1.9.5 Warning and Dissemination System

Phased development of warning and dissemination systems provides the earliest warning to citizens and more accurate information on the magnitude of disaster.

(1) Short-term Plan --- Seismometer, Warning siren, Mobile phone

(2) Medium-term Plan --- Tsunami Watch

(3) Long-term Plan --- GPS system, Integrated Warning System

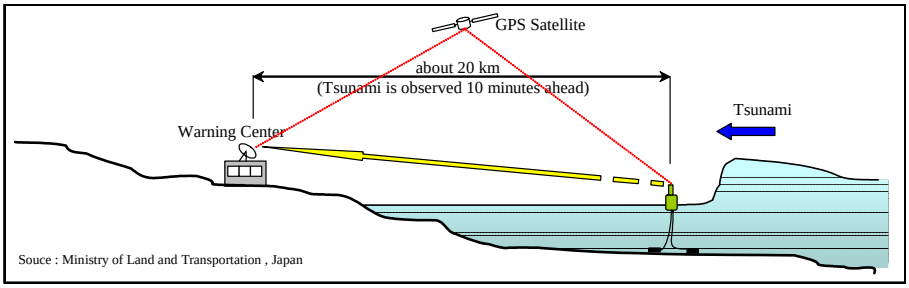


Figure 1.9.18 Schematic Diagram of GPS Real-time Tsunami Observation System

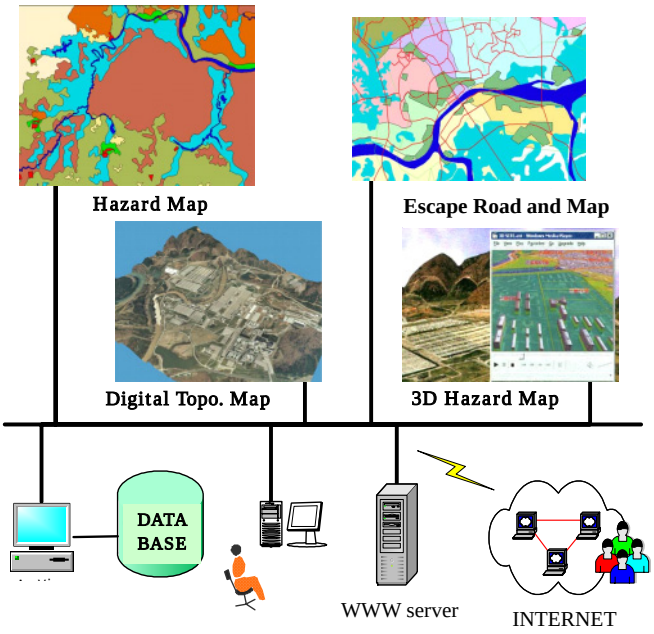


Figure 1.9.19 Configuration of Disaster Mitigation System

1.9.6 Public Education of Disaster Awareness

Various methods are applied for the purpose of public education of disaster awareness. The immediate actions are:

① Cooperation with mass media for public awareness on disaster management;

② Preparation of topographic map for disaster preparedness (Hazard map, etc);

③ Construction of public facilities for Disaster preparedness for tsunami awareness;

④ Installation of monument of tsunami inundation and run-up; and

⑤ Drill for escape from disaster.

1.10 GENERAL APPROACH TO VILLAGE PLANNING

Village plan is one of the most important elements in the city planning. For smooth and successful implementation of city development, villager's willingness, desires, traditional life style and culture are required to be incorporated into village plan through micro-macro planning procedures.

Village planning, however, requires various legal procedures including land titles based on village mapping, consensus building among villagers and coordination with neighboring villages.

In the devastated area, the residents who lost their houses have started discussion for preparing village plan with assistance of BPN, NGO and donors. It is however desirous to proceed following procedures:

(1) In principle, actual planning shall be executed by community and facilitated by accompanying team.

(2) Village plan shall include not only land use, but also basic infrastructure, housing, neighborhood facility, escape facility, and environment rehabilitation.

(3) The concept of village plan shall be disclosed to all villagers, prior to open to the neighboring villages.

(4) The community concerned shall hold a meeting with neighboring villages to adjust the inter-village space structuring such as road, drainage and other public facilities. If there is objection from neighboring village, sub-district apparatus and accompanying team should support finding a solution through discussions. Finally, village plan shall be agreed by the communities concerned.

(5) Then, the city approves village plans received from sub-district office. Communal agreements concerning status of land ownership are recorded by BPN. Finally, BPN may conduct new measurements, following administrative process for issuing land titles.

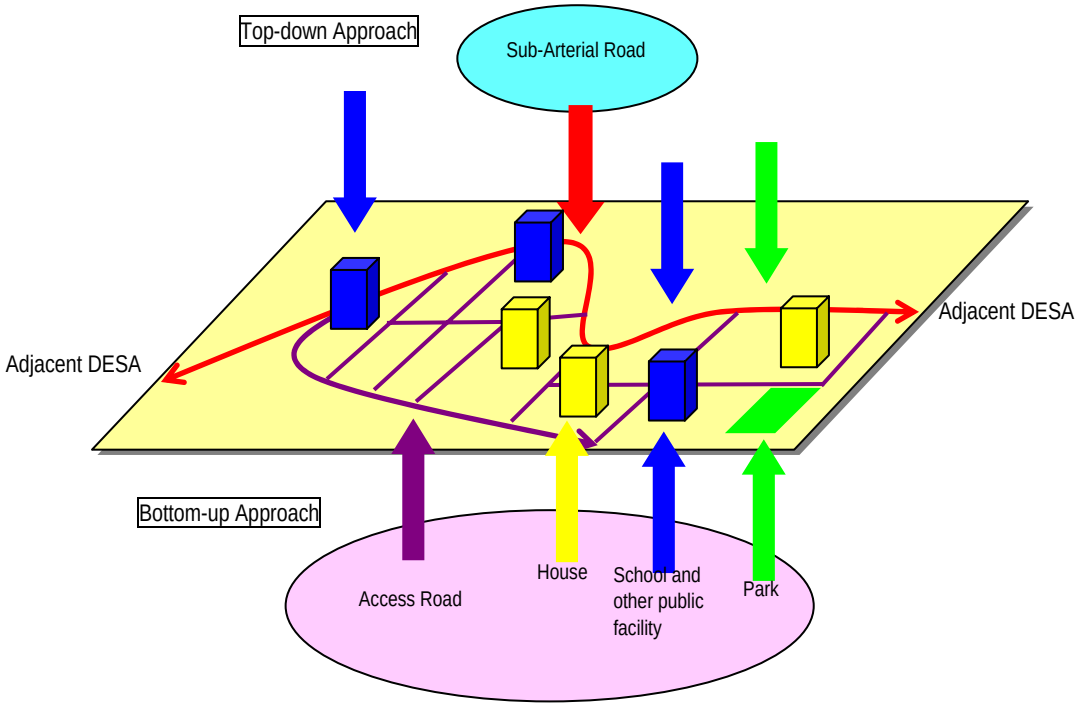
1.11 GENERAL APPROACH TO MICRO PLAN

1.11.1 Needs of Micro Planning

Procedures of village planning are regarded as people-centered and/or bottom-up approach. Every village, before establishing their definite plan, are required to coordinate and cooperate with the neighboring villages so that village plan could be formulated in an integrated manner. It would apparently be rational and efficient plan and easy for implementation (bottom-up approach).

On the other hand, the administrative authority formulates an overall city development master plan, in due consideration of various factors. This overall city development plan will be conveyed gradually to the district office from the city administration (say top-down approach), and subsequently at the district level such top-down concept and bottom-up approach would be assimilated to form unified city master plan. All the desires and willingness of the communities and the city administration's policy and concept of city development are integrated and absorbed by means of preparation of micro plan.

This integration and assimilation could be depicted schematically as seen in Figure 1.11.1.

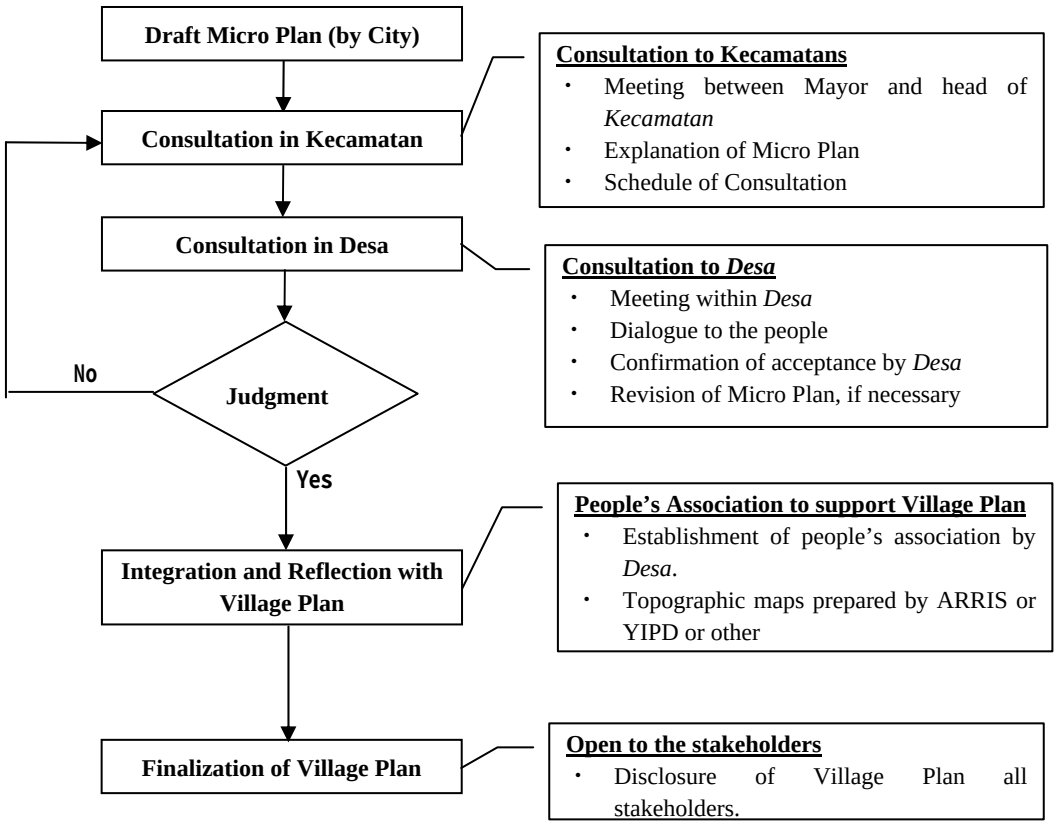


Source: JICA Study Team

Figure 1.11.1 Bottom-up Approach and Top-down Approach in Village

1.11.2 Flow of Micro Planning

It is anticipated that micro plan is absolutely required in the most devastated areas, in particular in the coastal area, since a complete re-development would take place in this area. The process of micro planning would be ideally as illustrated in Figure 1.11.2.



Source: JICA Study Team

Figure 1.11.2 Flowchart of Micro Planning

1.11.3 Approach to Micro Plan

In extending good guidance to village planning, it is necessary to establish basic framework for Micro Plan by the Local Government Units. The following four (4) plans are considered to be basic frameworks for Micro Plan:

Framework 1: Artery and Sub-artery Road Network Plan

Framework 2: Population Distribution Plan

Framework 3: Land Use Plan

Framework 4: New Residential Area Plan

1.12 CASE STUDY TO PROCEED WITH VILLAGE PLANNING

1.12.1 Most Conceivable Cases

JICA Study Team had actually conducted interview survey to catch up directly from inhabitants what is most serious concern to them in order to proceed with their village plan. As a result, the JICA Study Team identified three (3) major concerns as summarized below.

Concern 1 Alignment of arterial road: How to negotiate with arterial road alignment

Concern 2 Location of public facilities: How to locate public facilities evenly and consistently for convenience of majority of people.

Concern 3 Land consolidation: How to negotiate with land consolidation requirement.

It is strongly advisable to extend adequate and appropriate advice to the people engaging in village mapping and planning to take into account such concerns and importance of harmonizing village plan and micro plan.

2. SECTORAL PLANNING

2.1 WATER SUPPLY

2.1.1 Mission, Strategies and Goals

Mission, strategies and goals are presented as follows:

Table 2.1.1 Mission, Strategies and Goals for Water Supply

Mission
▸ To provide the safe and sufficient water to the people as many as possible ▸ To strengthen institutional and financial capability of PDAM Banda Aceh ▸ To develop the water supply system strong against disaster
Strategies
▸ To expand water distribution and reticulation networks in conformity with new urban development plan ▸ To reduce un-accounted for water (UFW) ▸ To conduct corporate development planning ▸ To re-train PDAM staff
Goals
▸ To re-install the distribution and reticulation network until 2006 ▸ To rehabilitate Lambaro and Siron waterworks until 2006 ▸ To achieve connection ratio of 80 % by 2009 ▸ To reduce UFW to 30 % by 2009

2.1.2 Urgent Rehabilitation and Reconstruction Plan

(1) Water Balance

Water demand amounts to 44,062 m^3/day in 2009, whereas aggregate production capacity of the Lambaro and Siron water treatment plants are 39,312m^3/day only. It is evident that there is a shortage of water in 2009, amounting to 4,750 m^3/day. On the other hand, water demand in 2015 is preliminarily estimated at 62,503 m^3/day, which is almost 140 % of the water demand in 2009. It is advisable to conduct the feasibility study as soon as possible, so that expanded water supply system could be commission into service by 2010 at latest.

(2) Preliminary Design

Urgent Rehabilitation of Lambaro Water Treatment Plant

Lambaro water treatment plant has suffered minor damages and is resumed its production already. However, it is reported by PDAM that the French and Swiss Governments have offered rehabilitation of this treatment plant for better operation and production of higher quality of treated water. At the time of preparation of this report, details of the proposed

rehabilitation works are not known.

Water Supply Distribution Network

Distribution and reticulation networks in the devastated area will be restored and newly installed in conjunction with the development of the new urban area. The Government of Japan has committed to rehabilitate distribution network as one of 13 "Quick Impact Projects" and its design is in progress at the time of preparation of this report. The alignment of new distribution networks is as shown in Figure 2.1.1.

Preliminary Proposal for Expansion of Water Supply System

It is necessary to implement an expansion of water supply system. Otherwise, Banda Aceh City would face a shortage of water supply from 2009 onward.

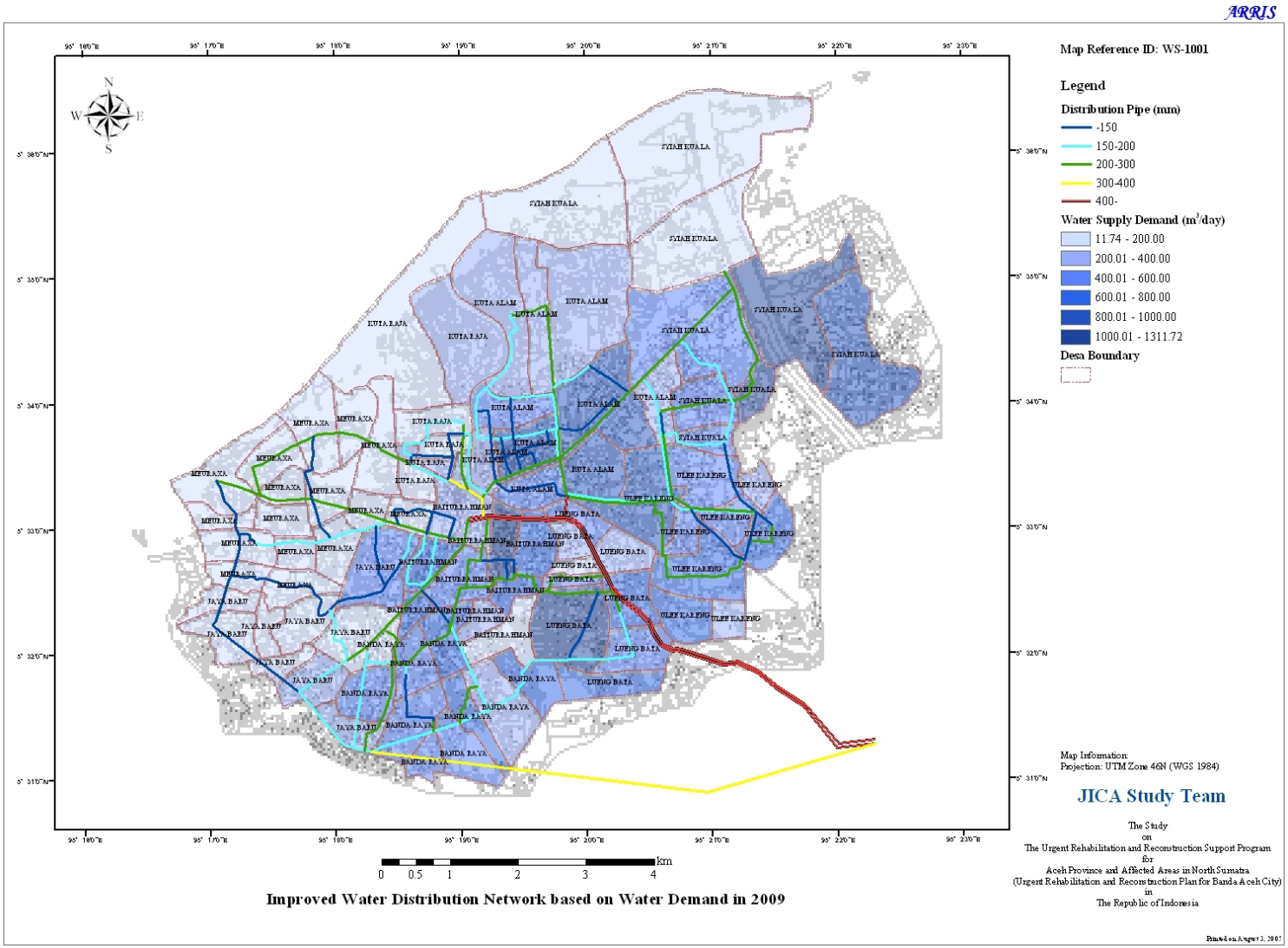
The water demand in 2015 is forecasted on a basis of rough population projection. The required additional supply is estimated at 23,191 m^3/day to meet the whole demand in 2015, as shown in Table 2.1.2.

It is presumed that the Aceh River has enough unregulated discharge to meet such increased water demand and there is an ample land available in the vicinity of existing Lambaro water treatment plant. This is one of feasible alternatives for consideration of PDAM.

Table 2.1.2 Forecast of Water Demand

Description		unit	2005	2006	2007	2008	2009	2015
Population		person	200,843	212,893	225,767	239,206	254,000	360,304
Served Population	Total	person	116,489	127,736	146,749	167,444	203,200	288,243
	House Conn.	person	104,840	114,962	132,074	150,700	182,880	259,419
	Public Tap	person	11,649	12,774	14,675	16,744	20,320	28,824
Net Demand	House Conn.	m^3/day	15,726	17,244	19,811	22,605	27,432	38,913
	Public Tap	m^3/day	466	511	587	670	813	1,153
	Non-Domestic	m^3/day	3,238	3,551	4,080	4,655	5,649	8,013
	TOTAL	m^3/day	19,430	21,306	24,478	27,930	33,894	48,079
UFW	Rate		50%	45%	40%	35%	30%	30%
	Amount	m^3/day	9,715	9,588	9,791	9,775	10,168	14,424
Gross Demand		m^3/day	29,146	30,894	34,269	37,705	44,062	62,503
Supply Capacity	Lambaro	m^3/day	37,584	37,584	37,584	37,584	37,584	37,584
	Siron	m^3/day	1,728	1,728	1,728	1,728	1,728	1,728
	Total	m^3/day	39,312	39,312	39,312	39,312	39,312	39,312
	Balance	m^3/day	10,166	8,418	5,043	1,607	-4,750	-23,191

Source: JICA Study Team



Source: ARRIS(GIS) prepared by JICA Study Team

Figure 2.1.1 Alignment of New Distribution Network

2.1.3 Preliminary Cost Estimate and Tentative Implementation Schedule

(1) Preliminary Cost Estimate

As shown in Table 2.1.3, the estimated project cost is of indicative natures and subject to change when more in-depth study is completed. The preliminary project cost is estimated at Rp. 145.7 billion, of which Rp. 21.7 billion is attributable to expansion of water supply system after 2009.

Table 2.1.3 Preliminary Cost Estimate

(Rp. billion)

Proposed Project/Program	Works	Amount
A. Projects	(1) PDAM Administrative Facilities	12.80
	(2) Rehabilitation of Lambaro Water Treatment Plant	14.42
	(3) Rehabilitation of Water Distribution System	87.65
	(4) Expansion of Lambaro Water Treatment Plant	21.67
	Sub-total for Projects	136.54
B. Programs	(1) Banda Aceh Water Supply Master Plan 2007-2020	3.14
	(2) PDAM Corporate Plan 2005-2009	0.33
	(3) Capacity Building Program	5.70
	Sub-total for Programs	9.17
	Total	145.71

Source: JICA Study Team

(2) Tentative Implementation Schedule

The urgent rehabilitation and reconstruction works are planned to be implemented with the following schedule:

Table 2.1.4 Tentative Implementation Schedule

Projects/Programs	Implementation Schedule				
	Rehabilitation Stage		Reconstruction Stage		
	2005	2006	2007	2008	2009
A. Projects					
(1) PDAM Administrative Facilities					
(2) Rehabilitation of LambaroWater Treatment Plant					
(3) Rehabilitation of Water Distribution System					
(4) Expansion of Lambaro Water Treatment Plant	Beyond 2009				
B. Programs					
(1) Banda Aceh Water Supply Master Plan 2007-2020					
(2) PDAM Corporate Plan 2005-2009					
(3) Capacity Building Program					

Source: JICA Study Team

2.2 URBAN SANITATION AND DRAINAGE

2.2.1 Mission, Strategies and Goals

Mission, strategies and goals for urban sanitation and drainage are set forth as stated below:

Table 2.2.1 Mission, Strategies and Goals for Urban Sanitation and Drainage

	Wastewater Treatment and Disposal	Solid Waste Management	Drainage
Mission	To secure health of whole population of 254,000 from waterborne deceases To create attractive and hygienic urban environment To conserve aqua-ecology in open water within city	To create clean urban environment To minimize generation of solid waste and garbage	To ensure safety of human lives and properties To enhance economic activities without any interruption throughout the year To complete systematic urban drainage network over the entire city area
Strategies	To guide people to adopt improved type of septic tank To apply technically and financially feasible and sustainable technology To strength DPPK so that all population receives equitable services	To introduce separation and recycling of solid waste with education and cooperation of people To strength DPPK so that all population receives equitable services	To minimize habitual inundation areas with reinforcement of drainage facilities To layout drainage network in conjunction with urban road development plan To remove sediment, debris and garbage in conduits To reinforce O& M capability of DPU
Goals	To break existing septage treatment plant into operation To reinforce septage collection and treatment capacity To treat the whole volume of septage to be generated by 2009 To develop sewerage system at adequate time	To develop promptly as possible new landfill site before 2009 To reinforce garbage collection vehicle and landfill equipment	To re-install systematic drainage in devastated area by 2009 To re-install and reinforce drainage pump stations urgently To rehabilitate broken and destroyed dyke and flood wall in two years period

2.2.2 Urgent Rehabilitation and Reconstruction Plan for Wastewater Treatment and Disposal

(1) Preliminary Design

The preliminary layout design is prepared for both the septage treatment plant and sewerage system as briefly described below.

Septage Treatment Plant

The required treatment capacity is 94m^3/day. It is proposed to locate the additional plant adjacent to the existing plant to minimize land acquisition and ease operation and maintenance. It is determined to adaptable the design prepared by UNICEF. The layout of the plant is shown in Figure 2.2.1 and principal features in Table 2.2.2.

Table 2.2.2 Principal Features of Additional Septage Treatment Plant

Structures	Nos.	Dimensions of Respective Structure (m)		
		Width	Length	Depth
Receiving area	1	4.5	9.0	1.1
Grease and Grit chamber	1	2.5	5.0	1.7
Bio-digester (circular shape	2	7.0 (dia)		
Sludge stabilization and stripping unit	2	6.0	21.0	2.9
Anaerobic baffled reactor, anaerobic filter	1	7.6	25.0	3.4
Sludge drying bed	12	7.0	15.0	1.5
Tunnel dryer	2	7.0	16.0	1.0
Horizontal gravel filter	2	12.0	30.6	1.0
Maturation pond	2	6.8	30.5	1.2

Source: UNICEF

The septage is one of pollution source to the rivers. The amount of pollutant is estimated to be 288 kg/day in terms of BOD_5 in 2005. With proper operation of existing and additional septage treatment plants pollution load would be reduced to 72 kg/day.

Sewerage System

The sewerage system will have a daily treatment capacity of 8,400m^3/day and comprise sewer network, wastewater treatment plant and sludge treatment and disposal. Its overall layout is as given in Figure 2.2.2. A salient feature of the wastewater treatment plant is as presented in Table 2.2.3.

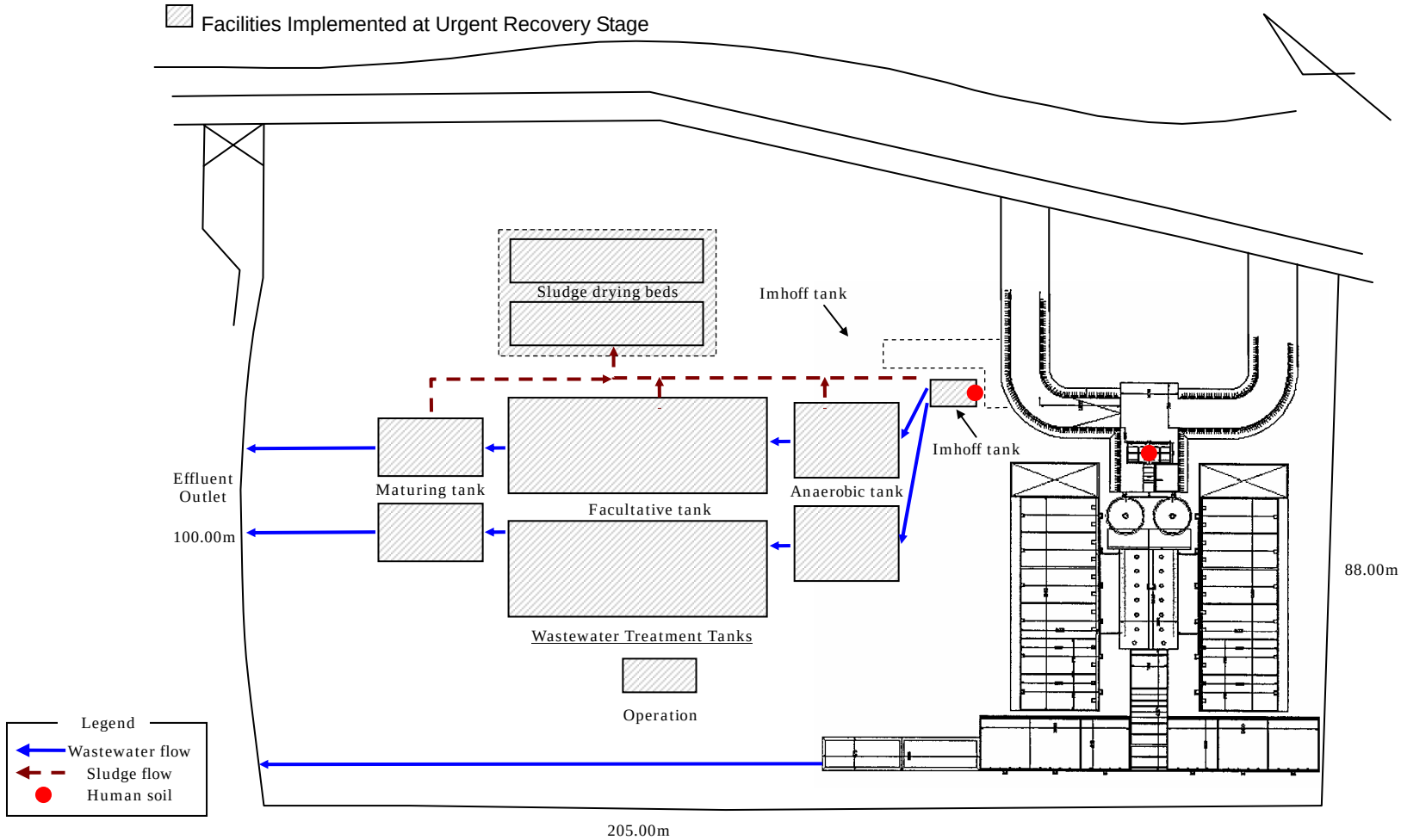
Table 2.2.3 Principal Features of Wastewater Treatment Plant

Main Component	Nos. of Unit	Width (m)	Length (m)	Depth (m)	Notes;
Grit chamber	2	1.0	5.0	0.5	
Oxidation ditch	6	8.0	60.0	2.9	
Final sedimentation tank	3	Dia. 21.5	-	-	Circular shape
Chlorine mixing chamber	1	6.0	50.0	1.2	
Sludge thickener	3	4.0	-	3.0	
Sludge dehydrator	3	-	-	-	
Composted yard	1	-	-	-	

Source: JICA Study Team

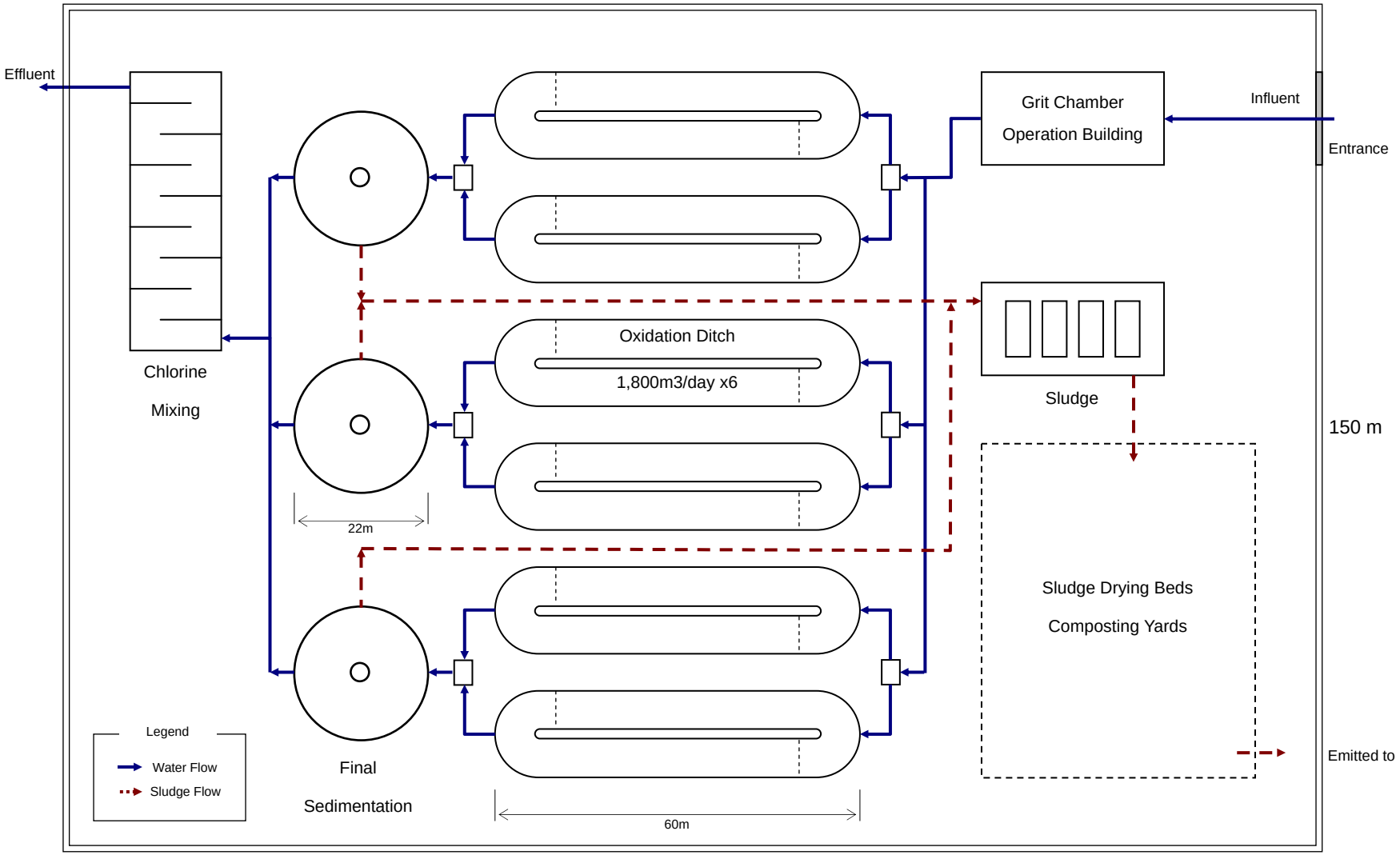
Reinforcement of Septage Collection Capacity

DKP had lost substantially its septage collection and transport fleet. As of July 2005, the septage collection is handled by international assistance. An attempt is made to estimate the number of septage collection cars required to collect the whole volume of septage in 2009. It is assessed that 20 numbers of collection vehicles, each with a capacity of 3tons, would be required by the year 2009. Details of this assessment are presented in Appendix 4.



Source: UNICEF Proposal

Figure 2.2.1 Layout Plan of Additional Septage Treatment Plant



Source: JICA Study Team

Figure 2.2.2 Layout Plan of Wastewater Treatment Plant

(2) Preliminary Cost Estimate

Preliminary project cost for the urgent rehabilitation and reconstruction works proposed in this study is estimated based on the following conditions and assumptions. However, these are subject to change due to finalization of the Indonesian authorities.

a) Land acquisition and compensation cost is not included.

b) The direct construction cost is assumed to include the amount of VAT but not to include import duties.

c) The physical and price contingencies are assumed to be 10 % of the direct construction cost, respectively.

d) The engineering service for design and construction supervision is assumed also to be 10 % of the direct construction cost.

Table 2.2.4 Preliminary Cost Estimate

(Rp. billion)

Proposed Project/Program	Works	Amount
A. Projects	(1) Rehabilitation of Existing Septage Plant	7.98
	(2) Additional Septage Treatment Plant	6.94
	(3) Procurement of Vacuum Cars	5.06
	(4) Sewerage Development	176.74
	Total	196.72

Source: JICA Study Team

(3) Tentative Implementation Schedule

It is recommendable to implement the urgent rehabilitation and reconstruction plan along with the following schedule:

Table 2.2.5 Tentative Implementation Schedule

Projects/Programs	Implementation Schedule				
	Rehabilitation Stage		Reconstruction Stage		
	2005	2006	2007	2008	2009
A. Projects					
(1) Rehabilitation of Existing Septage Plant					
(2) Additional Septage Treatment Plant					
(3) Procurement of Vacuum Cars					
(4) Sewerage Development	Beyond 2009				

Source: JICA Study Team

2.2.3 Urgent Rehabilitation and Reconstruction Plan for Solid Waste Management

(1) Preliminary Design

According to DKP it is most desirous to design the new landfill site with a life of 20 years. Assuming average filling thickness of 5 m, approximately 25 ha of land are required. As the same as existing landfill site, leachate pond will have to be provided to properly treat the water derived from the dumped materials. The new landfill site can be identified in the vicinity of existing landfill site.

Collection of garbage will be done by a combination of packer vans and dump truck. The solid waste other than domestic garbage will be collected by dump trucks and domestic garbage by packer van. Required numbers of dump truck (8 m^3) and packer van (3 m^3) will be 5 and 25 respectively, including stand-by. Details of estimate are presented in Appendix 4.

(2) Preliminary Cost Estimate

Project cost of new landfill site and procurement cost of garbage collection and transportation vehicles are estimated as presented in Table 2.2.6.

Table 2.2.6 Preliminary Cost Estimate

(Rp. billion)

Proposed Project/Program	Works	Amount
A. Projects	(1) Construction of new Landfill Site (TPA)	206.52
	(2) Procurement of Packer and Dump Trucks	2.97
	Total	209.49

Source: JICA Study Team

(3) Tentative Implementation Plan

In view of the residual life of existing landfill site, it is proposed that the new landfill site be completed by 2007 or operational from 2008. Tentative implementation schedule is set as follows.

Table 2.2.7 Tentative Implementation Schedule

Projects/Programs	Implementation Schedule				
	Rehabilitation Stage		Reconstruction Stage		
	2005	2006	2007	2008	2009
A. Projects					
(1) Construction of new Landfill Site (TPA)					
(2) Procurement of Packer and Dump Trucks					

Source: JICA Study Team

2.2.4 Urgent Rehabilitation and Reconstruction Plan for Urban Drainage System

(1) Preliminary Design

Primary drains and Pumping stations

The discharge capacity of existing primary drains and pumping stations was firstly assessed whether they are capable of draining the computed discharge.

Of the existing eight (8) pumping stations, seven (7) stations have less capacity than the required drainage quantity. Also it is assessed that existing drains are not capable of conveying storm run-off so that excess water should be absorbed in retardation basins. Figure 2.2.3 shows the outline of rehabilitation and reconstruction plan for urban drainage.

Retardation areas

It is proposed to create the retardation ponds at two (2) locations: one is at Pump Station No.8 with a storage capacity of 540,000m^3 and the other is in Sub-drainage 12 with a storage capacity of 75,000m^3.

(2) Preliminary Cost Estimate

The rehabilitation and reconstruction cost is roughly estimated as shown in Table 2.2.8, on the basis of experiences of the similar works.

Table 2.2.8 Preliminary Cost Estimate

(Rp. billion)

Proposed Project/Program	Works	Amount
A. Projects	(1) Urgent Recover (Priority 1 and 2)	130.28
	(2) Rehabilitation Works (Priority 3 and 4)	49.40
	(3) Reconstruction Works (Priority 4)	177.97
	(4) Rehabilitation and reconstruction of dykes and floodwall along major rivers	95.00
	Total	452.65

Source: JICA Study Team

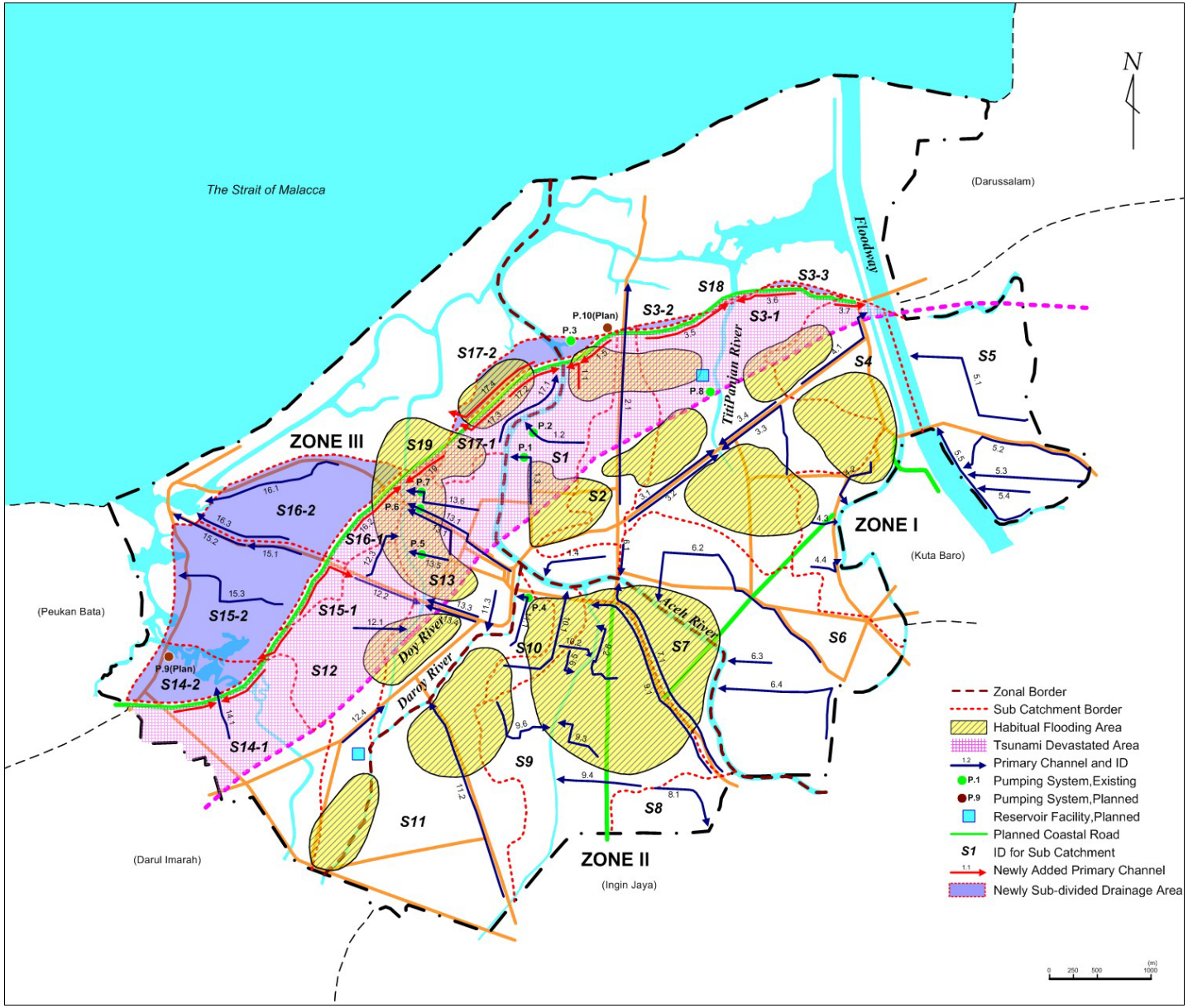
(3) Tentative Implementation Schedule

It is proposed the proposed plan will be implemented along with the following schedule:

Table 2.2.9 Tentative Implementation Schedule

Projects/Programs	Implementation Schedule				
	Rehabilitation Stage		Reconstruction Stage		
	2005	2006	2007	2008	2009
A. Projects					
(1) Urgent Recover (Priority 1 and 2)					
(2) Rehabilitation Works (Priority 3 and 4)					
(3) Reconstruction Works (Priority 5)					
(4) Rehabilitation and reconstruction of dykes and					

Source: JICA Study Team



Source: JICA Study Team

Figure 2.2.3 Outline of Rehabilitation and Reconstruction Plan for Urban Drainage