

TABLES

CHAPTER 10

**ENVIRONMENTAL AND SOCIAL
IMPACTS**

LIST OF TABLES

Chapter 10

Table 10.1.1	Result of Water Quality Test (West Floodway / Garang River)	T-10-1
Table 10.1.2	Abundance and Diversity of Plankton (West Floodway / Garang River)	T-10-3
Table 10.1.3	Abundance and Diversity of Benthos (West Floodway / Garang River)	T-10-5
Table 10.1.4	Result of Sediment Analysis (West Floodway / Garang River)	T-10-7
Table 10.2.1	Environmental Management Plan (Construction of Jatibarang Multipurpose Dam)	T-10-8
Table 10.2.2	Environmental Monitoring Plan (Construction of Jatibarang Multipurpose Dam)	T-10-9

**Table 10.1.1 (1/2) RESULTS OF WATER QUALITY TEST
(WEST FLOODWAY / GARANG RIVER)
(WET SEASON)**

Parameter	Water Quality Standard (B)	Sampling Location									
		KG1	KG2	KG3	KG4	KG5	KG6	KG7	KG8	KG9	KG10
Temperature	Normal (°C)	27.8	29.6	29.6	29.6	30.0	29.4	29.6	30.2	29.6	30.6
pH	5-9	7.6	7.6	7.2	7.7	7.9	7.8	7.6	7.6	7.5	7.5
EC	- µS/cm	20.8	31.2	30.8	26.4	26.9	28.5	33.3	30.9	30.7	107.5
TDS	1,000 mg/l	188	235	208	210	231	250	232	260	292	576
TSS	- mg/l	12	36	38	50	51	59	75	49	85	106
DO	6 mg/l	7.1	6.7	6.7	6.7	6.9	6.9	7.0	6.6	6.3	6.9
BOD	- mg/l	5.4	1.2	0.8	1.8	0.6	1.3	3.9	5.1	5.2	6.3
COD	- mg/l	8.35	3.00	1.33	3.34	1.67	4.67	6.01	12.69	9.68	10.35
NH ₄ -N	- mg/l	0.05	0.09	0.04	0.15	0.02	0.03	0.09	0.10	<0.02	0.17
NO ₃ -N	10 mg/l	0.01	0.03	0.07	0.04	0.05	0.05	0.06	0.05	0.05	0.07
NO ₂ -N	1.0 mg/l	0.04	0.09	0.05	0.07	0.08	0.11	0.13	0.13	0.20	0.09
PO ₄ -P	- mg/l	2.3	4.9	4.7	11.1	2.6	5.6	3.6	11.4	2.9	9.1
Sulfide	0.1 mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cl	600 mg/l	7.47	14.94	16.81	14.94	14.94	15.88	26.15	19.05	18.30	205.45
Ca	- mg/l	15.15	24.62	27.69	23.08	23.85	26.16	28.46	26.15	27.69	34.62
Mg	- mg/l	6.14	6.92	6.92	6.92	6.92	8.77	7.85	8.31	6.92	22.15
Fe	5 mg/l	0.86	1.60	0.62	0.74	0.78	0.70	0.53	0.41	0.45	0.35
Mn	0.5 mg/l	<0.05	0.07	0.05	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05
Na	- mg/l	3.82	1.20	0.50	15.25	8.94	12.18	13.58	11.89	7.12	165.26
Hardness(CaCo ₃)	- mg/l	63.46	90.39	98.08	86.54	88.46	101.92	103.85	100.00	98.08	178.85
Cd	0.01 mg/l	0.002	0.002	0.003	0.002	0.003	0.002	0.004	0.002	<0.002	0.003
Zn	5 mg/l	0.014	0.008	0.029	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005
Pb	0.1 mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06
Cr	- mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cu	1 mg/l	0.03	0.05	0.02	0.05	0.06	0.04	0.03	<0.01	<0.01	0.03
T. Coliform	10,000/100ml	93x10 ³	20x10 ²	43x10 ³	24x10 ³	93x10 ²	15x10 ⁴	43x10 ⁴	24x10 ⁴	23x10 ⁴	43x10 ⁴
Fecal Coliform	2,000/100ml	93x10 ³	20x10 ²	43x10 ³	24x10 ³	93x10 ²	73x10 ³	91x10 ³	93x10 ³	23x10 ⁴	23x10 ⁴

Table 10.1.1 (2/2) RESULTS OF WATER QUALITY TEST
(WEST FLOODWAY / GARANG RIVER)
(DRY SEASON)

Parameter	Water Quality Standard (B)	Sampling Location									
		KG1	KG2	KG3	KG4	KG5	KG6	KG7	KG8	KG9	KG10
Temperature	Normal (°C)	27.2	35.0	32.0	31.0	31.0	30.0	30.8	31.8	35.4	36.6
pH	5-9	7.9	8.5	8.6	8.4	8.1	7.8	8.1	8.1	9.0	9.1
EC	- µS/cm	28.6	46.8	31.8	32.5	33.7	37.4	103.8	539	1444	1593
TDS	1,000 mg/l	263	149	256	307	276	323	722	3692	9015	5144
TSS	- mg/l	30	34	74	21	76	29	82	74	71	85
DO	6 mg/l	7.77	7.73	7.74	7.25	7.26	5.37	7.12	6.93	0	0
BOD	- mg/l	4.11	5.52	3.88	4.96	5.9	2.17	6.02	4.22	4.99	5.21
COD	- mg/l	15.48	16.46	13.58	15.47	17.48	10.31	26.32	25.31	26.5	24.4
NH ₄ -N	- mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.19	<0.02	0.42
NO ₃ -N	10 mg/l	0.09	0.03	0.07	0.16	0.16	0.08	0.07	0.06	0.03	0.02
NO ₂ -N	1.0 mg/l	0.09	0.09	0.11	0.09	0.16	0.36	1.59	1.37	0.11	0.11
PO ₄ -P	- mg/l	<1	<1	<1	1.7	4.7	1.3	2.3	2.0	1.3	2.3
Sulfide	0.1 mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cl	600 mg/l	23.32	33.42	21.76	21.37	27.98	23.32	22.54	1821.68	6315.17	6369.91
Ca	- mg/l	24.4	39.1	33.9	33.98	33.9	39.1	47.5	75.6	173.9	247.8
Mg	- mg/l	4.7	6.8	5.7	5.7	5.7	8.9	100	132	302.6	347.8
Fe	5 mg/l	0.82	0.55	0.42	0.94	0.78	0.62	0.62	0.33	1.15	0.72
Mn	0.5 mg/l	<0.05	0.11	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Na	- mg/l	33.25	46.61	20.25	15.25	12.7	32.11	109.45	1234.2	5610.52	5856.35
Hardness(CaCo ₃)	- mg/l	73.9	126.1	108.7	108.7	108.7	134.8	208.7	739.2	1695.7	1902.3
Cd	0.01 mg/l	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.013	0.03	0.03	0.03
Zn	5 mg/l	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	0.08	<0.005	0.01	<0.005
Pb	0.1 mg/l	<0.05	<0.05	0.189	0.213	0.237	0.545	<0.05	0.49	0.49	0.065
Cr	- mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cu	1 mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
T. Coliform	10,000/100ml	46x10 ³	>24x10 ⁴	46x10 ³	46x10 ⁴	>24x10 ⁴	>24x10 ⁶	46x10 ⁵	93x10 ⁴	46x10 ⁵	43x10 ⁴
Fecal Coliform	2,000/100ml	46x10 ³	>24x10 ⁴	46x10 ³	46x10 ⁴	>24x10 ⁴	>24x10 ⁶	46x10 ⁵	43x10 ⁴	75x10 ⁴	43x10 ⁴

Table 10.1.2 (1/2) ABUNDANCE AND DIVERSITY OF PLANKTON
(WEST FLOODWAY / GARANG RIVER)
(WET SEASON)

Group	Total Individu/lit at Each Sampling Location									
	KG1	KG2	KG3	KG4	KG5	KG6	KG7	KG8	KG9	KG10
Fitoplankton										
- Chlorophyta (Green)	Individu 34	69	34	87	17	69	51	68	34	86
	Species 2	3	2	2	1	3	3	4	2	3
- Chrysophyta (Golden-brown)	Individu 86	207	278	226	260	121	278	469	17	86
	Species 4	6	6	5	7	5	5	8	1	4
- Cyanophyta (Blue-green)	Individu 17	17	17	17	34	17	52	87	34	104
	Species 1	1	1	1	2	1	2	1	2	3
- Euglenophyta (Green)	Individu -	-	-	-	17	17	35	17	17	-
	Species -	-	-	-	1	1	1	1	1	-
Zooplankton										
	Individu 34	17	34	-	-	-	-	51	34	17
	Species 2	1	2	-	-	-	-	3	2	1
Population (Individu/lit)	171	310	363	330	328	224	416	692	136	293
Total Species	9	11	11	8	11	10	11	17	8	11
Diversity Index (H')	2.16	2.05	2.17	1.87	2.13	2.24	2.03	2.49	1.00	2.39
Evenness Index	0.98	0.85	0.90	0.90	0.89	0.97	0.85	0.88	0.48	0.99

Table 10.1.2 (2/2) ABUNDANCE AND DIVERSITY OF PLANKTON
(WEST FLOODWAY / GARANG RIVER)
(DRY SEASON)

Group	Total Individu/ltr at Each Sampling Location										
	KG1	KG2	KG3	KG4	KG5	KG6	KG7	KG8	KG9	KG10	
Fitoplankton											
- Chlorophyta (Green)	Individu	34	262	52	52	122	1416	6663	23383	28845	21197
	Species	2	2	2	2	4	4	3	4	3	5
- Chrysoophyta (Golden-brown)	Individu	242	365	2552	2898	1204	1975	5192	20321	16631	19169
	Species	10	8	10	15	10	8	6	9	6	4
- Cyanophyta (Blue-green)	Individu	-	507	104	87	69	647	419	698	560	1819
	Species	-	2	2	1	2	2	3	4	2	3
- Euglenophyta (Green)	Individu	-	-	-	-	17	70	17	-	157	-
	Species	-	-	-	-	1	1	1	-	1	-
Zooplankton											
	Individu	34	17	-	34	69	1154	-	52	68	734
	Species	2	1	-	2	3	2	-	1	4	4
Population (Individu/ltr)											
		310	1151	2708	3071	1481	5256	12291	44454	46261	42919
Total Species		14	13	14	20	20	17	13	18	16	16
Diversity Index (H')		2.58	1.97	1.83	1.83	1.96	2.13	1.31	1.31	0.88	1.10
Evenness Index		0.97	0.76	0.69	0.61	0.65	0.75	0.52	0.46	0.32	0.39

**Table 10.1.3 (1/2) ABUNDANCE AND DIVERSITY OF BENTHOS
(WEST FLOODWAY / GARANG RIVER)
(WET SEASON)**

Species	Total Individu/m ² at Each Sampling Location									
	KG1	KG2	KG3	KG4	KG5	KG6	KG7	KG8	KG9	KG10
1. Crustacea										
- Gammarus pulex	-	-	-	-	-	-	-	15	-	-
- Macrobrachium sp	-	-	15	-	-	-	-	-	-	-
- Ketam	-	-	15	-	-	-	-	-	-	-
2. Gastropoda										
- Brotia spadicea	75	420	1140	150	360	-	-	-	-	-
- Brotia testudinaria	-	195	-	-	-	-	-	-	-	-
- Dreisseniidae	-	-	-	-	-	-	-	-	-	15
- Melanoides tuberculata	-	-	-	-	15	-	-	-	-	-
- Thiara scabra	-	-	-	-	15	-	-	-	-	-
3. Insecta										
- Chironomus thumii	15	30	15	-	-	-	-	-	-	-
- Hydropsyche instabilis	30	-	-	-	-	-	-	-	-	-
4. Oligochaeta										
- Pheretima sp	-	-	30	-	-	-	-	-	-	-
- Tubifex sp	-	-	120	-	-	-	-	45	-	-
Total Individu	120	645	1335	150	390	-	-	60	-	15
Total Species	3	3	6	1	3	-	-	2	-	1
Diversity Index (H')	0.38	0.83	0.44	0.00	0.32	-	-	0.56	-	0.00
Evenness Index	0.35	0.75	0.26	0.00	0.29	-	-	0.81	-	0.00

Table 10.1.3 (2/2) ABUNDANCE AND DIVERSITY OF BENTHOS
(WEST FLOODWAY / GARANG RIVER)
(DRY SEASON)

Species	Total Individu/m ² at Each Sampling Location									
	KG1	KG2	KG3	KG4	KG5	KG6	KG7	KG8	KG9	KG10
1. Bivalvia										
- Pisidium	105	-	-	-	-	-	-	-	-	15
2. Crustacea										
- Shrimp	-	-	-	-	-	-	-	-	-	30
3. Gastropoda										
- Brotia spadicea	525	90	-	525	345	225	15	-	-	-
- Indoplanorbis exustus	-	-	-	-	-	60	-	-	-	-
- Lymnaea sp	-	-	-	-	15	-	-	-	-	-
- Melanoides tuberculata	-	30	75	-	-	30	-	-	-	-
- Melanoides torloosa	-	-	45	75	-	-	-	-	-	-
- Syncera sp	-	-	-	-	-	15	-	-	-	-
- Thiara scabra	210	-	-	60	-	225	-	-	-	-
4. Insecta										
- Chironomus thumii	-	-	-	45	60	-	-	-	-	-
- Hydropsyche instabilis	-	-	30	-	15	15	-	-	-	-
5. Oligochaeta										
- Pheretima sp	-	-	-	-	-	-	-	-	-	120
- Prionospio sp	-	-	-	-	-	-	-	-	330	-
- Tubifex sp	-	-	-	-	-	1365	-	-	-	-
6. Polychaeta										
- Nereis sp	-	-	-	-	-	15	-	-	-	-
Total Individu	840	705	150	705	435	1950	15	0	330	165
Total Species	3	3	3	4	4	8	1	0	1	3
Diversity Index (H')	0.90	0.50	1.00	0.84	0.69	1.03	0.00	0.00	0.00	0.76
Evenness Index	0.82	0.50	0.94	0.61	0.50	0.49	0.00	0.00	0.00	0.69

**Table 10.1.4 RESULT OF SEDIMENT ANALYSIS
(WEST FLOODWAY / GARANG RIVER)**

(WET SEASON)

(Unit: mg/kg)

Parameter	Sampling Location				
	KG1	KG3	KG6	KG7	KG10
Cu	21.75	29.50	31.50	31.75	31.30
Cr	15.00	17.50	12.50	12.50	21.25
Cd	0.58	1.09	1.10	1.10	1.12
Zn	60.68	91.70	96.55	101.13	90.78
Pb	32.34	44.32	46.45	47.56	45.67

(DRY SEASON)

(Unit: mg/kg)

Parameter	Sampling Location				
	KG1	KG3	KG6	KG7	KG10
Cu	31.73	51.78	62.76	25.16	38.26
Cr	6.67	14.91	12.14	10.77	10.14
Cd	0.19	0.70	0.76	0.80	0.65
Zn	91.51	104.44	118.46	96.94	140.25
Pb	15.18	26.19	21.22	16.03	19.22

KG1: Proposed reservoir area on Kreo River

KG3: Tugu Suharto (Garang River)

KG6: Simongan weir (upstream)

KG7: Simongan weir (downstream)

KG10: Ring road bridge

**Table 10.2.1 ENVIRONMENTAL MANAGEMENT PLAN
(CONSTRUCTION OF JATIBARANG MULTIPURPOSE DAM)**

Managing Item	Source of Impact	Measuring Standard of Impact	Managing Approach	Management Location	Managing Agency Concerned
(Pre-Construction Stage)					
- Land ownership	- Land speculation	- Land values	- Restriction of land transaction	- Project-affected area	- Chief of village - Chief of subdistrict
- Social unrest	- Land acquisition - Assets evaluation	- Compensation - Public protest and demonstration	- Negotiations - Presidential decree No. 55/1993	- All project-affected villages	- Land acquisition committee - Project office - DGWRD
(Construction Stage)					
- Noise	- Operation of heavy equipment	- Noise level : 60 dBA	- Control of speed of vehicles/equipment - Working hours/schedule - Equipment operators	- Villages along access roads	- Project office
- Air pollution	- Mobilization of equipment - Earth works	- Air quality standard KEP decree No. 02/ MENLH/1988	- Covering materials with sheet - Watering the road - Selection of spoil site	- Villages along access roads - Dam site and borrow areas	- Project office
- Traffic disturbance	- Mobilization of equipment and materials	- Public complaint - Traffic congestion frequency/duration	- Schedule adjustment for equipment mobilization - Traffic control	- Villages along access roads	- Project office
- Water quality of the river	- All civil works relating to the project	- Water quality standard according to Gov. regulation No.20/1990	- Effort to minimize spill soil into the river - Protection net at downstream direction	- Dam site and borrow area - Kreo river - Spill way	- Project office - Environmental bureau of Provincial Gov.
- Sedimentation	- Earth works - Material stock yard	- Soil suspended level 100 to 250 mg/l	- Installation of sand settling pond	- Dam site and borrow area - Kreo river	- Project office
- Road damage	- Mobilization of equipment/materials	- Public complaint - Damage level	- Regular check system for road maintenance and repair	- Village road - Access road	- Project office
- Aquatic biota	- All civil works relating to the project	- Diversity index of plankton and benthos	- Base camp sanitation against water pollution - Sediment control - Effort to preserve natural ecology	- Dam site - Reservoir and its surrounding areas	- Project office
(Post-Construction Stage)					
- Illegal land use of reservoir surrounding areas	- Land acquisition - Recreational value due to impounded water	- Type of illegal land use - Number of squatters	- Control of illegal land use - Effort to gain public comprehension	- Dam and reservoir surrounding areas	- Project office - Chief of village - Chief of subdistrict
- Water quality	- Reservoir impounding	- Water quality standard according to Gov. regulation No.20/1990 - Diversity index of plankton and benthos	- Land clearing before impounding - Control of domestic waste discharge	- Reservoir and its surrounding areas - Uptream areas from the reservoir	- Project office - Chief of village - Chief of subdistrict
- Flow of Garang river	- Construction of dam	- Minimum (2.69 m ³ /s) for drought period - Maximum (790 m ³ /s) for flood period	- Adjusting flow discharge by dam operation	- PDAM water intake facility - Simongan weir	- Project office
- Land slide	- Fluctuation of water level in reservoir	- Soil test or geotechnical investigation	- Slope stabilization or protection	- Reservoir surrounding area	- Project office
- Goa Kreo park (tourism attraction)	- Change in recreational value due to the dam construction	- Number of tourists - Number of terrestrial fauna	- Providing facilities and infrastructures - Effort to upgrade environmental quality	- Goa Kreo park	- Project office - Tourism agency
- Land use pattern	- Increase in development potentiality due to the project	- Change of land use - Population increase	- Review of future land use plan - Institutional coordination - Environmental impact assessment	- Dam reservoir and its surrounding areas - such as Jatibarang, Jatirejo, Kandri and Kedungpane	- Project office - BAPPEDA - City planning agency
- Fish farming	- Construction of dam reservoir	- Fishing activities - Presence of investor	- Restrictions imposed on fish farming	- Dam reservoir area	- Project office - Chief of village

**Table 10.2.2 ENVIRONMENTAL MONITORING PLAN
(CONSTRUCTION OF JATIBARANG MULTIPURPOSE DAM)**

Monitoring Item	Monitoring Method	Location	Monitoring Frequency	Duration	Monitoring Agency Concerned
(Pre-Construction Stage)					
- Land issues and social unrest	- Interview and field inspection	- All project-affected villages - Proposed dam site and reservoir area	- Monthly	- As long as problems exist	- Land acquisition committee - Project office - DGWRD
(Construction Stage)					
- Noise	- Measured by noise level meter	- Project-affected villages	- Monthly	- Construction period	- Project office
- Air pollution	- High volume sampling method	- Project-affected villages	- Monthly	- Construction period	- Project office
- Traffic disturbance	- Traffic congestion frequency/duration	- Project-affected villages	- Weekly	- Construction period	- Project office
- Water quality of the river	- Test and analysis of sample water in laboratory	- Kreo river	- Monthly	- Construction period	- Project office - Environment bureau of Provincial Gov.
- Sedimentation	- Field inspection and measurement	- Sand settling pond - Kreo river	- Monthly	- Construction period	- Project office
- Road damage	- Field inspection and measurement	- Village road - Access road	- Monthly	- Construction period	- Project office
- Aquatic biota	- Test and analysis of sample water in laboratory	- Kreo river	- Monthly	- Construction period	- Project office
(Post-Construction Stage)					
- Illegal land use	- Field inspection	- Dam and reservoir surrounding areas	- Bi-monthly	- Min. 2 years	- Project office - Chief of village - Chief of subdistrict
- Water quality	- Test and analysis of sample water in laboratory	- Reservoir - Kreo river	- Monthly	- No limit	- Project office - Municipality
- Flow of Garang river	- Inspection and measurement	- Kreo river - Garang river	- Weekly	- Min. 2 years	- Project office
- Land slide	- Field inspection	- Reservoir surrounding areas	- Monthly	- Min. 2 years	- Project office
- Goa Kreo park	- Number of tourists - Number of terrestrial fauna	- Goa Kreo park	- Monthly	- Min. 2 years	- Project office - Tourism agency
- Land use pattern	- Field inspection	- Jatibarang, Jatirejo, Kandri and Kedungpane	- Every 6 months	- No limit	- Project office - BAPPEDA - City planning agency
- Fish farming	- Field inspection	- Dam reservoir	- Monthly	- No limit	- Project office - Chief of village

FIGURES

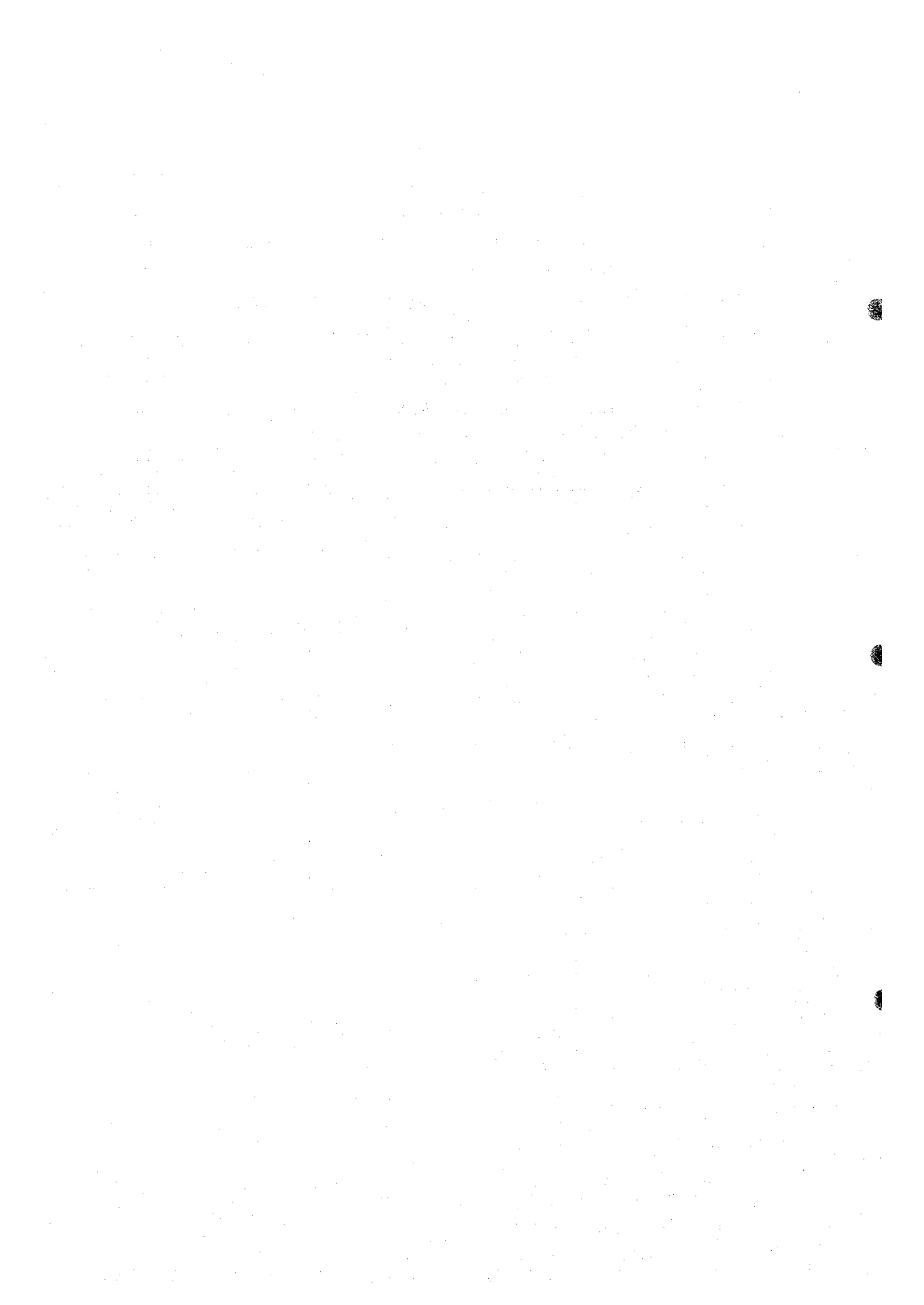
CHAPTER 10

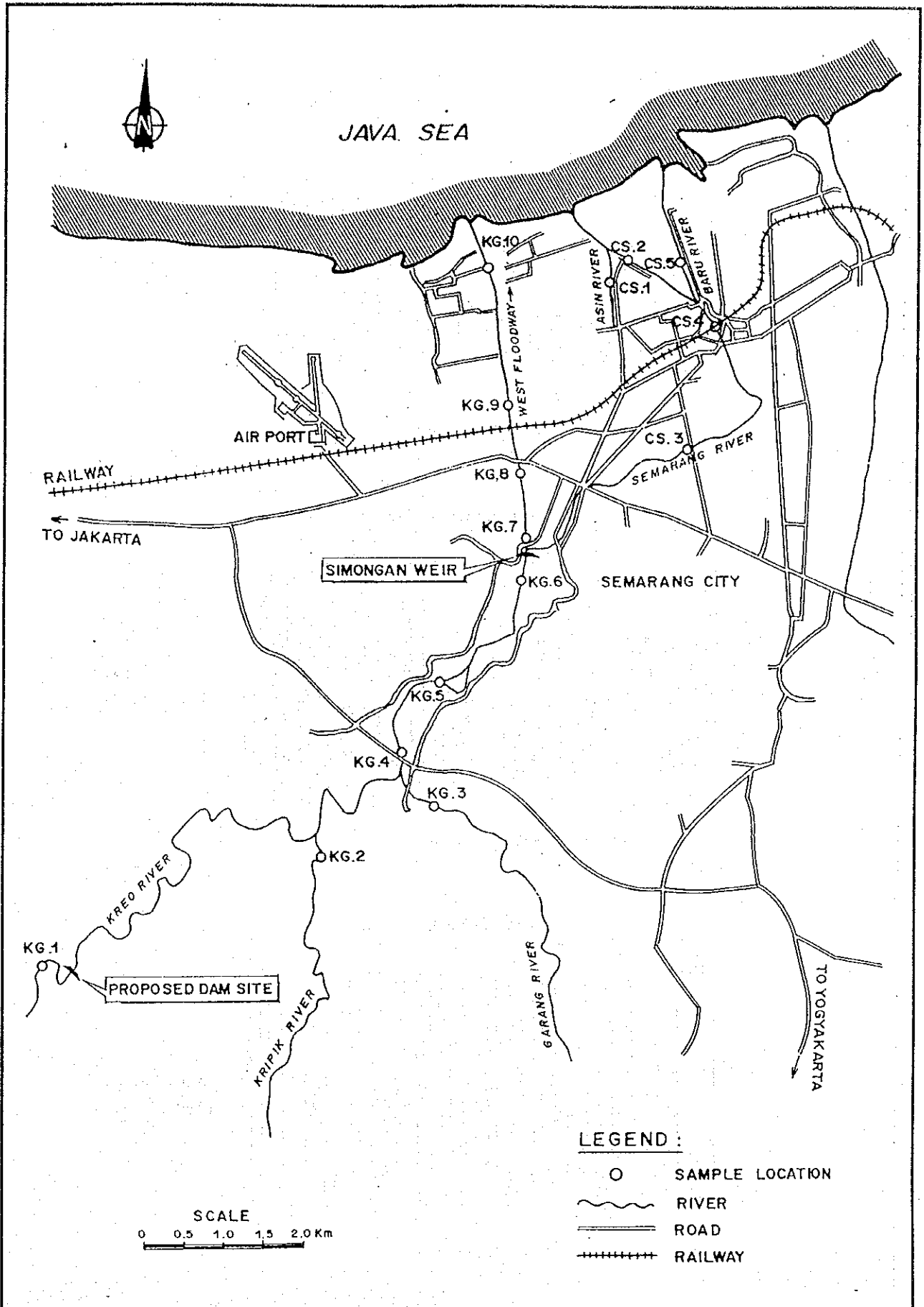
**ENVIRONMENTAL AND SOCIAL
IMPACTS**

LIST OF FIGURES

Chapter 10

Fig. 10.1.1	Water Sampling Location	F-10-1
Fig. 10.1.2	Concentrations of BOD, COD and DO	F-10-2
Fig. 10.1.3	BOD, COD and DO Compared with Results of 1992	F-10-3
Fig. 10.1.4	BOD and DO at PDAM Water Intake Location	F-10-4
Fig. 10.1.5	Concentration of Heavy Metal in Sediment	F-10-5
Fig. 10.1.6	Comparison of Heavy Metal Concentration between Water and Sediment	F-10-6
Fig. 10.1.7	Farm Economy of Villages in Dam Reservoir Area	F-10-8
Fig. 10.1.8	Public Perception for the Project and Expected Method of Compensation	F-10-9
Fig. 10.3.1	Groundwater Reservoir and Conditions of Aquifer Zone	F-10-10





THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

Fig. 10.1.1 WATER SAMPLING LOCATION

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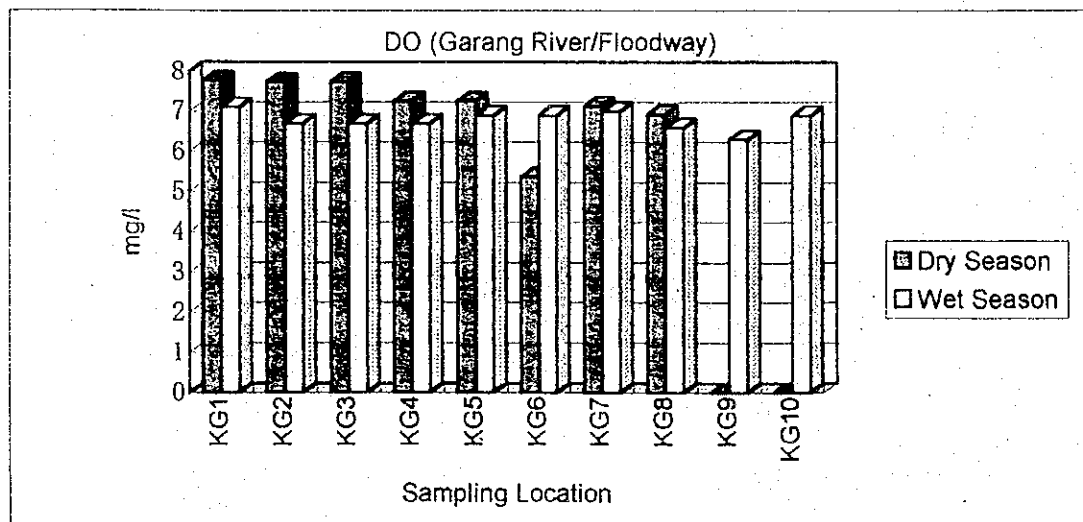
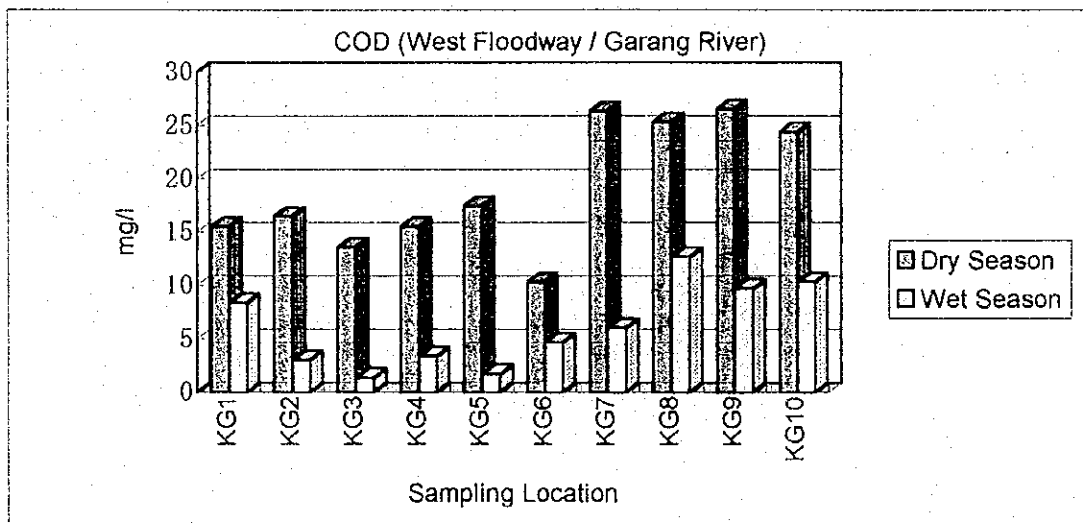
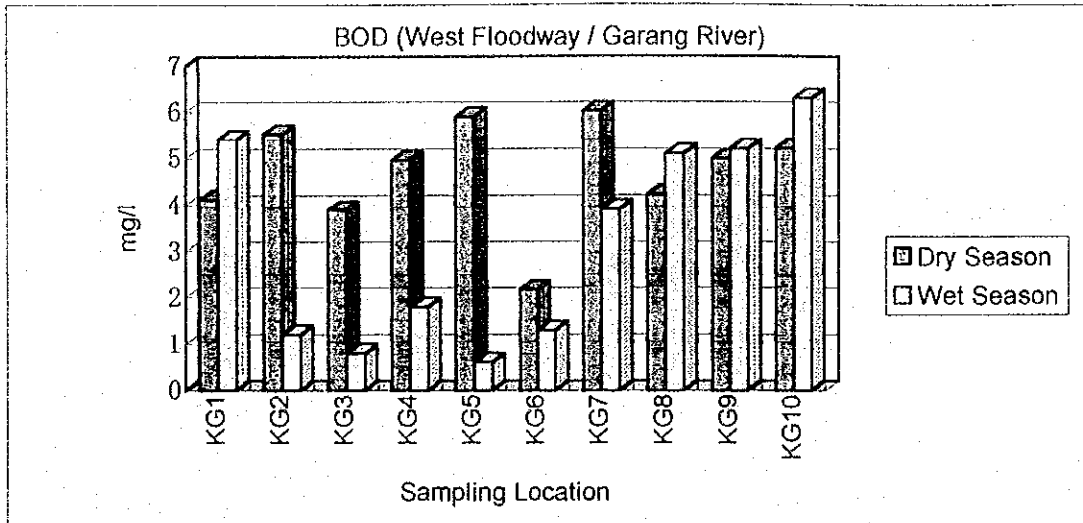


Fig. 10.1.2

CONCENTRATIONS OF BOD, COD AND DO

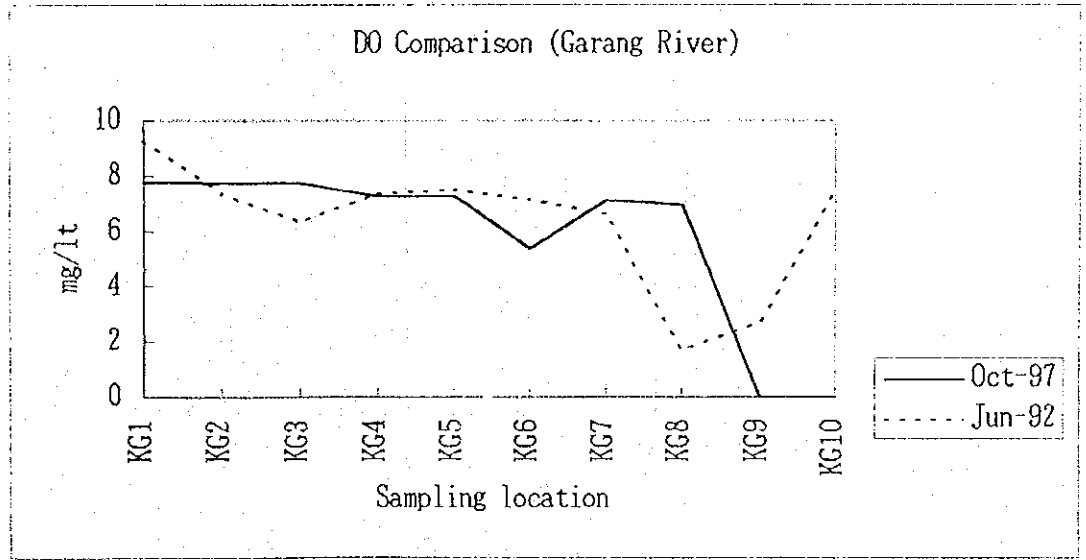
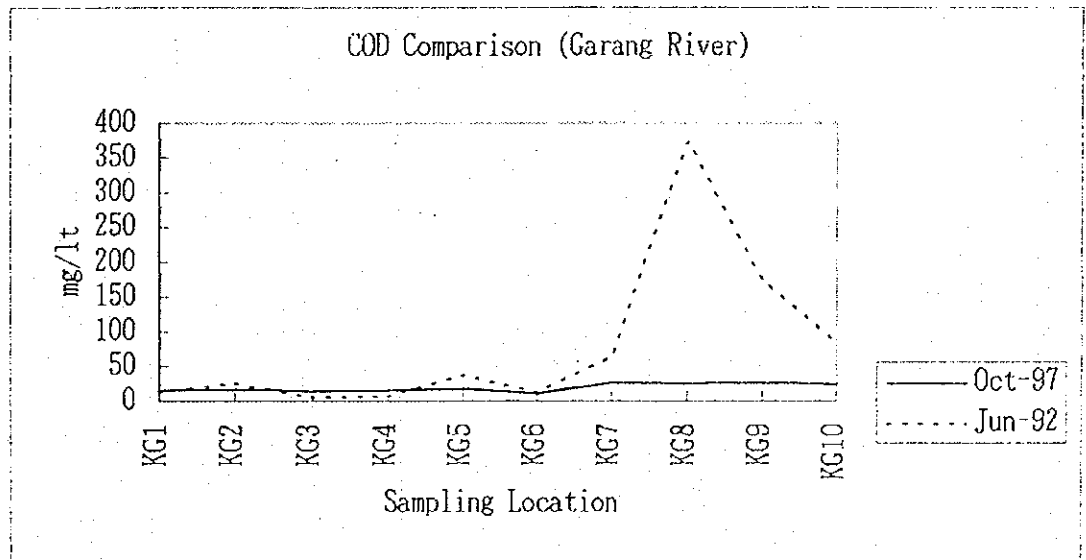
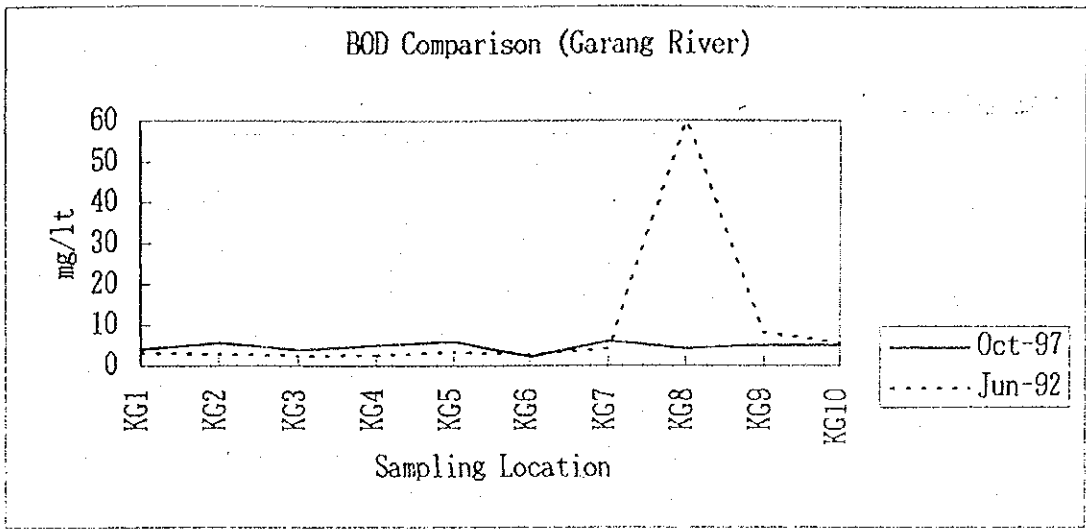
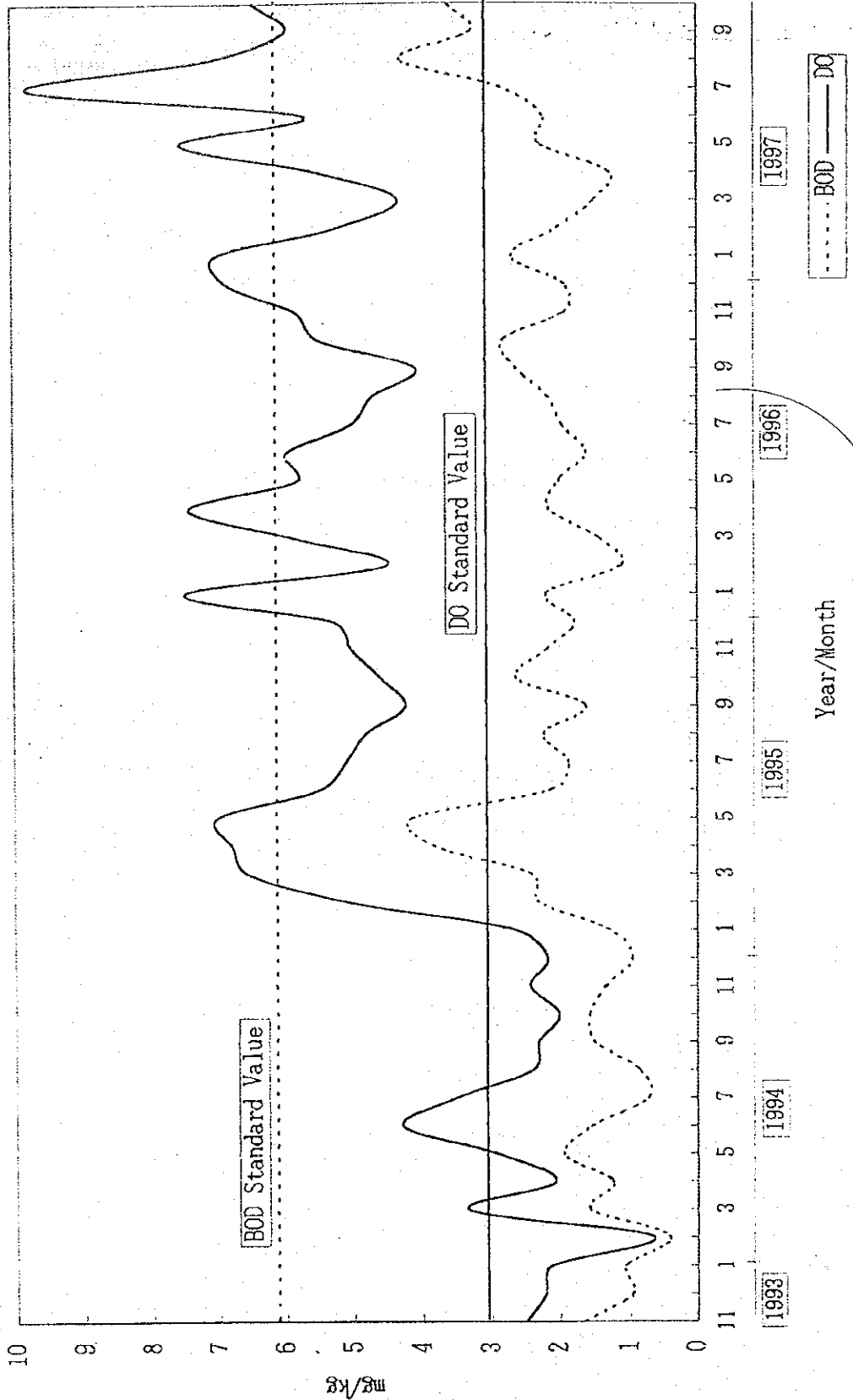


Fig. 10.13
BOD, COD AND DO COMPARED WITH RESULTS OF 1992

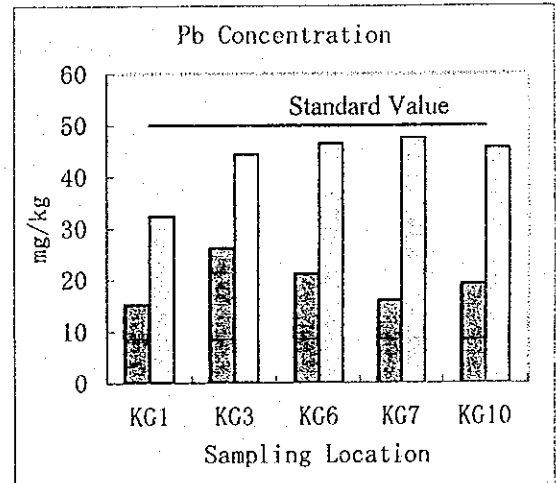
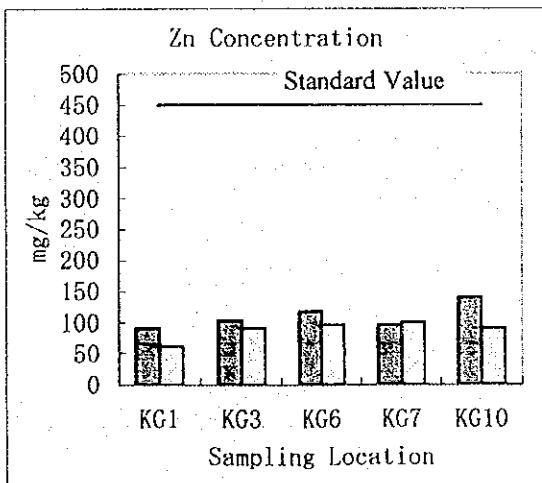
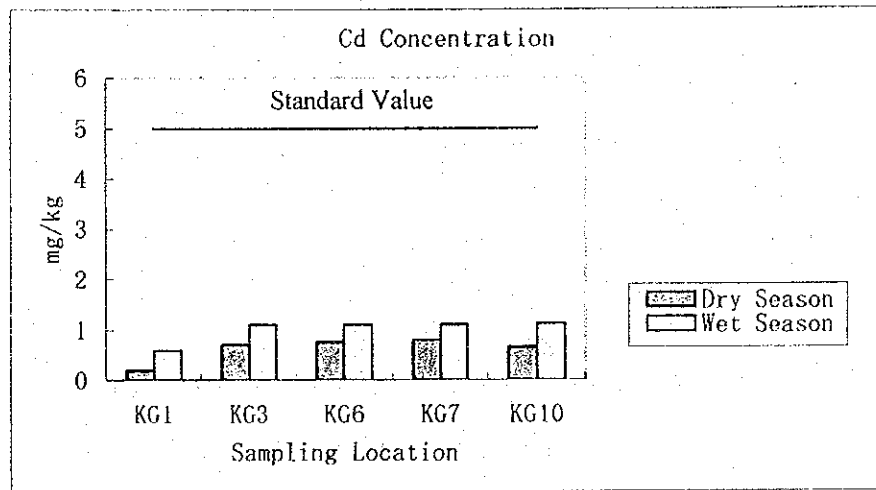
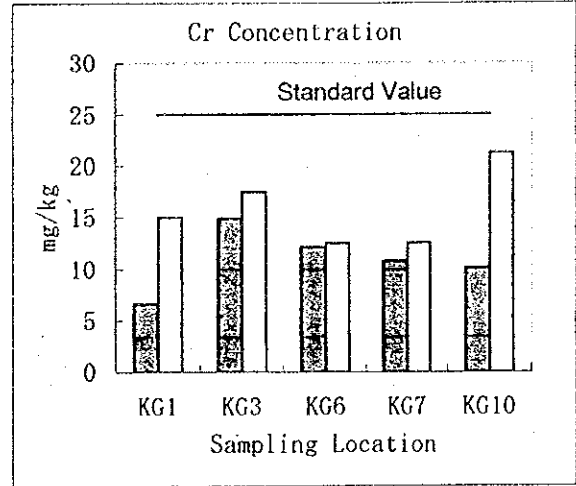
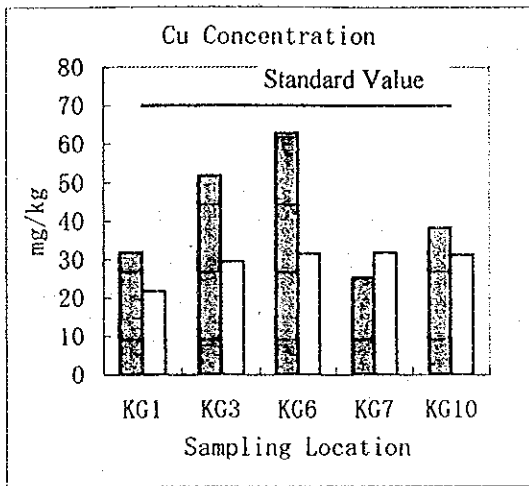
BOD and DO at PDAM Intake Location (Nov. '93-Oct. '97)



THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 10.1.4 BOD AND DO AT PDAM WATER INTAKE LOCATION

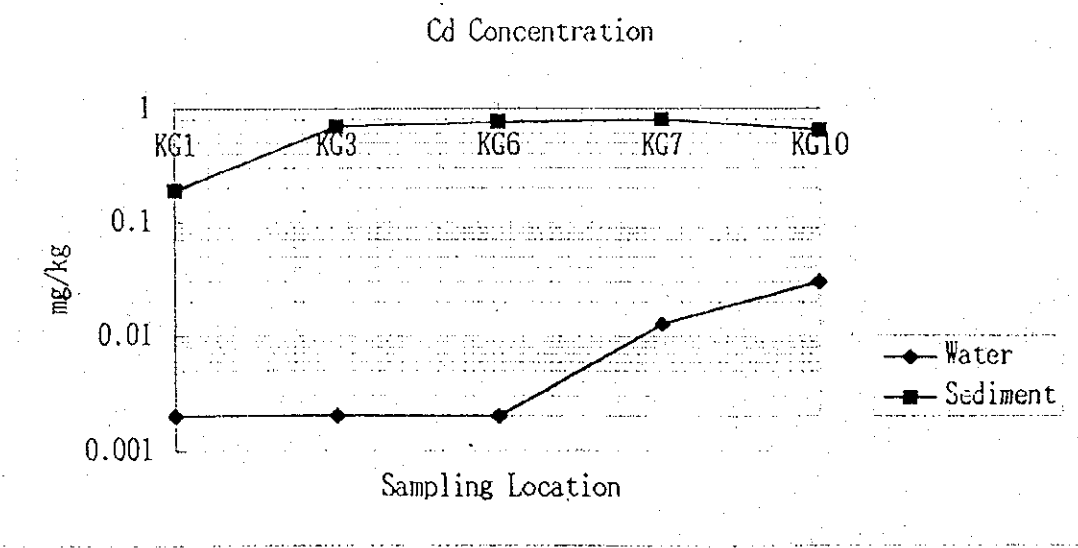
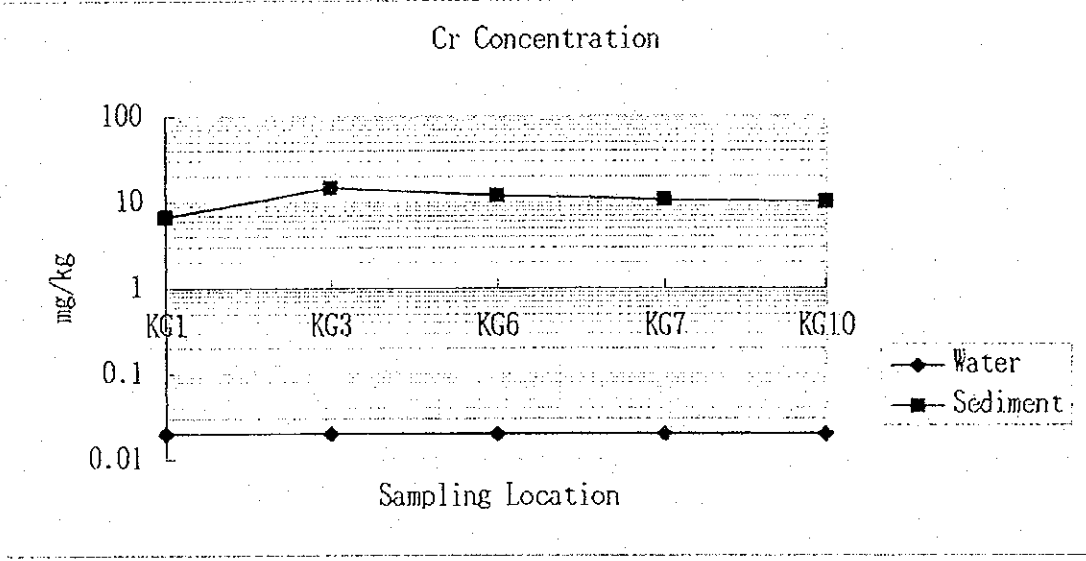
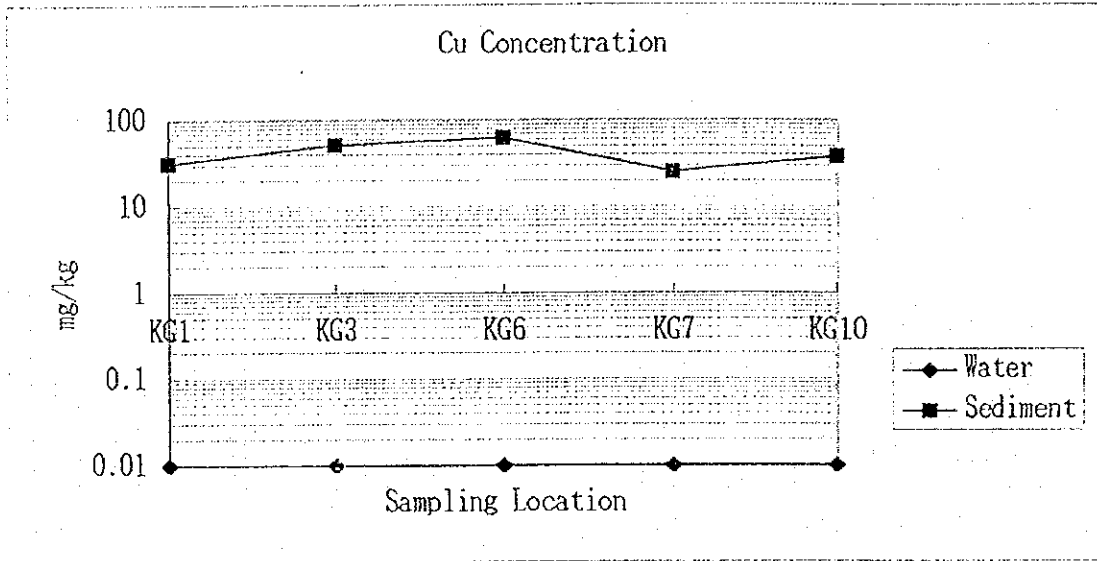


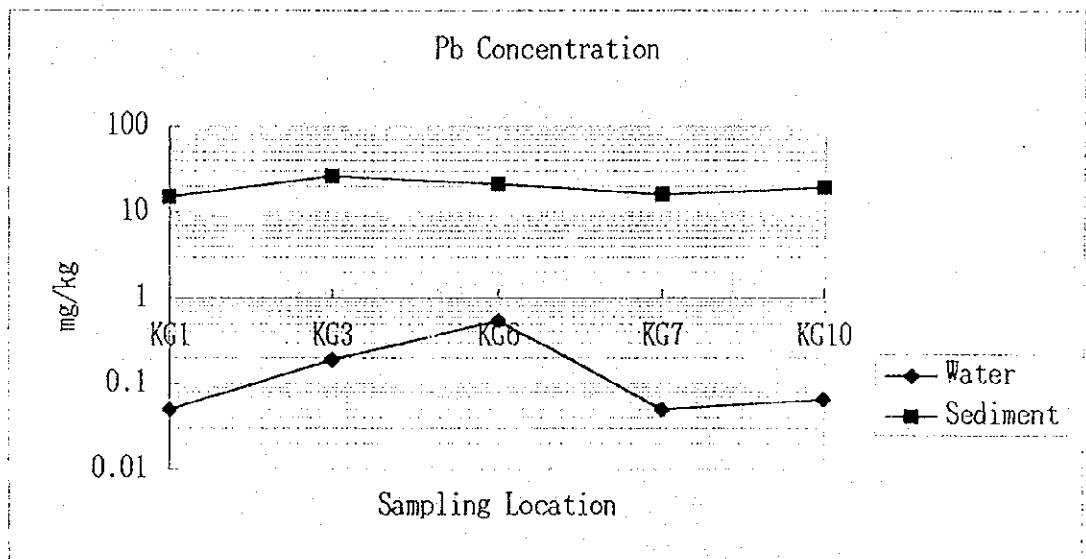
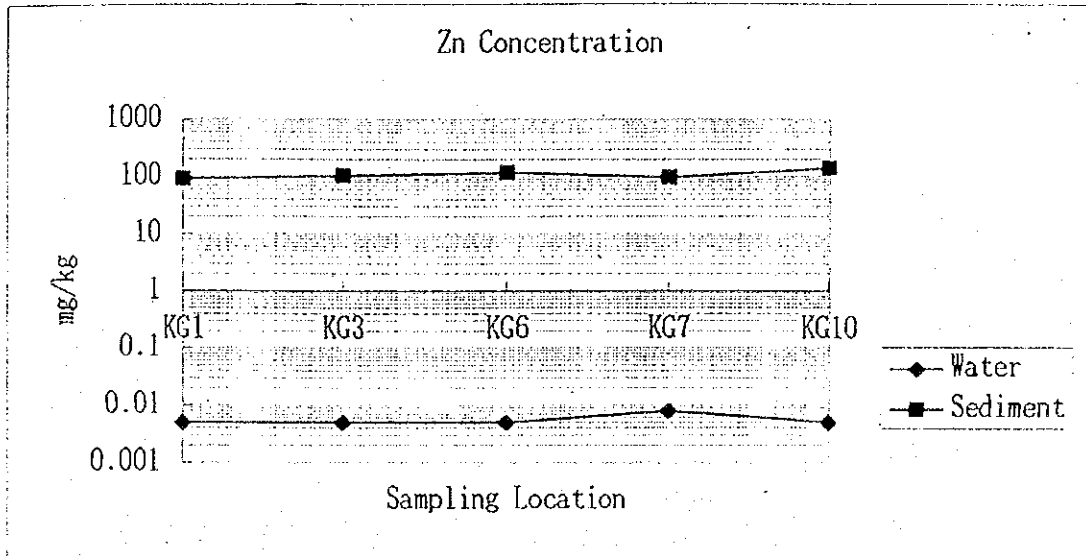
THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

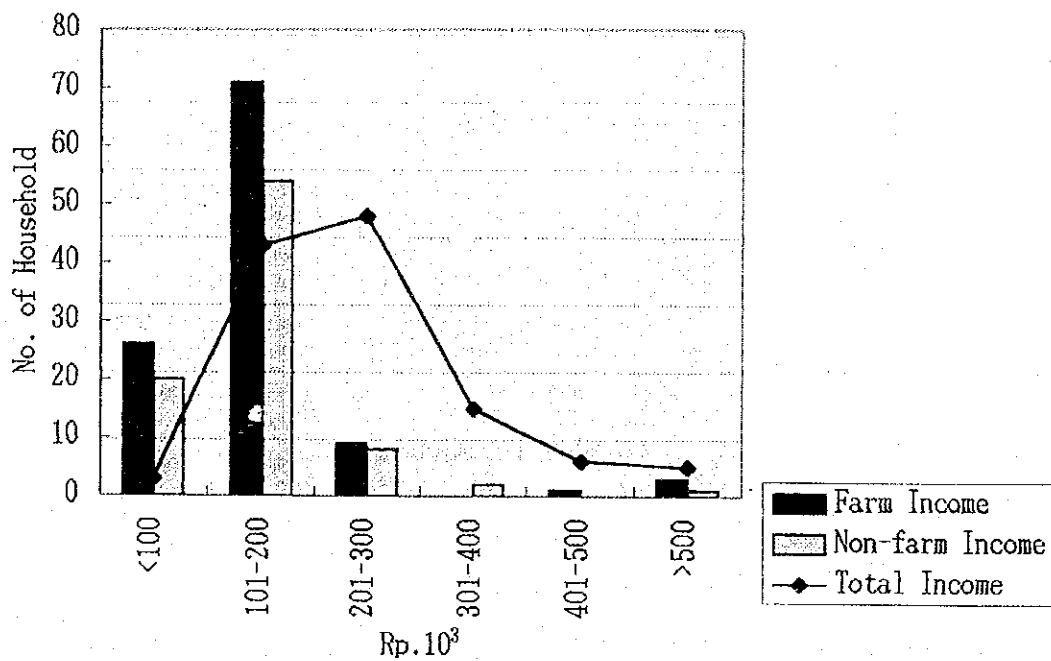
Fig. 10.1.5

CONCENTRATION OF HEAVY METAL IN SEDIMENT

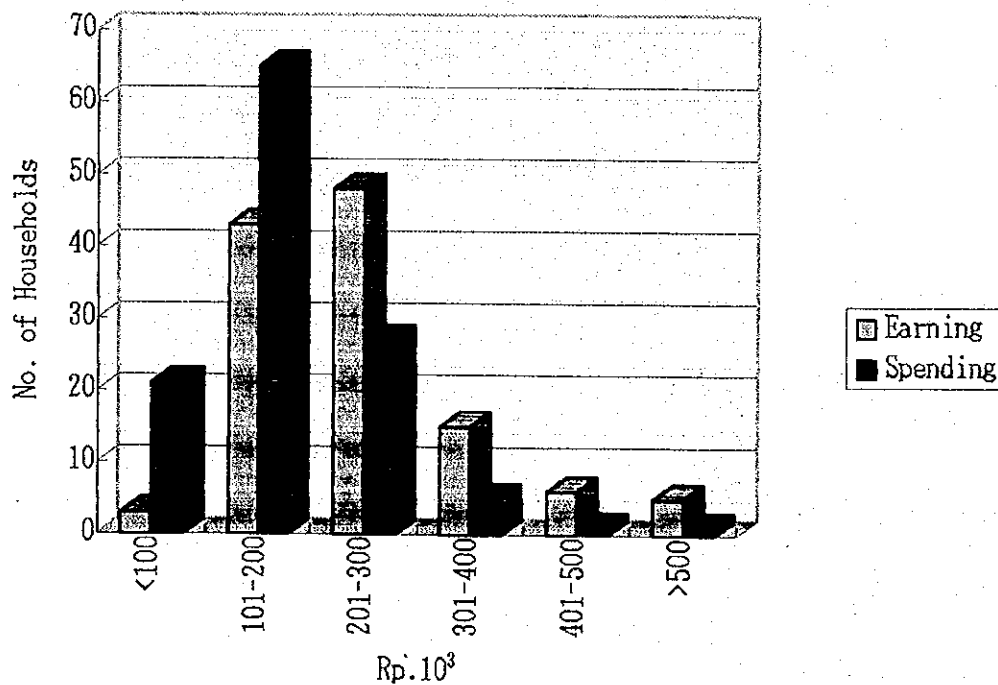


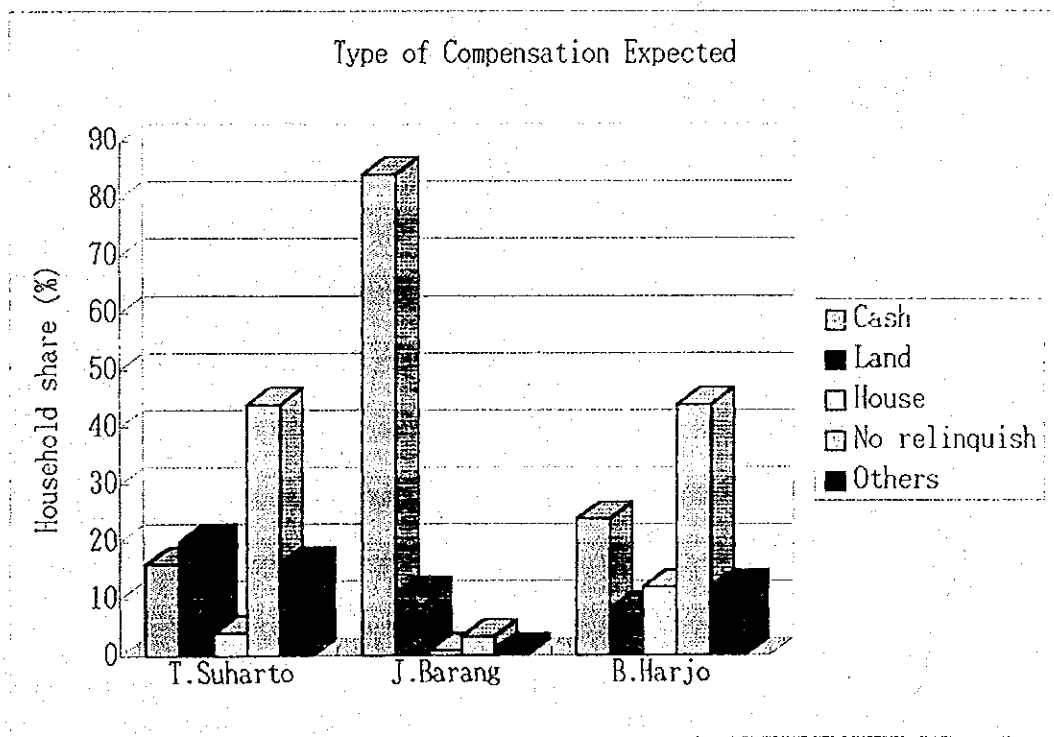
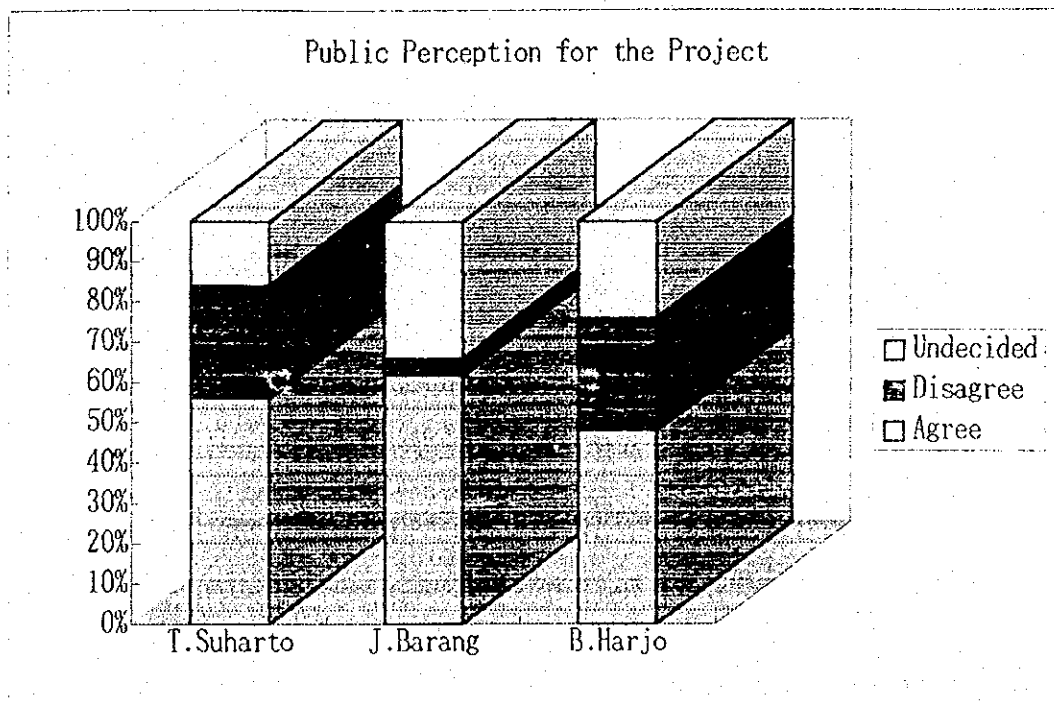


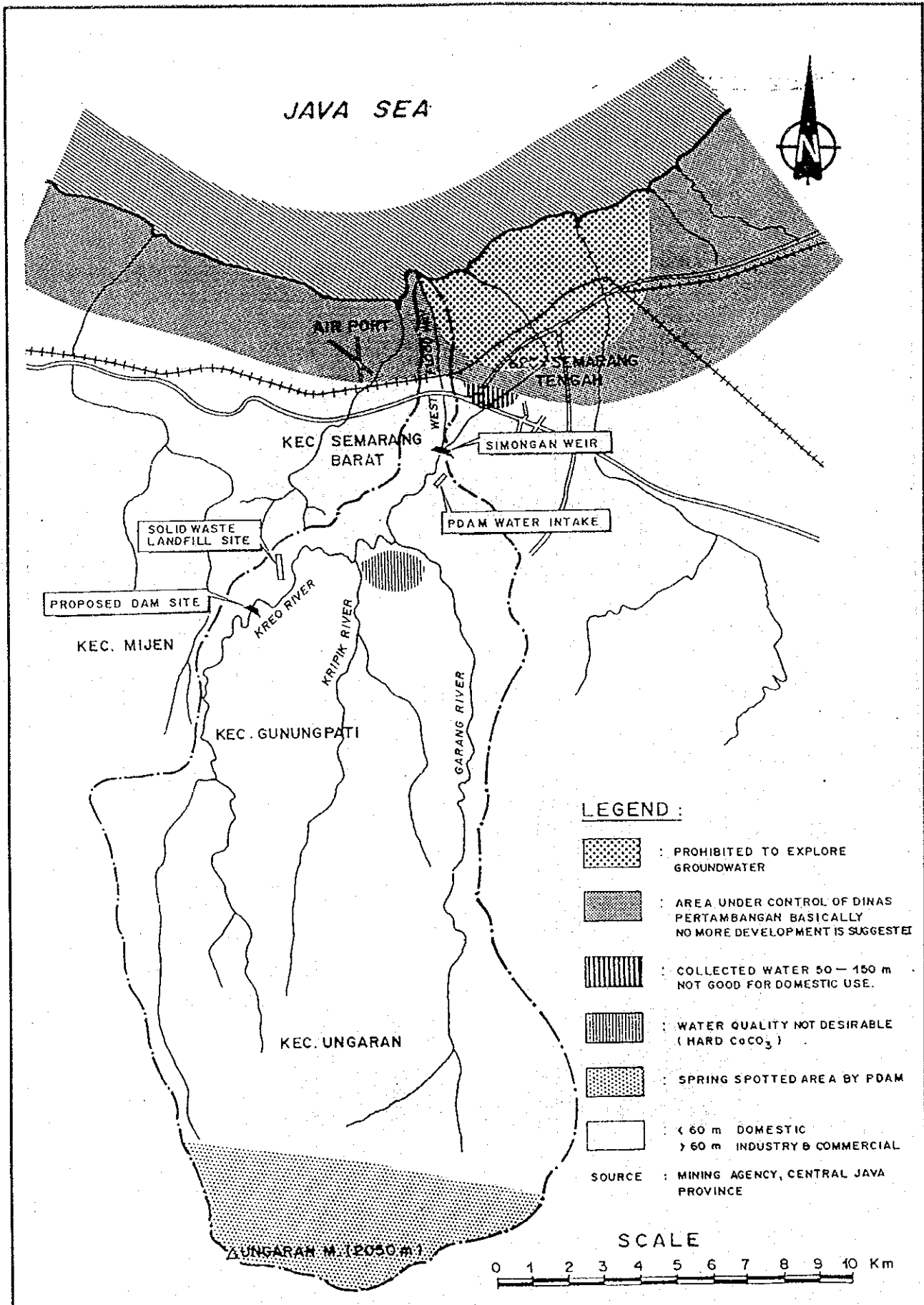
Monthly Income (Villages in Dam Reservoir Area)



Monthly Basis Farm Economic Balance





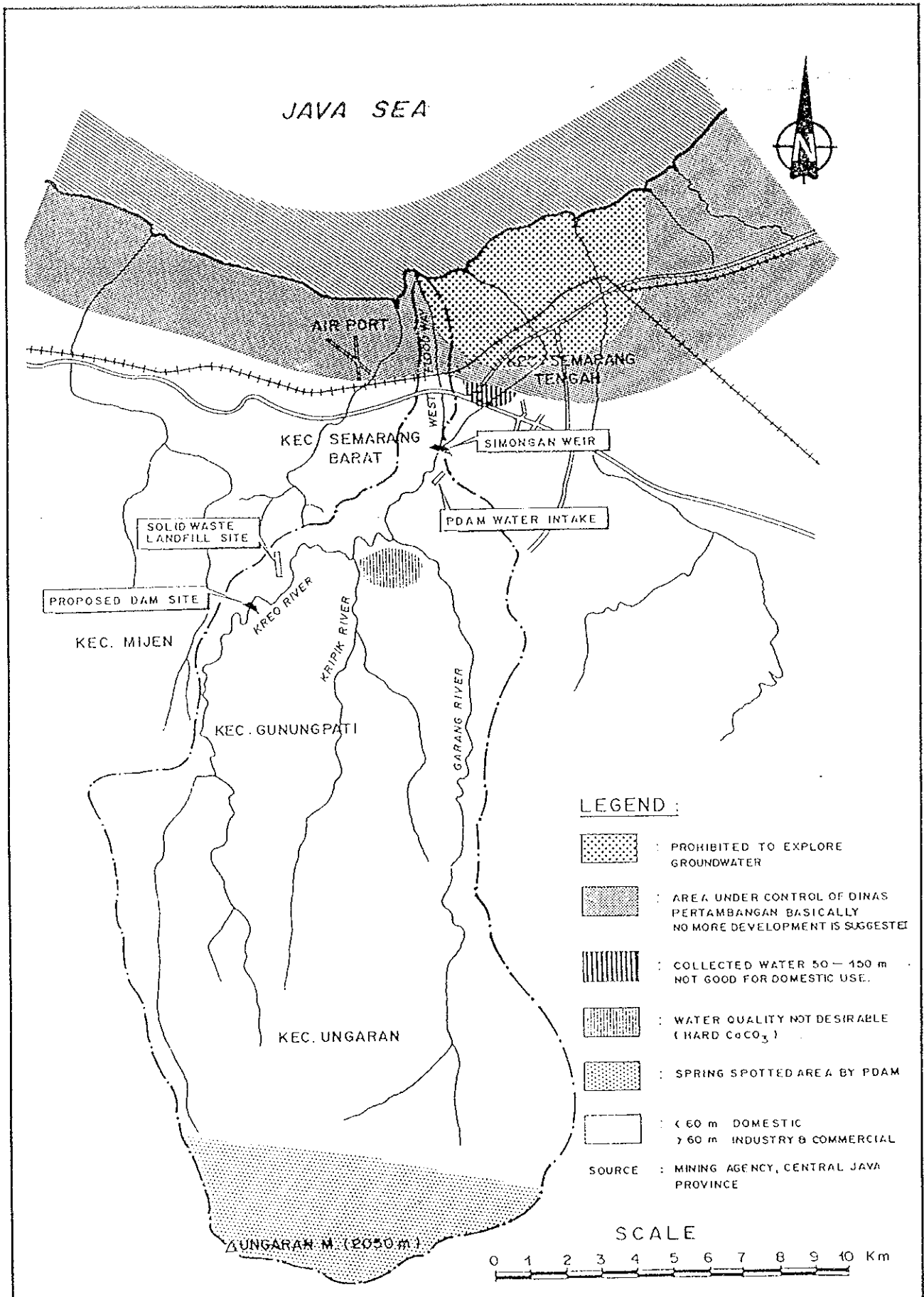


THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 10.3.1
GROUNDWATER RESERVOIR AND CONDITIONS OF AQUIFER ZONE

CHAPTER 11
OPERATION AND MAINTENANCE



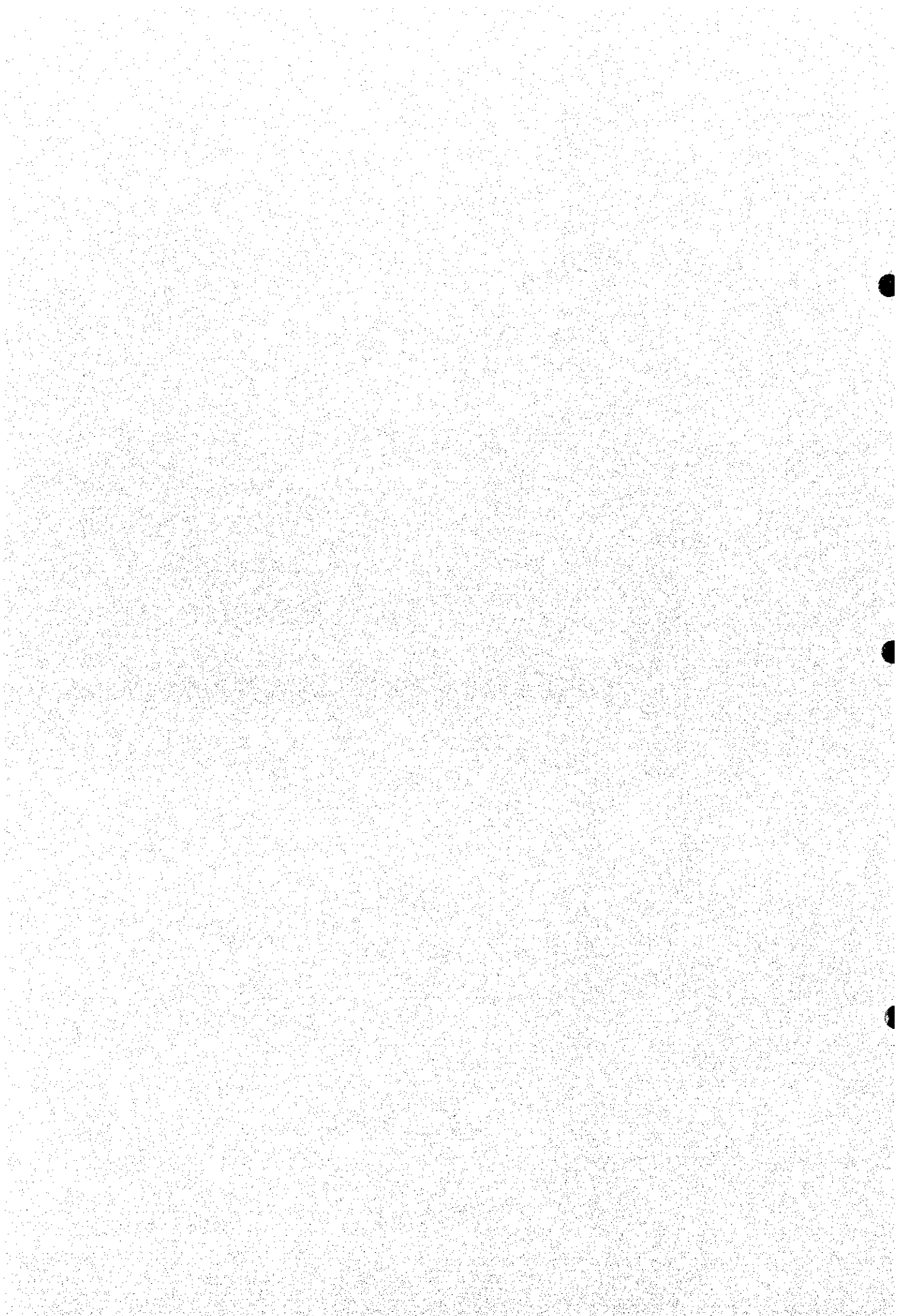
THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

Fig. 10.3.1
GROUNDWATER RESERVOIR AND CONDITIONS OF AQUIFER ZONE

JAPAN INTERNATIONAL COOPERATION AGENCY

CHAPTER 11

OPERATION AND MAINTENANCE



CHAPTER 11 OPERATION AND MAINTENANCE

11.1 General

(1) Purpose

Operation of Jatibarang Multipurpose Dam facilities is defined as the administration, management and performance of activities to keep facilities safe and functioning properly. Maintenance of the facilities includes the upkeep of facilities, the evaluation of the performance of facilities, the provision of materials to prevent the deterioration or damage to the facilities, and the repair of damages caused by deterioration, flooding, breakdown, vandalism, or failure.

The purposes of Operation and Maintenance (O&M) rules are summarized as below:

- 1) Ensure that the facilities are operated according to the design standards.
- 2) Ensure safe operation of the facilities,
- 3) Ensure the expected lifetime of the facilities,
- 4) Ensure that the established operation and maintenance procedures are followed,
- 5) Promote cost efficient operation,
- 6) Meet the legal and social obligation.

(2) Structure and Manpower for O&M Organization

The proposed structure and manpower for O&M organization are described in "CHAPTER 12"

11.2 Features of Reservoir Operation

Reservoir storage capacity of Jatibarang Multipurpose Dam is allocated to (1) sediment capacity (6,800,000 m³), (2) water use capacity (10,500,000 m³) and (3) flood control capacity (3,100,000 m³). The gross storage capacity becomes 20,400,000 m³.

A reservoir regulation for Jatibarang Multipurpose Dam depends on the deficit of discharge at Simongan Weir. To use the stored water effectively, the dam will not release more than this deficit. The secured discharge at the Simongan weir site is 2.69 m³/s which includes 0.65 m³/s for river maintenance, 0.58 m³/s for present use (PDAM) and 1.46 m³/s for newly developed. The maintenance discharge of 0.26 m³/s at the damsite means the minimum outflow released from the dam. Therefore, Jatibarang Reservoir will be operated by releasing of discharge from

minimum of $0.26 \text{ m}^3/\text{sec}$ to the deficit discharge at Simongan weir, and keeping a reservoir water surface between Low Water Surface EL. 136.0 m to Normal Water Surface EL. 148.9 m.

The service spillway, which corresponds to the flood control plan for 100-year probable flood, is an ungated overflow weir having ogee crest without any operation. The crest level is set at EL. 148.9 m. The surcharge water surface is set at EL. 151.8 m, which corresponds to the flood control capacity $3,100,000 \text{ m}^3$. The outflow at the surcharge water surface is estimated at $150 \text{ m}^3/\text{s}$.

11.3 Operation and Maintenance Works

Operation and maintenance after completion of the project is indispensable to assure the beneficial function of the project during the expected lifetime. The main points to be considered in operation and maintenance of the dam, reservoir and facilities are summarized hereinunder.

(1) Operation

(a) Control gates installed at downstream end of outlet pipe

Control gates of 650 mm and 250 mm diameter are operated to release the stored water in the reservoir to the downstream in accordance with the deficit discharge at Simongan Weir.

(b) Bulkhead gate installed at intake structure

Bulkhead gate shall keep fully opened. When the steel outlet pipe is necessary to be drained for inspection, maintenance and repair without lowering the reservoir water surface, the bulkhead gate will be fully closed.

(c) Emergency Gate installed at intake structure

The emergency gate equipped at EL. 115.0 m shall keep fully closed. It can be operated and be fully opened if the reservoir water has to be drawn down due to the emergency conditions.

(d) Hydropower Generation Equipment

The hydropower generation is carried out subordinately using the released

water necessary for water supply to Semarang City and river maintenance. The maximum power discharge is 3.0 m³/s with the Low Water Surface EL. 138.0 m until Mundingan Dam is constructed in the future.

(e) Recording reservoir data

Reservoir data including water surface elevation, outflow discharge through outlet facilities, spillway discharge, rainfall and other necessary data shall be recorded.

(f) Forecasting reservoir inflow

Forecasting reservoir inflow shall be done to estimate the periodical inflow volumes. These estimates provide the basic data for reservoir operation to permit optimization and coordination of water supply and hydropower generation.

(g) Dam discharge warning

The warning to the public in the target area shall be issued, when any damage would occur to the downstream target area or the rapid increase of the river water level due to discharge of water from the dam.

(2) Measurement of Dam Instrumentation

To make the assessment of safety and behavior of the structure during reservoir operation, the important features to be monitored are piezometric pressures in the impervious zone and foundation, deformations of the embankment and seepage/leakage through the dam body and foundation. Following instruments are equipped for monitoring:

- Pore Pressure	Impervious Zone	:	Piezometer
	Foundation	:	Standpipe Piezometer
- Deformation	Embankment	:	Movement Marker
			Probe Extensometer
	Foundation	:	Foundation Deformation Meter
	Gallery Joint Opening	:	Joint Meter
- Seepage		:	Seepage Measuring Device
- Seismic Events		:	Strong Motion Accelerograph

The observation of the behavior of dams is important during first reservoir filling and for several years after filling for the safety control of the dams, and frequent data collection of the instruments will be required. The frequency after several years may be reduced when the behavior of the dam has become stable, considering the degree of importance of the measuring items and change of measured values.

The items and frequency of data collection are given by classifying the period as follows:

First Reservoir Filling

- Pore Pressure	Piezometer	: Read Daily
	Standpipe Piezometer	: Read Daily
- Deformation	Movement Marker	: Read Weekly
	Probe Extensometer	: Read Daily
	Foundation Deformation	: Read Daily
	Joint Meter	: Read Daily
- Seepage		: Read Daily
- Seismic Events		: Read at Every Earthquake

Subsequent First Year's Operation

- Pore Pressure	Piezometer	: Read Weekly
	Standpipe Piezometer	: Read Weekly
- Deformation	Movement Marker	: Read Quarterly
	Probe Extensometer	: Read Monthly
	Foundation Deformation	: Read Monthly
	Joint Meter	: Read Monthly
- Seepage		: Read Weekly
- Seismic Events		: Read at Every Earthquake

After Dam Attains Stabilized Pattern of Behavior

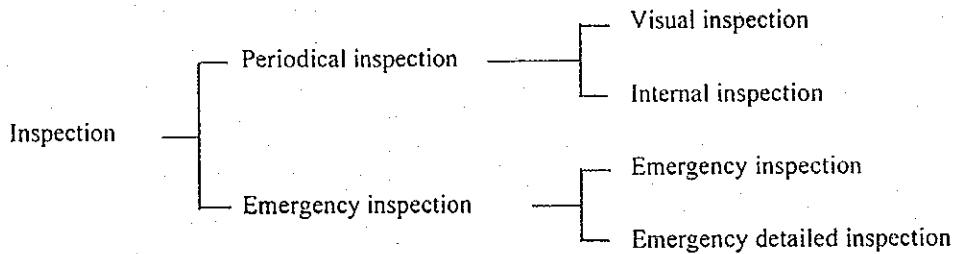
- Pore Pressure	Piezometer	: Read Weekly
	Standpipe Piezometer	: Read Weekly
- Deformation	Movement Marker	: Once a Year at High Reservoir
	Probe Extensometer	: Read Monthly
	Foundation Deformation	: Read Monthly
	Joint Meter	: Read Monthly
- Seepage		: Read Weekly

- Seismic Events : Read at Every Earthquake

(3) Inspection and Maintenance of Civil Structures

The inspection and maintenance of civil structures are generally concentrated on the following item and the contents.

- Deformation
- Cracks
- Seepage water

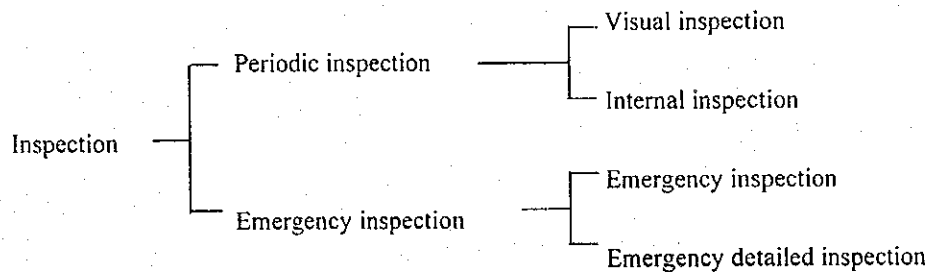


Visual inspection is conducted approximately once every month periodically to monitor the conditions of civil structures, to detect any abnormalities and to check their performance.

Emergency inspections are conducted after earthquakes, floods, heavy rain, etc., as deemed necessary. Emergency detailed inspection is conducted when deemed necessary after a patrol, visual inspection, internal inspection, or emergency inspection.

(3) Inspection of Electro-mechanical Facilities

In general, the inspection of electro-mechanical facilities is classified as follows:



Visual inspection is conducted periodically approximately once every one to three years. The turbine and generator are shutdown during this inspection to check for abnormalities and to check their performance.

Internal inspection is conducted periodically approximately once every five to ten years. The turbine and generator are overhauled, thoroughly cleaned and repaired to restore their performance. It is recommended that the inspection cycle be so set as to consider the inspection results and the operation conditions.

Emergency inspection is conducted when an abnormality or problem occurs in an electric component. The turbine and generator are shutdown during this inspection.

The major periodic inspection items of electric facilities are listed in Table 11.3.1.

TABLES

CHAPTER 11

OPERATION AND MAINTENANCE

LIST OF TABLES

Chapter 11

Table 11.3.1 Inspection Items for Electro-Mechanical Facilities T-11-1

Table 11.3.1 (1/2) Inspection Items for Electro-Mechanical Facilities

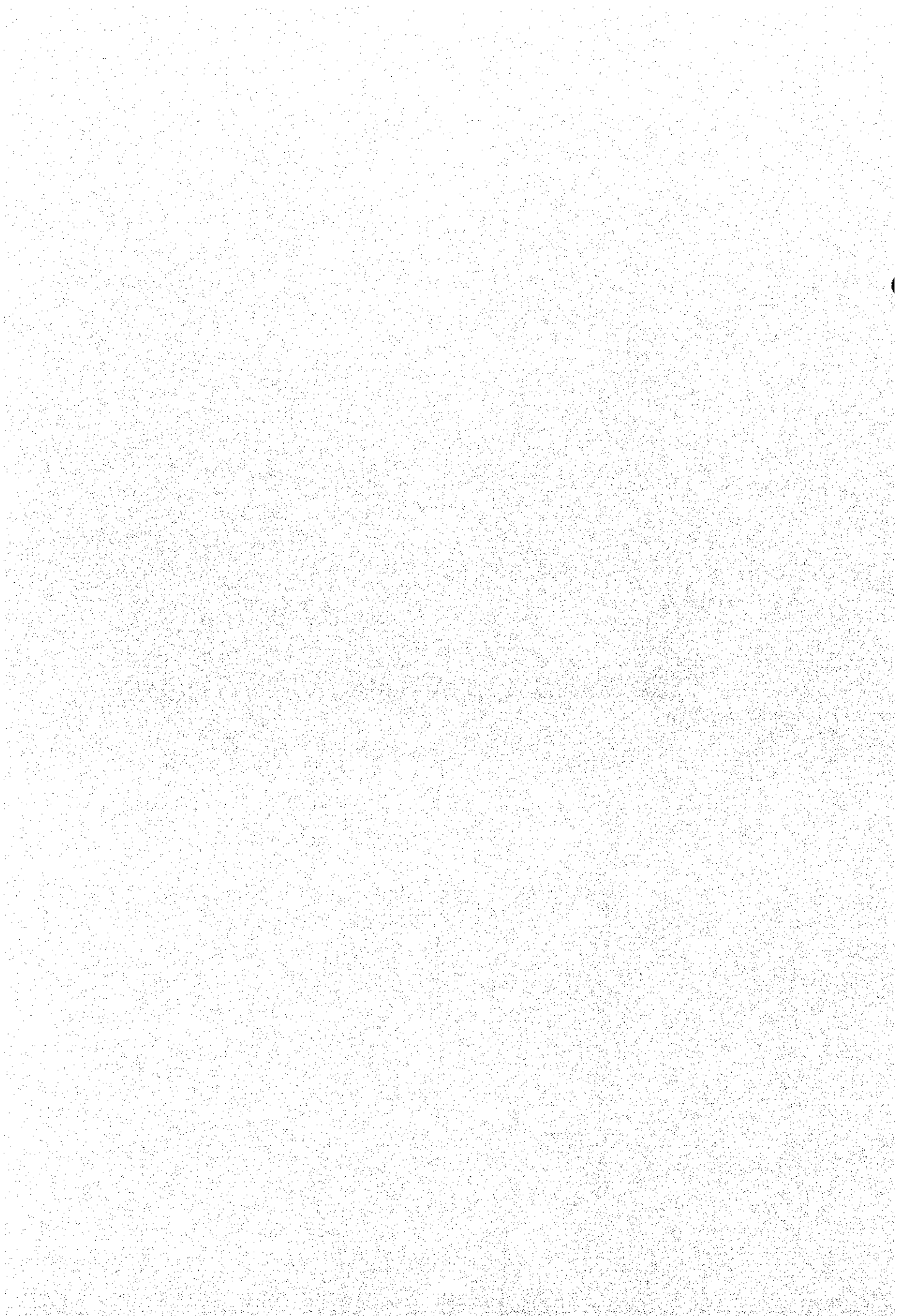
Component	Periodic inspection	
	Visual inspection	Internal inspection
1. Turbine	<p>(Turbine internal) Inspect and measure for abrasion, cracks, erosion, and rust on the runner, guide vane and casing interior. Measure the runner gap and guide vane gap. Check the bearing lubricant quality. * Test : automatic start/stop</p>	<p>(Turbine overhaul) Measure abrasion loss at each part. Inspect the sliding are and packing for damage and fine cracks. (Bearing overhaul) Measure the damage and gap on the sliding surface. Calibrate the cooling water pipe pressure resistance, thermometer and oil gauge. * Replace worn parts * Tests : load rejection, vibration measurement, stroke output, automatic start/stop</p>
2. Speed governing device	<p>(Mechanism) Inspect for abrasion of movable parts, loose wiring/lever, and strainer overhaul (Controller) Inspect the conditions of the printed circuit board and position transducer. Measure the insulation resistance.</p>	<p>(Mechanism overhaul) Overhaul movable part and PMG. Replace worn parts. * Tests: characteristics and load rejection</p>
3. Inlet valve	<p>(Inlet valve internal) Measure leakage. Inspect for abrasion and erosion. Measure sheet surface clearance. Inspect position indicator conditions.</p>	<p>(Operation mechanism overhaul) Inspect for damage to movable part and sliding area. (Valve body overhaul) Inspect for abrasion and erosion. Inspect for damage to the packing and the sealing condition. * Replace worn parts</p>
4. Oil pressure supply and lubrication oil system	<p>(Performance) Measure load operation time. Test oil quality. (Oil filtration) Test oil quality.</p>	<p>(Oil pressure supply and lubrication oil system overhaul) Inspect for abrasion and damage to internal movable part and sliding area, and motor insulation resistance. (Performance test) Measure pump discharge and grease feed volume.</p>

Table 11.3.1 (2/2) Inspection Items for Electro-Mechanical Facilities

Component	Periodic inspection	
	Visual inspection	Internal inspection
5. Water supply and drainage system	(Strainer overhaul) Inspect for abrasion and erosion	(Pump overhaul) Inspect for abrasion and damage to internal movable part and sliding area, and motor insulation resistance. (Performance test) Measure water supply and drain volume.
6. Automatic turbine control system	(Performance test of all relays)	
7. Generator	(Generator internal) Inspect for loose electric circuit terminals, discolored, peeled or loose coil, abrasion and damage to slip ring, loose and rusted revolving part. Measure brush contact pressure and the insulation resistance of electric circuit. (Control system) Inspect for shoe abrasion loose and operation state. (Neutral grounding resistor) Measure resistance and insulation resistance.	(Rotor lifting) Inspect for loose rotor core and winding. Measure winding deterioration. Inspect loose wedge, flaking varnish, and rust. (Control system, bearing, and air cooler overhaul) * Measure shaft current * Exciter characteristic test

CHAPTER 12

ORGANIZATION AND INSTITUTION



CHAPTER 12 ORGANIZATION AND INSTITUTION

12.1 Regional Government System in Indonesia

The new Autonomy Law i.e. No. 22 Year 1999 Re REGIONAL ADMINISTRATION was in force on the 7th of May 1999.

The principles of the execution of Regional Administration pursuant to Law Number 22 Year 1999 on Regional Administration are as follows:

- a. the implementation of decentralization*, deconcentration* and task attachment principles;
- b. the entire and complete execution of decentralization principles implemented in the Regency and Municipality Regions; and
- c. the attachment principle which can be implemented in the Provincial, Regency, Municipality and Village Regions.

(Note)

Decentralization is the transfer of Administration authority by the Government to the Autonomous Region within the framework of the Unitarian State Republic of Indonesia.

Deconcentration is the delegation of authority from the Government to the Governor as the Government's representative and/or as the (Central) Government's instrument in the Region.

The implementation of extensive regional autonomy is laid down at the Regency Regions and the Municipality Regions, while the Provincial Regional autonomy constitutes a restricted autonomy.

In the framework of the implementation of extensive regional autonomy, the whole authority is basically assumed by the Regency and Municipality Region.

The authority assumed by Provincial Region comprises authority of cross Regency and cross Municipality coordination, other authorities in certain fields of administration, authorities which still cannot be executed by the Regency and the Municipality Regions, as well as those authorities in the field administration which are delegated to the Governor as the representative of the Central Government within the framework of deconcentration.

At the moment when the Law Number 22 Year 1999 was in force, the old Law No. 5 Year 1974 on Principles of Regional Government was declared void, and any Law and Legislation which contrary to and/or not in accordance with the new Law No. 22/1999 shall be adjusted thereto.

One of the implementing regulations particularly in the field of Water Resources Development, i.e. the Central Java Regional Regulation No. 11 Year 1999 was enacted on the 20th of July 1999.

Details are discussed hereinafter. Italic words show Indonesian terms in this Chapter.

12.1.1 Structure and Powers of Regional Governments

Regional Governments are categorized into two levels, namely, Level I and Level II. Level I Regional Governments are composed of Provinces (*Propinsi*) and Level II Regional Governments are Regencies (*Kabupaten*) or Municipalities (*Kotamadya*). Regencies are governments in rural areas and Municipalities are in urban areas. Thus, Semarang Municipality (*Kotamadya Semarang*) is a Level II Regional Government in an urban area.

Regencies/Municipalities are the basic units of regional government system. Matters which affect over one Regency/Municipality are assumed by Provinces while those over one Province are assumed by the Central Government. Ministries of the Central Government have Regional Representative Offices (*KANWIL: Kantor Wilayah*). Regional Representative Offices make technical guidance to or technical coordination with Regional Government Services in the related field. Some Ministries including Education, Religion etc. have them for both Regional Government Level I and II. Ministry of Public Works has them only for Level I.

Regional Parliaments (*DPRD: Dewan Perwakilan Rakyat Daerah*) are established at each Level of Regional Government. Approval by the Regional Parliaments is necessary for making a budget and regional regulation, and for implementing regulations. In addition, each Regional Parliament elects candidate(s) of the regional government's head. Governor (*Gubernur*), the head of Province is appointed by the President, and Regent (*Bupati*), the head of Regency and Mayors (*Walikota*), the head of Municipality are appointed by the Governor.

Structure of regional government offices are similar both for Level I and Level II. Under the head of the regional government, established are Vice Head, such as Vice Governor (*Wakil Gubernur*), Vice Regent (*Wakil Bupati*) and Vice Mayor (*Wakil Walikota*), Secretariat (*Sekretariat Daerah*), Regional Development Planning Board (*BAPPEDA: Badan Perencanaan Pembangunan Daerah*), Inspectorate (*Inspektorat*) which reports to the head of the regional government, and Services (*Dinas*).

Vice Head assists the Region's Head, coordinates the activities of the Regional Government institutions and is responsible to the Region's Head.

Perencanaan Pembangunan Daerah), Inspectorate (*Inspektorat*) which reports to the head of the regional government, and Services (*Dinas*).

Vice Head assists the Region's Head, coordinates the activities of the Regional Government institutions and is responsible to the Region's Head.

Secretariat supports the Region's Head, collects and analyze information on regional administration.

Services are offices for implementation of government services in respective fields. They execute implementation procedures of services, guidance, planning, licensing and supervision/administration of implementation. The organization of each Service consists of

- a. Head of the Service;
- b. Administration Division;
- c. Sub-services; and
- d. Functional Group.

BAPPEDA draws up a development plan and financial plan, coordinates government services between the Services in dealing with problems on development.

Refer to Fig. 12.1.1 for the structure of the Regional Governments.

Sub-Regional Governments

Under Regencies/Municipalities, there are Sub-Regional Governments. Their characteristics are summarized as follows:

- (1) Many authorities of the higher level of the Government are assumed by the Regency/Municipality Governments. Matters related in one Regency/Municipality are managed by the Regency/Municipality Government.
- (2) Every Region is led by a Region Head as Chief of the Executive Body who is assisted by a Vice Region Head.
- (3) The Region Head and Vice Region Head as elected by the Regional Parliament and Stipulated as Head and Vice Head of the Region for a five-year term by the Regional Parliament but they shall be authorized by the President.
- (4) The Region Head and Vice Region Head are inaugurated by the President or by other official acting on behalf of the President
- (5) The Provincial Region Head is referred to as Governor, who is ex-officio also Representative of the Central Government.
- (6) In his capacity of the Central Government's Representative the Governor is subordinated and accountable to the President.
- (7) In his capacity of the Region Head, the Governor is accountable to the Provincial Parliament.
- (8) The Head of a Regency (*Kabupaten*) is referred to as *Bupati* (Regent).
- (9) The Head of Municipality (*Kotamadya*) is referred to as *Wlikota* (Mayor).
- (10) In the execution of his task and responsibility as Region Head, the *Bupati/Wlikotais* accountable to the Regency/Municipality Parliament.

12.1.2 Finance of Regional Governments

The execution of Regional Government's tasks and the Regional Parliament shall be financed from and borne by the Regional budget. The execution of the Central Government's tasks in the Region shall be financed from and borne by the Central Government's budget.

The sources of revenue in the implementation of Regional Government's tasks are:

- (1) Regional original revenue;
- (2) Proportion Funds;

- (3) Regional loans; and
- (4) Other legal regional revenues.

Sources of Regional original revenue consist of:

- (1) Regional tax collection;
- (2) Regional fine collection;
- (3) Income of the region owned enterprises, from the management of separated Region's assets; and
- (4) Other legal regional original revenue.

The Proportion Funds consists of:

- (1) Region's proportion from Land and Building Tax revenue, Land and Building Acquisition Duty and revenues from natural resources;
- (2) General Allocation Funds; and
- (3) Special Allocation Funds.

Certain percentage of the Proportion Funds are paid to Regional Governments. The proportion between the Central Government and the Regional Government is as follows:

Proportion Funds

Source	Central Government	Regional Government
Land and Building Tax	10%	90%
Land and Building Acquisition Duty	20%	80%
Natural Resources (Forestry, General Mining & Fishery)	20%	80%
Oil Mining	85%	15%
Natural Gas Mining	70%	30%
General Allocation Funds	It is stipulated at least 25% from the domestic revenue stipulated in the State's Budget. 10% of the Fund is allocated to Level I and 90% for Level II.	
Special Allocation Funds	It is transferred from the State Budget to certain Regions to assist financing special needs, observing the availability of funds in the State Budget.	
Reforestation Funds	60%	40% for producing Regions as Special Allocation Funds

Proportions between Level I and Level II will be decided in the new Regional regulations except that of General Allocation Funds.

The total revenue is Rp. 1,325 billion for the Central Java Province and Rp. 117 billion for Semarang Municipality in 1995/1996. The latter amounts to 8.8% of the former. Subsidies amount to 73.6% in the total revenue for Central Java Province while only 30% for Semarang Municipality, which shows a clear contrast in the revenue structure. It means that Semarang Municipality has relatively abundant in its own financial sources.

Issuing bonds by Regional Governments is very limited because it is strongly restricted by the Central Government which is very cautious about budgetary deficit as well as the market is not developed yet for the Regional Government bonds. Loans to Regional Governments are mainly those underwritten by the Central Government. In 1995/1996 budget, Central Java Province borrowed no loans while Semarang Municipality borrowed Rp. 20 billion.

Expenses are divided into two: one is the routine budget and the other is the development budget. The routine budget is allocated to current expenditures and the development budget is spent on the project bases. The total expenditure is Rp. 1,261 billion for the Central Java Province and Rp. 103 billion for Semarang Municipality in 1995/1996. In Central Java Province, the ratio between the routine budget and the development budget is 85.8% to 14.2% while in Semarang Municipality 48.3% to 51.7%. The largest items in the routine budget is salaries (85.6% in the Province and 36.5% in the Municipality). Concerning the development budget, relatively larger portion is allocated to the transportation sector (19.9% in the Province and 33.5% in the Municipality).

12.2 Present Situations of Organization and Institution for Operation and Maintenance

12.2.1 Related Laws and Regulations

The basic law on rivers in Indonesia is the Government Regulation No. 35/1991. This Regulation is enacted for the implementation regulation of the Law No. 11/1976 on Water Resources Development, under which the Government Regulation No. 22/1982 on Water Management, the Government Regulation No. 23/1982 on Irrigation, the Government Regulation No. 20/1990 on Control of Water Pollution and the Government Regulation No. 27/1991 on Swamps are also promulgated.

The background of the enactment of these Regulations is that the increase of water demand due to growth of population and industrial development as well as the deterioration of water quality and decrease of water resources necessitate the implementation of Regulations.

Law No. 11/1974 on Water Resources Development

The State has the responsibility for control, development and management of water resources. Priority is put on water uses for drinking, irrigation and energy in water planning and allocation. Direct beneficiaries are to participate in the operation and maintenance with the Central or Regional Government assuming the operation and maintenance responsibility.

Government Regulation No.22/1982 on Water Management

This Regulation sets up the basis for river basin management including the requirement for a comprehensive water resources plan for each basin which is to be incorporated in a National Water Plan as part of the National Development Plan. Except for domestic use, all water use requires license from the Provincial Government, including groundwater extraction.

Government Regulation No. 35/1991 on River

It declares that rivers have multi-purpose uses and delegates responsibility for their development and management to either Central or Regional Government in accordance with a classification of their economic importance. Construction of river structure with the aim for public welfare and safety shall be made by the Government or a state-owned corporation. In addition, operation of river and river facilities shall be made by the Government or a state-owned corporation.

12.2.2 Related Authorities

(1) *JRATUNSELUNA* Master Project Office

JRATUNSELUNA stands for the names of five river basins (Jragung, Tuntang, Serang, Lusi and Juana) which the office covers in a part of the Central Java Province. It manages the projects for water resources development falling in the scope of Region Level I within the said river basins including Semarang Project Area. The General Manager of the Master Project Office makes guidance to such projects from the viewpoint of policy matters, under the supervision of the Ministry of Public Works. On the other hand, those projects are also guided by Head of Water Resources Development Unit of the Central Java Province in terms of technical matters. Under the Project Manager, there are three implementation units for projects (refer to Fig 12.2.2).

The implementation unit for Irrigation is now abolished because the World Bank loan

for the irrigation project has finished. The implementation unit of *PKSDA* (*Proyek Konservasi Sumber Daya Air* or Water Resources Conservation Project) has changed to *PPKSA* (*Proyek Pengembangan dan Konservasi Sumber Air* or Water Sources Development & Conservation Project).

The budget by each project implementation unit is as follows:

Budget by Project Implementation Unit of *JRATUNSELUNA*

Unit: Rp. 1,000

Fiscal Year	Water Resources Management & Flood Control Project		Water Source Development & Conservation Project		Raw Water Supply Project	
	Allocation	Realization	Allocation	Realization	Allocation	Realization
1996/1997	21,128,841	8,234,024	7,161,257	6,956,324	5,210,147	5,205,387
1997/1998	20,903,308	8,080,109	3,137,309	2,986,313	11,042,967	11,039,432
1998/1999	43,384,725	25,713,950	10,742,070	10,669,398	16,413,856	4,454,778

Usually, *JRATUNSELUNA* does O&M services for two years after the construction of facilities. The same implementation unit will take in charge in the O&M stage. The budget allocated for the O&M of facilities is very small. It is not proper to show the budgets of previous years for the purpose of the study of the financial capacity with the following reasons:

- (a) Budget of *JRATUNSELUNA* is made on the project basis. Thus, the actual budget allocated for the facility cannot be estimated until the project is really started.
- (b) The budget allocated for the O&M of facilities is very small. The amount of budget was decided with no reasonable calculation.
- (c) Presently, the government system in Indonesia is changing drastically, such as restructuring of Ministries, decentralization of power, clean up of corruption, etc. *JRATUNSELUNA* is also planned to change in the near future.

In the construction stage, the implementation unit of *PPKSA* will take the Jatibarang Multipurpose Dam in charge, and the implementation unit of *PPSAPB* (*Proyek Pengembangan Sumber Air dan Pengendalian Banjir* or Water Sources Development and Flood Control) will take the West Floodway/Garang River Improvements in charge. It is presently planned that *PPSAPB* coordinates with Housing Facilities Improvement Project Office (*P2P*) under Directorate General of Human Settlement (*Directorat Jenderal Cipta Karya*) for the construction of Urban Drainage Facilities.

No new organization is planned to be established for the Project Facilities.

(2) Water Resources Development Service of Central Java Province (*Dinas PU Pengairan*)

The present organization of the Water Resources Service is in a transition period, awaiting the promulgation and implementation of the new Regional Regulation on the organization and procedures of Central Java Province. The draft of this Regional Regulation has been approved by the Provincial Parliament but has still to wait for the numbering and the promulgation as well as the announcement in the Regional Gazette, which will take some longer time.

In the New Regional Regulation of Central Java Province on the Organization and Procedures for Water Resources Development Service, which is expected to be signed and promulgated by the end of July 1999, the following provisions are stipulated:

Status: Water Resources Development Service is an Implementation Element of the Provincial Government in the field of water resources development, led by a Head of Service, being subordinated to and responsible to the Governor of the Province;

Tasks are as follows:

- (a) Implementation of part of the Provincial Government services in the field of water resources development;
- (b) Implementation of supporting tasks for the Provincial Government services in the field of water Resources development transferred to Provincial Government.

Functions are as follows:

- (a) Formulation of development plan and management of technical policy, provision of guidance and licensing in the field of water resources development pursuant to the policy stipulated by the Governor;
- (b) Implementation of development in the field of water resources development;
- (c) Supervision and technical control of water resources development, operation and maintenance of water resources infrastructure and facilities, and activities of water sources' exploitation, monitoring and control;
- (d) Guidance toward Water Resources Development Section of Public Works Service in the Regencies/Municipalities in the field of water resources

development having technical and functional characteristics based on the policy stipulated by the Minister for Public Works;

- (e) Management of Service administration; and
- (f) Management of the Water Resources Management Units.

Organization: The Organization of Water Resources Development Service consists of Head of the Service, Administration Division, five Sub-Services, Water Resources Management Units, and Specialist Group. Refer to Fig. 12.2.3.

The budget of the Central Java Flood Disaster Re-construction Project is shown below for the reference of the annual budget for the operation and maintenance by the Service.

Budget of Central Java Flood Disaster Re-construction Project

Unit: Rp. 1,000

1995/1996	1996/1997	1997/1998	1998/1999
985,000	1,515,000	3,060,000	2,135,589

Pursuant to the newly promulgated Central Java Regional Regulation No. 11 Year 1999 on Organization and Procedure of the Public Works Water Resources Development Service of Central Java Province Level I Region, 'Branch Offices (*Cabang Dinas*)' will not exist in the organizational structure of the Service in Level I Region.

Nevertheless, in the Transitional Provision [Art. 66 Central Java Regional Regulation No. 11 Year 1999] it is provided that prior to the establishment of the Public Works Water Resources Development Service in Level II Regions, the handling of part of the Administration affairs in the field of Public Works Water Resources in the Level II Region will be executed by (old style) Branch Office.

Based on the Central Java Regional Regulation No. 8 Year 1988, such (old style) Branch Office is subordinated and accountable directly to the Head of the Water Resources Development Service in Level I Region.

Branch Offices (*Cabang Dinas*)

There were 29 Branch Offices under the Provincial Water Resources Development

Service. Their job is now only irrigation. They are under the Public Works Service of Regencies/Municipalities following the implementation of the new Provincial Regulations on Water Resources Development Service.

The scope of working areas of the Branch Offices, which had been referring to the river basin unit beforehand, has been changed to the scope of administrative territory of the Regencies/Municipalities.

River Basin Water Resources Management Units (*Balai Pengelolaan Sumber Daya Air*)

The River Basin Water Resources Management Units have been established, which serves as Technical Implementation Units of Water Resources Development Service of Central Java Province within the region.

There are presently eight Units and later will be combined to seven. Their job is those related to more than one Regency/Municipality. On the other hand, jobs which are related to only one Regency/Municipality are transferred to the Regency/Municipality. For example, the management of Silandak River has been transferred to Semarang Municipality.

The tasks of the River Basin Water Resources Management Units are:

- (a) Irrigation beyond one Regency/Municipality;
- (b) Raw water supply for multifarious purposes (industry, harbor, clean water, hydro-electric power, water traffic, ponds, etc.);
- (c) River;
- (d) Reservoir, lake, natural pond (*situ*) and small reservoir (*embung*);
- (e) Flood control and drought prevention;
- (f) Swamp;
- (g) Water pollution control;
- (h) Coastal protection; and
- (i) Estuary and delta.

To implement the above-mentioned tasks, the Water Resources Management Units have the following functions:

- (a) Operation of the service provision to the public in the field of water resources;
 - (b) Operation, maintenance, repairs and constructions of water resources infra-structures;
 - (c) Operation water sources conservation ;
 - (d) Maintenance of surface water sources and water resources facilities; and
 - (e) Implementation of administrative technical services.
- (3) Public Works Service of Semarang Municipality (*Dinas Pekerjaan Umum Kotamadya Semarang*)

Public Works Service of Semarang Municipality is characterized as follows:

Purpose: To enhance the execution of Government and development efficiently in particular in the field of operation and maintenance of the construction of roads, bridges, and city channels.

Status: an implementation unit of the public works in the Municipality.

Tasks/Duties: Assisting the Head of Public Works Service in the execution of Government services in the field of the construction of roads, bridges, city channels, water supply facilities and buildings.

Functions are itemized as follows:

- (a) Coordinates the implementation and maintenance of the construction of roads, bridges, city channels, water supply facilities and buildings owned by the Regional Government in its working area which are financed by the Level II Regional Budget Funds, Subsidy of Level I Budget and Subsidy of the National Budget;
- (b) Reporting on the result of the implementation of the works in its working area to the Head of Public Works Service;
- (c) Submitting technical considerations to the Head of Public Works Service; and
- (d) Implementing other works provided by the Head of the Public Works Service.

The **Organization** of Public Works Service consists of the Head of the Service,

Administration Sub-Service, and five Sections. Refer to Fig. 12.2.4.

The budget of the O&M for urban drainage is Rp. 1,062,394,000 in 1998/1999 and Rp. 991,000,000 in 1999/2000, which is categorized as Project Budget.

(4) Other Related Authorities

Other related authorities concerning water resources development are summarized as follows:

Other Related Authorities Concerning Water Resources Development

Abbreviation	Indonesian Name	English Trans.	Main Tasks & Responsibilities
DGWRD (MPW)	Direktorat Jenderal Pengairan	Directorate General of Water Resources Development (M. of Public Works)	Responsible for planning, development and management of water resources in the nation excluding ground water. Responsible for all river works and flood control in rural and urban areas and for drainage works in urban areas.
DPU Cipta Karya	Directorat Jenderal Cipta Karya, Dep. Pekerjaan Umum	Directorate General of Human Settlements (M. of Public Works)	Responsible for planning, development of human settlement in rural and urban areas.
DPE	Departemen Pertambangan dan Energi	Ministry of Mining and Energy	Gives technical advice to provincial government Gives approval of groundwater exploitation Overseas PT PLN activities in coordination with DGWRD which controls water licensing for hydro use.
DISTAMB	Dinas Pertambangan Daerah Propinsi Dati.I Jateng	Provincial Mining Service, Central Java	Determines the allocation and extraction schedules after getting approval of DPE
BAPEDAL	Badan Pengendalian Dampak Lingkungan	Environment Impact Management Agency	To assist the President in managing environmental impacts including prevention of and control over pollution and environmental damage To assist the President in rehabilitating environmental quality.
BAPEDALD A	BAPEDAL Daerah Propinsi Dati.I Jateng	Provincial Agency for Environment Impact Management	Responsible for monitoring inspecting and controlling quality of water, air and soil. Coordinating for environmental damages.
Dinas Penyehatan	Dinas Penyehatan TK I Jawa Tengah	Sanitation Services, Central Java	Responsible for clean water demand in Central Java Province
DDN	Departemen Dalam Negeri	Ministry of Home Affairs	Responsible for implementation of public services in Indonesia
PT PLN	Perseroan Terbatas Perusahaan Listrik Negara	State Electric Power Company	Responsible for power generation, transmission and distribution of electricity Responsible for planning, construction and operation of power supply facilities
PDAM Semarang	Perusahaan Daerah Air Minum	Regional Drinking Water Supply Company (Semarang)	Responsible for providing municipal and industrial water Surface water of the K. Garang is withdrawn for Semarang mainly groundwater is pumped up for other areas than these two.
Dam Safety Unit	Balai Keamanan Bendungan	Dam Safety Unit	Responsible for preventing negative impact of dams in Indonesia

12.3 Proposed Organizations and Cost for Operation and Maintenance

Usually, *JRATUNSELUNA* does O&M services for two years after the construction of facilities. The same implementation unit will take in charge of the O&M services. After that,

O&M responsibilities will be transferred to the Regional Government according to the Regional Regulation on the organization and procedures.

12.3.1 Proposed Organizations

According to the new Regional Regulation on the organization and procedures of Central Java Province, operation and maintenance of the river facilities are carried out by **Jragung-Tuntang West Water Resources Management Unit**, which is under the Head of Water Resources Development Service, Central Java Province. **Jatibarang Multipurpose Dam Operation & Maintenance Management Office** is established in the Operational Management Section (refer to Fig. 12.3.1).

Operation and maintenance staff for the proposed facilities are to be designated from the staff in the existing organizations including those in the Water Resource Development Service and Branch Office, which is transferred to the Level II Regional Government, in order to set up the new system as simple as possible. See the table below:

O&M Staff for Jatibarang Dam

Assignment of Staff	Number	Original Organization
Manager	1	Maintenance and Rehabilitation Sub-Section of the Unit (<i>Balai</i>)
Assistant Manager (Section Chief)	2	Maintenance and Rehabilitation Sub-Section of the Unit (<i>Balai</i>)
Legal Specialist	1/3	Branch Office (<i>Cabang Dinas</i>)
Clerk	2	Administration Sub-Division of the Unit (<i>Balai</i>)
Accountant	2	Administration Sub-Division of the Unit (<i>Balai</i>)
Computer Operator	2	Administration Sub-Division of the Unit (<i>Balai</i>)
Janitor	2	Administration Sub-Division of the Unit (<i>Balai</i>)
Engineer of Operation Section	4	Maintenance and Rehabilitation Sub-Section of the Unit (<i>Balai</i>)
Engineer of Maintenance Section	4	Equipment and Logistic Sub Division of the Service (<i>Dinas</i>)
Operator/Technician	8	Administration Sub-Division of the Unit (<i>Balai</i>)
Truck Driver Steersman of Patrol Boat	2	Equipment and Logistic Sub Division of the Service (<i>Dinas</i>)
Driver	3	Administration Sub-Division of the Unit (<i>Balai</i>)
Worker	6	Administration Sub-Division of the Unit (<i>Balai</i>)
Total	39 + 1/3	

A Legal Specialist should be added in the staff list (same as an Assistant Engineer level) for legal matters. The same Legal Specialist works for three offices such as West Floodway/Garang River Lower Reaches Operation & Maintenance Management Office, Simongan Weir Operation & Maintenance Management Office and Jatibarang Multipurpose Dam Operation & Maintenance Management Office. Many staff including legal specialists,

however, belong to Branch Offices and they have been transferred to Level II Regional Governments as a result of the implementation of New Regional Autonomy Law. It is possible and there is an example of asking somebody in a Level II Regional Government to work for the job of Water Resources Development Service, Central Java Province.

12.3.2 Budgetary Arrangement

There are several financial sources for the O&M of proposed facilities. These are (1) Provincial budget, (2) subsidy from the Central Government and (3) charge/fee collected from those who make money utilizing the resources bestowed in the river basin.

Firstly, the Provincial Government should consider the possibility of tax increase if the budget is not enough to allocate to the O&M of proposed facilities. Especially, those who are living and/or running business in the area which is released from the periodical flood should bear the part of the cost.

Secondly, a subsidy from the Central Government budget should be considered from the viewpoint of balanced development in the Republic. It is transferred from the State Budget to the Region to assist financing special needs, observing the availability of funds in the State Budget.

Thirdly, the charge for sand mining, for example, should be increased with the competence of the river basin management body.

12.3.3 Preparation of Schedule and Budget

Annual Schedule

Annual implementation schedule for maintenance of facilities is prepared taking into consideration of the optimum distribution of both work items and work volume, and the selection of the effective time of work. The schedule is programmed based on the following considerations.

- (1) The period and the time are determined carefully considering characteristics of the location of work, traffic condition and the work procedure at the site;
- (2) Personnel, equipment and materials to be used are distributed properly and effectively through the year;
- (3) Repairing is most important, and early implementation is required; and

- (4) The maintenance/repair work is implemented with two procedures, temporary/short term base and long term base.

Personnel in Charge of O&M for the Project

Personnel/staff stated in Table 12.3.1 is proposed to be assigned to the O&M for the Project. The kind and number of personnel are determined based on the contents of O&M work and its volume.

Budget

This section deals with the annual O&M cost and replacement cost for the Project. These cost, however, should be reviewed during the supervision stage based on the actual contract price and the prevailing Government regulations at that time.

Necessary yearly costs of the O&M and replacement for the proposed facilities are Rp. 1,042,900,000 for Jatibarang Multipurpose Dam as follows:

Required Annual Operation & Maintenance Cost for Jatibarang Multipurpose Dam

Description	Yearly Cost (Rp)
1. Salary for Staff	207,200,000
2. Office Consumable and Running Cost	132,200,000
3. Operation and Maintenance Cost for Equipment/Tools	96,000,000
4. Contractual Maintenance	100,000,000
5. Replacement Cost of Electrical/Mechanical Equipment per year	500,000,000
6. Training and Seminar	4,500,000
TOTAL	1,039,900,000

Refer to Table 12.3.2 for the details.

TABLES

CHAPTER 12

ORGANIZATION AND INSTITUTION

LIST OF TABLES

Chapter 12

Table 12.3.1	Staff of Operation and Maintenance Office for Jatibarang Multipurpose Dam	T-12-1
Table 12.3.2	Required Annual Operation & Maintenance Cost for Jatibarang Multipurpose Dam	T-12-2



Table 12.3.1 STAFF OF OPERATION AND MAINTENANCE OFFICE
FOR JATIBARANG MULTIPURPOSE DAM

Assignment of Staff	Number	Tasks and Responsibility
- Manager	1	- Responsible for overall management, operation and administration - Supervision of overall works - Request of budget
Administration Section		
- Legal Specialist	(1/3)	- Assistance to the Engineer for legal matters
- Truck Driver Steersman of Patrol Boat	2	- Operation of dump truck, patrol boat
- Driver	4	- Driving cars
- Clerk	2	- Keeping record and documents
- Accountant	2	- Accounting for office works
- Janitor	2	- Security guard for office and facilities
- Worker	6	- Works for maintenance of facilities
- Computer Operator	2	- Assistance to the Engineer to operate computer facilities
Dam Section		
- Assistant Manager (Dam Section Chief)	1	- Assistance to the Manager for management and operation of dam facilities except for hydropower generation facilities
- Engineer of Operation Subsection	2	- Responsible for daily operation of dam facilities except for hydropower generation facilities - Collection and evaluation of hydrological data - Warning to the public in the target area during flood
- Engineer of Maintenance Subsection	2	- Periodical inspection, maintenance and repair of dam facilities except for hydropower generation facilities - Periodical measurement and observation of instrumentation in and around dam facilities
- Operator/Technician	4	- Assistance to the Engineer
Hydropower Generation Section		
- Assistant Manager (Dam Section Chief)	1	- Assistance to the Manager for management and operation of hydropower generation facilities
- Engineer of Operation Subsection	2	- Responsible for daily operation of hydropower generation facilities
- Engineer of Maintenance Subsection	2	- Periodical inspection, maintenance and repair of hydropower generation facilities
- Operator/Technician	4	- Assistance to the Engineer
Total	39 + 1/3	

Table 12.3.2 REQUIRED ANNUAL OPERATION & MAINTENANCE COST
FOR JATIBARANG MULTIPURPOSE DAM

Description	Unit	Yearly Quantity	Unit Cost (Rp)	Yearly Cost (Rp)
1. Salary for Staff				
- Manager	man	1	9,000,000	9,000,000
- Assistant Manager (Section Chief)	man	2	7,200,000	14,400,000
- Clerk	man	2	4,800,000	9,600,000
- Accountant	man	2	4,800,000	9,600,000
- Computer Operator	man	2	4,800,000	9,600,000
- Janitor	man	2	3,600,000	7,200,000
- Engineer (Staff of Operation Subsection)	man	4	6,000,000	24,000,000
- Engineer (Staff of Maintenance Subsection)	man	4	6,000,000	24,000,000
- Operator/Technician	man	8	5,400,000	43,200,000
- Truck Driver, Steersman of Patrol Boat	man	2	4,800,000	9,600,000
- Driver	man	4	4,200,000	16,800,000
- Worker	man	6	4,200,000	25,200,000
- Seasonal Employee including Legal specialist		L.S.		5,000,000
Subtotal		39		207,200,000
2. Office Consumable and Running Cost				
- Electricity/Water/Gas	month	12	1,000,000	12,000,000
- Communication	month	12	600,000	7,200,000
- Office Consumable	month	12	1,000,000	12,000,000
- Car Running Cost	car-month	48	1,000,000	48,000,000
- Heavy Equipment, Patrol Boat Running Cost	car-month	24	2,000,000	48,000,000
- Miscellaneous		L.S.		5,000,000
Subtotal				132,200,000
3. Operation and Maintenance Cost for Equipment/Tools				
- Construction Material	month	12	3,000,000	36,000,000
- Fuel and others	month	12	3,000,000	36,000,000
- Maintenance of Equipment	month	12	2,000,000	24,000,000
Subtotal				96,000,000
4. Contractual Maintenance	L.S.			100,000,000
5. Replacement Cost of Electrical/Mechanical Equipment per year	L.S.			500,000,000
6. Training and Seminar	L.S.			4,500,000
TOTAL				1,039,900,000

FIGURES

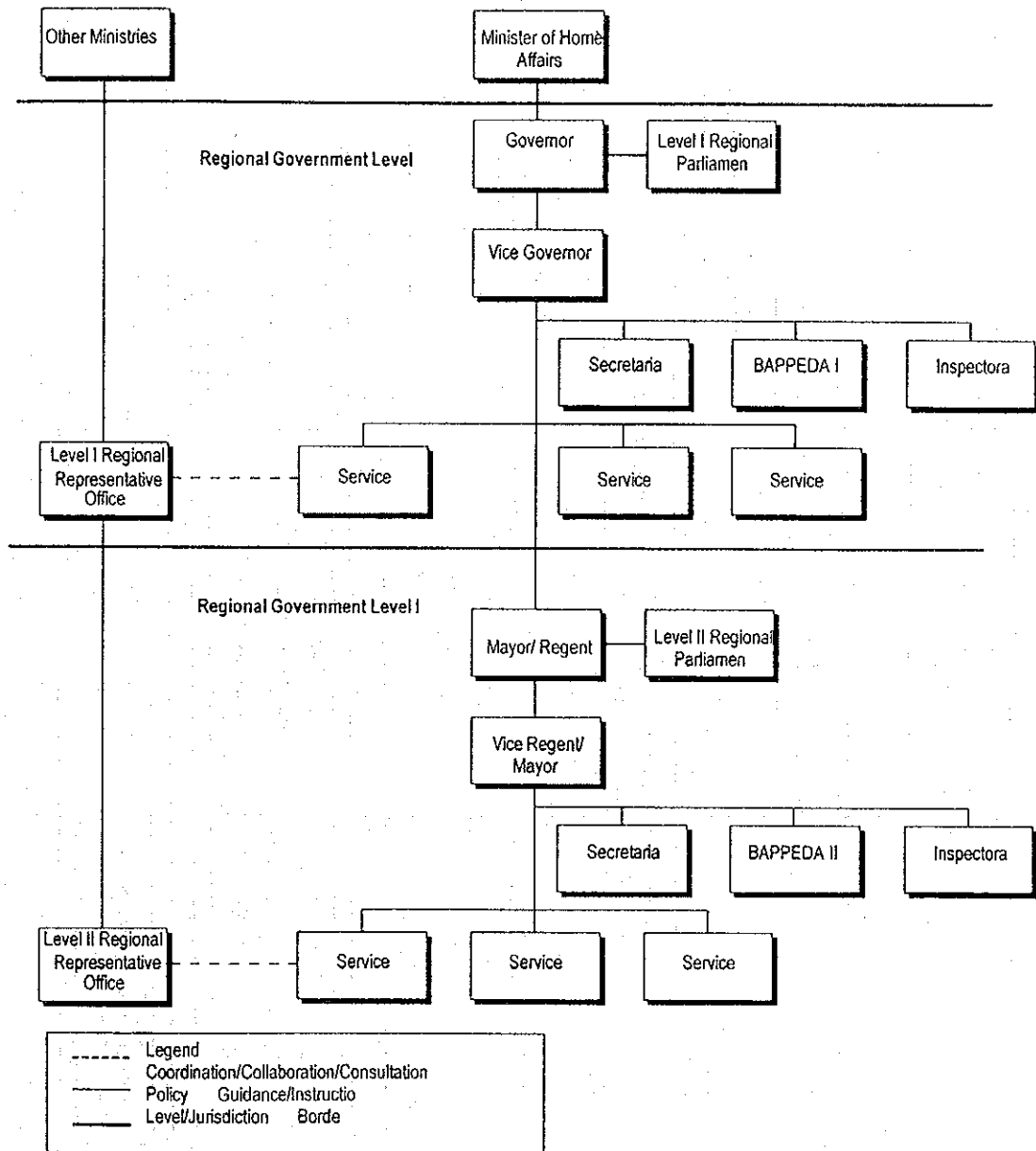
CHAPTER 12

ORGANIZATION AND INSTITUTION

LIST OF FIGURES

Chapter 12

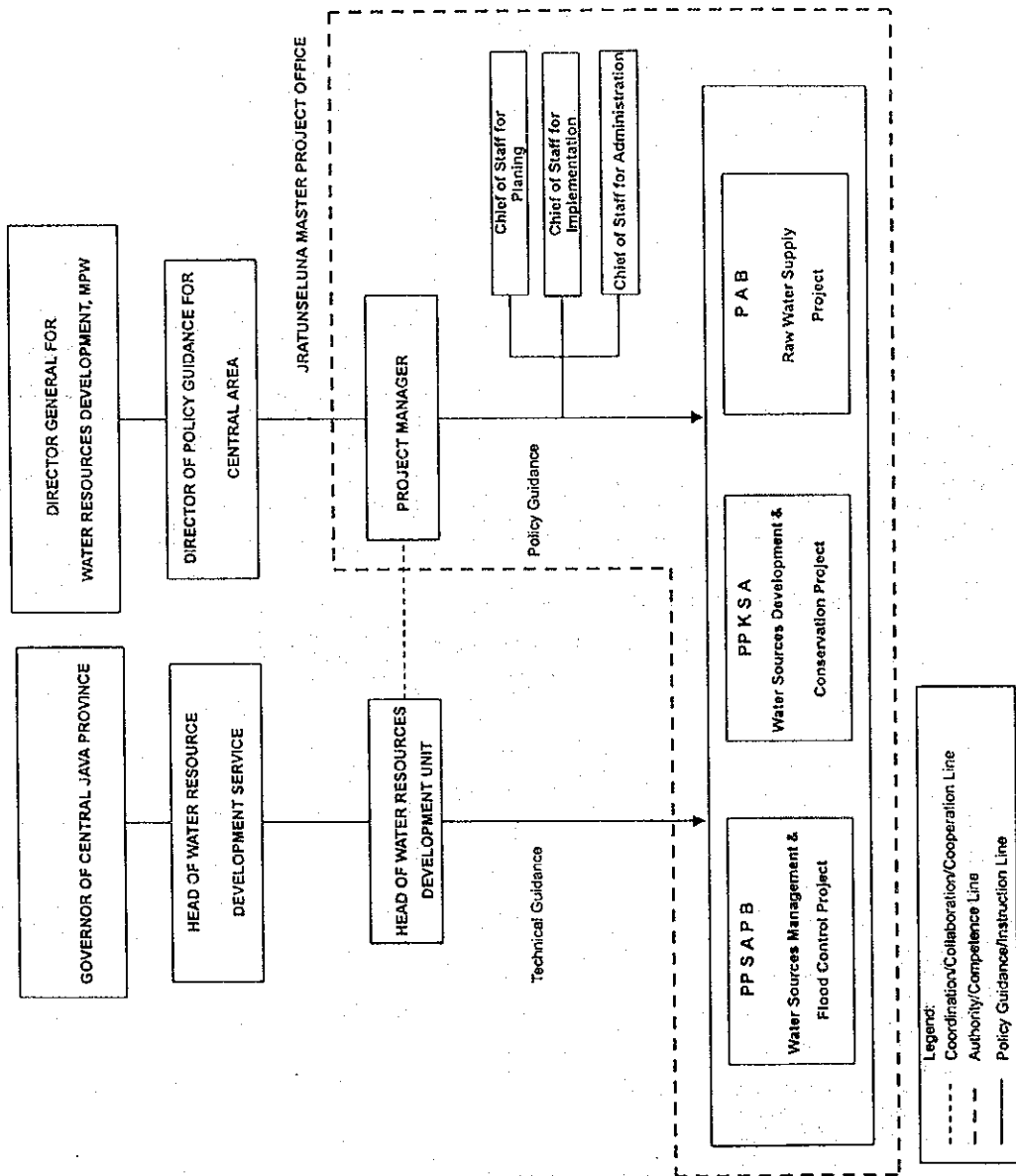
Fig. 12.1.1	Structure of Regional Government	F-12-1
Fig. 12.2.2	Organization of Jratunseluna Master Project Office and Its Related Authorities	F-12-2
Fig. 12.2.3	Water Resources Development Service of Central Java Province	F-12-3
Fig. 12.2.4	Organization of Public Works Service of Semarang Municipality	F-12-4
Fig. 12.3.1	Jragung-Tuntang West Water Resources Management Unit	F-12-5



THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

Fig. 12.1.1
STRUCTURE OF REGIONAL GOVERNMENT

JAPAN INTERNATIONAL COOPERATION AGENCY

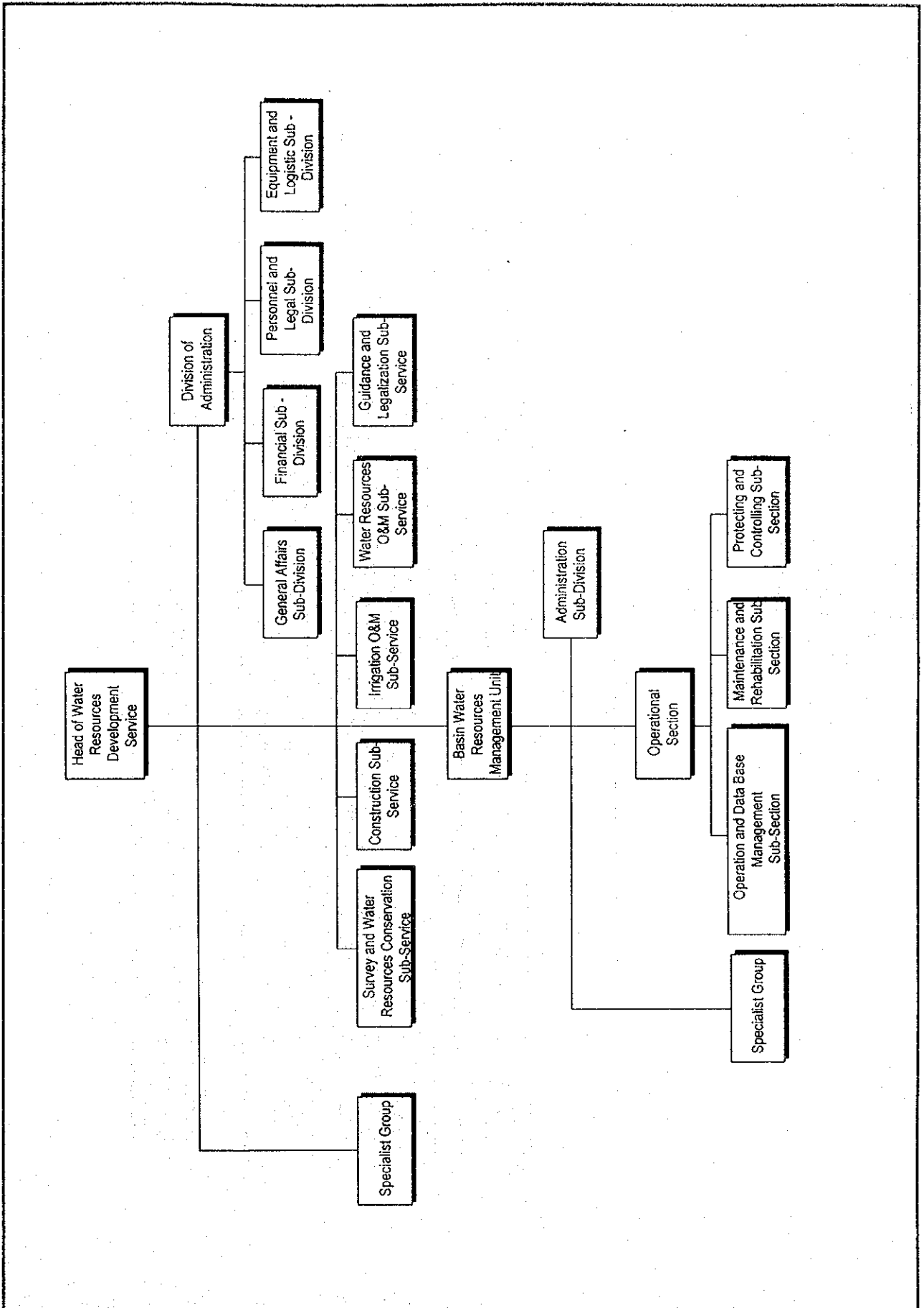


THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

Fig. 12.2.2

ORGANIZATION OF JRATUNSELUNA MASTER PROJECT OFFICE AND ITS RELATED AUTHORITIES

JAPAN INTERNATIONAL COOPERATION AGENCY

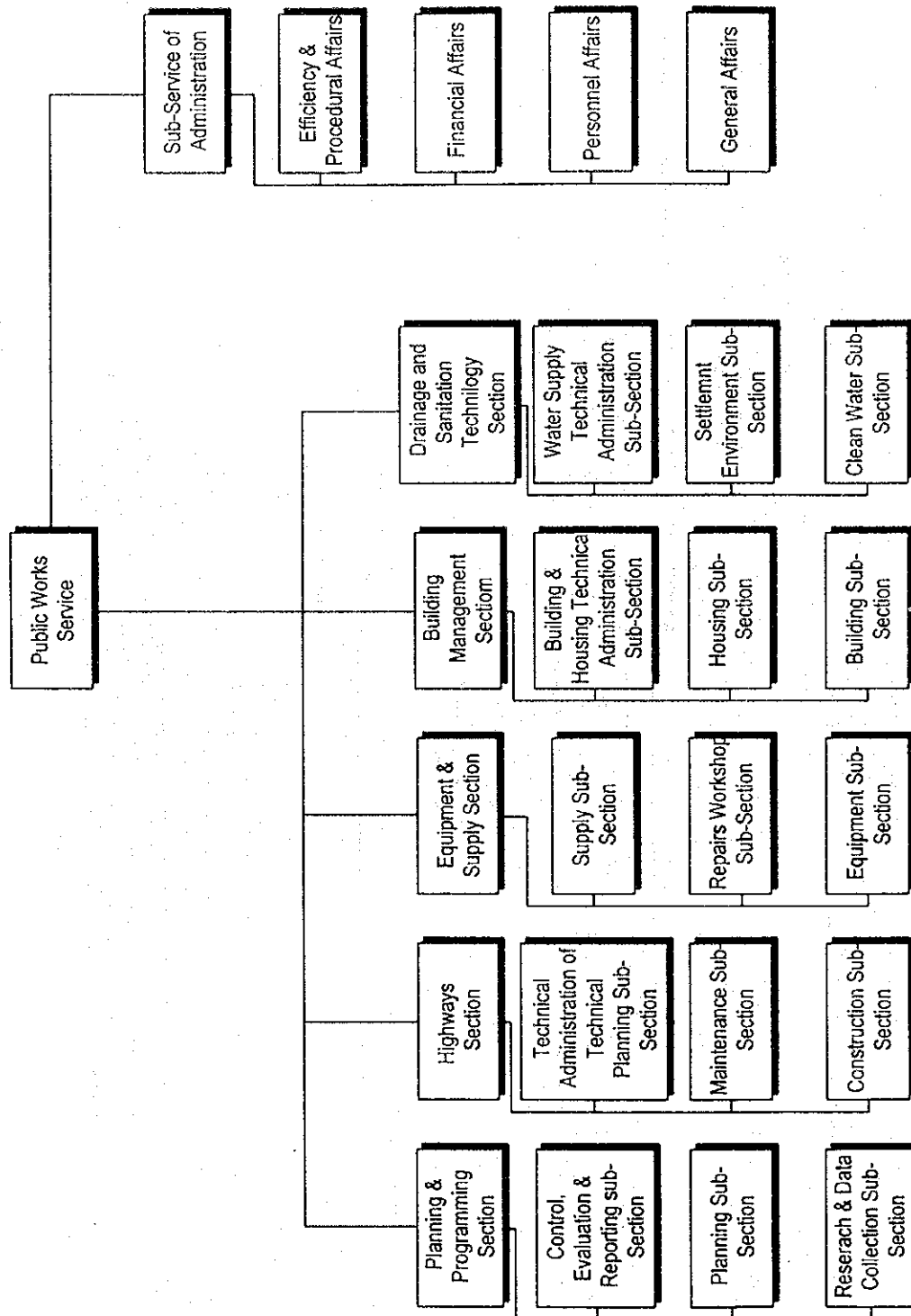


THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 12.2.3

WATER RESOURCES DEVELOPMENT SERVICE OF CENTRAL JAVA PROVINCE

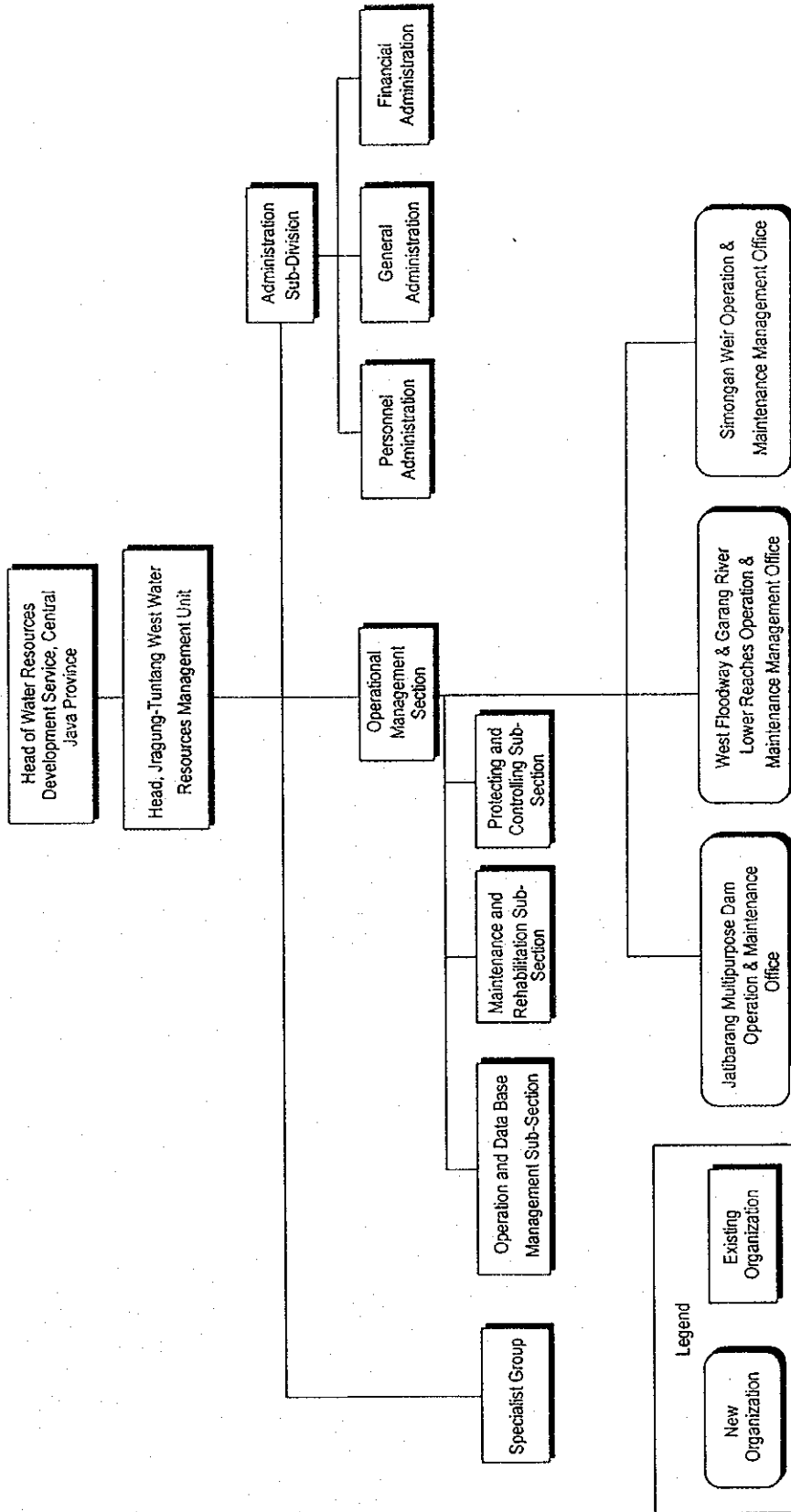


THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 12.2.4

ORGANIZATION OF PUBLIC WORKS SERVICE OF SEMARANG MUNICIPALITY



THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 12.3.1
JRAGUNG-TUNTANG WEST WATER RESOURCES MANAGEMENT UNIT

CHAPTER 13

PROJECT IMPLEMENTATION

CHAPTER 13 PROJECT IMPLEMENTATION

13.1 Implementation Method and Time Schedule

13.1.1 Executing System

Project Component

As mentioned in "CHAPTER 1, 1.1 Background", the Project "Construction of Jatibarang Multipurpose Dam" is one of the three (3) components proposed for the urgent realization of the flood control, urban drainage and water resources development in Semarang City. The other two (2) components are "West Floodway/Garang River Improvement" and "Urban Drainage System Improvement".

Construction of these three (3) components is expected to be implemented under one loan program.

Executing Organization

It is proposed that the component "Construction of Jatibarang Multipurpose Dam" is executed as mentioned below.

The organization of the Central Government of Indonesia was drastically changed in October 1999. As of August 2000, the responsible offices for the implementation of the Project would be the Directorate General of Rural Development, Ministry of Settlement and Regional Development (KIMBANGWIL). Actual project execution is to be entrusted to the JRATUNSELUNA Project Office.

Executing Method

As mentioned before, the detailed engineering design for the Project is being conducted under the JICA Development Assistance Program. It is expected that construction of the Project will be carried out immediately after this D/D Study.

The construction of the Project is expected to be undertaken under the financial assistance by a foreign developed country. Therefore, the procedure of the implementation will follow to a guideline of a financial assistance agency of the country as well as the laws and regulations of the Government of Indonesia for the procurement of engineering services and construction

contractors. The implementation schedule as well as the acquisition of project funds are discussed below.

13.1.2 Project Packaging and Construction Schedule

Aiming at an effective implementation of the project, the whole construction works are divided into some sub-components (contract package). Packaging the project works is basically made based on factors such as nature of the project, topographical condition, construction method, project cost and so on.

The contract package for the component of Construction of Jatibarang Multipurpose Dam was discussed between JRATUNSELUNA Project Office and the JICA Study Team. Consequently, the following two (2) contract packages were selected (refer to Fig. 13.1.1).

Package 1 : Jatibarang Multipurpose Dam including Appurtenant Structures

Package 2 : Operation and Maintenance Buildings, and Goa Kreo Bridge

Based on the construction plan, each work of the packages, with regard to the construction time, is allocated as shown in Tables. 11.4.1 and 11.4.3. As the figures show, the whole construction period is estimated to be 45 months.

13.1.3 Implementation Schedule

The implementation schedule is prepared to achieve prompt construction of the Project so as to release properties from flood damage and improve the environmental conditions in and around Semarang City. Necessary undertakings and activities are incorporated in the Implementation Schedule as shown in Fig. 13.1.2.

This D/D Study is to be completed in March 2000 at the draft final report level, and the final report will be submitted in August 2000. During the D/D Study, environmental impact assessment and inventory survey for compensation such as land acquisition and house evacuation are simultaneously undertaken. Furthermore, the preparation works for loan acquisition (foreign currency portion) and local fund for compensation will be executed as a pre-construction works. Then, construction of the Project is executed during the period from April 2001 and completed in December 2004. The major work items for the project implementation are listed in the table below together with the period estimated.

Major Work Item	Period
1. Detailed Design	
1-1. Detailed Design including Tender Documents	Aug. 1997 - Mar. 2000
1-2. Approval on ANDAL and RKL/RPL	Sep. 1999
2. Required Administration Works	
2-1. Fund Requirement	Nov. 1999 - Jan. 2000
2-2. Land Acquisition and Compensation	Apr. 2000 - Dec. 2003
3. Loan Acquisition	
3-1. Request for Loan	Apr. 2000
3-2. Loan Appraisal	Jul. 2000
3-3. Pledge/Loan Agreement	Sep. 2000
4. Construction of the Project	
4-1. Selection and Contract of Consultant	Nov. 2000
4-2. PQ, Tendering and Contract for Construction	Dec. 2000 - Feb. 2001
4-3. Construction	
Package 1	Apr. 2001 - Dec. 2004
Package 2	Apr. 2002 - Apr. 2004

13.2 Fund Requirement

13.2.1 Project Cost and Loan Amount

The total project cost is estimated at Rp. 530,076 million (¥8,778 million), excluding value added tax. Assuming that the Project is implemented with financial assistance from a foreign developed country, the loan amount is estimated as follows:

- (1) In case the total eligible cost is larger than 85% of the total project cost, Upper limit of total loan amount shall be 85% of the total project cost.
- (2) In case the total eligible cost is less than 85% of the total project cost, the total loan amount shall be the total eligible cost.

Non-eligible costs are considered for the following categories, but they could be included in the total project cost:

- Land acquisition cost,
- Compensation,
- Tax and duties as well as government administration cost, and

The total project cost is adjusted so as to estimate the loan amount as follows:

Item	Amount (million Rp)	Amount (million ¥)
1. Construction Base Cost	332,533	5,506
2. Engineering Service Cost	33,372	553
3. Compensation Cost	13,500	224
4. Administration Cost	24,222	401
5. Physical Contingencies (10% of 1. to 3.)	37,940	628
6. Price Contingency	88,509	1,466
7. Total	530,076	8,778
8. Value Added Tax	48,218	798
9. Grand Total	578,294	9,576

From the table above, the ratio of eligible cost (construction base cost, engineering service cost and part of physical contingency) is estimated at Rp. 482,180 million corresponding to 83.4 % of the total project cost. Therefore, the total loan amount including physical contingencies is estimated to be Rp. 482,180 million.

13.2.2 Disbursement Schedule

The disbursement schedule is prepared as discussed below.

(1) Annual Disbursement Schedule

Annual disbursement schedule for the Project is prepared in accordance with the implementation schedule as presented in Table 13.2.1.

(2) Operation, Maintenance and Replacement Cost

Operation, maintenance and replacement cost was discussed in "CHAPTER 10, 10.3.3 Preparation of Schedule and Budget", and summarized below.

Annual O&M Cost	Rp. 1,040 million
Construction Base Cost	Rp. 332,533 million
Percentage to Construction Base Cost	0.31 %

13.3 Works Required for Project Implementation

13.3.1 Clearance of Environmental Issue

Under the Ministry of Public Works (DPU), the study on environmental impact analysis is conducted taking account of the importance for the protection of natural and social environment. The Environmental Impact Study (AMDAL) has to be carried out at the stage of feasibility study, and its results seem to be of great significance to judge whether the project is feasible or not.

During the D/D Study, in accordance with the government regulation "PP No.51/1993" and the regulation from the State Minister of Environment No. Kep. 39/MENKLH/8/1996, the following reports were duly prepared and submitted to the Central Committee (KOMPUS) for approval.

- (1) Terms of Reference of the Environmental Impact Statement (KA-ANDAL)
- (2) Environmental Impact Assessment (ANDAL)
- (3) Environmental Management Plan (RKL)
- (4) Environmental Monitoring Plan (RPL)

The results of AMDAL and ANDAL were discussed in the official meetings organized by both regional and central committees (called KOMDA and KOMPUS, respectively) to evaluate the project in terms of environment. Through the several meetings, ANDAL, RKL and RPL documents were modified based on the comments and suggestions from the committee members, and were submitted again. Then, the final reports were approved by KOMPUS.

13.3.2 Compensation Works

Jatibarang Multipurpose Dam Construction Project will affect relatively wide area of farmland and woods in and around proposed damsite including the reservoir area. The total required area for the construction of dam and reservoir is estimated at about 150 ha of land which is presently used for paddy, upland, small plantation, woods and so on, and no people are living there. In consequence, no house evacuation is required.

resettlement problem does not occur due to its land use pattern. It is confirmed that whole required area is covered with only farm land and unutilized land. Under such circumstances, land acquisition will be conducted on cash-based compensation which is supposed to be the most realistic option.