

c. Monetary contribution

About Rp. 2000 - Rp. 5000/household/month to RT,
including community security.

3-3. Model Institution of municipal SWM.

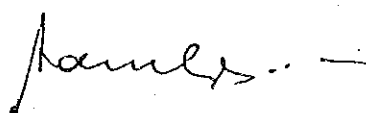
- a. Medan Cleansing Enterprise
- b. Section under Cleansing dept.
- c. Retribution Section under cleansing dept.
- d. LKMD, RT/RW and Mitra pasukan kuning.

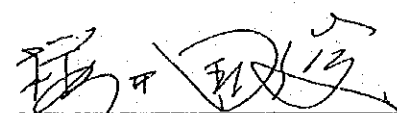
附属資料3. S/W

SCOPE OF WORK
FOR
THE MASTER PLAN AND FEASIBILITY STUDY
ON
WASTEWATER DISPOSAL AND SOLID WASTE MANAGEMENT
FOR
THE CITY OF UJUNG PANDANG,
THE REPUBLIC OF INDONESIA

AGREED UPON BETWEEN
DIRECTORATE GENERAL OF HUMAN SETTLEMENTS,
MINISTRY OF PUBLIC WORKS
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

JAKARTA,
DECEMBER 13, 1993


RACHMADI B. S.
DIRECTOR GENERAL OF
HUMAN SETTLEMENTS,
MINISTRY OF PUBLIC WORKS


KUNITOSHI SAKURAI
LEADER,
PREPARATORY STUDY TEAM,
JAPAN INTERNATIONAL
COOPERATION AGENCY

I. INTRODUCTION

In response to the request of the Government of the Republic of Indonesia (hereinafter referred to as "the Government of Indonesia"), the Government of Japan has decided to conduct a Master Plan and Feasibility Study on Wastewater Disposal and Solid Waste Management for the City of Ujung Pandang, the Republic of Indonesia (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programmes of the Government of Japan, will undertake the Study in close cooperation with the authorities concerned of the Government of Indonesia.

The present document sets forth the Scope of Work with regard to the Study.

II. OBJECTIVES OF THE STUDY

The objectives of the Study are the followings:

1. To formulate a master plan up to 2015 for the improvement of environmental sanitation of Ujung Pandang City (Phase I Study). This master plan will include two components, namely, a plan for wastewater sub-sector and a plan for solid waste sub-sector.
2. To conduct a feasibility study for the first priority project(s) based on the Master Plan (Phase II Study).

III. STUDY AREA

1. The Study area of the Phase I Study covers Ujung Pandang City. The area involved in Phase I Study is shown in Appendix 1.
2. The Study area of the Phase II Study will be selected based on the result of the Phase I Study.

IV. SCOPE OF THE STUDY

In order to achieve the objectives mentioned above, the

Study will cover the followings:

[Phase I]

1. Basic Study

(1) Collection and analysis of relevant data and information, review of previous studies and reconnaissance

[common items for both wastewater and solid waste sub-sectors]

- a) Data on natural conditions such as climate, topography, geology, etc.
- b) Hydrological, hydraulic and water quality conditions
- c) Social and economic conditions and statistics
- d) Population, population density and land use
- e) Health condition, waterborne diseases and other environmental damages
- f) Surface and ground water use
- g) National laws, regulations, policies and development plans related to the Study
- h) Urban planning for Ujung Pandang City
- i) Legislation and institutional aspects
- j) Community and private sector participation
- k) Financial conditions
- l) Review of existing studies and on-going projects related to the Study
- m) Present system
 - administration
 - institutional aspect
 - legal aspect
 - financial aspect

[related to wastewater sub-sector]

- a) Existing and future water supply system
- b) Existing and future urban drainage system
- c) Flood damages
- d) Present wastewater disposal system
 - toilet types
 - septage collection and its disposal

[related to solid waste sub-sector]

- a) Present solid waste management system
 - generation
 - discharge
 - collection and transfer
 - transportation and road traffic system
 - treatment and disposal
 - street sweeping
 - composting
 - recycling

(2) Field Surveys

[common surveys for both wastewater and solid waste sub-

sectors]

- a) Environmental survey
- b) Public consciousness survey

[related to wastewater sub-sector]

- a) Amount of wastewater and its composition
- b) Performance of existing facilities

[related to solid waste sub-sector]

- a) Amount of solid waste and its composition
- b) Time and motion study

- (3) Analysis of collected data and field surveys
 - a) Assessment of the present condition
 - b) Identification of the problems to be solved

2. Formulation of the Master Plan

- (1) Determination of planning framework
- (2) Determination of basic policies, goals, targets, and strategies
- (3) Preparation of the alternatives for the wastewater disposal and solid waste sub-sectors
- (4) Rough estimation of construction and operation and maintenance cost
- (5) Preparation of the Terms of Reference of "Analisa Dampak Lingkungan (Environmental Impact Analysis)" (hereinafter referred to as "ANDAL")
- (6) Evaluation of the alternatives from the viewpoint of public health, technology, society, economy, finance, institution and environment, and the selection of the best alternative
- (7) Organizational and institutional plan
- (8) Plan for community and private sector participation
- (9) Environmental education and promotion plan
- (10) Financial plan
- (11) Evaluation of the Master Plan
- (12) Implementation plan
- (13) Identification of the priority project(s)

3. Preparation of the Pilot Study

[Phase II]

4. Feasibility Study on the priority project(s)

- (1) Confirmation of the planning framework
 - a) Target year
 - b) Planning area
 - c) Service level
 - d) System components
- (2) Collection of supplemental data and detailed field investigations
- (3) Facility plan
 - a) Examination of alternatives
 - b) Preliminary design of facilities
 - c) Investigation of necessary equipment
- (4) Organization and management plan
- (5) Operation and maintenance plan
- (6) Cost estimation
- (7) Financial plan
- (8) Project evaluation
 - a) Financial analysis
 - b) Social and economic analysis
 - c) Institutional analysis
 - d) Environmental and Environmental sanitation analysis
- (9) ANDAL
- (10) Project implementation plan

5. Conduct of the Pilot Study

V. STUDY SCHEDULE

The Study will be carried out in accordance with the tentative work schedule attached herewith Appendix 2.

VI. REPORTS

JICA shall prepare and submit the following reports in English to the Government of Indonesia:

1. Inception Report
Fifty(50) copies within one (1) month after the commencement of the Study
2. Progress Report (1)
Fifty(50) copies within five (5) months after the commencement of the Study
3. Interim Report
Fifty(50) copies within eight (8) months after the commencement of the Study
4. Progress Report (2)
Fifty(50) copies within twelve (12) months after the commencement of the Study
5. Draft Final Report
Seventy(70) copies within sixteen (16) months after the commencement of the Study. The Government of Indonesia shall submit its comments to JICA within thirty(30) days after the receipt of the Draft Final Report
6. Final Report
Seventy(70) copies within two(2) months after JICA's receipt of the said comments on the Draft Final Report from the Government of Indonesia

VII. UNDERTAKING OF THE GOVERNMENT OF INDONESIA

1. To facilitate smooth conduct of the Study, the Government of Indonesia shall take necessary measures:
 - (1) to secure the safety of the Japanese Study Team (hereinafter referred to as "the Team"),
 - (2) to permit the members of the Team to enter, leave and stay in Indonesia for the duration of their assignment therein, and exempt them from foreign registration requirements and consular fees,
 - (3) to exempt the members of the Team from taxes, duties and other charges on equipment, machinery and other materials brought into Indonesia for the conduct of the Study,
 - (4) to exempt the members of the Team from income tax and charges of any kind imposed on or in connection with any emoluments or allowance paid to the members of the Team for their services in connection with the implementation of the Study,
 - (5) to provide necessary facilities to the Team for remittance as well as utilization of the funds introduced into

Indonesia from Japan in connection with the implementation of the Study,

(6) to secure permission for entry into private properties or restricted areas for the conduct of the Study,

(7) to secure permission for the Team to take all data and documents (including maps and photographs) related to the Study out of Indonesia to Japan, and

(8) to provide medical services as needed. Its expenses will be chargeable on the members of the Team.

2. The Government of Indonesia shall bear claims, if any arises against the members of the Team resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Team.

3. The Directorate General of Human Settlements, Ministry of Public Works (hereinafter referred to as "CIPTA KARYA") shall act as the counterpart agency to the Team and also as the coordinating body in relation with other relevant organizations for the smooth implementation of the Study.

4. CIPTA KARYA shall, at its own expense, provide the Team with the followings, in cooperation with other organizations concerned:

(1) available data and information related to the Study,

(2) counterpart personnel,

(3) suitable office space with necessary equipment in Ujung Pandang City,

(4) credentials or identification cards.

VIII. UNDERTAKING OF JICA

For the implementation of the Study, JICA shall take the following measures:

1. to dispatch, at its own expense, the Team to Indonesia, and

2. to pursue technology transfer to Indonesian counterpart personnel in the course of the Study.

IX. OTHERS

JICA and CIPTA KARYA shall consult with each other in respect of any matter that may arise from or in connection with the Study.

Appendix 2

TENTATIVE WORK SCHEDULE

| MONTH DESCRIPTION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---------------------|---------------------|-------|---|---|----------|-------|---|--------|---|----|----------------------|----------|----|----|----|--------|----|-------|
| WORK IN INDONESIA | | ----- | | | | | | | | | | | | | | | | |
| WORK IN JAPAN | | | | | | ----- | | | | | | | | | | | | |
| REPORT PRESENTATION | ▲ IC/R | | | | ▲ P/R(1) | | | ▲ IT/R | | | | ▲ P/R(2) | | | | ▲ DF/R | | ▲ F/R |
| STAGE OF THE STUDY | M/P (Phase I Study) | | | | | | | | | | F/S (Phase II Study) | | | | | | | |

NOTE: IC/R : Inception Report
P/R : Progress Report
IT/R : Interim Report
DF/R : Draft Final Report
F/R : Final Report

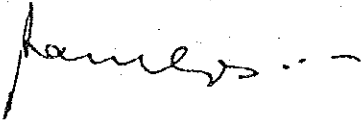
附属資料 4. M/M

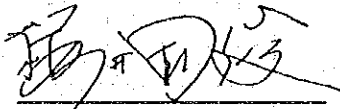
MINUTES OF MEETINGS
FOR
THE MASTER PLAN AND FEASIBILITY STUDY
ON
WASTEWATER DISPOSAL AND SOLID WASTE MANAGEMENT
FOR
THE CITY OF UJUNG PANDANG,
THE REPUBLIC OF INDONESIA

AGREED UPON BETWEEN
DIRECTORATE GENERAL OF HUMAN SETTLEMENTS
MINISTRY OF PUBLIC WORKS
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

JAKARTA.

DECEMBER 13, 1993


RACHMADI B. S.
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HUMAN SETTLEMENTS,
MINISTRY OF PUBLIC WORKS


KUNITOSHI SAKURAI
LEADER,
PREPARATORY STUDY TEAM,
JAPAN INTERNATIONAL
COOPERATION AGENCY

The Japan International Cooperation Agency (hereinafter referred to as "JICA"), at the official request of the Government of the Republic of Indonesia, dispatched a preparatory study team (hereinafter referred to as "the Preparatory Team") headed by Dr. Kunitoshi SAKURAI from December 5 to December 22, 1993 to discuss the Scope of Work for the Master Plan and Feasibility Study on Wastewater Disposal and Solid Waste Management for the City of Ujung Pandang, the Republic of Indonesia (hereinafter referred to as "the Study").

The Preparatory Team had a series of discussions with the Indonesian authorities concerned such as the Directorate General of Human Settlements, Ministry of Public Works (hereinafter referred to as CIPTA KARYA). The list of those who attended these discussion meetings is shown in the Annex. Both sides agreed on the Scope of Work for the Study.

This document sets forth the main items discussed.

1. Both the Preparatory Team and the Indonesian side agreed to change the name of the Study from "Master Plan and Feasibility Study for Environmental Sanitation (Human Waste & Water Disposal, and Solid Waste Management) for the City of Ujung Pandang" to "Master Plan and Feasibility Study on Wastewater Disposal and Solid Waste Management for the City of Ujung Pandang, the Republic of Indonesia". This change has been made based on the mutual understanding that the term "wastewater" includes both human waste and wastewater.
2. The Study Area for the Master Plan consists of the whole area under the jurisdiction of the City of Ujung Pandang. It shall include, however, sites for future wastewater treatment plant and sanitary landfill, and their environs, even in the case of their siting beyond the boundary of the City of Ujung Pandang. When the sanitary landfill site is located in a nearby local authority, the landfill shall be designed to accommodate not only the solid waste from Ujung Pandang but also that from the said local authority.
3. Both sides agreed that the target year of the Master Plan shall be 2015 and those of the Feasibility Study on wastewater sub-sector and solid waste sub-sector shall be 2005.

4. Both sides agreed that the type of wastewater to be studied is limited to the domestic sewage, commercial sewage and industrial wastewater which would not cause problems both qualitatively and quantitatively to wastewater facilities. As for the type of solid waste to be studied, it is limited to the municipal solid waste such as domestic waste, market waste and street sweeping waste. However, non-hazardous industrial and hospital waste shall be included in the Study.

5. The Indonesian side requested JICA to carry out the Study based on the following approach:

Conceptual development and preparation of the Master Plan regarding wastewater disposal and solid waste management shall be linked and integrated with drainage system/town flushing development in Ujung Pandang.

In the preparation of the Master Plan, the necessity and priority of each of drainage/flushing, wastewater disposal and solid waste management shall be studied and indicated.

In the Feasibility Study, the affordability to invest shall be taken into account.

- appropriate technology shall be applied if necessary.

- improvement shall be carried out in a stepwise manner in area dimension along with the Master Plan.

The Preparatory Team took note of the request.

6. As for the environmental evaluation of the priority project(s), firstly the Japanese Study Team (hereinafter referred to as "the Team") shall prepare in English "Kerangka Acuan(Terms of Reference)" (hereinafter referred as "KA") of "Analisa Dampak Lingkungan (Environmental Impact Analysis)" (hereinafter referred as "ANDAL") with full participation of the Indonesian side. Secondly, the Team shall carry out ANDAL together with the Indonesian side. Preparation of KA-ANDAL and ANDAL shall be done according to the Indonesian laws and guidelines. CIPTA KARYA shall take necessary procedure after the receipt of the result of KA-ANDAL and ANDAL.

7. Both sides agreed to conduct a pilot study consisting of the following

three components as a part of the Study.

- a) Communal system for wastewater management, i.e. septic tanks for the treatment of black/gray water from 10 families
- b) Communal container system for solid waste collection, i.e. containers located along roadside for the discharge of solid waste by nearby residents
- c) Health and environmental education to promote the residents' awareness, willingness to pay and communal participation

As for a), the ongoing project may be used for the pilot study within the Study timeframe.

8. The Indonesian side agreed to organize a steering committee and a technical committee to formulate the basic policy of the Study and to deal with technical matters, respectively. The committees shall be composed of the representatives of concerned agencies as follows:

a) Steering Committee

- | | |
|---------------|---|
| Chairman | : Director General of Human Settlements |
| Vice Chairman | : Head of BAPPEDA of South Sulawesi Province |
| Secretaries | : 1. Director of Environmental Sanitation : 2. Head of Public Works Office for South Sulawesi Province |
| Members | : 1. Head of Technical Foreign Cooperation Bureau Ministry of Public Works 2. Head of P4R Bureau, BAPPENAS 3. Director of Foreign Fund, Ministry of Finance 4. Director of Planning Development, DGHS 5. Director of Water Supply 6. Mayor Kotemadya Ujung Pandang 7. Director of Hazardous Waste Management, BAPPEDAL 8. Director of ROM, BPPT |

b) Technical Committee

- | | |
|----------|---|
| Chairman | : Director of Environmental Sanitation, PLP |
|----------|---|

- Vice Chairman : Head of Dinas PU CIPTA KARYA,
South Sulawesi Province
- Secretaries : 1. Head of BAPPEDA of Kotamadya Ujung Pandang
2. Head of Sub Directorate of Human Waste and
Wastewater Disposal, PLP
- Members : 1. Head of Sub Directorate of Solid Waste, PLP
2. Head of Sub Directorate of Foreign Aid
Administration, Directorate of Planning
Development, DGHS
3. Head of Sub Directorate Preparation of
Project Evaluation, Directorate of Planning
Development, DGHS
4. Head of Sub Directorate of Technical Plan-
ning Directorate of Water Supply, DGHS
5. Director of Water Supply Enterprise,
Kodya Ujung Pandang
6. Head of Public Works Department for
Kotamadya Ujung Pandang
7. Head of Cleansing Department,
Kotamadya Ujung Pandang
8. Head of Infrastructure Development, BAPPEDA
Kotamadya Ujung Pandang
9. Project Manager of Environmental Sanitation
for the South Sulawesi Province
10. Center for Environmental Study,
Hasanuddin University
11. JICA Expert in SWM
12. JICA Expert for Wastewater

9. The Preparatory Team requested the Indonesian side to prepare an office for the Team in Ujung Pandang. This office should be equipped with the following:

- a) Desks, chairs and air conditioners
- b) Telephone and facsimile

The Indonesian side accepted the request of the Preparatory Team.

10. The Preparatory Team requested the Indonesian side to appoint a counterpart team corresponding to the Team in order to execute the Study jointly and to achieve the effective technical transfer. The Indonesian side agreed to assign the necessary counterpart personnel for the Study. The Indonesian side requested the Preparatory Team to give training to counterpart personnel in Japan and hold a seminar in conjunction with the submission of the Draft Final Report. The Preparatory Team took note of the request.

11. The reports shall be prepared in English. Summaries of following reports shall be prepared also in Indonesian. In case any doubt arises in interpretation, the English version shall prevail.
 - a) Inception Report
 - b) Interim Report
 - c) Draft Final Report
 - d) Final Report

12. The sites for priority project(s), such as wastewater treatment plant and sanitary landfill, shall be determined by the Indonesian side by the time of submission of Interim Report.

13. For the smooth conduct of the Study, appropriate truck scale shall be installed at the entrance of the existing final disposal site, before the commencement of the first work in Indonesia stated in the Tentative Work Schedule of the Scope of Work. The procurement of the truck scale shall be carried out by JICA, while its installation and construction of the temporary site office with electricity shall be done by the Indonesian side.

List of Attendants

1. CIPTA KARYA

| | |
|---------------------|--|
| Mr. Djoko Kirmanto | Director of Program Development |
| Mr. Darmawan Saleh | Director of Environmental Sanitation |
| Mr. Suwarso | Head of Sub-Directorate of Foreign Aid Administration, BPCK |
| Mr. Jacob Ruzuar | Head of Sub-Directorate of Wastewater |
| Mr. Hidayat Kailani | Repr. of Sub-Directorate PEP, BPCK |
| Mr. Handi Legowo | Repr. of Sub-Directorate SWM |
| Mr. Dwityo Akoro | -ditto- |
| Mr. Maliki | Repr. of Sub-Directorate Wastewater |
| Mr. Rustam | -ditto- |
| Ms. Marina | Sub-Directorate PU, BPCK |
| Mr. Bambang Dumtoto | Sub-Directorate PEP, BPCK |
| Mr. Hamdi | Administration Division, PLP |
| Ms. Mulyani | Sub-Directorate TK II, DTKTD |
| Mr. Darminto | Bureau KLN |
| Mr. Amwazi Idrus | Sub-Directorate PUW, DTKTD |
| Mr. Rudi J. Utomo | Repr. of Sub-Directorate PEP, BPCK |

2. South Sulawesi Province

| | |
|-----------------------|--|
| Mr. Sayadi | Head of Physical and Infrastructure Division, BAPPEDA |
| Mr. Bonar Simanjuntak | Head of PLP Project |
| Mr. Eddy | PLP Project |

3. City of Ujung Pandang

| | |
|-------------------|--|
| Kol. Galib, SH | Acting Mayor (Vice Governor of South Sulawesi) |
| Mr. Bambang | Head of BAPPEDA |
| Mr. Andi Sommeng | Head of Cleaning Department |
| Mr. Marsin Sahibu | Cleansing Department |
| Mr. B. Nurkin | Center for Environmental Study, Hasanuddin University |

4. JICA Expert

Mr. Shinji Omori

JICA Expert on Sewerage Planning.

CIPTA KARYA

Mr. Akio Ishii

JICA Expert on Solid Waste Management.

CIPTA KARYA

5. JICA Preparatory Study Team

Dr. Kunitoshi Sakurai

University of Tokyo

Mr. Hisataka Sokawa

Japan Sewage Works Agency

Mr. Hisayuki Futami

Japan Environmental Sanitation Center

Mr. Masakazu Nakao

Japan Sewage Works Agency

Mr. Takao Watanabe

Japan Education Center of Environmental

Sanitation

Mr. Motoi Muraoka

JICA

Mr. Shin-ichi Osaka

Nippon Jogesuido Sekkei Co., Ltd.

附属資料5. 主要面会者リスト

日本大使館

| | |
|------|-------|
| 石川 浩 | 一等書記官 |
| 森口 裕 | 二等書記官 |

JICAインドネシア事務所

| | |
|--------|------|
| 岡崎 剛一郎 | 所長 |
| 山田 史子 | 担当職員 |

OECFジャカルタ駐在員事務所

| | |
|--------|-------|
| 玉石 鍊太郎 | 次席駐在員 |
|--------|-------|

世銀ジャカルタ事務所

| | |
|-------------------|-------|
| Mr. George Straya | Staff |
|-------------------|-------|

公共事業省人間居住総局 (CIPTA KARYA)

| | |
|---------------------|--|
| Mr. Rachmadi B. S. | Director General |
| Mr. Djoko Kirmanto | Director of Program Development |
| Mr. Darmawan Saleh | Director of Environmental Sanitation |
| Mr. Suwarso | Head of Sub-Directorate of Foreign Aid Administration, BPCK |
| Mr. Jacob Ruzuar | Head of Sub-Directorate of Wastewater |
| Mr. Hidayat Kailani | Repr. of Sub-Directorate PEP, BPCK |
| Mr. Handi Legowo | Repr. of Sub-Directorate SWM |
| Mr. Dwityo Akoro | -ditto- |
| Mr. Maliki Moersid | Repr. of Sub-Directorate Wastewater |
| Mr. Rustam | -ditto- |
| Ms. Marina | Sub-Directorate PU, BPCK |
| Mr. Bambang Dumtoto | Sub-Directorate PEP, BPCK |
| Mr. Hamdi | Administration Division, PLP |
| Ms. Mulyani | Sub-Directorate TK II, DTKTD |
| Mr. Darminto | Bureau KLN |
| Mr. Amwazi Idrus | Sub-Directorate PUW, DTKTD |
| Mr. Rudi J. Utomo | Repr. of Sub-Directorate PEP, BPCK |

南スラウェシ州

| | |
|-----------------------|--|
| Mr. Sayadi | Head of Physical and Infrastructure Division. BAPPEDA |
| Mr. Bonar Simanjuntak | Head of PLP Project |
| Mr. Eddy | PLP Project |

ウジュンパンダン市

| | |
|----------------------|---|
| Kol. Galib, SH | Acting Mayor (Vice Governor of South Sulawesi) |
| Mr. Bambang Heryanto | Head of BAPPEDA |
| Mr. Andi Sommeng | Head of Cleansing Department |
| Mr. Marsin Sahibu | Cleansing Department |

ハサヌディン大学

| | |
|---------------|----------------------------------|
| Dr. B. Nurkin | Center for Environmental Studies |
| Dr. Ambo Upe | -ditto- |

水道環境衛生トレーニングセンター

| | |
|-------------|---|
| Mr. Sudjoko | Head of Staff Administration |
| 嶋崎 敏昭 | Chief Adviser |
| 宮川 隆 | JICA Expert on Environmental Sanitation |

JICA 専門家

| | |
|-------|---|
| 大森 信慈 | JICA Expert on Sewerage Planning. CIPTA KARYA |
| 石井 明男 | JICA Expert on Solid Waste Management. CIPTA KARYA |

附屬資料 6. 現地調査經費資料

6-1 測量

| 項 目 | PT. ALPHAVILLE BARU | PT. ARKONIN | PT. ASTRON POLARIS | PT. INDRA KARYA | PT. INFRATAMA YAKTI | PT. YASARANGIN PRAKARSA |
|--|------------------------|-------------|-----------------------|--------------------|------------------------|----------------------------|
| 1. 地 形 縮尺 = 1/500、メッシュ = 20m 面積 = 10ha | (Rp/回) | (Rp/ha) | (Rp/ha) | (Rp/ha) | (Rp/回) | (Rp/ha) |
| 1) 商業地区 | 400,000 | 800,000 | 125,000 | 150,000 | 400,000 | 125,000 |
| 2) 住宅地区 (高密) | 350,000 | 600,000 | 125,000 | 150,000 | 350,000 | 110,000 |
| 3) " (中密) | 325,000 | 450,000 | 100,000 | 125,000 | 325,000 | 90,000 |
| 4) " (低密) | 300,000 | 450,000 | 75,000 | 120,000 | 300,000 | 50,000 |
| 5) 農耕地 | 250,000 | 450,000 | 50,000 | 110,000 | 250,000 | 65,000 |
| 6) 山地 | 250,000 | 450,000 | 75,000 | 100,000 | 250,000 | 75,000 |
| 7) " (傾斜10° 以上) | 250,000 | 600,000 | 100,000 | 95,000 | 250,000 | 90,000 |
| 2. 路線 (縦断) 縮尺 = 1/500 | (Rp/回) | (Rp/km) | (Rp/km) | (Rp/km) | (Rp/回) | (Rp/km) |
| 1) 5 km | 600,000 | 1,000,000 | 150,000 | 450,000 | 600,000 | 250,000 |
| 2) 10 km | 1,100,000 | 800,000 | 175,000 | 350,000 | 1,100,000 | 225,000 |
| 3) 20 km | 1,900,000 | 500,000 | 175,000 | 250,000 | 1,900,000 | 200,000 |

6-2 土質分析

| 項 目 | PT. ALPHAVILLE BARU | PT. ARKONIN | PT. ASTRON POLARIS | PT. INDRRA KARYA | PT. INFRATAMA YAKTI | PT. YASARANGIN PRAKARSA |
|----------------------|------------------------|-------------|-----------------------|---------------------|------------------------|----------------------------|
| 1. ボーリング機据付 (Rp/回) | 500,000 | 15,000,000 | — | 750,000 | 500,000 | 1,500,000 |
| 2. ボーリング (Rp/n) | N < 5 | 30,000 | 35,000 | 125,000 | 40,000 | 100,000 |
| | N < 20 | 50,000 | 45,000 | 40,000 | 50,000 | 125,000 |
| | N < 50 | 60,000 | 45,000 | 50,000 | 140,000 | 150,000 |
| | N > 50 | 65,000 | 60,000 | 50,000 | 150,000 | 175,000 |
| サング (Rp/回) | 400,000 | 25,000 | 55,000 | — | 400,000 | 75,000 |
| 3. 標準貫入 試験 (Rp/m) | シルト | 200,000 | 50,000 | 100,000 | 50,000 | 200,000 |
| | 砂 | 250,000 | 50,000 | 100,000 | 50,000 | 250,000 |
| | 硬いシルト | 300,000 | 60,000 | 125,000 | 60,000 | 300,000 |
| | 粒度試験 | 25,000 | 40,000 | 45,000 | 50,000 | 25,000 |
| 4. 室内試験 (Rp/サング) | アッターベルグ (コンスタント) 限界 | 20,000 | 25,000 | 45,000 | 50,000 | 20,000 |
| | 比重試験 | 30,000 | 15,000 | 45,000 | 50,000 | 30,000 |
| | 乾湿単位体積重量 | 50,000 | 25,000 | 45,000 | 50,000 | 50,000 |
| | 一軸圧縮試験 | 75,000 | 40,000 | 45,000 | 75,000 | 75,000 |

6-3 水質分析

(1/2)
(単位: Rp)

| 項 目 | PT. ALPHAVILLE BARU | PT. ARKONIN | PT. ASTRON POLARIS | PT. INDR KARYA |
|--------------------|------------------------|-------------|-----------------------|-------------------|
| 1) カドミウム及びその化合物 | 3,250 | 20,000 | | 3,000 |
| 2) シアン化合物 | 3,250 | 7,500 | | 5,500 |
| 3) 有機リン化合物 | 3,000 | 7,500 | | 12,000 |
| 4) 鉛化合物 | 2,500 | 20,000 | | 4,000 |
| 5) 六価フロム化合物 | 3,250 | 10,000 | | 4,000 |
| 6) ひ素及びその化合物 | 3,000 | 6,000 | | 4,500 |
| 7) 水銀及び " | 6,500 | 30,000 | | 10,000 |
| 8) アルキル化合物 | — | 35,000 | | 10,000 |
| 9) 水素イオン濃度 pH | 2,000 | 2,000 | | 2,000 |
| 10) 溶存酸素 DO | 4,500 | 7,500 | | 5,000 |
| 11) 生物化学的酸素要求量 BOD | 10,000 | 15,000 | | 10,000 |
| 12) 化学的酸素要求量 COD | 7,500 | 15,000 | 全項目計 | 10,000 |
| 13) 浮遊物質 SS | 3,000 | 5,000 | 225,000 | 5,000 |
| 14) n-ヘキサン抽出物質 | — | 5,000 | | — |
| 15) フェノール類 | 6,500 | 20,000 | | 8,500 |
| 16) 銅 | 2,000 | 20,000 | | 4,500 |
| 17) 亜鉛 | 2,000 | 20,000 | | 3,000 |
| 18) 鉄 | 3,000 | 6,000 | | 4,500 |
| 19) マンガン | 2,000 | 10,000 | | 3,500 |
| 20) クロム | 3,500 | 15,000 | | 4,500 |
| 21) フッ素 | 4,500 | 30,000 | | 4,500 |
| 22) 大腸菌群数 | 10,000 | — | | 70,000 |
| 23) ポリ塩化ビフェニール PCB | 135,000 | — | | 30,000 |
| 24) 全窒素 T-N | 12,500 | 20,000 | | 4,000 |
| 25) 全リン T-P | 5,000 | 10,000 | | 4,000 |

(2/2)
(単位: Rp)

| 項 目 | PT. INFRATAMA YAKTI | PT. YASARANGIN PRAKARSA | HASANUDDIN UNIV. | BEKASI- TRAINING CENTER |
|--------------------|------------------------|----------------------------|---------------------|-------------------------------|
| 1) カドミウム及びその化合物 | 3,250 | | 10,000 | 3,000 |
| 2) シアン化合物 | 3,250 | | 10,000 | 5,000 |
| 3) 有機リン化合物 | 3,000 | | 7,500 | — |
| 4) 鉛化合物 | 2,500 | | 7,500 | 3,000 |
| 5) 六価フロム化合物 | 3,250 | | 7,500 | — |
| 6) ひ素及びその化合物 | 3,000 | | 10,000 | — |
| 7) 水銀及び " | 6,500 | | 12,500 | 10,000 |
| 8) アルキル化合物 | — | | 12,500 | — |
| 9) 水素イオン濃度 pH | 2,000 | | 2,500 | — |
| 10) 溶存酸素 DO | 4,500 | | 4,000 | — |
| 11) 生物化学的酸素要求量 BOD | 10,000 | | 12,500 | 5 項目計 |
| 12) 化学的酸素要求量 COD | 7,500 | 全項目計 | 7,500 | 25,000 |
| 13) 浮遊物質 SS | 3,000 | 150,000 | 2,500 | — |
| 14) n-ヘキサン抽出物質 | — | | 7,500 | — |
| 15) フェノール類 | 6,500 | | 10,000 | 10,000 |
| 16) 銅 | 2,000 | | 7,500 | 3,000 |
| 17) 亜鉛 | 2,000 | | 7,500 | 3,000 |
| 18) 鉄 | 3,000 | | 7,500 | 1,500 |
| 19) マンガン | 2,000 | | 7,500 | 1,500 |
| 20) クロム | 3,500 | | 7,500 | 3,000 |
| 21) フッ素 | 4,500 | | 10,000 | 5,000 |
| 22) 大腸菌群数 | 10,000 | | 15,000 | 15,000 |
| 23) ポリ塩化ビフェニール PCB | 135,000 | | 15,000 | — |
| 24) 全窒素 T-N | 12,500 | | 6,000 | 10,000 |
| 25) 全リン T-P | 5,000 | | 6,000 | 5,000 |

6-4 大気分析

| 項 目 | PT. ARKONIN | PT. INDRA KARYA |
|-----------------|-----------------------------------|-----------------|
| 1) メタン | CH ₄ | 30,000 |
| 2) 二酸化炭素 | CO ₂ | 55,000 |
| 3) アンモニア | NH ₃ | 20,000 |
| 4) 硫化水素 | H ₂ S | 52,500 |
| 5) 硫化メチル | (CH ₃) ₂ S | 30,000 |
| 6) メチルメチルカルプロタン | CH ₃ SH | 50,000 |
| 7) 一酸化炭素 | CO | 75,000 |
| 8) 二酸化硫黄 | SO ₂ | — |
| 9) 二酸化窒素 | NO ₂ | — |
| 10) 全オキシダント | — | — |

附属資料 7. ローカルコンサルタントリスト

(1/2)

| 会社名 | PT. ALPHAVILLE BARU | PT. ARKONIN | PT. ASTRON POLARIS | PT. INDRA KARYA |
|---------------|--|--|--|---|
| 所在地 | Jakarta Selatan | Jakarta | Jakarta | Jakarta |
| 電話 | 8292664 | 7364176 | 8300293~4 | 8192636 |
| FAX. | 8302511 | 7363829 | 8307593 | 8192179 |
| 代表者 | Ir. Hermansyah Mardanus | Ir. H. Habis Sung Kowa D. Ir. Rachmat Suryadi Ir. H. Diding Muchidin | Ir. Permadi Suetio. IAI | Ir. Machmud Ali |
| 設立年 | 1987 | 1975 | 1978 | 1972 |
| 資本金(百万Rp) | 250 | 5,186.8 | 1,095 | 7,685.8 |
| 売上高 (百万Rp) | 1990 | 3,656 | 1,329.7 | — |
| | 1991 | 5,104 | 2,059.6 | — |
| | 1992 | 700 | 3,322.5 | — |
| 支店 | — | — | Semarang, Palang Kan Raya Palembang | Malang, Semarang |
| 調査分野 | (測量) 航空、地形、路線 (水質) (環境調査) | (土質) ポーリング 室内試験、載荷試験 (測量) 航空、地形 路線、深淺 (水質) (気象) (交通量) (環境調査) | (測量) 地形、路線 (環境調査) | (土質) ポーリング 室内試験、載荷試験 (測量) 航空、地形、路線 深淺 (水質) (交通量) (環境調査) |
| 職員数 | 土木—2、衛生—6、構造—1 機電—1、水文地質—1 化学—1、測量士—2 経済—1、その他—18 | 建築—27、土木—30、衛生—11 構造—5、交通—2、道路—3 機電—14、施工—7、化学—1 水文地質—3、生物—1 都市計画—3、測量—2 土木—2、経済—4、法律—2 心理—1、その他—160 | 建築—5、土木—5、衛生—5 構造—3、機電—4、施工—2 水文地質—2、都市計画—2 測量—4、土質—1、経済—1 農業—1、産業—1 その他—30 | 建築—4、土木—38、衛生—10 構造—15、交通—8、機電—21 水文地質—1、化学—1 都市計画—3、測量—14 土質—3、経済—23 その他—17 |

| | | | | |
|---------------|---|---|---|---|
| 会社名 | PT. INFRATAMA YAKTI | PT. YASARANGIN PRAKARSA | HASANUDDIN UNIV. | BEKASI-TRAINING CENTER |
| 所在地 | Jakarta Selatan | Ujung Pandang | Ujung Pandang | Bekasi Timur, Jawa Barat |
| 電話 | 8292664 | 411-442592 | 411-510200, Ex. 2085, 79 | 8804156 |
| FAX. | 8302511 | 411-442272 | 411-510088, 510024 | 8804243 |
| 代表者 | Ir. Prawotoy | Mrs. Maria Gasong | Dr. Baharuiddin Nurkin (ハサヌディン大学環境研究センター) | Mr. Sudjoko Mr. Toshiaki Shimazaki (島崎 敏昭氏) |
| 設立年 | 1987 | 1993 | 1978 | 1991 |
| 資本金(百万Rp) | 550 | 250 | — | — |
| 売上高 (百万Rp) | 1990 | 1,200 | — | — |
| | 1991 | 1,300 | — | — |
| | 1992 | 2,100 | — | — |
| 支店 | Bandung | — | — | — |
| 調査分野 | (測量) 航空、地形、路線 (気象) (環境調査) | (土質) ポーリング (測量) 地形、路線、深淺 (海象) 海象、漂砂 (交通量) (環境調査) | (水質) (気象) (環境調査) | (水質) (大気) (土壌) |
| 職員数 | 土木—2、衛生—12、構造—2 機電—1、水文地質—2 化学—1、生物—1、測量—2 経済—2、その他—36 | 建築—2、土木—6、衛生—2 構造—2、交通—1、機電—3 施工—1、水文地質—1 化学—1、都市計画—1 測量—10、土質—1、経済—4 その他—10 | 建築—2、土木—1、衛生—1 構造—1、水文地質—1 化学—3、生物—3、土質—1 都市計画—2、経済—2 その他—2 | |

附属資料 8. 主要収集資料リスト

| No. | 資料名称 | 形態 | 判型 |
|-----|--|----|-----|
| 1 | Outline Plan Pembuangan Air Limbah Domestik Kotamadya Ujung Pandang -Laporan Akhir- | イ語 | A 4 |
| 2 | Ditto -Final Report- | イ語 | A 4 |
| 3 | Review Rencana Umum Tata Ruang Wilayah Metropolitan Minasamaupa | イ語 | A 4 |
| 4 | Sulawesi Selatan Kotamadya Ujung Pandang Dalam Angka 1992 Kerya Sama BAPPEDA dan Statistik | イ語 | |
| 5 | Indonesia -Health Profile Visualization 1992 インドネシア-保健概要 1992 | 英語 | A 4 |
| 6 | Sulawesi-Irian Jaya Urban Development Project (Loan No. 3340-IND) Quarterly Progress Report No.05 (Jul.-Sep.1993) スラウェシーイリアンジャヤ 都市開発計画 四半期報告書 No.05 (1993年 7-9月) | 英語 | A 4 |
| 7 | Program Pembangunan Prasarana Kota Terpadu <P3KT> Project Memorandum Kotamadya Daerah Tingkat II Ujung Pandang 総合都市インフラ開発計画-プロジェクトメモランダム ウジュンパンダン | イ語 | A 4 |

| No. | 資料名称 | 形態 | 判型 |
|-----|--|-----|-----------|
| 8 | Country Report - July 1993 -The Exchange of Information on Sewage Works with the Government of Malaysia - インドネシア国下水道カントリーレポート | 英語 | A 4 |
| 9 | National Policy for Solid Waste Management in Indonesia インドネシアの廃棄物処理政策 | 英語 | A 4 |
| 10 | インドネシアの廃棄物処理事情 JICAセクター別資料 | 日本語 | A 4 |
| 11 | Analisis Mengenai Dampak Lingkungan (Peraturan Pemerintah Nomor 29 Tahun 1986) 環境影響評価政令 No.29, 1986 | イ語 | 10cm×20cm |
| 12 | Analisis Mengenai Dampak Lingkungan (Peraturan Pemerintah Nomor 51 Tahun 1993 tanggal 23 Oktober 1993) 環境影響評価政令 No.51, 1993 | イ語 | A 4 |
| 13 | Septic Tank Pasang Surut 腐敗槽パンフレット | イ語 | A 4 |
| 14 | Rencana Pembilasan (Flushing) Drainase Kota Ujung Pandang | イ語 | A 4 |
| 15 | PROKASIH - Clean River Programme - Brochure きれいな河川計画 - パンフレット | 英語 | A 4 |
| 16 | ADIPURA - Program Kebersihan Kota 都市美化表彰制度 | イ語 | A 4 |
| 17 | Sulawesi Map 1:1,500,000 スラウェシ島地図 | 英語 | |

| No. | 資料名称 | 形態 | 判型 |
|-----|--|----------|-----------|
| 18 | Ujung Pandang Map 1:30,000 ウジュンパンダン市地図 | イ語 | |
| 19 | Municipal City of Jung Pnadang-OHP- ウジュンパンダン市概況-OHP- | 英語 | A 4 |
| 20 | Hasanuddin University Environmental Studies Center-Brochure ハサヌディン大学環境研究センターパンフレット | 英語 | 10cm×20cm |
| 21 | Ujung Pandang Industrial Estate -Brochure -The Right Location for Your Factory - ウジュンパンダン工業団地パンフレット | 英語 イ語 | 10cm×20cm |
| 22 | Water Supply and Environmental Sanitation Training Center -Brochure 水道環境衛生訓練センターパンフレット | イ語 英語 | A 4 |
| 23 | PERUM PERUMNAS 住宅公社住宅標準図 | イ語 | A 3 |
| 24 | EVENS -STOG(AQUA -LIFE) Waste Water Treatment System 水中ポンプ使用曝気装置カタログ | 英語 | A 4 |
| 25 | Wirbeljet -The System for the Efficient Cleaning of Basins 同上 | 英語 | A 4 |
| 26 | Hasil Uji Coba Reaktor Upflow Anaerobic Sludge Blanket (UASB) di Tangerang, September 1993 上向流嫌気性スラッジブランケット反応槽実験結果 | イ語 | A 4 |
| 27 | Anaerobic Sewage Treatment in Colombia UASB 報告書 | 英語 | A 4 |

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