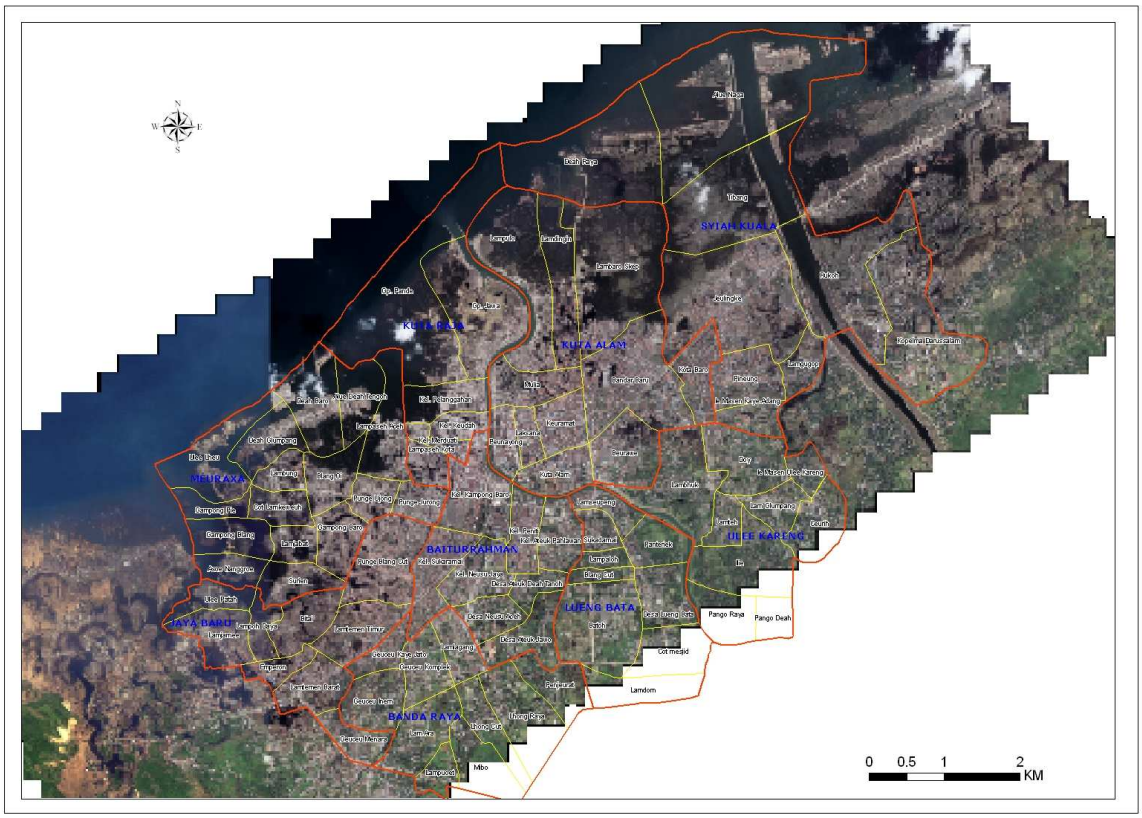
CHAPTER 6 SECTORAL MEASURES BY KECAMATAN

(1) Characteristics of Kecamatans

The boundary of the kecamatans on IKONOS image is shown in Figure 6.1.



Source: ARRIS: JICA Study Team

Figure 6.1 Location of Kecamatans in Banda Aceh City

The urban area and characteristics by kecamatan is shown in Table 6.1. They are characterized into three grouping, that is, inland area, central area and coastal area.

Table 6.1 Urban Area and Characteristics by Kecamatan

Area	Kecamatan	Present built-up area (ha)	Total urban area in 2009 (ha)	Ratio of urban area	Characteristics
Inland	ULEE KARENG	255.6	530.4	86.2%	No tsunami damage, Low density residential area, roads not sufficient, agricultural land in south
	BANDA RAYA	237.5	457.5	95.5%	No tsunami damage, Low density residential area, South: plan of urban development (Satellite City)
	LUENG BATA	191.9	414.7	77.6%	No tsunami damage, Low density residential area, roads not sufficient, agricultural land included

Area	Kecamatan	Present built-up area (ha)	Total urban area in 2009 (ha)	Ratio of urban area	Characteristics
Central	SYIAH KUALA	394.1	432.2	30.5%	North: serious damage, land submergence, swamp and fishery ponds, coastal forest; South: residential area; South-east: Darussalam (Syiah Kuala University)
	BAITURRAHMAN	280.5	280.5	65.4%	City center (commercial and cultural/administration), Damage of commercial area, residential area
	KUTA ALAM	356.0	356.0	97.4%	North: serious damage; Central-south: Partial damage of commercial and residential area
Coastal	JAYA BARU	111	248.00	56.1%	Serious damage, land submergence, large swamp in the center, flooding
	MEURAXA	0	71.00	7.9%	Serious damage, land submergence, large swamp, flooding, ferry port
	KUTA RAJA	0	82.00	22.4%	Serious damage, land submergence, flooding

Source: ARRIS: JICA Study Team

(2) Measures in Urban Sanitation and Drainage Sector by Kecamatan

Table 6.2 shows measures in Urban Sanitation and Drainage Sector in accordance with the characteristics by Kecamatan.

Table 6.2 Measures in Urban Sanitation and Drainage Sector by Kecamatan

Area	Kecamatan	Sanitation / Drainage		
		Wastewater Treatment	Solid Waste Management	Urban Drainage
Inland	ULEE KARENG	100% of sludge collection and treatment at IPLT(desludge treatment plant) in inhabitant area is planned in Rehabilitation Stage (-2007)	Regular collection is served at least 2 times/week. All area is included in relocated landfill system (-2007)	Less significant damage has been observed, but some part of primary channel is recovered in Urgent Recovery Stage (-2006), remaining are in Rehabilitation Stage (-2009)
	BANDA RAYA	100% of sludge collection and treatment at IPLT(desludge treatment plant) in inhabitant area is planned in Rehabilitation Stage (-2007)	Regular collection is served at least 2 times/week. All area is included in relocated landfill system (-2007)	Less significant damage has been observed, but malfunctioned channels are renovated in Rehabilitation Stage (-2009)
	LUENG BATA	100% of sludge collection and treatment at IPLT(desludge treatment plant) in inhabitant area is planned in Rehabilitation Stage (-2007)	Regular collection is served at least 2 times/week. All area is included in relocated landfill system (-2007)	Less significant damage has been observed, but malfunctioned channels are renovated in Rehabilitation Stage (-2009)

Area	Kecamatan	Sanitation / Drainage		
		Wastewater Treatment	Solid Waste Management	Urban Drainage
Central	SYIAH KUALA	100% of sludge collection and treatment at IPLT(desludge treatment plant) in inhabitant area is planned in Rehabilitation Stage (-2007)	Regular collection is served at least 2 times/week. All area is included in relocated landfill system (-2007)	Less significant damage has been observed, but some part of primary channel is recovered in Urgent Recovery Stage (-2006), remaining are in Rehabilitation Stage (-2009)
	BAITURRAHMAN	100% of sludge collection and treatment at IPLT (-2007), Sukaramai, Neusu Jaya, Peniti and Kampong Baro are included in Sewage Treatment Area in Reconstruction Stage (-2015)	Regular collection is served at least 2 times/week. All area is included in relocated landfill system (-2007)	No direct damage observed, but to avoid flooding 1 pump and its primary channels are renovated in Urgent Recovery (-2006), remaining are Rehabilitation Stage (-2009)
	KUTA ALAM	100% of sludge collection and treatment at IPLT (-2007), Peunayong, Laksana, Keuramat and Mulia (part) are included in Sewage Treatment Area in Reconstruction Stage (-2015)	Regular collection is served at least 2 times/week. All area is included in relocated landfill system (-2007)	3 major pumps are blown by tsunami hit, 1 pump and its primary channels are recovered in Urgent Recovery (-2006), 2 pump are treated in Rehabilitation (-2009). Primary channels covered in northern area are designed in Reconstruction (-2015)
Coastal	JAYA BARU	100% of sludge collection and treatment at IPLT(desludge treatment plant) in inhabitant area is planned in Rehabilitation Stage (-2007)	Regular collection is served at least 2 times/week. All area is included in relocated landfill system (-2007)	Less significant damage has been observed, but malfunctioned channels are renovated in Rehabilitation Stage (-2009)
	MEURAXA	100% of sludge collection and treatment at IPLT(desludge treatment plant) in inhabitant area is planned in Rehabilitation Stage (-2007)	Regular collection is served at least 2 times/week. All area is included in relocated landfill system (-2007)	Serious damage needs a huge recovery works, reconstruction is designed in Reconstruction Stage in this area (-2015)
	KUTA RAJA	100% of sludge collection and treatment at IPLT(desludge treatment plant) in inhabitant area is planned in Rehabilitation Stage (-2007), IPLT and Sewage Treatment Plant will be located in this area	Regular collection is served at least 2 times/week. All area is included in relocated landfill system (-2007)	Pumping systems have been seriously damaged, 1 pump is treated in Urgent Recovery (-2006) and 1 pump is in Rehabilitation (-2009). Primary channels are devastated, recovery is designed in Reconstruction Stage (-2015)

(3) Measures on Road and Transport Sector by Kecamatan

Table 6.3 shows measures in Road and Transport Sector in accordance with the characteristics by Kecamatan.

Table 6.3 Measures in Road and Transport by Kecamatan

Area	Kecamatan	Measures in Road and Transport Sector by Kecamatan	
Inland	ULEE KARENG	Preparation and improvement of the relief road, (Construction of vehicle inspection center)	Road rehabilitation for Jl.Tengku Iskandar etc., Improvement of Ulee kareng crossing, Access road development
	BANDA RAYA		Road rehabilitation for Jl.Wedana etc., Improvement of crossings along Jl. Soekarno Hatta, Access road development, Reconstruction of bus terminal
	LUENG BATA		Road rehabilitation, Extension of Jl. Syiah Kuala, Access road development
Central	SYIAH KUALA	Preparation and improvement of the relief road	North area: Road rehabilitation, Reconstruction of sub-arterial road, Construction of coastal road, Access road reconstruction
	BAITURRAHMAN		Road rehabilitation, Traffic management improvement (crossing, traffic lights, traffic signs), Reconstruction of bus terminal
	KUTA ALAM		Road rehabilitation, Traffic management improvement (crossing, traffic lights, traffic signs), Construction of coastal road
Coastal	JAYA BARU	Improvement of the escape road, Construction of escape/relief road (coastal road)	Road rehabilitation, embankment and relocation if necessary
	KUTA RAJA		Road rehabilitation, embankment and relocation if necessary
	MEURAXA		Road rehabilitation, embankment and relocation if necessary; Reconstruction of ferry terminal

(4) Measures on Health Sector by Kecamatan

Table 6.4 shows measures in Health Sector in accordance with the characteristics by Kecamatan.

Table 6.4 Measures in Health Sector by Kecamatan

Area	Kecamatan	Primary care service facilities
Inland	ULEE KARENG	No major rehabilitation and reconstruction is required as damage by the disaster was not serious and existing facilities could cover the projected population in 2009. District hospital (Meuraxa Hospital) is relocated to Banda Raya as core hospital in western area of the city.
	BANDA RAYA	
	LUENG BATA	
Central	SYIAH KUALA	Health center in Komplema and sub health center in Langugop should be rehabilitated. One sub health center should be relocated to one of villages projected to be high population density in 2009.
	BAITURRAHMAN	A health center should be newly established as population is projected to increase because of new business district.
	KUTA ALAM	A health center and a sub health center should be newly established and 2 existing sub health centers should be rehabilitated as population is projected to increase because of new business district.
Coastal	JAYA BARU	No health center is reconstructed as projected population in 2009 in the area is small and those areas are located nearby the new central business district where are Meuraxa hospital is to be relocated to inland area, where is to be new business district. Sub health centers should be relocated to villages projected to be high population density in 2009.
	KUTA RAJA	
	MEURAXA	

(5) Measures on Education Sector by Kecamatan

Table 6.5 shows measures in Education Sector in accordance with the characteristics by Kecamatan.

Area	Kecamatans	Before the tsunami	After the tsunami	Direction of reconstruction and development of elementary schools
Inland	Ulee Kareng	8 SD/MI, 2 SMP/MT	All the schools was in normal.	There are no damaged schools. 3 new SD and 1 SMP will be established due to the population increase.
	Lueng Bata	6 SD/MI, 2 SMP/MT	All the schools was in normal.	There are no damaged schools. 5 new SD and 1 SMP will be established due to the population increase and many desas not covered by the existing schools.
	Southeastern Baiturrahman	15 SD/MI, 4 SMP	All the schools was in normal.	There are no damaged schools. New school construction is not necessary.
	Eastern Banda Raya	6 SD/MI, 1SMP	All the schools was in normal.	There are no damaged schools. 3 new SD and 1 SMP will be established due to the population increase.
Central	Southern Syiah Kuala	3 SD/MI, 3SMP/MT	2 SD/MI were damaged.	Rehabilitation or reconstruction of the damaged schools will be carried out and a new school construction will be done due to the population increase.
	Southern Kuta Alam	4 SD, 4 SMP	All the schools were in normal.	There are no damaged schools. A new SMP will be established
	Northwestern Baiturrahman	11 SD, 4 SMP/MT	7 SD were damaged.	Rehabilitation or reconstruction of the damaged schools will be carried out.
	Western Banda Raya	2 SD, 1SMP	All the schools were damaged partially.	Rehabilitation or reconstruction of the damaged schools will be carried out.
Coastal	Meuraxa	18 SD/MI, 4 SMP/MT	All the schools were damaged severely.	Relocation of heavily damaged 16 SD/MI and 1 MT will be carried out due to the decrease of population. The remaining damaged schools will be reconstructed.
	Kuta Raja	14 SD/MI, 2 SMP	Almost all the schools were damaged severely.	Relocation of heavily damaged 4 SD and 1 SMP will be carried out due to the decrease of population. The remaining damaged schools will be reconstructed.
	Northern Kuta Alam	20 SD/MI, 8 SMP/MT	All the schools were damaged.	Reconstruction of the damaged schools will be carried out.
	Northern Syiah Kuala	11 SD/MI, 3 SMP/MT	9 SD/MI were damaged severely.	Reconstruction of the damaged schools will be carried out .
	Jaya Baru	9 SD/MI, 2 SMP	All the schools was damaged severely or partially.	Rehabilitation or reconstruction of the damaged schools will be carried out.

(6) Measures on Disaster Preparedness by Kecamatan

Table 6.6 shows measures in Disaster Preparedness in accordance with the characteristics by Kecamatan.

Table 6.6 Measures in Disaster Preparedness by Kecamatan

Area	Kecamatan	Measures in Disaster Preparedness by Kecamatan
Inland	ULEE KARENG	Preparation and improvement of the relief roads and emergency bases
	BANDA RAYA	
	LUENG BATA	
Central	SYIAH KUALA	Preparation and improvement of the relief roads and emergency bases, Preparation of Escape Buildings, Preparation of detached breakwater, seawalls and coastal forests (Syiah Kuala), Preparation of Escape Towers (Syiah Kuala)
	BAITURRAHMAN	
	KUTA ALAM	
Coastal	JAYA BARU	Preparation and improvement of the escape roads and relief roads, Preparation of Escape Buildings, Preparation of detached breakwater, seawalls and coastal forests
	KUTA RAJA	
	MEURAXA	

APPENDIX 3

WATER SUPPLY

APPENDIX 3 WATER SUPPLY

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CHAPTER 1 WATER SUPPLY BEFORE DISASTER

1.1 PUBLIC WATER SUPPLY IN KOTA BANDA ACEH

The water supply in Kota Banda Aceh is under management of PDAM (Water Supply Authority) Tirta Daroy-Banda Aceh (called as PDAM). It treats and distributes pipe water and collection of water tariff. It is in principle independent autonomous organization but is financially subsidized by the city council.

Its service area extends over the entire administrative area of Kota Banda Aceh and includes part of Aceh Besar.

Before disaster, PDAM had 173 staff as shown in Table 1.1.

Table 1.1 PDAM Staff Composition as August 2004

Position	Staff
Director	1
Chief of Division	5
Division of Administration and Finance	34
Division of Technical	58
Kecamatan/District Unit	23
Division of Customer Relation	49
Division of Internal Audit	3
TOTAL Staff	173

1.2 PDAM's WATER SUPPLY SYSTEM

A schematic layout of water supply in Kota Banda Aceh is as shown in Figure 1.1 and 1.2. There are basically two (2) different water supply systems for potable water supply in Kota Banda Aceh. One is Lambaro system and the other is Siron system. Both the systems comprise a raw water pumping station on the Aceh River, water treatment plant, treated water transmission pump station and distribution network. There is no service reservoir, excepting clear water reservoir in the water treatment plant, and thus the treated water is directly distributed to the consumers by means of pump pressure flow.

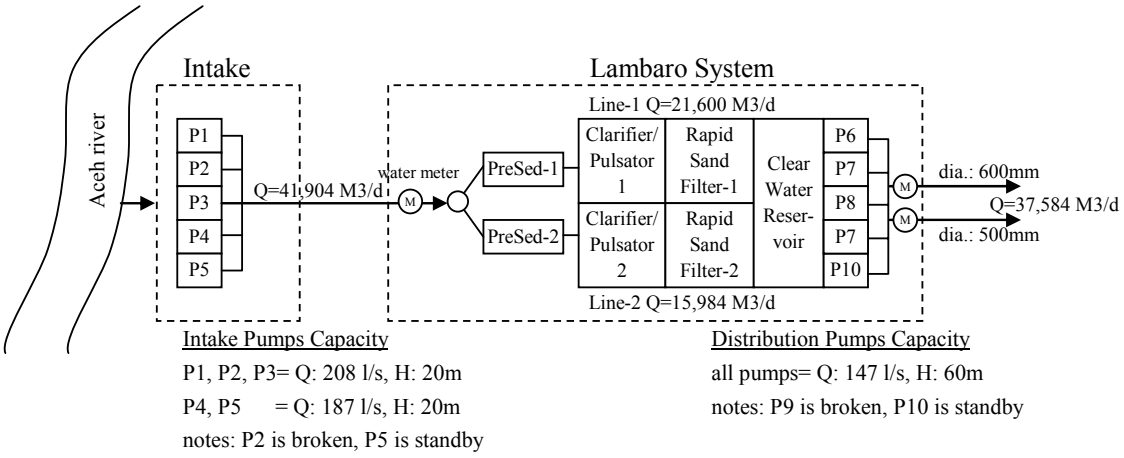

Figure 1.1 Schematic Layout of Lambaro System

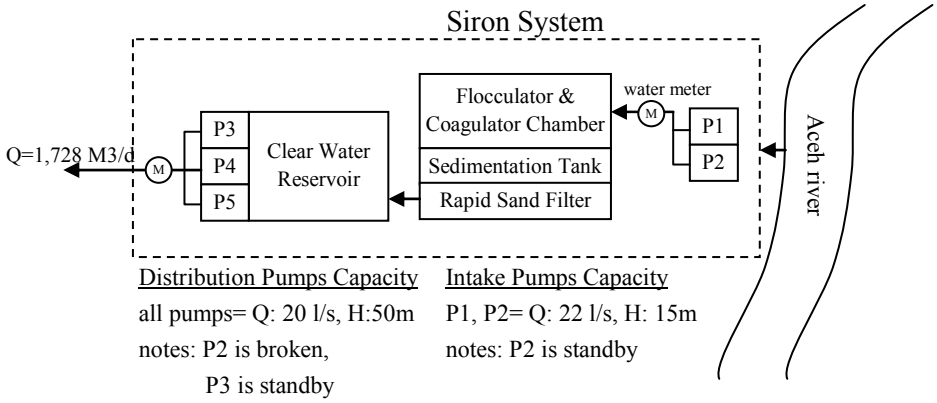

Figure 1.1 Schematic Layout of Siron System

Because of disaster, PDAM had lost various records, and thus it is so difficult to catch up exactly details of various facilities, water quality monitoring, water supply and tariff collection records, etc. The features of existing water supply facilities are based on hearing from the PDAM staff and investigation.

Table 1.2 Features of Water Supply Systems

Main Facilities		Lambro System	Siron System
Raw water pumping station	Number: Capacity of each	5 [Q;208 l/s, h;20m] x3 [Q;147 l/s, h;20m] x2	2 [Q;22 l/s, h;15m] x2
Water treatment plant	Production capacity	37,584 m^3/d	1,728 m^3/d
	Treatment process	Rapid sand filtration	Rapid sand filter
	Number of treatment line	2	1
	Main treatment component	Pre-sedimentation, clarifier, rapid sand filter, clear water reservoir	Flocculator and Coagulator chamber, sedimentation tank, rapid sand filter, clear water reservoir
Treated water pump station	Number of pump Capacity of each	5 [Q:147 l/s, h:60m] x5	3 [Q:20 l/s, h:50m] x3
Distribution pipelines	Pipe materials	Steel pipe (SP) for D300 – 600 Polyvinyl chloride (PVC) for D100 - 250	
	Pipe length	D600; 7,566m D500; 6,053m D400; 1,451m D300; 754m D250; 6,389 D200; 4,090m D150; 31,789m D100; 29,255m	
Water meter	Number	24,411	

Source: PDAM

(1) Raw water pumping station

The pumping stations of Lambaro and Siron systems are located on the right and left banks of the Aceh River, respectively. In both pumping station one pump was always kept as stand-by.

(2) Water treatment plant

The Lambaro and Siron treatment plants were initially commissioned into service in 1974 and 1994 respectively. It is supposed that there was no substantial maintenance and/or improvement works since their commissioning. According to PDAM, both the plants had been operated at their full capacity in order to meet increasing water demand. The quality of the treated water was said to be slightly inferior compared to the Indonesian standards, probably owing to less use of chemicals and deterioration of treatment facilities.

Both the plants provided with clear water reservoir; 2,500 m^3 in Lambaro and 200 m^3 in Siron. This reservoir absorbs daily and maximum water demands.

(3) Treated water pumping station

There are two (2) primary distribution pipelines from the water treatment plant in each system. The treated water transmission pump station is located immediately after the clear water reservoir and equipped with distribution water meter on each pipe.

(4) Distribution network

Distribution network covered almost the whole area of Kota Banda Aceh. The distribution system is classified into three (3) categories according to PDAM;

- Primary pipelines with D300 – 600mm
- Secondary pipelines with D150 – 250mm
- Tertiary pipelines with D25 – 120mm

As shown in Figure 1.2, distribution network was so complicated, mainly owing to expansion of network with less regards to its efficiency. This resulted in uneven distribution of water and residual pressure from place to place.

(5) House connection and public taps

As of August 2004, there were 24,411 house connections and 100 public taps within water service area of PDAM.

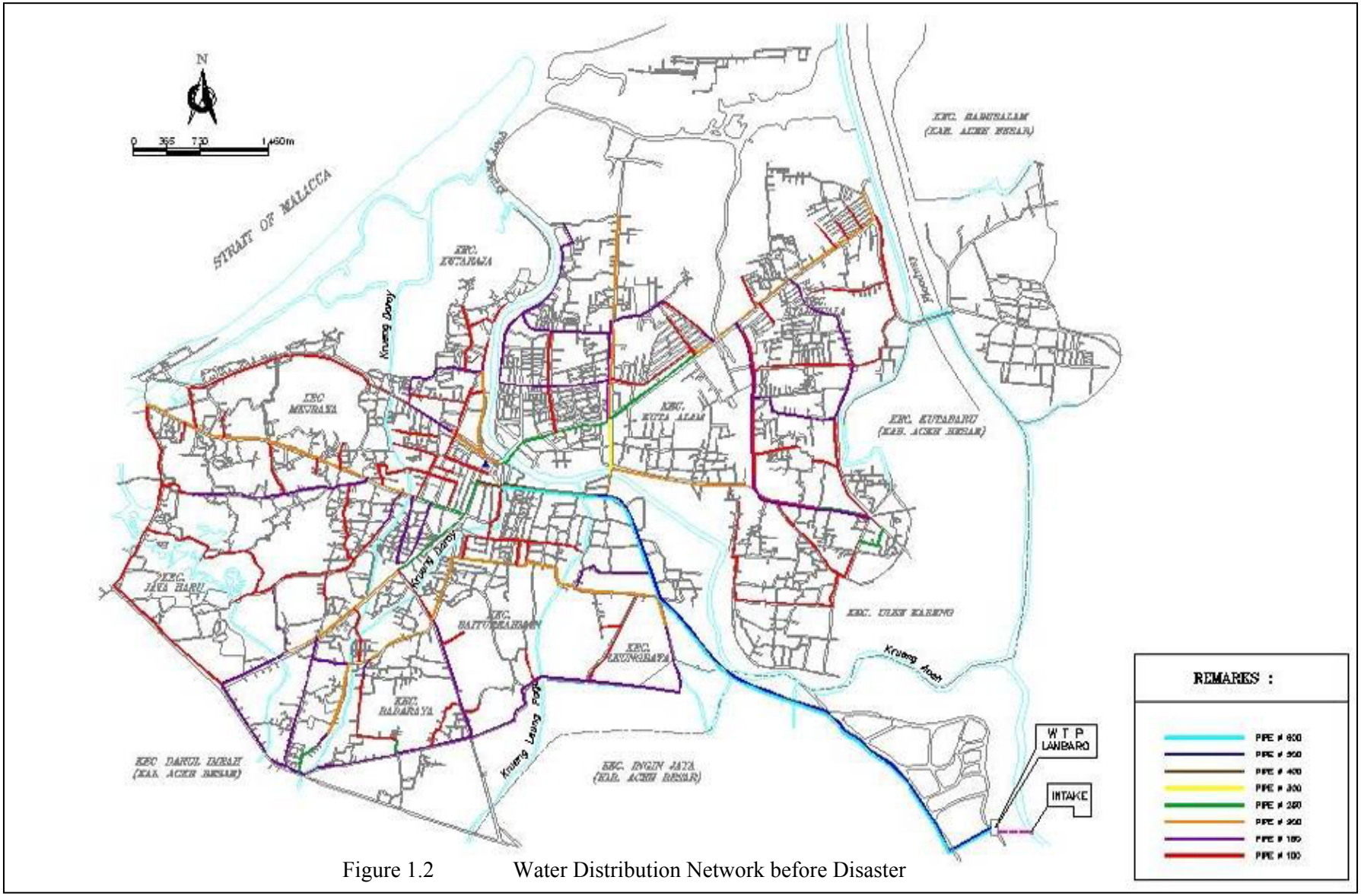

Figure 1.2 Water Distribution Network before Disaster

1.3 PAST WATER SUPPLY

1.3.1 Connection Ratio

The PDAM annual audit report describes the water service ratio by PDAM over the period from 2000 to 2004 was made available. It is summarized as given in Table 1.3.

Table 1.3 Connection to PDAM Service

Description	2000	2001	2002	2003	2004
Total Population	220,737	223,223	225,996	235,532	243,419
Number of House Connection	20,646	20,918	21,907	23,907	24,411
Served Population	116,578	120,270	127,308	133,692	138,984
Assumed Average Family Size	5.6	5.7	5.8	5.6	5.7
Service Ratio (%)	52.8%	53.9%	56.3%	56.8%	57.1%

Source: Laporan Audit BPK Nopember 2004 (PDAM)

As show in the table above, connection rate was only 57% in 2004. It is not known exactly how rest of population depended for their water supply. As reported in the succeeding sub-section 1.3.2 unaccounted-for-water was relatively high. It is supposed that among the unconnected people some were illegally connected to the pipe water service and some people were resorted to other water resources such as dug well and deep well.

1.3.2 Quality of Water Supply

From the same source as connection rate, the quantity of water supply was obtained as presented in Table 1.4.

Table 1.4 Quantity of Water Supply by PDAM

Description	2000	2001	2002	2003
Quantity of Treated Water Production (m^3)	9,730,630	9,297,579	11,545,261	12,947,638
Revenued Quantity (m^3)	6,598,255	6,052,973	6,601,681	6,647,017
UFW (%)	32.2%	34.9%	42.8%	48.7%
Served Population	116,578	120,270	127,308	133,692
Per Capita Consumption (lpcd)	154.6	137.9	142.1	136.2

Source: Laporan Audit BPK Nopember 2004 (PDAM)

It should be noted that the unpaid billing is not includes in the UFW figures above. It is supposed that the actual UFW rate including both physical and non-physical aspect will be more higher.

The water consumption was relatively high, 136 liter per capita per day on average in 2003.

CHAPTER 2 DAMAGES ON WATER SUPPLY FACILITIES

2.1 DAMAGES ON HUMAN RESOURCES AND EQUIPMENT

The 2004 disaster (earthquake and tsunami) resulted in damaging various water supply facilities and also in loosing human resources, equipment and various documents necessary for operation.

According to PDAM, out of 173 PDAM staff, 29 staff were lost their life and/or missing, causing hampering operation of water supply system, billing and collecting tariff. Also out of three (3) operation and maintenance vehicles, two (2) were lost.

2.2 DAMAGES ON WATER SUPPLY SYSTEM

2.2.1 Lambro Water Supply System

In general there was no serious damage in the system, excepting for distribution pipelines especially in area along the coast. Damages observed in the respective component are as described below. This system is now supplying the treated water at a rate of 31,536 m^3/day, slightly less than its full production capacity.

(1) Raw water pumping station

Of 5 intakes pumps existed on the bank of the Aceh River, one pump was washed away. There is no serious matter in the present situation but there is no stand-by pump now.

(2) Water treatment plant

Fortunately, there is no serious structural mechanical damage, so that the plant has started its production soon after disaster. Some structure suffered physical damage (Figure 2.1). Installment in auto-desludging equipment in pre-sedimentation and clarifier was out of order after disaster. For operation of the plant various international and domestic organizations concerned are supplying chemicals required.

Figure 2.1 Damages in Lambro Water Treatment Plant and Primary Pipe at River-Crossing

(3) Treated water pumping station

No damage is observed.

(4) Distribution pipelines

The distribution pipelines were destroyed in many locations and areas. Though the water treatment plant was operational, it was not possible to distribute the treated water to the service area owing to deterioration of distribution pipelines and also break of primary pipeline especially at river-crossing. An emergency measure was taken immediately after disaster to restore the distribution network through cooperation of international organization and the government organizations/agency such as DPU (Dinas Pekerjaan Umum: Department of Public Works) and PDAM from other regions of the country. Figure 2.2 shows emergency repair works so far completed.

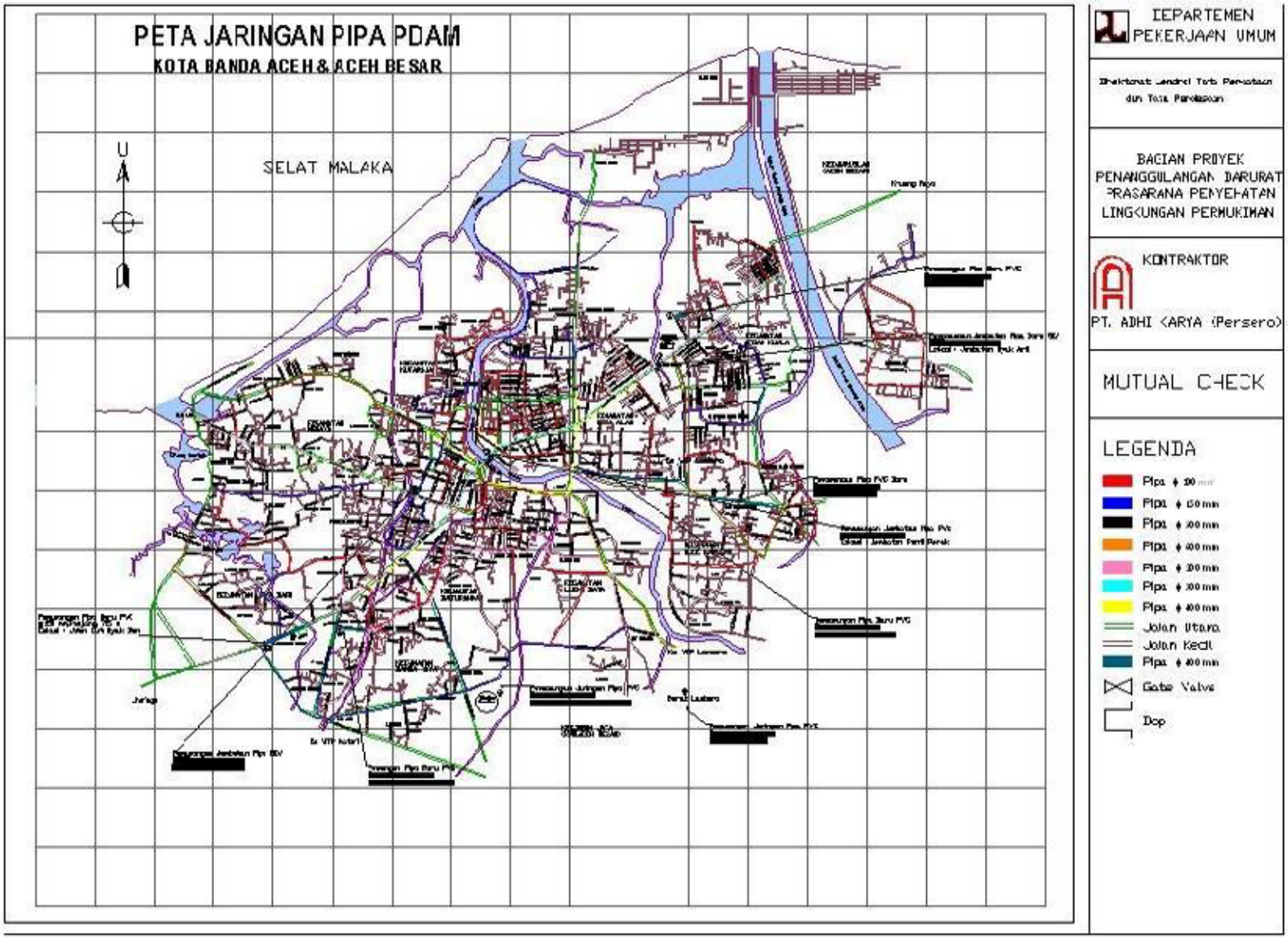

Figure 2.2 Completed Emergency Repair Works of Distribution Network

2.2.2 Siron Water Supply System

This system was not damaged at all. Unfortunately, the system suspended its operation temporarily due to lack of chemicals for operation of the water treatment plant.

2.3 BILLING AND COLLECTION OF TARIFF

Immediately after disaster, billing system was unusable due to broken computer. It is, however, already re-functioning now. At present there is no problem in billing and collection of tariff.

2.4 EMERGENCY RELEIF ON WATER SUPPLY SECTOR

As described above, there were lots of assistance from international and domestic donors, and some of such assistance are still continuing. Table 2.1 summarizes such assistance according to PDAM.

Table 2.1 Assistance on Water Supply Sector during Emergency Relief Period

Aid Item	Donors	Aid Contents /Capacity	Notes
Mobile Water Treatment Equipment	Australia	480 m^3/day	With staff
	LAPI-ITB&Kodam III	199.2 m^3/day	With staff
Chemicals for waterworks	Ministry of Public Works	48 ton	Aluminium-sulphate
	UNICEF	200 ton	Aluminium-sulphate, etc.
	ICRC	52 ton	Various kinds
Installation of public tap	DPU	46 units	Grant
Re-installation of pipes	DPU		Provision of contractor
Water tankers	DPU	6 units	Grant
	PDAM-Medan	2 units	Rental
	PALYJA	2 units	Rental
	PT Nidya Karya	4 units	Rental
	NGOs	12 units	Rental
Human assistance	PDAM-Medan	operators	
	PDAM-Kabupaten Bogor	engineers	
	IATPI	engineers	
	PALYJA	operators mechanics engineers	
	PDAM-Padang	engineers	
Cash fund	Dana Pensiun PERPAMSI	Rp.45million	
Vehicle	Swis Red Cross	One pick-up	

Source: PDAM

Figure 2.3 Mobile Water Treatment Equipment and Temporary Public Tap

CHAPTER 3 APPROACH FOR REHABILITATION AND RECONSTRUCTION PLANNING

3.1 MISSION, STARATEGIES AND GOALS

As stated in Chapter 2 of this report, there are some damages on Lambaro water treatment plant and huge damage on supply distribution pipeline. The distribution pipelines were tentatively repaired in order to sustain lifeline of the human-beings. However, it is pre-requisite to install a complete water supply system aiming at earliest recover from disaster and enhancing economic development in the city. Such system development, on the other hand, should be planned and implemented in a harmony with the new urban development plan including city road development.

Table 3.1 Mission, Strategies and Goals for Urgent Rehabilitation and Reconstruction Plan of Water Supply System

Mission	➢ To provide the safe and sufficient water to the people as many as possible ➢ To strength institutional and financial capability of PDAM Banda Aceh ➢ To develop the water supply system strong against disaster
Strategies	➢ To expand water distribution network in conformity with new urban development plan ➢ To reduce conduct leakage survey to contribute reduction of UFW ➢ To conduct corporate development planning ➢ To re-train PDAM staff
Goals	➢ To re-install the distribution network until 2006 ➢ To rehabilitate Lambaro and Siron water treatment plants until 2006 ➢ To achieve connection ratio of 80% by 2009 ➢ To achieve rate of UFW at 30 % by 2009

3.2 AVAILABLE DATA AND INFORMATION ON REHABILITATION AND RECONSTRUCTION PLANNING

3.2.1 The Master Plan for Rehabilitation and Reconstruction of Aceh Region and Nias

The Government of Indonesia published the Master Plan for Rehabilitation and Reconstruction of Aceh Region and Nias (called as Blueprint) on March 2005. It establishes overall and sector rehabilitation and reconstruction policy and strategy. As far as water supply sector is concerned, the Blueprint sets forth the following strategies and targets.

(1) Strategies

- System development plan should be harmonized with other development plans, such as city plan, housing development plan and resettlement plan.
- Water supply should be given higher priority among urban infrastructure.
- System development plan should be community-oriented.

(2) Target during Rehabilitation Period (2005-2006)

- Unit water consumption: 150 lpcd or same as before disaster in urban area and 90 lpcd, for rural area.
- Water supply system: pipe water for urban and well / communal system for rural.

(3) Target during Reconstruction Period (2007-2009)

- Connection rate: 100% rate of 200 lpcd for piped supply and 90 lpcd for non-piped supply.
- Supply hour: 24 hours with minimum head of 10m for piped supply.
- To be subsidized by the local administration to sustain the operation and maintenance.

3.2.2 Revised Plan of Regional Space Layout, Banda Aceh City, Year 2001-2010

Revised Plan of Regional Space Layout, Banda Aceh City, Year 2001-2010 (called as the City Master Plan) was published in 2001 by the city council and sets forth the following targets for the water supply sector. Those development targets are not in consistent with those of the Blueprint.

(1) Development Target for Year 2010

- Pipe water connection ratio: 80%
- UFW: 20%
- Meter connection: 49,231
- Estimated total water requirement: 52,600m^3/day

(2) Water supply development program

- Construction of distribution reservoir
- Expansion of distribution network (refer to Figure 3.1)
- Increase of house connection meter
- Installation of public taps at low income residence area
- Socialization of water sanitary education
- Study on water resources potential
- New water resources development to cope with increasing water demand

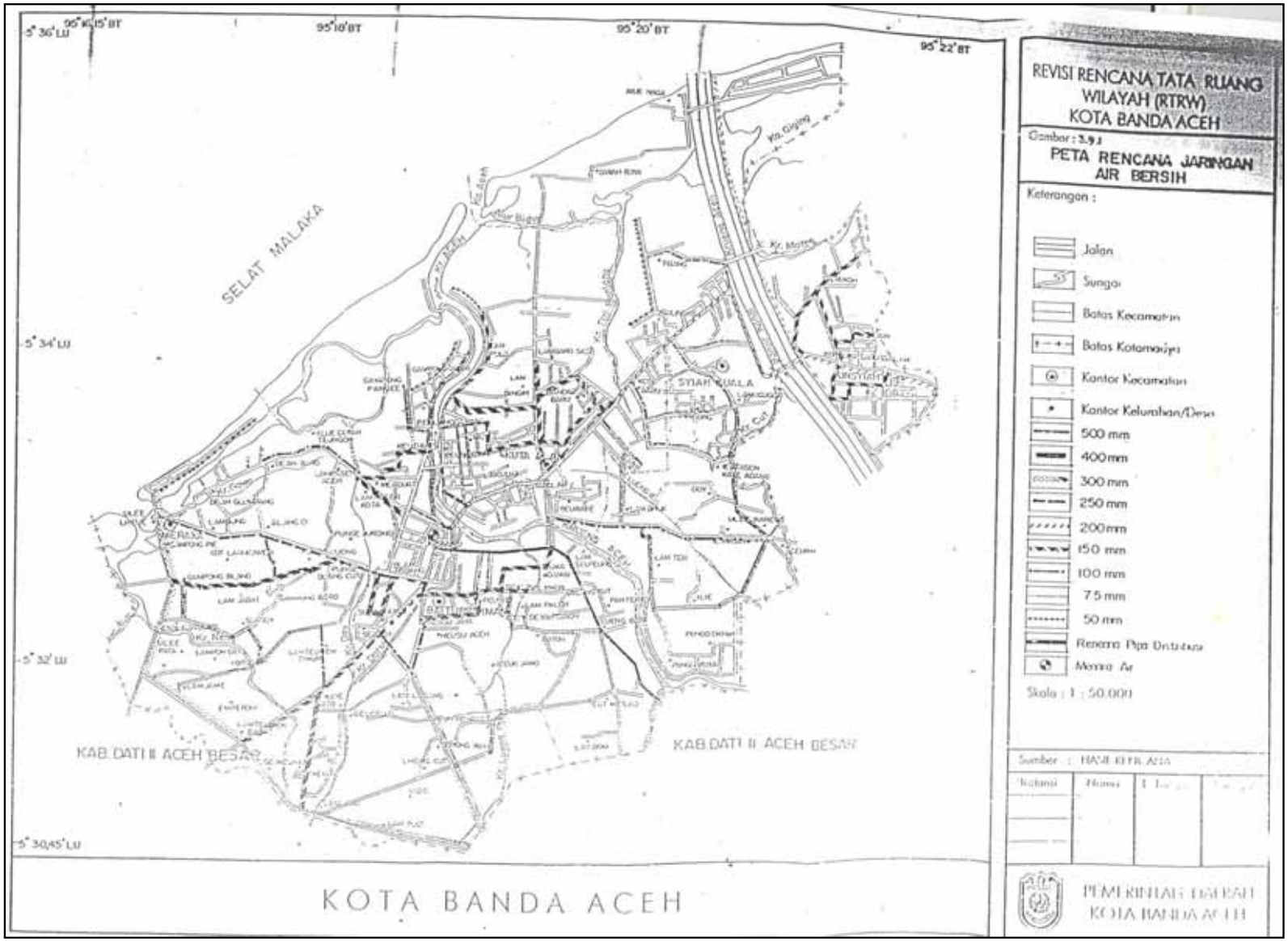

Figure 3.1 Distribution Network Plan (2001-2010)

3.2.3 Anticipated International Assistance during Rehabilitation and Reconstruction Period

According to PDAM, the following international assistance is anticipated for the water supply sector.

Table 3.2 Ongoing Projects and Donors Intentions

Assistance	Donor	Notes
Lambaro Water Treatment Plant	France	Not know yet.
	Switzerland	Rehabilitating pumps, buildings and office equipment as stated in MOU.
Distribution Pipeline	Japan	Prepare Corporate Plan and urgent rehabilitation of distribution network.
PDAM Office Building	Switzerland	Building rehabilitation and office equipment supply.
Capacity Development	USA	Needs assessment to the peoples. Prepare capacity building program.
Others	The Netherlands	Under consideration.

CHAPTER 4 URGENT REHABILITATION AND RECONSTRUCTION PLAN

4.1 PLANNING CRITERIA

One of the most important fundamentals in water supply planning, population projection and its distribution is based on Baseline Data in Appendix 2 of this Study report. For the planning of distribution network rehabilitation, roads development plan is also referred to herein. The roads development plan is compiled in Appendix 5 of this Study report.

In order to achieve the missions and goals, the planning criteria are set forth as shown in Table 4.1 below.

Table 4.1 Planning Criteria

Description		unit	2005	2006	2007	2008	2009	PU guideline
Connection	Served population	%	58	60	65	70	80	
	Average family size		1:5					1:(5-6)
	House connection	%	90					80-90
	Public tap	%	10					10-20
Unit consumption	House connection	lpcd	150					150
	Public tap	lpcd	40					30-50
	Non-Domestic	%	20					15-30
UFW		%	50	45	40	35	30	30-50
Maximum Daily Demand Factor			1.1					1.1-1.25
Peak Hourly Demand Factor			1.5					1.5-2.0

note: PU guideline for house connection per capita consumption applied figure for the city with 100,000-500,000 population.

4.1.1 Water Demand Forecast and Supply

The water demand during the planning horizon is forecast as presented in Table 4.2. In order to facilitate establishing a long-term development plan (say to the year 2015), the demand is also forecast assuming that population increases at a rate of 6% per annum, the same rate as that during the planning horizon.

Table 4.2 Water Demand Forecast and Supply Capability

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

As shown in table above, the 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.

4.2 PRELIMINARY DESIGN OF WATER SUPPLY SYSTEM

4.2.1 Urgent Rehabilitation of Lambaro Water Treatment Plant (WTP)

The Lambaro water treatment plant has suffered minor damages as noted in Chapter 2 of this report, and is resumed its production already. However, as also reported in Chapter 3 of this report, 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.

According to PDAM, the following works, at least, should be executed as a part of rehabilitation works.

(1) To replace two (2) intake pumps, each with a capacity of 208 L/s and one (1) distribution pump with capacity of 147 L/s.

(2) To replace 600 mm diameter distribution water meter.

(3) To calibrate a raw water meter and 500 mm diameter distribution water meter.

(4) To repair installment of automatic de-sludging systems on pre-sedimentation tank and clarifier.

(5) To replace filter media.

4.2.2 Water Supply Distribution Network

As noted in Chapter 3 of this report, 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 rehabilitation design targets to distribute the forecast water demand of 2009 throughout the city with minimum residual head of 5m.

The alignment of new primary and secondary distribution pipelines is as shown in Figure 4.1 and breakdown of distribution pipes are as given in Table 4.3 below. It is reported that Ductile Iron Pipe (DIP) and Polyethylene Pipe (PE) are selected as pipe materials.

There is an item "house connection recovery" in Table 4.3. This means a set of tertiary pipe (PVC: Polyvinyl chloride) and water meter for individual connection. It is reported that 8,000 sets will be provided to PDAM.

Table 4.3 Project Feature of Quick Impact Project for Distribution Network

Components	Pipe Material	Diameter	Quantity
1. Replacement Works			
Primary pipe	DIP	600 mm	378 m
Primary pipe	DIP	500 mm	303 m
Primary pipe	PE	400 mm	73 m
Primary pipe	PE	300 mm	250 m
Secondary pipe	PE	250 mm	319 m
Secondary pipe	PE	200 mm	3,660 m
Secondary pipe	PE	150 mm	6,116 m
Tertiary pipe	PE	100 mm	1,463 m
Tertiary pipe	PE	75 mm	1,200 m
Water pipe bridge (steel)	-	-	5 units
Public tap	-	-	20 units
Fire hydrant	-	-	10 units
House connection recovery	-	-	7,860 units
Others connection recovery	-	-	140 units
2. Extension Works			
Distribution pipe	PE (10bar)	300 mm	6,500 m

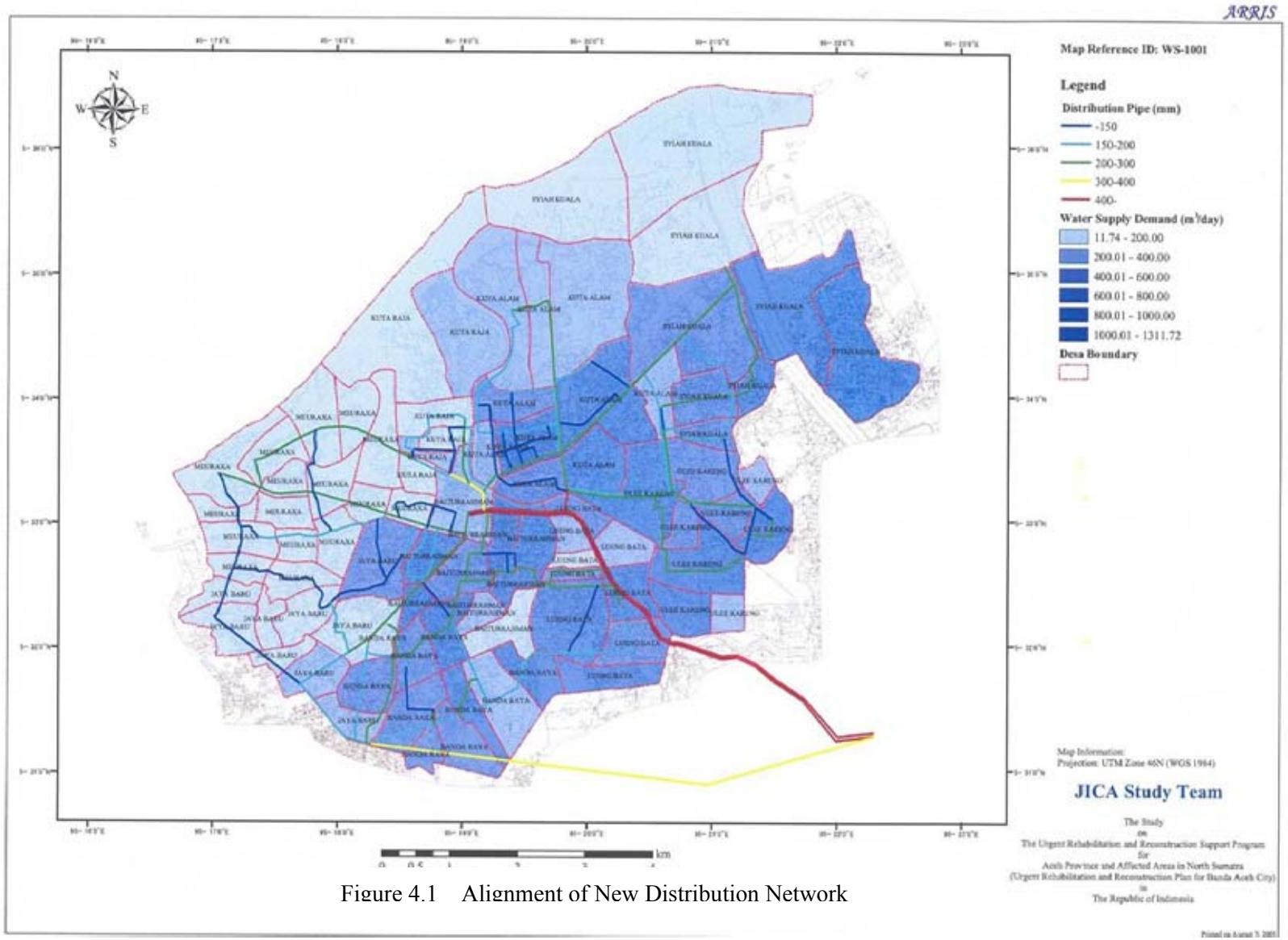

Figure 4.1 Alignment of New Distribution Network

4.3 PRELIMINARY PROPOSAL FOR EXPANSION OF WATER SUPPLY SYSTEM

It is necessary to implement an expansion of water supply system as assessed in Section 4.2 herein. Otherwise, Kota Banda Aceh 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.

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.

CHAPTER 5 PRELIMINARY PROJECT COST ESTIMATE AND TENTATIVE IMPLEMENTATION SCHEDULE

5.1 PRELIMINARY PROJECT COST ESTIMATE

Preliminary project cost for the urgent rehabilitation and reconstruction works proposed in this study is estimated making reference to actual costs of similar types of the project in Indonesia, and based on the preliminary design as well as the following conditions and assumptions, however, these are subject to change due to finalization of the Indonesian authorities.

Conditions and Assumptions for Preliminary Cost Estimate

(1) Physical contingency and price escalation are assumed to be 10 % each of the direct construction cost.
(2) Engineering service is assumed to be 10% of the direct construction cost for detailed study & design and construction supervision.
(3) If project is purely program type and/or procurement, only price contingency is considered.
(4) VAT is included in the cost, however, import duties are not included in the cost.
(5) Land acquisition and compensation costs are not included in the Project cost due to difficulty of estimation at this time

As shown in Table 5.1, 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 5.1 Preliminary Total Project Cost

Project Description		Amount (Mil Rp.)
A. PROGRAMS		
Rehabilitation	Banda Aceh Water Supply Master Plan 2007-2020	2,850
	PDAM Corporate Plan 2005-2009	300
	Capacity Building Program	5,180
	Sub-Total	8,330
	Price Escalation	833
	Total	**9,163**
B. CONSTRUCTION WORKS		
Rehabilitation	PDAM Administrative Facilities	9,840
	Rehabilitation of Lambaro Water Treatment Plant	11,090
	Rehabilitation of Water Distribution System	67,420
Reconstruction	Expansion of Lambaro Water Treatment Plant	16,670
	Sub-Total	105,020
	Physical Contingency	10,502
	Price Escalation	10,502
	Engineering Services	10,502
	Total	**136,526**
TOTAL AMOUNT		**145,689**

5.2 TENTATIVE IMPLEMENTATION SCHEDULE

Tentative implementation schedule is shown in Figure 5.1. This schedule takes into account of the following;

(1) The urgent rehabilitation works such as rehabilitation of water treatment plant and distribution network shall be completed before 2006.

(2) The capacity building of PDAM could also be given priority to reinforce water supply services in general and to be financially autonomous in a long run.

(3) Expansion of water treatment plant differed beyond 2009.

Project Description	Implementation Schedule				
	Rehabilitation		Reconstruction Stage		
	2005	2006	2007	2008	2009
A. PROGRAMS					
Banda Aceh Water Supply Master Plan 2007-2020					
PDAM Corporate Plan 2005-2009					
Capacity Building Program					
B. CONSTRUCTION WORKS					
PDAM Administrative Facilities					
Rehabilitation of Lambaro Water Treatment Plant					
Rehabilitation of Water Distribution System					
Expansion of Lambaro Water Treatment Plant	beyond 2009				

Figure 5.1 Tentative Implementation Schedule of Water Supply Sector

5.3 ANNUAL FUND REQUIREMENT

The annual fund requirement is prepared on the basis of the preliminary project cost estimate and tentative project implementation schedule. It is shown in Table 5.2.

Table 5.2 Annual Fund Requirement for Water Supply Sector (unit: million Rp)

Project Description	Rehabilitation		Reconstruction Stage			Long Term 2010-2015	TOTAL
	2005	2006	2007	2008	2009		
A. PROGRAMS							
Banda Aceh Water Supply Master Plan 2007-2020		3,135					3,135
PDAM Corporate Plan 2005-2009	330						330
Capacity Building Program	1,331	1,925	924	759	759		5,698
B. CONSTRUCTION WORKS							
PDAM Administrative Facilities	7,865	247	4,680				12,792
Rehabilitation of Lambaro Water Treatment Plant	4,147	10,270					14,417
Rehabilitation of Water Distribution System	14,317	72,289	1,040				87,646
Expansion of Lambaro Water Treatment Plant						21,671	21,671
Sub-Total	**27,990**	**87,866**	**6,644**	**759**	**759**	**21,671**	**145,689**
TOTAL	**115,856**		**8,162**				