

IV.11 Organization and Management

IV.11.1 Current WRM and its Problems

There are 34 organizations in total that are involved in the water resources management in the Brantas river basin. They include 8(eight) ministries such as MPW, MOFi(finance), MOFo (forestry), MIT(industry and trade), MME(mining and energy), MOE(environment), MOH(health) and MHA(home affairs). They also include 7(seven) Provincial Services Offices (Dinas) covering water resources, forestry and soil conservation, agriculture, fishery, industry, mining and sanitation services. Representative offices of ministries(Kanwil), Government managed projects, public corporations, limited corporations and some related committees are also included.

There exists the Provincial Water Management Committee(PWMC) which assists the Governor in coordinating water management in the province. The PJT gives the committee technical recommendation on water allocation which is finally decided by the Governor. The secretariat of the committee is Dinas Pengairan(Provincial Water Resources Service).

Some problems are observed with respect to sharing roles and responsibilities among the related agencies : (i) duplication and obscurity of works and duties e.g. in water quality management and (ii) lack of task coverage: e.g. in watershed management sector, there is no agency responsible for water conservation.

IV.11.2 Current Operation and its Problems of PJT

The current operation of PJT is based on the provision of Minister of Public Works Regulation No. 56 / PRT / 1991 in which the main tasks of PJT are stipulated as follows :

- (a) Operation and maintenance of water resources infrastructure,
- (b) Dealings in water and water resources,
- (c) River basin management i.e. conservation, development and utilization of water and water resources, and
- (d) Rehabilitation of water resources infrastructure.

Although stipulated in the regulation as shown above, construction activities are not being done in routine practices of PJT. Neither conservation works are being done. Thus only (a) and (b) are actually implemented in daily practices of PJT.

The current organization structure of PJT is as stipulated in Figure 11. Under the President Director, three(3) directors are assumed to be responsible for Technical Affairs, Operation and Administration and Finance. The current number of staffs of PJT is 436 in total. The Board of Management is the superior organization of all the managerial decision. The Supervisory Board is supervising the management of PJT executed by Board of Management.

Some problems in managerial aspects of PJT are pointed out hereunder.

- (a) No water charge system is established. Water rates are negotiated between PJT and such beneficiaries as PT PLN, PDAM and industries individually every year.
- (b) Fixed Assets are not well managed. The proper bookkeeping is absolutely necessary for the full recovery of the cost.
- (c) Strengthening of manpower is needed.
- (d) Reform of organization is required for e.g. public relations, legal affairs and marketing besides specific engineering fields.

IV.11.3 Proposals on Overall Water Resources Management System

- (a) MPW-PJT administrative line for WRM in the Brantas.

Two administrative lines exist at present in the water resources management in the Brantas river basin: one is the line of MPW and another is that of Provincial Government. The obscurity for responsibility sometimes causes duplication of management activities and/or lack of necessary action. Based on the analysis of current conditions of the water resources management in the Brantas, the basic concept of "one river, one plan and one management" with the MPW-PJT line management is proposed to be applied for the WRM system. Figure 13 shows the proposed overall water resources management system in the Brantas.

- (b) Delegation of responsibility for implementation from MPW to other Ministries

When the MPW administrative line is established, the MPW is assumed to be solely responsible for WRM in the basin and the responsibility for administration will be delegated to the Ministries related to the sectors of WRM. For daily operation in WRM, the responsibility will be delegated from MPW to PJT. And in the areas where PJT is not appropriate to be responsible, the responsibility will be delegated further from PJT to other responsible agencies. It is proposed in this Study that BRLKT(Sub-division Malang) and DPKT(Regency level) will be lead agencies in the watershed management sector. It is also proposed that BAPEDALDA(Provincial level) will be the lead agency in the water quality management sector in the Brantas.

- (c) Basin Water Resources Management Committee (BWRMC)

As already acknowledged widely, the Brantas river basin is at the stage from "development" to "management" and a "fine tuning" is required in water resources management.

It is proposed that a Basin Water Resources Management Committee (BWRMC) will be established in the Brantas basin. The main task will include preparing water allocation plan, land utilization plan, flood control operation plan, conducting soil and water conservation activities and promoting the community participation activities.

(d) Consolidation of PKB, PGKS and PJT

There exists duplication of tasks among PKB, PGKS and PJT. It is proposed to consolidate these three agencies into one. Merits of the consolidation from the point of view of water resources management as a whole comprise to raise efficiency of activities related to construction, rehabilitation and operation and maintenance of river infrastructures and to save manpower committed to water resources management in the Basin.

IV.11.4 Organizational Development of PJT

Accompanied by the change of roles and responsibility of PJT in water resources management in the Brantas, the organizational development of PJT will be required. The time schedule for change of organization of PJT is proposed in this Study as shown below:

- Consolidation with PKB and PGKS : in January 2002
- Transformation to Persero : in January 2005

There are two managerial aspects for a water resources management body like PJT(Figure 13):

- a. water management and
- b. corporate management.

The water management nature requires PJT to be service oriented and the corporate management nature requires PJT to be profit oriented. Under the current Perum status, PJT is required to fulfill the both. As a matter of natural, the former should go ahead of the latter. The profit seeking should be pursued only after the public service needs is satisfactorily fulfilled. The public service has a higher priority than the corporate management. This is to be well recognized in the present study. As shown in Figure 13, MPW will be the responsible agency for daily operation of the Persero. While MOF will be the supervisory agency for its corporate management activities.

The PJT's rationale for the transformation to Persero is conceived as follows:

- a. Privatization is the government's general policy for the public service and PJT is requested to be autonomous as a business oriented body.
- b. Efficiency in supplying water is able to be raised through the competition with private sector enterprises. Another merit will be activation of the whole company through profit oriented management direction.

Through investigating merits and demerits of transforming to Persero, it is proposed in this study for PJT to proceed to Persero status. As stated earlier in this section, there are two different aspects of management in PJT i.e. water management nature and corporate management nature. From the water management nature, PJT cannot expect any profit. It can only expect the full cost recovery. It is corporate management that creates profit to PJT. The profit oriented management can raise efficiency and activate all the organization which will induce an activation of water management as well.

A new Government Regulation was enacted on public company(Perum) in January 1998. Based on this new regulation, a Perum is allowed to make joint venture companies and subsidiary companies. However, other regulations like the limit of internal reserve ratio and the ratio for government development fund still remains as they are. This means that a Persero still has advantages in storing its internal reserve for its future investment. The proposal of the Study Team for the transformation to Persero is not changed by the new regulation.

In the present Study, the organizational structure of PJT as of December 1997 (Figure 11) is adopted as the base organization. As a matter of actual, however, the organizational change was made thereafter and the current organizational structure of PJT as of March 1998 is accommodated in the Main Report (Figure III.17) for reference's sake.

IV.11.5 Tasks and Organization of New PJT and Persero Jasa Tirta

The fundamental management concept of PJT will not be changed even after the change of organization including the consolidation and Persero transformation. The mission and the main tasks of the organization are as shown below:

- (1) Mission
 - (a) To provide public service for the benefit of people's life
 - (b) To produce profit through business oriented management
- (2) Main tasks
 - (a) Water resources management
 - O&M of water resources infrastructure
 - Conservation of water and water resources
 - Development and rehabilitation of water resources
 - (b). Corporate management
 - Water sales
 - Water related business development
(including tourism, contracting and consulting, equipment leasing, clean water, waste water treatment etc.)

The PJT after the consolidation with PKB and PGKS is tentatively designated as "New PJT" in this report. And the PJT after transformed to Persero status is also tentatively designated as "Persero Jasa Tirta". These formal naming is better be made by PJT personnel themselves.

Broadly speaking, the tasks of New PJT will be those of current ones to which the construction and rehabilitation of river infrastructures (former PKB's tasks) and land prevention works (former PGKS's tasks) are added. While, the tasks of Persero Jasa Tirta will be those of New PJT to which the commercial base business development are added. The structural organization thereof will be designed to effectively implement all the tasks assigned to each unit of the organization. The structural organization of Persero Jasa Tirta in 2005 is proposed as shown in Figure 12.

IV.12 Institutional Study

Institutional study has been made for providing a basis for understanding on water resources institutions in the Brantas river basin. There have been five major categories of study made:

Basic legislation and regulations related with water resources development and management in Indonesia,

Legal and regulatory provisions of Perum Jasa Tirta, PKB and PGKS,

Description of water allocation and water fee,

Water resources institutions including private sector participation in selected countries in water supply, and

Water demand management as a non-structural water saving measures.

The report first reviews major points of the above and then presents recommendations.

(1) Basic Legislation and Regulations Related with Water Resources Development and Management in Indonesia

Law 11 of 1974 on Water Resources Development gives the responsibility for control, development and management of water resources to the State. Drinking water, agricultural water use and energy are the lead categories in the three groups of priority for water planning and allocation. Government Regulation No. 22 of 1982 sets that comprehensive water management plan is to be formulated for each basin. Government Regulation No. 35 of 1991 on River provides stipulations on management of rivers. Ministry of Home Affairs Decree No. 179 of 1996 sets that basin water resources management bureau (Balais) should be established. There seems to be a contradiction regarding the roles of river basin management in the case of Brantas river basin, i.e. discrepancy between the roles of PJT set by the Government Regulation and Balai set by the Ministry of Home Affairs.

Major regulatory provisions on water quality and pollution control, construction and operation and maintenance of river structure, mining in river, irrigation and flood control are summarized as well.

(2) Legal and Regulatory Provisions of Perum Jasa Tirta, PKB and PGKS

Perum Jasa Tirta Public Corporation was established in 1990 based on the Government Regulation No. 5 of the Year 1990 on Jasa Tirta Public Corporation. A few follow-up regulations were enacted. The most specific provisions are found in Minister of Public Works Regulation No. 56 / PRT / 1991 on the general policy for managing Jasa Tirta Public Corporation. It stipulates the major tasks of Perum Jasa Tirta as follows:

- (a) Operation and maintenance of water resources infrastructure;
- (b) Trading on water and water resources;

- (c) River basin management i.e. conservation, development and utilization of water and water resources;
- (d) Rehabilitation of water resources infrastructure

Current PJT's human and financial resources do not seem sufficient to be responsible for (c) River basin management and (d) Rehabilitation.

In order to clarify the discrepancies between PJT mandate set forth in the above mentioned regulations and actual practices in the basin, Ministry of Public Works Decree on the designation of authorities and responsibilities of Perum Jasa Tirta was drafted and is now under discussion.

Activities of PJT will expand to a great degree if this Draft Decree is enacted. This Draft Decree attempts to provide PJT with authorities and responsibilities in many areas of works. It seems necessary to carefully analyze organizational setting of PJT including human and financial resources in order to cope with its expanded authorities and responsibilities foreseen in the Draft Decree.

Regarding activities outside the Brantas River basin but currently assumed by PKB and PGKS, such activities can be remained under the supervision of Directorate of Construction Guidance, Central Region. The new PJT shall be allowed to engage in water resources development and management activities outside the basin. In this case, new PJT should engage in such activities as contracted work basis upon request from the Ministry of Public Works.

(3) Description of Water Allocation and Water Fee

Overall water allocation in the province is decided by the Governor based on the recommendation from the Water Management Committee.

Irrigation water; Irrigation Service Fee is only collected from farmers for operation and maintenance of irrigation canals. Brackish fishery water: Fish farmers do not pay for their water use. Domestic water; PJT receives contribution from three Regional Drinking Water Companies (PDAM). Approval of the Governor and the Minister of Public Works is required in fee setting. Industry water; some industrial enterprises abstract water directly from the Brantas River while others receive water supply from respective PDAM. River maintenance water; River maintenance water is managed at PJT's discretion. Water quality standard is set as Provincial Governor's decree. Hydropower generation; PLN pays contribution to PJT. Approval of the Minister of Public Works is required in fee setting.

(4) Water Resources Institutions in Selected Countries

Common factors or trends for water resources institutions in the five countries: Japan, Netherlands, U.K., France U.S.A. and Australia were summarized.

- (a) Governmental units, either central or provincial level, carry responsibility for overall or broad planning, allocation and regulatory functions. Execution of these functions

can be decentralized or delegated to lower level organizations. Central government, however, manages major rivers;

- (b) Participation of beneficiaries or water users in basin management plan is realized in France and in some countries under examination;
- (c) Special purpose governmental service entities for managing water resources are established in some countries;
- (d) Almost all countries have adopted the river basin as the management unit;
- (e) Domestic water supply is the first component to be privately operated;
- (f) Separation of regulatory function from operating function is common. Examples of private sector participation in water supply are presented.

It is too early to draw any conclusion from private sector participation in water supply projects in Asian cities. Therefore, cases of four Latin American cities are reviewed. Principle features of these four examples are summarized below.

Principle Features of Private Sector Participation in Four Cities

Name of Cities	Year of privatization	Participation of Foreign Capital	Length & Type of Contract	Agency for Regulation
Buenos Aires Argentina	93	IBRD, France U.K. Spain	30yrs BOT	autonomous regulatory agency
Cancun Mexico	94	N/A	30yrs BOT	regional agency
Cartagena Colombia	95	IBRD, Spain	25yrs Mgmt contract	central&municipal governments
Santiago Chile	80	N/A	Service contract	national agency

PJT is a water resources development and management organization. The above four cases are the examples of outsourcing and concession of water supply by municipal water supply organizations. New PJT shall make appropriate institutional arrangement when they actually start providing drinking water. The government support is necessary. The Government shall issue Government Regulation to show its commitment and support for private sector participation in water supply. Without the governmental support, it will be difficult to attract private sector investment.

(5) Water Demand Management

The following recommendations are provided as non-structural water saving measures. The recommendations reflect such water resources management principles as 'service to pay' and 'full cost recovery'.

(a) Extension of IPAIR Collection

Though it is not PJT mandate, it is necessary to collect IPAIR in all irrigation areas in the Brantas basin. The amount of IPAIR should be adjusted to recover actual cost for operation and maintenance of irrigation canals by 2001 ten years after its introduction. This would reduce financial burden of governments. It would contribute to improvement of farmers' water use as well. This is the beginning of awareness building for farmers concerning cost of water management.

(b) Cost Recovery for Reservoir Operation and Maintenance

Farmers do not pay for reservoir operation and maintenance cost. PJT is providing agriculture water at operational loss. Farmers should pay for O&M cost of reservoirs as proposed as 'beneficiary to pay' principle. It is thus necessary to set water service fee for agricultural water use as well. The fee should be set based on size of land but it should reflect the actual amount of water distributed. Collection of water service fee should start by 2005 since the new organization is supposed to start its operation as Persero. Persero requires appropriate level of operational profit, to be modest.

(c) Cost Recovery for Capital Investment

In this study, it is proposed that at first, farmers should bear the cost for O&M of irrigation channel through payment of IPAIR. Second, cost recovery for O&M costs for reservoir is proposed. To this point, farmers are requested to pay for water related costs just as other water users PDAM Industry and PLN pay. As agricultural sector is the largest water user, it makes great contribution if farmers could pay for O&M costs.

When these two proposals are being realized, cost recovery for capital investment should also be proposed for all water users. Ability to pay concept should be considered. In 2020, income level of farmers is expected to improve. Cost allocation method should reflect benefit each water user sector receives. The Economic Evaluation Expert in the Study Team describes cost allocation method and cost calculation for capital investment and O & M costs.

(d) Promotion of 'Pollution Prevention Pays' Concept

Service cost or operation and maintenance cost required for provision of domestic water and industrial water is the same. 'Ability to pay' consideration seems to be reflected in the difference in water service fee between the two. Higher pricing for industrial water has the two negative influences: one is the higher production cost which may lead to decrease in non-oil export for Indonesia, the other is the over use of ground water. Though the retribution for groundwater is higher than surface water, it is more difficult to measure over abstraction compared to surface water. On the other hand, higher cost of water may lead to adoption of 'clean technology'. This 'pollution prevention pays' concept should be prevailed as well as 'Polluters pay principle'.

IV.13 Community and Beneficiaries Participation

(1) Purpose of Community and Beneficiaries Participation

As a river basin management shifts from its development stage to the management stage, the importance of community and beneficiaries participation in water resources management will increase. The unit construction cost increases as suitable sites for development in the river basin decreases. The financial support of water users becomes indispensable. The awareness building to the public for the limitation and scarcity of water resources becomes necessary to use water efficiently. At the same time, the benefit water users are enjoying is to be recognized by beneficiaries themselves in order to spread the beneficiaries-pay concept. Considering the above, the purpose of the community and beneficiaries participation can be summarized as shown below.

- 1) Financial support: To spread the beneficiaries-pay concept so that the cost of river facilities built by Government's public investment may be recovered by its users.
- 2) Efficient use of water: Saving water may make a new construction of facilities delayed and save a new investment. To nourish the consciousness to the importance of saving water is one of the purpose of community and beneficiaries participation.
- 3) Benefit consciousness: To recognize the benefit water users are obtaining from water use is important in order to understand the beneficiaries-pay concept. This can be attained through a public campaign for water users.

(2) Community and Beneficiaries Participation activities by PJT

The PJT has been implementing the participation activities by coordinating with such organizations as related government agencies, educational institutes and NGOs since the beginning of 1990s. They include annual Prokasih movements ("Clean river campaign") and the awareness building campaigns at middle/high schools. The expenditure for these activities amounts to about Rp. 1,400 million in total by 1997. A loan program with low interest rate to small and medium industries has been implemented as a community life improvement program since 1993. The loan outstanding amounts to Rp. 221 million in total by 1995.

(3) Community and Beneficiaries Participation Activities by Other Related Agencies

The Dinas Pengairan has made the training of canal rehabilitation works for irrigation farmers. The BBLH(reformed to BAPEDALDA in November 1997) has been doing awareness building campaign to inhabitants on environmental pollution control. While in the universities like Brawidjaya, IKIP and Merdeka in Malang, the universities being coordinated with PJT have been implementing education and training on awareness and consciousness to water and environment. The NGOs are also promoting technical training and awareness building activities to the public people.

(4) Awareness Survey to Water Users

An awareness survey on water resources management was conducted to such water users in the Brantas as irrigation farmers, fishery farmers and industries. The main purpose of the survey was to seek the possibility for inhabitants and beneficiaries to participate in the water resources management in the Brantas. The survey was done through interviews to 500 irrigation farmers in five(5) areas, 10 fish pond owners in the Delta area and 30 industries located along the main Brantas.

In the survey, 60% of the total irrigation farmers replied that they understood the beneficiaries-pay concept well. However, they are deemed to say that they understand the concept as they are currently paying the irrigation service fee and the land and building tax every year. And they are not deemed to say that they are ready to pay any new water charge in the future. Meanwhile, many irrigation farmers showed their interests to participate in such a management activities as canal rehabilitation.

Industries of nearly 60% of the total think that they are already participating in the water resources management activities in the Brantas. This is based on the fact that they attend meetings of the industrial association where such problems as water quality, water charge and water shortage are being discussed. More participation in the future is supported by many industries. However, a water charge higher than the present level seems not acceptable though all the industries are now paying the water charge to PJT.

(5) Recommendations to Participation Activities of PJT

The PJT being the responsible agency for water resources management of the Brantas is recommended to focus its effort into public campaign for awareness building to water. That will include campaigns for the consciousness of limitation and scarcity of water and those for the importance and effectiveness of water saving. That will also aim at making people aware that water is not a mere gift from the God but a resource that is produced by facilities constructed by the public investment. It is recommended for PJT to have a section for public relations in which a group will become in charge of community and beneficiaries participation activities. In implementing the activity, the inter-agency information network system which is proposed in the present study will be availed effectively.

(6) Recommendations to Participation Activities of Related Agencies

As stated above, PJT should be responsible for the public campaign for general people for awareness building, while the related agencies are recommended to be responsible for the participation activities of beneficiaries in each sector. In the sector of water quality management, the Prokasih movement of BBLH has already achieved some results in these years. In the sector of watershed management, the newly built Technical Team for watershed management in the upper reaches of the Brantas of which secretariat is PJT is expected to lead the participation activities for reforestation and soil conservation. In the sector of fishery water management, to build an association of fish farmers is the first thing to do. In the field of irrigation farmers which is the largest beneficiaries of water, to spread the beneficiaries-pay concept is the current biggest problem. For this purpose, what is to be done first is to grasp the

needs of farmers in daily operation and to fulfill the needs as far as possible. It will take a long time but there is no short cut for the solution.

IV.14 Derivation of Appropriate Water Charges

(1) Objective

An analysis on the water charge mechanism is carried out for the following objectives.

- (a) To establish a full cost recovery system for PJT for operating and maintaining all the water-related facilities based on cost allocation among sectors. The costs should be recovered by water charges and government subsidy as classified below.
 - Costs for watershed management, flood protection, sabo and river maintenance flow are to be borne by government budget and not reflected in water charges.
 - Costs for power generation and irrigation, industrial and domestic water supply are to be recovered by water charges.
- (b) To find out appropriate levels of raw water charges. The objectives of charging raw water at an appropriate level are the following.
 - to strengthen and expand the financial foundation of PJT so as to be able to operate and maintain the water-related facilities appropriately and adequately
 - to promote an efficient use of water in a tight water supply and demand situation

(2) Assumptions

The assumptions underlying the analysis are the following:

- (a) The costs to be recovered by water charges include both investment cost and operation and maintenance costs of the facilities.
- (b) Water charges are derived for the following two cases.
 - Water tariff for the existing facilities as of 1997
 - Water tariff for the existing and planned facilities as of 2020
- (c) Water charges for raw water supply and power generation are derived. Costs include those of dams and weirs with functions of creating and supplying raw water. Costs, however, do not include those for water distribution systems such as irrigation intakes and canals, PDAMs' water purification plant and distribution systems and PLN's power station.
- (d) Water charges are derived as averages for the Brantas River Basin as a whole, not for each facility or area.
- (e) The present analysis would provide a framework for the methodology and appropriate water charge levels based on the data available within the scope of the study. Prior to the introduction of a new system, a detailed analysis on water charges would be recommendable.

(3) Results

Cost Allocation between Water Charge Portion and Subsidy Portion

The following table shows the allocation proportions derived based on the cost allocation of the investment cost in 1997 and 2020 and the operation and maintenance costs allocated to water charge portion and subsidy portion:

Operation and Maintenance Costs Allocated to Water Charge Portion and Subsidy Portion

Item	1997	2020
(%)		
Water charge portion	41.8	43.0
Government subsidy portion	58.2	57.0
Total	100.0	100.0
(OM cost in Rp. 10 ⁶)		
Total	24,445	42,980
Water charge portion	10,218	18,481
Government subsidy portion	14,227	24,499

To operate and manage the non-chargeable facilities appropriately, 58% in 1997 and 57% in 2020 of the total OM costs, or Rp.14,227 million and Rp. 24,499 million, need to be financed by the government expenditure, while the rest should be recovered by water charges.

Derived Water Charges

For the water charge portion, water charges are first derived at such a level as to fully recover investment costs and operation and maintenance costs. These derived water charges are analyzed from the affordability point of view. It would be important that water consumers can afford the water charges newly introduced. The following table summarizes the result.

Derived Water Charges

(Unit : Rp/ kWh, m³)

Sector	Present charges	Full cost-recovery		Realistic level	
		1997	2020	1997	2020
Power	12	11	23	12	23
Irrigation	0	25	50	5	26
Domestic	30	10	25	30	30
Industry	51	30	43	51	51

Realistic irrigation water charges are set at 20% in 1997 and 52% in 2020 of the full cost-recovery levels, considering the affordability for farmers. The shortfall in revenue due to lower irrigation water charge should be covered by cross subsidy by other sectors, as has been practiced until now. The water charges of domestic and industry sectors, therefore, are proposed to remain at the present levels until 2020. These sectors would be able to afford these rates,

since they actually have been paying these rates. For the power sector, the rate is to remain at the present level for the existing facilities, but to rise to the full cost-recovery level at Rp. 23 per kWh in 2020. The power sector would be able to afford this rate, considering high profit-generating structure of hydropower generation.

The shortfall in revenue can not be fully covered by cross subsidy by power, domestic and industrial sectors to the irrigation sector. The remaining shortfall should be met by government subsidy. The amount of required subsidy is estimated to be Rp. 29,662 million per year in 1997 and Rp. 27,227 million per year in 2020.

IV. 15 Human Resources Development

(1) Present Condition and Evaluation of Manpower

Present number of staff of PJT is 436 in total. (53% is responsible for technical matters, 47% is responsible for administration. 39% is organic (permanent), 61% is non organic (non permanent.) Most organic staff is government officials.

Present number of staffs for PKB is 894 in total. (40% is responsible for technical matters, 60% is responsible for administrative matters. 60% of staff is government official and 40% of staff is local staff.)

Present number of staffs for PGKS is 242 in total. (43% is responsible for technical matters, 57% is responsible for administrative matters. 55% is government official and 45% is local staff.)

Aging is a major concern for the manpower of PJT, PKB, and PGKS. More than a half of staffs are age older than 40 years old.

Close to 80% of staff has education level of high school or lower. Fourteen percent of staff has bachelor or higher degree, and rest of staff has diploma from universities.

Low quality of skills can be seen in some sectors in PJT, which is caused by inexperience for executing tasks, lack of basic knowledge, and attitude of staffs. Skill improvement for these staff can be achieved by proper training, but specialists for sectors in biology, environment, accounting, law, and tourism needed to be recruited.

Overall skill of staffs for PKB and PGKS is acceptable, but some sections, especially administration sections, have too many staffs and needed to be reduced.

(2) Methodology for Manpower Estimation

Manpower for New PJT after consolidation in 2002, Persero Jasa Tirta (2005), and target year (2020) is estimated in following manners.

- (i) Section chief evaluated the present condition of manpower for present job requirement.

- (ii) JICA Study Team examined the number of staff needed for each task of W.R.M. for each section of New PJT, including tasks required after consolidation, such as sabo, construction, and river improvement.
- (iii) Basic condition for estimation of manpower is to maintain the appropriate number of staff and for new projects, out sources, such as consultants and sub-contractors will be fully utilized.
- (iv) Not many projects for water resources development is not expected in the future, except on-going project (Wonorejo Dam) and proposed project (Beng Dam). The number of staff for water resources development is estimated by assuming that staffs for one project in construction stage and one project in detail design, including Wonorejo dam and Beng dam will always be needed.

(3) Required Number of Manpower for New PJT in the Year 2002

The result of estimation shows that staff needed for the year 2002 (after consolidation of PJT, PKB, PGKS) is 593.

The classification of staff is those 114 staffs for Directorate for Technical Affairs, 389 for Directorate for Infrastructure, 23 for Directorate for Business Development, and 43 for Directorate for Administration and Finance. Besides there directorates, 5 staff for Internal Audit Unit, 12 staff for Quality Management Unit, 7 staff for Management Development Unit, attached to Board of Directors, is required. Detail is shown in Table 3.

(4) Required Number of Manpower for Persero Jasa Tirta in the Year 2005

Required manpower for Persero Jasa Tirta in the year 2005 is considered the same with the manpower requirement of 2002. The reason is that there is not much of difference in job requirement, composed of projects, additional O&M, and area to be covered, for 2002 and 2005, except for water supply (drinking water), and staff for new business development is already included in the manpower requirement for 2002.

(5) Manpower Requirement for the Target Year (2020)

Business development and expansion is expected after changing status to Persero in 2005; however, manpower required for 2020 is expected to be same as manpower for 2002 because out-sources will be utilized and labor productivity is expected to improve.

(6) Staff Arrangement among PJT, PKB, and PGKS

Consolidation scheduled in 2002 involves PJT, PKB, and PGKS. Selection of staff who will be transferred to New PJT should be conducted carefully.

A condition for transfer is that engineering staffs, especially those who are working at project sites have a priority for transferring to New PJT. The number of staff who will be transferred to New PJT is calculated by examining the present number of engineering staffs working at project sites for PJT, PKB, and PGKS. Total number of staff required to be transferred from

PJT is 354, PKB is 134, and PGKS is 48. New staff will be recruited to sections where shortage of staff is expected after consolidation.

(7) Arrangement Criteria for Manpower Remain in New PJT

According to the manpower estimate, the number of staff whom New PJT is needed is rather limited, so that not all staff, currently employed by PJT, PKB, and PGKS, can be integrated to New PJT. Arrangement of staffs, who will not be able to join New PJT is needed to be taken care of before consolidation.

(8) Manpower Training Program

The purpose of training is to develop general technical skills, technical skills for sector, as well as managerial skills. In order for efficient and effective skill development, training program should match individual needs as well as organizational goals. Two types of training programs will be provided to meet the demands for skill development: Intensive training program and routine training program.

(a) Intensive training program

Intensive training program focuses on the sectors that should be strengthened by 2002 for preparation of consolidation of organization and preparation for Persero. Three training programs are provided for intensive training.

a) Training programs for laws and regulations, corporate management that are mandated for all staff :

- Laws and regulations
- Corporate management

b) Programs targeting for technical sector:

Basic engineering skill development:

- Hydrology and meteorology
- Operation and maintenance of river facilities
- Inter-agency information system

Sector training program for engineering staff:

- Watershed management
- Management and Operation of FFWS and LWMS
- Water Resources Development
- Water quality management
- River environment
- New business development

c) Programs targeting for administrative sector:

- Basic administrative skill development

Sector training program for administrative staff:

- Accounting

- Human resources development
- Administration.

(b) Routine training program

Routine training program is characterized as training that will be carried out continuing basis. Three programs will be provided for routine training.

- a. Training for new employees
- b. Training for management
- c. Training for new tasks and modification and updating of systems

(9) Action Plan

(a) Preparation for implementation

Preparation of human resources development, recommended to start from 1999 and completed in a year, consists of following items.

- Human resources development for Persero Jasa Tirta is important, so the Section of HRD will be strengthened by changing status to Bureau of HRD.
- Consultants should be selected at early stage of Action Plan because implementation of human resources development requires involvement of consultants, which will support preparing HRD development plan and actual implementation monitoring. Consultants and government officials from foreign countries will be fully utilized as needed.
- Task analysis should be conducted by Bureau of HRD with consultants for preparation of human resources development implementation plan.
- HRD development implementation plan, which is based on task analysis, should include detail training programs (selection of training method, selection of trainee, coordination for overseas training, coordination with other agencies related to training), staff arrangement, and recruitment.

(b) Training implementation

Training starts with basic skill development, followed by skill development for sector. Training for laws and regulations, basic training for technical sector, and basic training for administrative sector will be completed in 6 to 12 months, followed by sector training programs, which will last 2 to 3 years. Routine training program will be provided as needed.

(c) Staff selection and placement

PJT, PKB, and PGKS will be involved in the process of staff selection and placement. A concern for consolidation is the staffs who will not join New PJT. Possibility of absorbing to MPW Central Region Office, the central government, local government,

private sector, and the other options should be considered. Selection and placement of staff should be completed before the consolidation in 2002.

(d) Responsible agencies

Bureau of Human Resources Development and Management Development Unit are in charge of implementation. Consultants will always be stationed at Management Development Unit for monitoring the implementation.

IV.16 Financial Plan and Budget Resources of PJT

(1) Financial Situation

(a) Operation record of PJT

In order to analyze the operating and financial positions and forecast future development, consideration is given to the figures of its financial statements from the beginning to date.

The company performance is well maintained. Profit increased every year. Return on equity ratio was 13.1% in FY1995 and 14.8% in FY1996. It was evaluated as "Very Healthy" in both 1995 and 1996 by MOF standard.

Due from PLN amounted to Rp. 3,266 million at the end of 1995, which was 33.8% of the year revenue from PLN and 11.7% of total asset. This reveals some trouble in price negotiation process between two parties.

(b) Current method of contract system with financial sources

The water rate is determined by the Decree of Minister of Public Works ever year as tariff adjustment. A formula to determine the water rate is not established yet. It is necessary for PJT to reach agreement between the beneficiaries on the basis of cost recovery principle for the service delivered by PJT.

(2) Financial Issue

(a) Bookkeeping of managed assets

Facilities constructed by PKB has being transferred to PJT under its management for operation and maintenance. Bookkeeping and periodical reports of those properties and utilization are required by the decree of Minister of Public Works by appointing "property manager" in PJT.

PJT is handling the state owned assets with off-balance sheet as managed asset.

Depreciation calculation of managed asset is necessary to evaluate present value of assets and projection of O&M cost. Development of bookkeeping method is shown by 3 steps according to the company's legal status. At the first step, we suggest it should be done by off-balance-sheet as is now. At the second step, when PJT, PKB and PGKS are consolidated, off balance asset should be also integrated to its new balance sheet as on balance asset, using contradictory suspense account without affecting equity capital.

The third step will be in accordance with the status change to Persero. At the time issuance of capital note is suggested for equity finance and to cover depreciation.

(b) Cost recovery system

Financial reform of PJT is required as a self-supporting unit, through introduction of cost recovery system supported by related agencies and back up by upgrading of accounting and management information system, based on cost allocation to beneficiaries.

(c) Management information system

In July 1997, "Accounting System General Ledger (ASGL)" started as MIS, integrated to accounting system. It outputs segment information. However more detailed information by MIS is necessary to back up cost recovery principle.

(3) Financial Forecast

PJT was established as a self supporting corporation independent to the state budget. It must create profit as to be a going concern.

At the end of year 2002,2005 and 2020, consolidated income statement will be as follows;

FY	(Rp. Billion)		
	2002	2005	2020
operating revenue	163	180	280
operating expense	150	151	212
operating income	13	29	68
non operating income	4	3	6
income before tax	17	32	74
income after tax	12	23	52

(4) Revenue Projection

Revenue from PLN PDAM Industry is projected at the price of water fee estimated by cost allocation method and water demand estimation.

Revenue from irrigation and fishery is also counted. Construction and Sabo is taken into account after consolidation as project creating income of 5%.

Non operating income consists of PGPS salary, interest and dividend. PGPS salary stops in FY2005 at the time of status change to Persero.

(5) Expense Projection

O&M direct cost consists of operating cost, materials and sub contractor fee, that projected to increase every year and reaches the peak in the year of 2002. At that time book value of managed asset comes to its peak and 1% of book value for Rp.27billion is projected as O&M

direct cost. Book value of the asset decreases thereafter but O&M direct cost is projected to stay at this level up to FY2020. It is necessary to research adequate maintenance cost for each facility. In addition, dredging cost is projected Rp19 billion in FY2002, and Rp9 billion each in 2005 and 2020, mainly for Wlingi.

Personnel cost will increase to Rp.8 billion for 593 organic employee at FY2002. Non organic personnel cost is absorbed by sub contractor account of O&M. Personnel cost is projected as no increase up to FY2020, owing to generation renewal without consideration of inflation element.

(6) Investment Plan

Projected investments are Wonorejo dam, water quality laboratory, Beng dam, Genten I dam, Kudungwarak dam, irrigation channel, sabo construction. Total cost will be over Rp.2 trillion by FY2020.

(7) Budget Control and New Source of Income

Budget is controlled by RKAP (Government Approved Projection), and income should be checked through revenue and expense matching principle supported by MIS and over head controlled by annual budget.

(8) Development Scenario to Persero Jasa Tirta

(a) Government Regulation No. 13

It is understood that Perum is now able to conduct joint venture with another company or establish a subsidiary according to the government regulation.

However, the followings can be pointed out as some merits of status change to Persero from the view point of financial aspect.

- **Borrowing from financial market.** Since its assets cannot be given as collateral, Perum is difficult to be main obligor to commercial banks. It may narrow the way to project finance such as "BOT" without government guarantee.
- **Funding in the capital market.** Bond issuance underwritten by Government is possible. However, regulator may not approve it if proceeds be used for new business with investment risk. It is preferable to issue notes to be purchased by basin residents for community participation.
- **Reserve ratio to equity.** Under the status of Persero, the reserve ratio is higher than the Perum status. It is assumed to increase from 25% to 40% in this Study. This reserve is added to that of previous year.

(b) Expected new business field

PJT has various merits of resources in comparison with those of other enterprises. They are huge areas of land including golf course, forests, water to drink or for swimming pools, dam

lakes for water sports and others. PJT's operation at large is regionally monopolized in water management and treatment. Weak points would be lack of know-how in new business field and financial funding capability.

Under the Persero status, it would be encouraged for Persero Jasa Tirta to tackle with high-return private sector projects utilizing the advantage in fund financing.

V IMPLEMENTATION PROGRAM OF WATER RESOURCES MANAGEMENT MASTER PLAN

V.1 Implementation Program Towards Year 2020

The implementation program of the water resources management master plan covering the year 1999 to 2020 is presented in Figure 14. Figure 14 shows the projects incorporated in the said master plan and related programs with those implementation schedule and annual investment requirement.

The total investment amount for the master plan between 1999 and 2020 is about 2,800 billion Rupiah including VAT(US\$1.14 billion equivalent), while about 4,200 billion Rupiah including VAT(US\$1.72 billion equivalent) for related projects.

The projects incorporated in the water resources management master plan are mainly of improvement plans of the water resources management facilities. In order to undertake smooth implementation of those improvement plan, it is recommended that a Pre-consolidation 3-year Program between 1999 and 2001 aiming at consolidation of PKB, PGKS and PJT shall be implemented as a part of the action plan towards the transformation to Persero in 2005. Implementation schedule of Pre-consolidation 3-year Program and action plan are recommended as shown in Figure 15.

V.2 Pre-consolidation 3-year Program

(1) Basic Strategy

New PJT is established in 2002 with consolidation of PKB, PGKS, and PJT. It is strongly recommended that Pre-consolidation 3-year Program as presented hereunder be implemented for preparatory works for realizing New PJT establishment considering the following:

- (a) Managerial aspect
 - (i) Detailed examination on existing organization of PKB, PGKS, and PJT
 - (ii) Review and final confirmation on scope of works of W.R.M.
 - (iii) Clarification of tasks and duties of respective agencies related to W.R.M.
 - (iv) Clarification of tasks and duties of BWRMC
 - (v) Formulating a business prospectus of New PJT
 - (vi) Preparation of necessary institution and regulation, and its official declaration
 - (vii) Training of New PJT's staff.
- (b) Technical aspect
 - (i) Preparation of ledgers of the rivers including river facilities and water right as well as establishment of O/M work demarcation
 - (ii) Formulation of system introducing plan of the inter-agency information system

and management information system.

(iii) Training and education of New PJT's technical staff

(2) Implementation Schedule

Preparatory works will be started in 1999, and finished in 2001. To implement this program, outside professionals and consultants will be employed. Scope of works of the professionals and the consultants are as follows:

- (a) Preparation of Implementation plan of 3-year program
- (b) Detailed examination of the existing organizations, PKB, PGKS, and PJT
- (c) Guidance for preparing New PJT's business Prospectus
- (d) Guidance for preparing work specifications and standards on technical matters
- (e) Guidance for preparing internal operation and management rules
- (f) Technical guidance and training
- (g) Development of water charge system
- (h) Implementation of Inter-agency Information System and Management Information System within the New PJT
- (i) Implementation of 3-year training program

The specific subjects to be executed in both managerial and technical aspects are as follows:

- (a) Establishment of Water Resources Management System
 - (i) Establishment of MPW line
 - (ii) Clarification of sector responsibility
 - (iii) Establishment of BWRMC
- (b) Development of Corporate Management
 - (i) Water charge system
 - (ii) Assets management
 - (iii) MIS improvement
 - (iv) Reform of organization
- (c) Human Resources Development
 - (i) Preparation of human resources development program
 - (ii) Implementation of training program
 - (iii) Staff selection and placement for establishment of New PJT
- (d) Water Quality Control Program
 - (i) Establishment of new laboratory in Malang

- (e) Water Resources Development
 - (i) Preliminary survey for Beng dam construction
- (f) Maintenance of Existing River Facilities
 - (i) Ledgers of the rivers(including river facilities and water right) and O/M work demarcation
- (g) Establishment of Inter-agency Information System
 - (a) Preparation of system introduction.

V.3 Action Program Towards 2004

For transformation of the New PJT to PJT(Persero), execution of the action plan between 1999 and 2004 is recommended as well as managerial and institutional arrangement. Outline of the action plan is shown as follows:

(1) Feasibility Study

Besides the aforementioned Pre-consolidation 3-year Program, it is recommended to conduct the following studies separately in accordance with medium and long term development plans:

- (a) Preparation of master plan for watershed management and water quality control
- (b) Feasibility study on water resources development plan for selected priority projects among the projects incorporated in the Master Plan.

(2) Watershed Conservation, Sabo and Flood Control

- (a) Continuous investigation on actual conditions of illegal sand mining on riverbed.
- (b) Investigation on actual conditions of flood damage (grasp of major damage area).
- (c) Preparation of proposed flood control manual.
- (d) Preparation and announcement of flood risk area map in the whole basin.

(3) Water Quality Control

- (a) Establishment of continuous water quality management system
- (b) Strengthening of legislation and institutions
- (c) Preparation of waste water treatment map
- (d) Implementation of a model project of Gappei Johkaso

(4) Water Resources Development

- (a) Hydrological investigation in the project area
- (b) Investigation of land use and resettlement requirement in the project area

- (c) Selection of the consultants, detailed design services and procurement of the contractor(s) for the Beng dam project

(5) River Facilities

- (a) Stipulation of the operation rules for all river facilities in the Brantas river basin by mutual consent with related agencies, to avoid the conflicts and disputes on the water resources management.
- (b) Establishment of authorized method of the budget estimates for OMR activities.
- (c) Making of a consensus among beneficiaries about allocation of OMR cost.

(6) Effective Operation of Water Resources

- (a) Set up of tentative rule for water allocation and operation of the Wonorejo dam system including the Tulungagung pump station by mutual consent with related agencies.
- (b) Establishment of the proper low flow forecast in the Brantas river basin including the Ngrowo river basin.

(7) Monitoring and Information System

- (a) Introduction of Inter-agency Information System.
 - Installation of equipment for the system and test of operation.
 - Training of the system manager of New PJT and end users.

V.4 Project Investment Program and Economic Evaluation

(1) Investment Program and Required OM Costs

The total investment amount for the master plan between 1999 and 2020 is about 2,800 billion Rupiah including VAT(US\$1.14 billion equivalent), while about 4,200 billion Rupiah including VAT(US\$1.72 billion equivalent). Table 4 shows annual operation and maintenance cost of the water resources management plan excluding those for the existing facilities. At the full development stage at 2021, the annual operation and maintenance cost is estimated to reach 42 billion Rupiah per year.

The following table compares the past expenditures of PJT, PKB and PGKS and the proposed investment and operation and maintenance costs.

(Unit : Rp.million/year)

Item	Past Expenditure*	Proposed by 2020	Rate of change
Investment ⁽¹⁾	123,856	126,909	4%
OM, existing facilities ⁽²⁾	18,151	30,966	71%
OM, proposed facilities	0	41,563	-
Total	142,007	199,438	40%

* The figurese are average of three years between 1994 and 1996.

(1) Expenditure by PKB and PGKS for past expenditure

(2) Expenditure by PJT for past expenditure

The proposed investment cost at 127 billion Rupiah per year is almost equivalent to the past total expenditures of the two organizations (PKB and PGKS), indicating that the magnitude of the proposed investment program is within a realistic level.

The operation and maintenance costs for the existing facilities should be increased by 71%. The proposed 31 billion Rupiah per year is the amount needed to operate and maintain the existing facilities appropriately and adequately. The cost spent by PJT in the past has not been sufficient to maintain a desirable level of operation and maintenance works.

A new mechanism is required to finance the increased operation and maintenance costs. A new financial arrangement should include the expansion of revenue from water charges based on the "beneficiary-pay-principle" and the subsidy from the government based on the "government obligation principle."

In total, an increase by 40% is envisaged including both investment and OM costs. This level of expenditure would be attainable with new financial set-up arranged for financing increased OM costs, both for the existing facilities and the planned facilities.

(2) Economic Evaluation

An economic evaluation is conducted for the measures proposed as the components of a water resources management plan. Quantitative analyses are made applying such indices as economic internal rate of, benefit – cost ratio and cost comparison for such measures as valuation of benefits are possible. For other types of measures for which benefits are difficult to estimate, expected positive effects are explained. The following table summarizes the findings. High economic feasibility and the importance of the proposed measures are confirmed.

Measure	Result	Benefit
Dams		
Beng dam	IRR : 18.6 %	Domestic and industrial water supply, power generation
Genten I	IRR : 13.3 %	Domestic and industrial water supply, power generation
Kedungwarak	IRR : 10.0 %	Domestic and industrial water supply
Dredging of Wlingi, Lodojo, Senggunih	-	Maintain the existing functions
Sediment diversion channel	-	Sediment reduction in Wlingi and Lodojo dams
Water Saving		
Irrigation canal lining	IRR : 19.3 %	Saving in irrigation water demand and partial conversion to industrial/domestic uses
Industrial water saving	-	Most economical measure for limiting demand (creating
Flood Control		
Widas	IRR : 14.1 %	Flood damage mitigation
Lodojo diversion tunnel	IRR : 14.5%	Flood damage mitigation, reduction in sediment in reservoirs
Improvement of FFWS	-	Better low flow management
Watershed Management		
Reforestation and terracing	IRR : 23.7%	Reduction in sediment discharge into river
Experimental research	-	Clarification of reforestation effects
Sabo		
Mt. Kelud	B/C : 1.46	Reduction in sediment discharge into river
Lesti/Brantas	B/C : 1.80	Reduction in sediment discharge into river
Water Quality Monitoring	-	Prerequisite for water quality improvement
River Environment	IRR : 59.6%	Creation of recreation opportunities
Inter-agency Information System	-	Improved efficiency in data collection and decision making
Human Resource Development	-	Prerequisite for an appropriate water resources management

* B/C ratio is applied since costs and benefits occur in parallel. Discount rate of 12% is applied

VI RECOMMENDATION

Present condition and major problems of present W.R.M. of the Brantas is firstly summarized, and recommendations and suggestions follow.

VI.1 Present Condition and Problems on W.R.M of the Brantas

V.1.1 Technical Problems

(1) Review and /or update of the Master Plan (M/P)

- 1) M/P of the Brantas River Basin Development was firstly formulated in 1961.
- 2) The M/P was reviewed twice in 1972 and 1985 respectively.
- 3) Water Resources development was proceeded extensively up to 1985, however declined thereafter.
- 4) No M/P updating has been conducted after 1985.
- 5) The M/P should be reviewed including Sabo Works.

(2) Watershed Conservation and Sediment Control

- 1) Watershed conservation aiming at reducing land erosion, debris production, and flood magnitude, and preserving water resources.
- 2) Such watershed conservation has been little executed.
- 3) Specific watershed conservation for the Brantas would be needed. However, available data to formulate such plan are insufficient.
- 4) The Sabo works and watershed conservation at present are rather poor.
- 5) Sabo works have been executed on the basis of the M/P which was formulated in 1970, 28 years ago. The M/P should be updated urgently.
- 6) Sedimentation in Senguruh and Sutami Reservoirs are serious problems. The large-scale sediment control works are essential.
- 7) Sedimentation in Wlingi and Lodoyo reservoirs is the continuous problems. The improvement of existing by-pass channel is needed.

(3) Flood Control Management

- 1) Design flood of the Brantas is 50-year flood for the main Brantas and 10-50 years flood for the tributaries.
- 2) River improvement works have been almost completed for the main Brantas, the Porong and the Surabaya and presently being implemented for the tributaries.
- 3) In order to upgrading safety against flood, upgrading of design flood would be required in the future. Lodoyo diversion tunnel project which has been recommended in the last M/P is not implemented yet, but essential.

(4) Water Resources Development and Water Supply Management

- 1) New water resources development will be needed to fulfill the water demand increase. New dam project(s) will be needed following Wonoredjo dam project.

- 2) Water saving and precise water allocation management would be necessitated. Dam construction and saving water are economically comparable at present.
- 3) Irrigation and industrial water saving should be considered. Proper water allocation should be adopted in due consideration of land use and industrial structures.
- 4) River maintenance flow is to be kept to maintain river water quality and river environment.

(5) Water Quality Management

- 1) River water quality is seriously deteriorated. It is more than 10mg/l in many places.
- 2) Major reason of water quality deterioration is untreated wastewater from domestic sewerage, industrial manufacturer, livestock and illegal waste abolition.
- 3) Community awareness building as well as construction of sewerage system, industrial wastewater treatment system and secure of maintenance flow is required.

(6) River Environment Management

- 1) Number of fish species has been decreased since the beginning of 1900th. Biodiversity is one of the important factors of the river environment.
- 2) The Government has made effort to protect biodiversity and river environment including river use for recreation. River use is still limited in time and place.
- 3) Sewerage system and industrial waste treatment have been little progressed. River environment may not be improved without river water quality improvement.
- 4) Multiple natural river creation in due consideration of biodiversity and river front management would be an issue for the future.

VI.1.2 Managerial Problems

(1) Current W.R.M. system

- 1) W.R.M. in the Brantas at present is not always sufficient.
- 2) W.R.M. organizations in the Brantas are counted for as many as 34 organizations.
- 3) There are two management lines, i.e. i) Public Works. Central Government, and ii) Provincial Government. Responsibility structure is not clear.
- 4) Many agencies by sector are involved in W.R.M. Their right and responsibility are not always clear. PJT's tasks are rather limited. A unified management system should be established yet.
- 5) The Brantas River is the source of water supply to not only the Brantas basin but also outside the Brantas. The water supply should be considered in conjunction with the Solo, Umbulan Spring, etc. Thus, comprehensive management of the

Brantas is needed.

- 6) The present W.R.M. System involves organizational problems as i) unclear tasks and duty ii) no responsible organization in some sectors, iii) subdivided organization. Re-organizational setup would be necessary.
- 7) There is a plan to set up 3 BALAIs in the Brantas river basin. Such subdivision of a basin would bring about some problems in W.R.M.

(2) Managerial Problems in PJT

- 1) According to MPW degree, PJT's tasks are i) maintenance and management of the facilities, ii) dealing water, iii) river basin management (water conservation, water resources development), and iv) rehabilitation.
- 2) PJT has undertaken a part of i) and ii), but little activities on iii) and iv).
- 3) River basin boundary of PJT's responsibility is not clearly defined.
- 4) Revenue of PJT comes from i) PLN, PDAM, private industries as water charge, and ii) self- business such as recreation, land lease, leasing construction equipment, selling sand, etc.
- 5) The revenue of PJT comes from mainly PLN and PDAM. PJT received no revenue from irrigation water supply which is the largest sector of water supply by the Brantas. It implies that PLN and PDAM have paid more than the reasonable.
- 6) PJT has not received any payment on operation and maintenance of facilities such as watershed management, flood control, and Sabo, etc. all of which serve to indefinite many beneficiaries. The Government should share these expenses.
- 7) Reasonable charge system should be established yet.
- 8) PJT's staffs are rather of older age. Younger people should be employed to sustain PJT's business operation.

VI.2 Recommendation

The recommendations are expressed covering common aspect to all sectors as well as by sector.

VI.2.1 Recommendation on Overall W.R.M.

(1) Definition of W.R.M.

The Term of Water Resources Management (W.R.M.) should be clearly defined as mentioned below.

- 1) There are many terms relating to the W.R.M. such as "Water Resources Management", "Water Management", "River Management / River Environment Management", "Water Resources Development". These terms are used confusedly
- 2) "Water Resources Management (W.R.M.)" is defined herein in a wide sense to cover all the water-related management.
- 3) Water Resources Development seems to be understood as a mainstream of the

W.R.M. in many occasions. The water resources development is just one of the component.

- 4) W.R.M. covers i) watershed management, ii) flood control management, iii) water supply management including water resources development, and water supply, iv) water quality management, and v) river environment management.
- 5) This definition should be known well by all the inhabitants as well as all the related agencies. This definition should be set in related regulations.

(2) Basic Principle of W.R.M.

Basic Principle of W.R.M. which presented in Chapter IV is repeatedly shown hereunder. W.R.W. is to be executed following this basic principle.

- 1) The objective of W.R.M. is to support sustainable society building.
- 2) One River- One Plan- One Management principle
- 3) Full Cost Recovery Principle
 - a) Beneficiaries pay principle
 - b) Government obligation principle
 - c) Polluter's pay principle
 - d) Service to receive principle

In this connection the Minister of Public Works suggested that main canal and secondary canal of irrigation may be included to scope of works of PJT and appropriate O/M fee is to be collected by PJT.

(3) Clarification of Operation and Maintenance (O&M)

O&M are inevitably needed for all the facilities. O&M cost is rather heavy but essential. Related agencies on W.R.M. should understand clearly O&M concept to maintain the facilities in good condition as long as possible.

- 1) O&M cost for water resources-related facilities would be equivalent to 0.5-3% of the capital cost according to the nature of facilities.
- 2) The concept of O&M cost is at present not so clearly understood by W.R.M.
- 3) It is recommended that the Government should issue regulations to clarify the Government obligation principle in relation to O&M and the Government shares the cost based on the "Full Cost Recovery" principle as described above.

In accordance with the above basic principle, it is recommended that the W.R.M. system of the Brantas River should be strengthened and all the proposed projects as presented in the previous Chapter be implemented. Hereunder, recommendation and suggestions are given in technical and managerial aspects.

VI.2.2 Recommendation on Managerial Aspect

(1) Restructuring of overall W.R.M. Organization

- 1) Unified management system should be established, and right and responsibility of each organization should be clearly setup.
- 2) MPW should be the supervising authority of PJT.
- 3) PJT should be the implementing agency of W.R.M. for the Brantas river basin.
- 4) Basin Water Resources Management Committee (BWRMC) should be setup. Its function is assumed as;
 - a) Coordination among all the related agencies on W.R.M.
 - b) Preparation and submission of Recommendation to MPW and get an approval therefrom.
- 5) New Water Resources Management organization through equal consolidation of PKB, PGKS, and PJT should be set up.
- 6) The tasks of New PJT are assumed as primary management (raw water management). All the agencies concerned shall continue their current obligations in principle. Basic obligated works are enumerated below.
 - a) Overall management and coordination: New PJT
 - b) Watershed management: Land conservation bureau
 - c) Flood control and Sabo: New PJT
 - d) Water quantity management:
 - i) Water resources development and raw water supply: New PJT
 - ii) Watershed conservation: New PJT
 - iii) Water supply management to end users: Respective agencies
 - e) Water quality management:
 - i) River water quality management: New PJT
 - ii) Domestic, industrial, and livestock breeding: Respective agencies
 - f) River environment management: New PJT
 - g) Basin Water Resources Management Committee: Secretariat by New PJT
- 7) Institutional arrangement should be setup to realize the above obligatory assignment to the related agencies on the basis of above principle.

(2) Restructuring of New PJT

Assuming New PJT will be established in 2002, the following organizational setup is recommended.

- 1) New PJT will continue the obligations undertaken by PKB, PGKS, and current PJT
- 2) New PJT will do profit oriented business as currently doing as well as the public services for W.R.M.
- 3) As for W.R.M., New PJT shall do public service under the supervision by MPW
- 4) As for profit oriented business, New PJT is suggested to do the water-related business and its surroundings.
- 5) New PJT's property management should be strengthened. National Government

- property and self-property should be clearly managed.
- 6) To establish water charge system in accordance with the basic concept of W.R.M.
 - 7) New PJT is obligated to promote beneficiaries and community participation on the W.R.M.
 - 8) New PJT should be obligated to strengthen its staffing through staff training in order to implement high quality and effective W.R.M.

New PJT, so far explained above, will be the same status as "PERUM". It is recommendable for New PJT to shift "PERSERO" status in 2005, subject to introduction of self-supporting financial plan. The purposes of this movement are as follows.

- a) Privatization of public service in accordance with Government policy
- b) Reactivation of PJT by means of competitive operations in profit oriented business, and thus government cost saving in W.R.M.
- 9) New PJT after shifting PERSERO is obligated to operate itself taking into account the following
 - a) Acquisition of fund and capital from stock exchange market and/or private investor become possible.
 - b) Internal reserve of profit, and re-investment of the profit become possible.
 - c) New PJT is to be re-activated through profit oriented business which will result in more effective operation of W.R.M.
 - d) New PJT after PERSERO is obligated to do the business clearly dividing into public service and profit oriented business.
 - e) W.R.M. should be of public service obligation. So as not conducting excessively profit oriented business, W.R.M activities shall be strictly supervised by MPW.

VI.2.3 Recommendation on Technical Aspect

(1) Review of Master Plan

- 1) New PJT should do the review /updating of M/P by itself.
- 2) Review of M/P should be done timely according to the changes of basin economic and social conditions and hydrological changes.
- 3) M/P should be updated at least once 10 years.

(2) Strengthening Watershed management

- 1) New PJT should formulate watershed conservation, and submit it to Forest and Land conservation bureau for its implementation
- 2) New PJT should recommend Forest and Land conservation Bureau to conduct experimental reforestation and terrace farming.
- 3) New PJT is obligated to review the result of the said experimental works, and review the overall watershed conservation plan.

(3) Flood control and Sabo works

- 1) New PJT should continuously implement Sabo works until the rest of Kelud volcano.
- 2) New PJT should do periodical observation of riverbed changes and sediment deposit in the existing Sabo facilities. Thus, it should review overall Sabo plan
- 3) New PJT should prepare ledger sheets of existing river facilities including history of construction, operation and maintenance, and should update it
- 4) New PJT should improve existing FFWS, including observation stations, telecommunication system, and computer control system.

(4) Water Resources Development and Water supply

- 1) New PJT should conduct F/S of Beng dam project
- 2) To accelerate water saving,
 - a) Water saving in irrigation and industrial water uses should be accelated.
 - b) New PJT should prepare the overall water saving plan and submit it to the related agencies with recommendation of its implementation.
 - c) Irrigation water saving (canal lining) is recommendable to be undertaken by provincial irrigation service.
 - d) Industrial water saving (including industrial wastewater treatment and increase of its productivity) is recommendable to be undertaken by Industry and Trading Ministry and Provincial Industry Bureau.
- 3) To accelerate Low water management,
 - a) New PJT should do periodical review of dam and reservoir operation rule
 - b) New PJT should prepare Low Water Management Rule and noticed to all the related agencies.
 - c) Water supply to end-users is to be managed by respective agencies. This should be authorized by Government regulation.
 - d) New PJT should establish/ upgrade the necessary low water control facilities

(5) Water Quality Management

- 1) River water quality management should be a task of New PJT
 - a) Water quality management is at present under the responsibility of BAPEDALDA. River water quality should however be under the responsibility of New PJT. Necessary institutional arrangement should be done.
 - b) New PJT is requested to upgrade its own water quality test facilities, and reinforcing its own staff
- 2) Industrial wastewater treatment and sewerage systems should be established by the related agencies. This should be clearly announced through regulations
- 3) River maintenance flow should be managed by New PJT
- 4) New PJT should prepare the basic plan on water quality control and submit it to the related agencies with recommendation for their implementation
- 5) New PJT should conduct investigation and research on natural river self purification

(6) River Environment

- 1) River environment management is of New PJT's task.
- 2) New PJT should prepare river environment standard and management rules for the Brantas, and submit it to the related agencies after getting approval of higher authority
- 3) River environment standard should include river water quality standard, rules for river water use, and definition of river area, and rules for river area use
- 4) New PJT is obligated to conduct investigation, research, planning and implementation on protection of natural biota and creation of multiple natural river

VI.3 Conclusion

This JICA Study started in February 1997, and will finish in July 1998. The Study presented many recommendations during this rather short period. The Study Team acknowledges many thanks for extensive cooperation of PKB, PGKS, and PJT as a counterpart.

W.R.M. is recognized nowadays as one of the important issues worldwide not only Indonesia in view of the environmental protection. Water resources development in the Brantas is known as the most advanced one in Indonesia. However, W.R.M. would be more and more important with the development progress.

It would be very expectable that this study will be a good guide for implementation of W.R.M in the Brantas first. It is expected further that realization of this program is one of the examples in Indonesia and is adopted further for expanding to the other river basins.

This Study presents a lot of recommendations in both hard and soft components on strengthening W.R.M. in the Brantas. Its realization would need much time, cost and effort by all the related agencies. It is a real expectation that with its realization, this program would contribute to welfare of the people living in the Brantas basin, thus further to the sustainable development of whole Indonesia

During the Study, economic crisis due to devaluation of Rupiah currency has happened since June 1997. In spite of the Government effort, such economic condition is still continued. However, expectation, after several years, is that a steady development of Indonesia will take place again. This Study may not take into account such unforeseen economic crisis on the macro-economic forecast and several economic indices for the Study. During the preparatory works as recommended in this Chapter, this very serious fluctuation of Rupiah exchange rate would be settled and the proposed plan is realized.

TABLES

Table 1 Summary of Basic Concept of W.R.M. for the Brantas River Basin and Proposals/Adoptions in the Study

Basic Concept	Proposals/Adoptions of Study Team
<p>1. Objective To support sustainable society building by means of distributing water in time and in place as demanded.</p> <p>2. Basic Principle: One River, One Plan, One Management.</p> <p>3. Areas and Rivers of PJT Responsibility:</p> <ol style="list-style-type: none"> 1) All the Brantas river basin including its tributaries 2) Basin area of 11,800 km² <p>4. Work Field of PJT's Responsibility</p> <ol style="list-style-type: none"> 1) Watershed management 2) Flood control management 3) Water supply including water resources development 4) Water quality management 5) River environment management <p>5. Scope of Works of PJT</p> <ol style="list-style-type: none"> 1) Operation and maintenance of water resources infrastructure 2) Dealings in water and water resources 3) River basin management, i.e. conservation, development and utilization of water and water resources 4) Consultation on water related activities by other organization 5) Water resources development <p>6. Self-supporting Body (In terms of Finance and Budget)</p> <ol style="list-style-type: none"> 1) Full cost recovery principle <ol style="list-style-type: none"> a) Beneficiary-to-pay principle b) Government obligation principle 2) Service-to-receive principle <ol style="list-style-type: none"> a) Business through contract basis b) Cost allocation system <p>7. Operational Strategy</p> <ol style="list-style-type: none"> 1) Cooperation and coordination with other related agencies <ol style="list-style-type: none"> a) Delegation of duty and task b) Basin Water Resources Management Committee (BWRMC) 	<p>:Establishment of MPW-PJT administrative line.</p> <p>:Adopted in the Study.</p> <p>"Balai" should not be built in the basin.</p> <p>:All the field covered in the Study.</p> <p>:Adopted in the Study. Consolidation of PKB, PGKS and PJT is proposed.</p> <p>:Adopted in the Study.</p> <p>:In case beneficiaries can be specified. Water charge system is proposed.</p> <p>:Adopted in the Study.</p> <p>:In case beneficiaries can not be specified. Water charge system is proposed.</p> <p>:Adopted in the Study.</p> <p>Water charge system is proposed.</p> <p>Water charge system is proposed.</p> <p>:Proposed in watershed and water quality sectors.</p> <p>:Proposed to be established.</p>

Table 2 Water Balance Analysis Incorporating Possible Development(1/2)

(Units: million m³)

Demand	Water Saving	Present (1996)	Expected Water Deficit during Drought Season												
			1992	1977	1987	1990	1994	1991	1988	1996	1979	1975	1981	1978	
Demand Present (1996)	No-Saving	WITH W/F	Potential Flow(Annual) (Drought Season)												
			Water Resources	741.1	818.9	891.3	992.2	1,033.9	1,053.8	1,382.4	1,597.6	1,736.7	2,008.2	2,316.9	3,928.0
			Natural Flow(N.F.)	539.4	564.8	474.9	501.7	269.5	279.7	278.9	120.1	164.8	134.2	94.3	0.0
			N.F.+Sutami(WL:272.5-260)	424.1	449.5	359.6	386.4	154.2	164.4	163.6	4.8	49.5	18.9	0.0	0.0
			N.F.+Sutami(WL:260-246)	366.3	391.7	301.8	328.5	96.4	106.6	105.8	0.0	0.0	0.0	0.0	0.0
			Natural Flow(N.F.)	235.1	307.4	198.8	244.1	38.3	41.5	97.6	2.6	43.2	27.8	25.8	0.0
			N.F.+Sutami(WL:272.5-260)	119.8	192.1	83.5	128.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	N.F.+Sutami(WL:260-246)	62.0	134.3	25.6	70.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	No-Saving w/Mainte Flow	WITHOUT W/F	Potential Flow(Annual) (Drought Season)												
			Natural Flow(N.F.)	699.5	624.0	532.2	563.4	327.5	341.3	332.8	168.3	215.1	175.5	114.2	0.0
			(1) N.F.+Sutami(St. WL:272.5-260)	513.3	527.8	436.0	467.2	231.3	245.1	236.6	72.1	118.9	79.3	18.0	0.0
			(2) N.F.+Sutami(St. WL:260-246)	473.9	488.4	396.6	427.8	191.9	205.7	197.2	32.7	79.5	39.9	0.0	0.0
			(3) N.F.+St(260)+Wonorejo(Wj: Dam+Push-back Scheme)	388.6	403.1	311.3	342.5	106.6	120.4	111.9	0.0	0.0	0.0	0.0	0.0
			(4) N.F.+St(246)+Wonorejo(Wj: Dam+Push-back Scheme)	349.2	363.7	271.9	303.1	67.2	81.0	72.5	0.0	0.0	0.0	0.0	0.0
(5) N.F.+St(260)+Wj + Umbulan			327.9	342.4	250.6	281.8	45.9	59.7	51.2	0.0	0.0	0.0	0.0	0.0	
(6) N.F.+St(246)+Wj + Umbulan	288.5	303.0	211.2	242.4	6.5	20.3	11.8	0.0	0.0	0.0	0.0	0.0			
Demand Saving w/Mainte Flow	No-Saving	WITH W/F	Potential Flow(Annual) (Drought Season)												
			Natural Flow(N.F.)	536.0	565.0	467.1	496.7	263.4	273.3	279.5	121.2	178.4	143.7	90.8	0.0
			(1) N.F.+Sutami(260)	439.8	468.8	370.9	400.5	167.2	177.1	183.3	25.0	82.2	47.5	0.0	0.0
			(2) N.F.+Sutami(246)	400.4	429.4	331.5	361.1	127.8	137.7	143.9	0.0	42.8	8.1	0.0	0.0
			(3) N.F.+St(260)+Wonorejo(Wj: Dam+Push-back Scheme)	315.1	344.1	246.2	275.8	42.5	52.4	58.6	0.0	0.0	0.0	0.0	0.0
			(4) N.F.+St(246)+Wonorejo(Wj: Dam+Push-back Scheme)	275.7	304.7	206.8	236.4	3.1	13.0	19.2	0.0	0.0	0.0	0.0	0.0
			(5) N.F.+St(260)+Wj + Umbulan	254.4	283.4	185.5	215.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Saving w/Mainte Flow	WITHOUT W/F	Potential Flow(Annual) (Drought Season)												
			Natural Flow(N.F.)	107.4	136.4	38.5	68.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			(6) N.F.+St(260)+Wj + Umbulan	68.0	97.0	0.0	28.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			(7) N.F.+St(246)+Wj + Umbulan	37.4	66.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			(8) N.F.+St(260)+Wj + Umbulan + Beng	53.4	82.4	0.0	14.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			(9) N.F.+St(260)+Wj + Umbulan + Beng + Gengeng I	0.0	12.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			(10) N.F.+St(260)+Wj + Umbulan + Beng + Kedungwarak	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Demand Present (1996)	No-Saving	WITH W/F	Potential Flow(Annual) (Drought Season)												
			Natural Flow(N.F.)	14.0	43.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
			(11) N.F.+St(260)+Wj + Umbulan + Beng + Gengeng I	0.0	27.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
			(12) N.F.+St(246)+Wj + Umbulan + Beng + Gengeng I	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
			(13) N.F.+St(246)+Wj + Umbulan + Beng + Kedungwarak	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
			(14) N.F.+St(246)+Wj + Umbulan + Beng + Gengeng I + Kedungwarak	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
			(15) N.F.+St(246)+Wj + Umbulan + Beng + Gengeng I + Kedungwarak	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Table 2 Water Balance Analysis Incorporating Possible Development (2/2)

Demand : 2010		unit : million m ³															
		1982	1977	1987	1980	1994	1991	1988	1996	1979	1995	1981	1978	1981	1978	1978	1978
Demand	Water Saving	Potential Flow(Annual) (Drought Season)															
		1/20 20-yr drought	2/20 10-yr drought	3/20 6.7-yr drought	4/20 5-yr drought	5/20 4-yr drought	6/20 3.3-yr drought	7/20 2.5-yr drought	8/20 2-yr drought	9/20 1.7-yr drought	10/20 1.3-yr drought	11/20 1.05-yr drought	12/20 1-yr drought	13/20 1-yr drought	14/20 1-yr drought	15/20 1-yr drought	16/20 1-yr drought
2010	Water Resources	Expected Water Deficit during Drought Season															
		Natural Flow(N.F.)															
		(1) N.F.+Sutami(St. WL:272.5-260)															
		(2) N.F.+Sutami(St. WL:260-246)															
		(3) N.F.+St(260)+Wonoarjo(Wj. Dam+Push-back Scheme)															
		(4) N.F.+St(246)+Wonoarjo(Wj. Dam+Push-back Scheme)															
		(5) N.F.+St(260)+Wj + Umbulan															
		(6) N.F.+St(246)+Wj + Umbulan															
		(7) N.F.+St(260)+Wj + Umbulan + Beng															
		(8) N.F.+St(246)+Wj + Umbulan + Beng															
		(9) N.F.+St(260)+Wj + Umbulan + Beng + Genteng I															
		(10) N.F.+St(260)+Wj + Umbulan + Beng + Kedungwarak															
		(11) N.F.+St(260)+Wj + Umbulan + Beng + Genteng I + Kedungwarak															
		(12) N.F.+St(246)+Wj + Umbulan + Beng + Genteng I															
(13) N.F.+St(246)+Wj + Umbulan + Beng + Kedungwarak																	
(14) N.F.+St(246)+Wj + Umbulan + Beng + Genteng I + Kedungwarak																	
2010	Water Saving w/ Maifite Flow	Natural Flow(N.F.)															
		(1) N.F.+Sutami(St. WL:272.5-260)															
		(2) N.F.+Sutami(St. WL:260-246)															
		(3) N.F.+St(260)+Wonoarjo(Wj. Dam+Push-back Scheme)															
		(4) N.F.+St(246)+Wonoarjo(Wj. Dam+Push-back Scheme)															
		(5) N.F.+St(260)+Wj + Umbulan															
		(6) N.F.+St(246)+Wj + Umbulan															
		(7) N.F.+St(260)+Wj + Umbulan + Beng															
		(8) N.F.+St(246)+Wj + Umbulan + Beng															
		(9) N.F.+St(260)+Wj + Umbulan + Beng + Genteng I															
		(10) N.F.+St(260)+Wj + Umbulan + Beng + Kedungwarak															
		(11) N.F.+St(260)+Wj + Umbulan + Beng + Genteng I + Kedungwarak															
		(12) N.F.+St(246)+Wj + Umbulan + Beng + Genteng I															
		(13) N.F.+St(246)+Wj + Umbulan + Beng + Kedungwarak															
(14) N.F.+St(246)+Wj + Umbulan + Beng + Genteng I + Kedungwarak																	

Note : Figure in the above table shows water deficit against water demand for 2020 to be expected during 6 months of drought season by available water resources including natural flow of each year, reservoir storage and water savings.

Zero (0) in a shaded column means no deficit.

Sutami means total capacity of Sutami and Lahor

Table 4 Operation and Maintenance Cost of the Brantas River Basin Management Plan

Project	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
Urban																								
Beng	0	0	0	0	0	0	0	0	0	0	0	4,439	4,439	4,439	4,439	4,439	4,439	4,439	4,439	4,439	4,439	4,439	4,439	4,439
Kedungwark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geneng I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	124	124	124	124	124	124	124
Extension of Sediment Bypass Channel	0	0	0	0	0	381	381	381	381	381	381	381	381	381	381	381	381	381	381	381	381	381	381	381
Wringi dredging	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lodoyo dredging	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senngunuh dredging	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	381	381	381	381	381	381	4,820	4,820	4,820	4,820	4,820	4,820	4,944	4,944	4,944	4,944	4,944	4,944	9,912
River improvement/PPWS																								
Improvement of PPWS	0	0	0	327	327	327	327	327	327	327	327	327	327	327	327	327	327	327	327	327	327	327	327	327
Widas River	0	0	0	0	0	365	365	624	624	624	624	624	624	779	779	779	779	779	779	779	779	779	779	779
Lodoyo diversion tunnel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	327	327	712	712	951	951	951	951	951	951	1,106	1,106	1,106	1,106	1,106	1,106	1,106	1,106	1,106	1,106	4,733
Waterbed management/Subor/R&D																								
Siboo	0	144	8	238	588	887	1,185	1,484	1,783	1,938	2,092	2,247	2,402	2,557	2,712	2,866	3,021	3,176	3,331	3,486	3,640	3,795	3,950	4,105
Experimental research	0	0	152	296	546	895	1,193	1,492	1,791	1,946	2,100	2,255	2,410	2,565	2,720	2,874	3,029	3,184	3,339	3,494	3,648	3,803	3,958	4,113
Total	0	144	152	296	546	895	1,193	1,492	1,791	1,946	2,100	2,255	2,410	2,565	2,720	2,874	3,029	3,184	3,339	3,494	3,648	3,803	3,958	4,113
Water quality																								
New laboratory of PJT	0	0	0	0	0	0	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625
River environment																								
Biological Diversity Monitoring and labor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Creation of wetland and fisheries (a)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Recreation development program (b)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others																								
Inter-agency information system	0	0	0	0	0	0	1,055	1,055	1,055	1,055	1,055	1,055	1,055	1,055	1,055	1,055	1,055	1,055	1,055	1,055	1,055	1,055	1,055	1,055
Irrigation canal lining	0	0	0	177	274	411	548	686	823	960	1,097	1,234	1,371	1,508	1,645	1,782	1,919	2,056	2,193	2,330	2,467	2,604	2,741	2,878
Human resource development	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	177	274	411	1,603	1,741	1,878	2,015	2,152	2,289	2,426	2,563	2,700	2,837	2,974	3,111	3,248	3,385	3,522	3,659	3,796	3,933
GRAND TOTAL	0	152	152	760	1,197	2,399	4,514	5,190	5,626	5,918	6,209	10,956	11,248	11,540	11,832	12,124	12,416	12,708	13,000	13,292	13,584	13,876	14,168	14,460
Related investment (b)																								
Waste water treatment (a)	0	770	1,540	2,810	4,080	5,350	6,620	7,890	9,160	10,430	11,700	12,970	14,240	15,510	16,780	18,050	19,320	20,590	21,860	23,130	24,400	25,670	26,940	28,210
Reforestation and terracing	0	0	0	81	161	242	323	403	484	565	645	726	806	887	968	1,048	1,129	1,210	1,290	1,371	1,452	1,532	1,613	1,693
Total of related investments	0	770	1,540	2,891	4,241	5,592	6,943	8,293	9,643	10,993	12,344	13,694	15,044	16,394	17,744	19,094	20,444	21,794	23,144	24,494	25,844	27,194	28,544	29,894

(a) % of investment cost assumed.
 (b) Related to Water Resources Management Plan, but not included in the program cost.

FIGURES

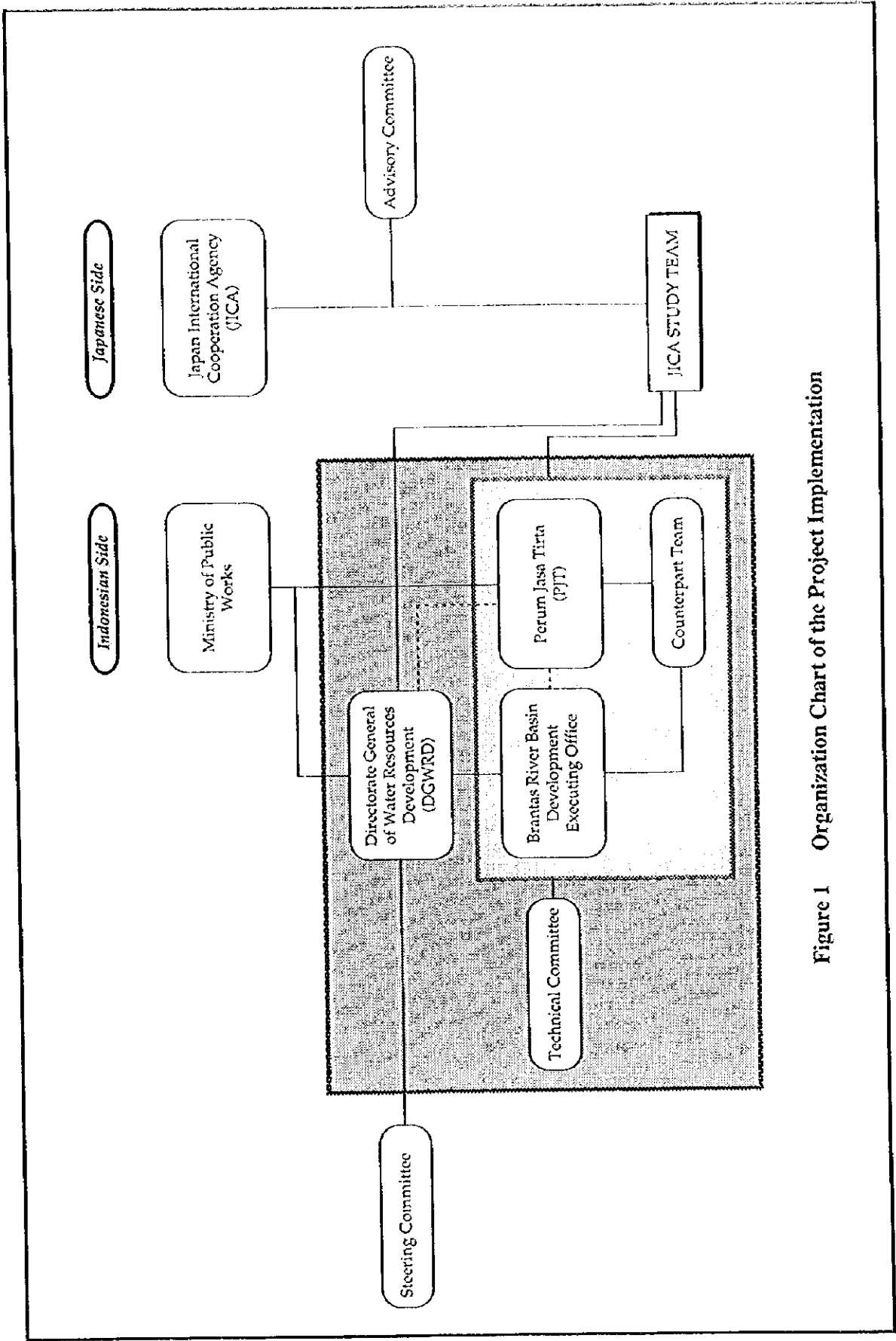


Figure 1 Organization Chart of the Project Implementation

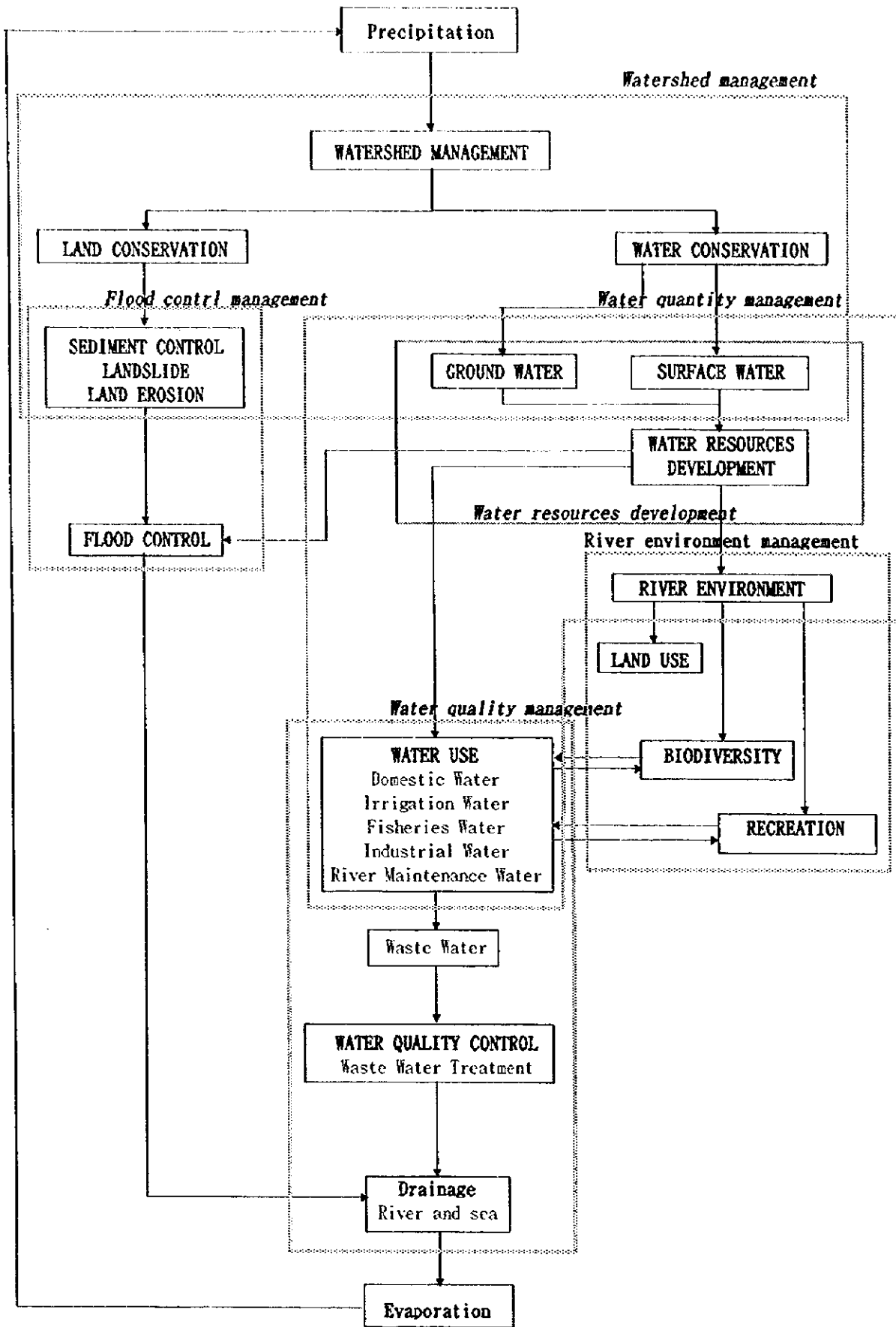


Figure 2 A General Model of Hydrological Cycle and Hydrosocial Cycle

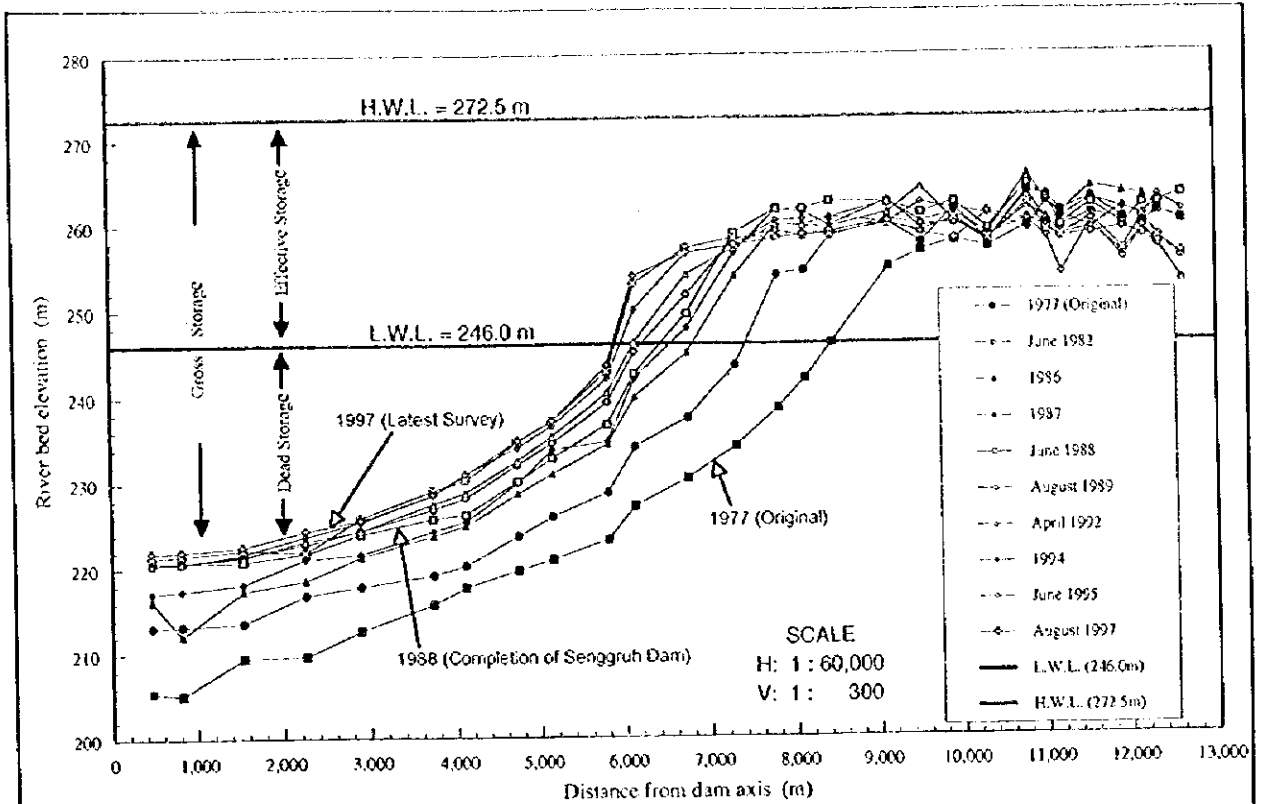


Figure 3 Longitudinal Sections in Sutami Reservoir (Brantas River)

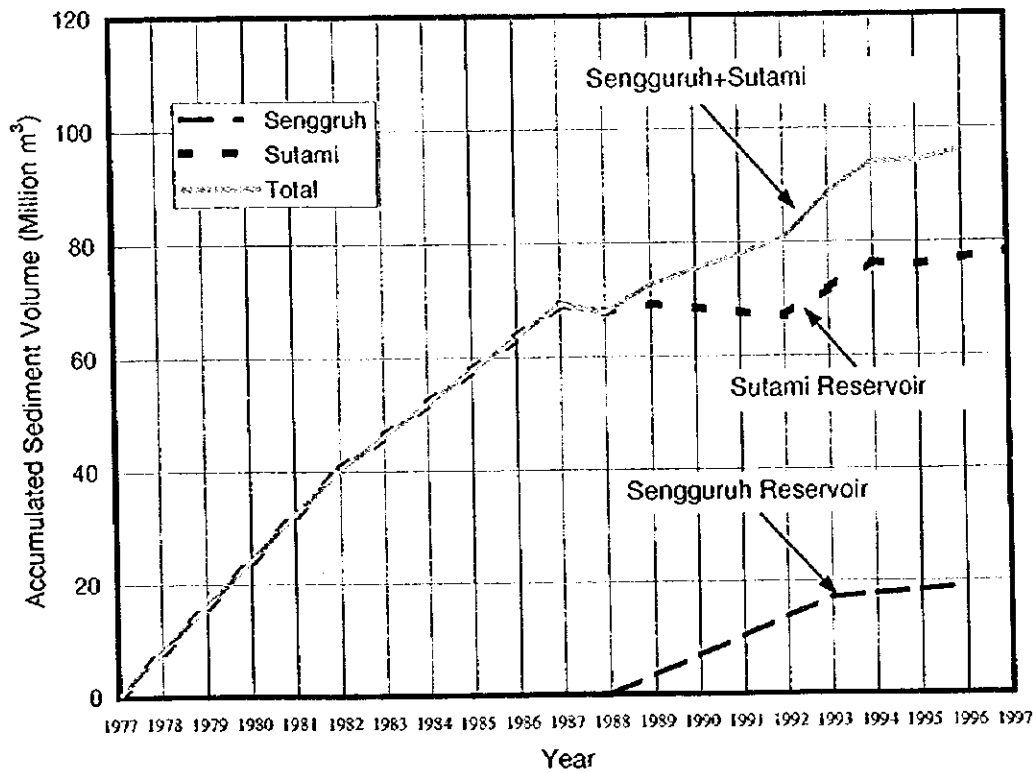


Figure 4 Transition of Sediment Volume in Sengguruh and Sutami Reservoir

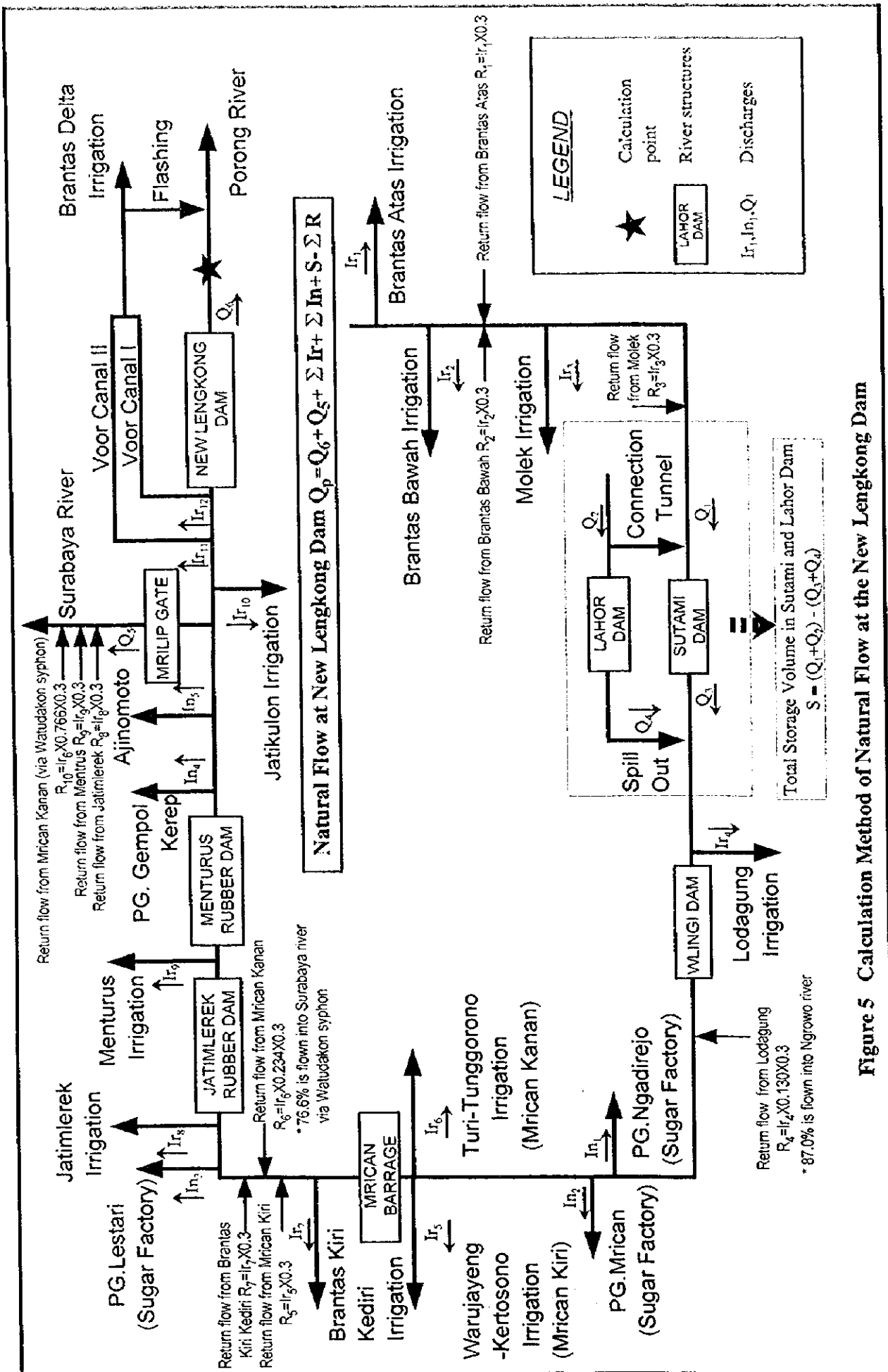
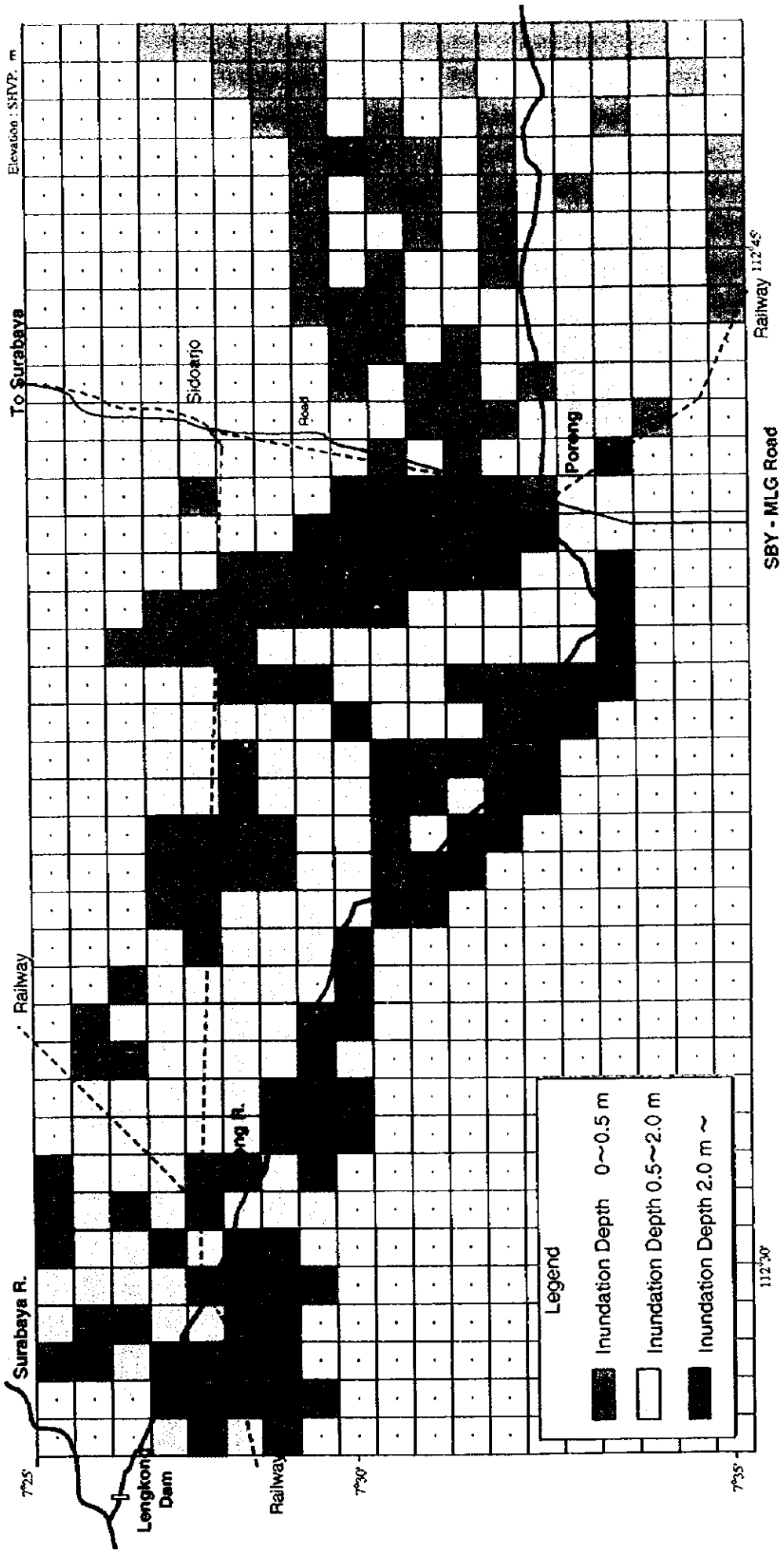


Figure 5 Calculation Method of Natural Flow at the New Lengong Dam

Flood Risk Map (Hmax of 6 cases)



Source : Peta Garis Surabaya Phase II in 1986, Scale 1:2,500
 Topographic map revised by US Army in 1945, Scale 1 : 50,000

Scale :  1 Km x 1 Km

Figure 6 Hazard Map

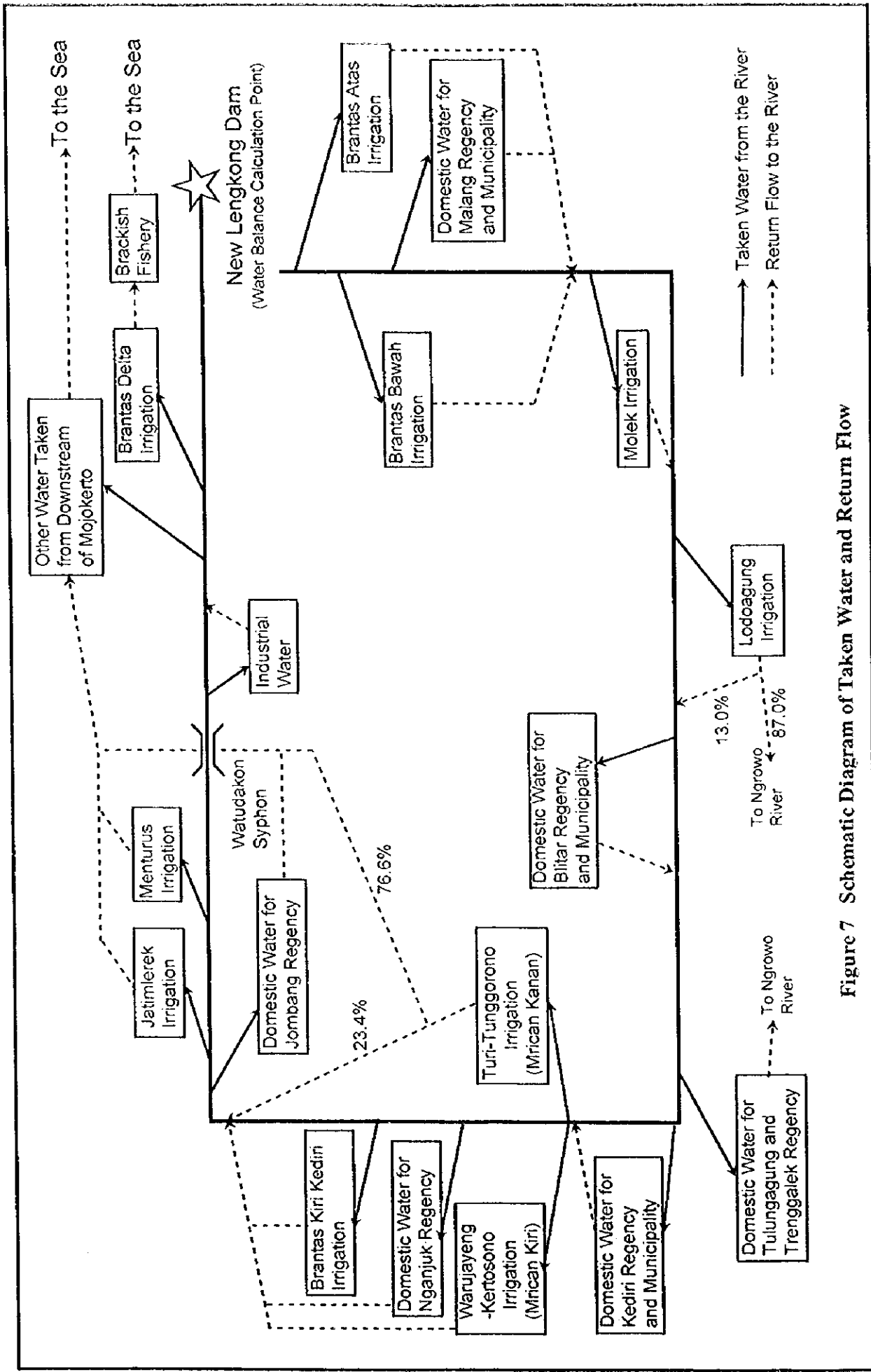


Figure 7 Schematic Diagram of Taken Water and Return Flow

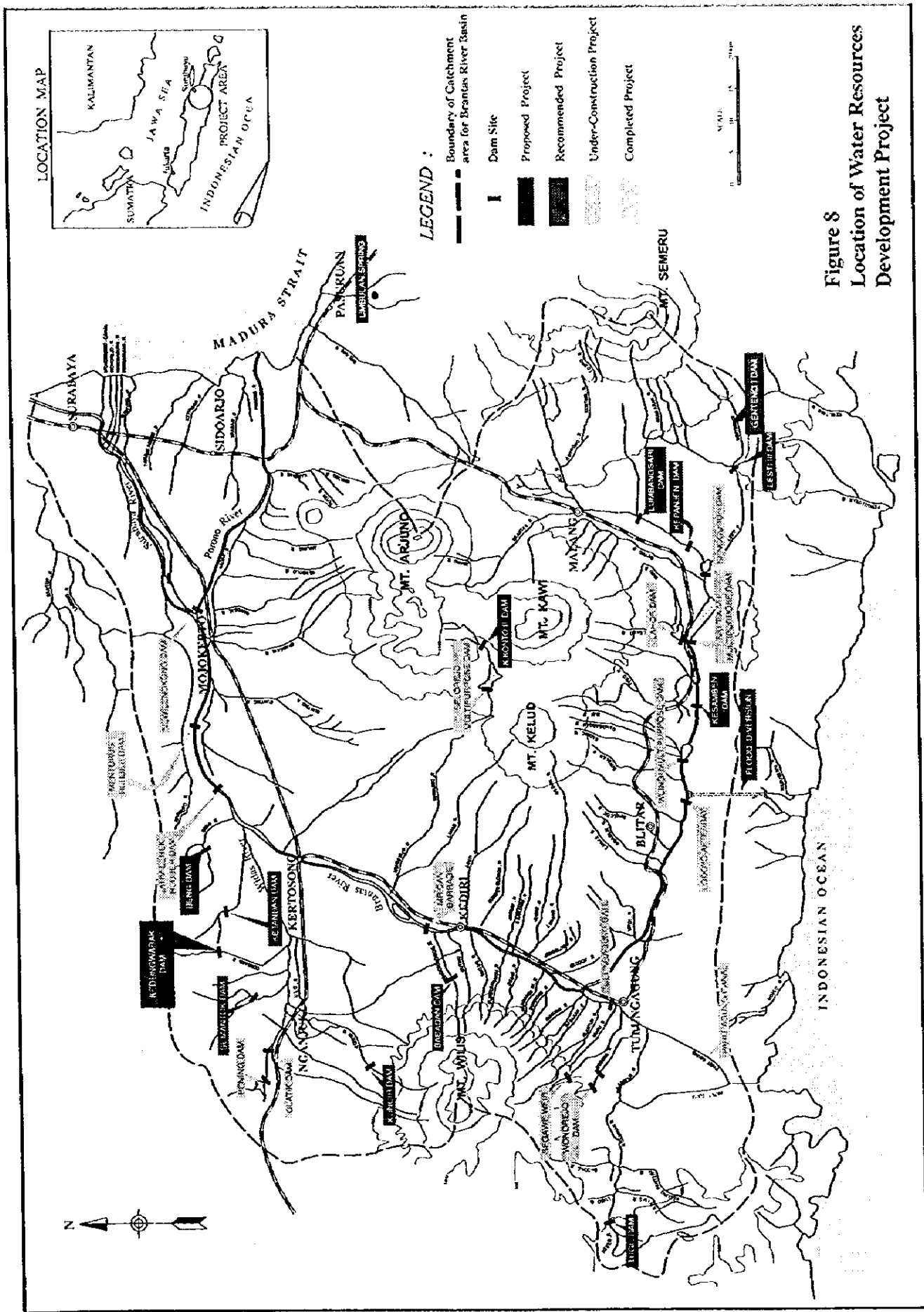
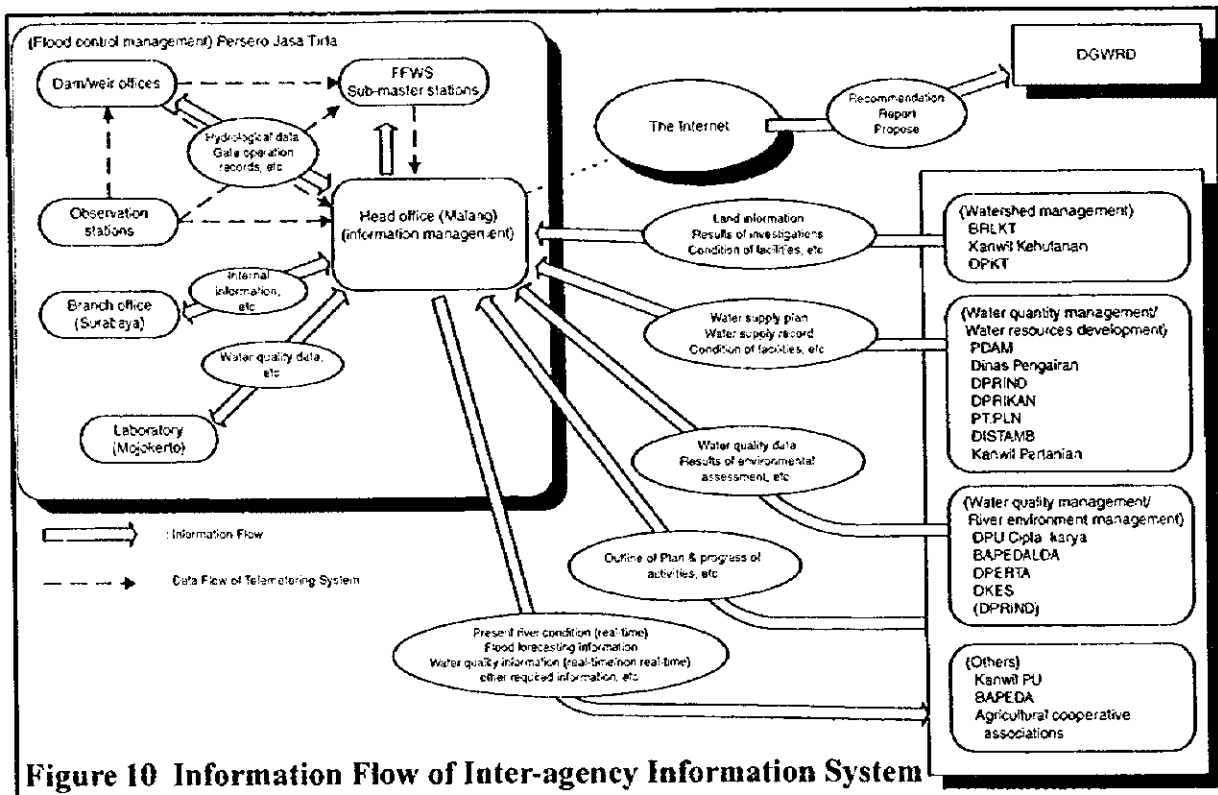
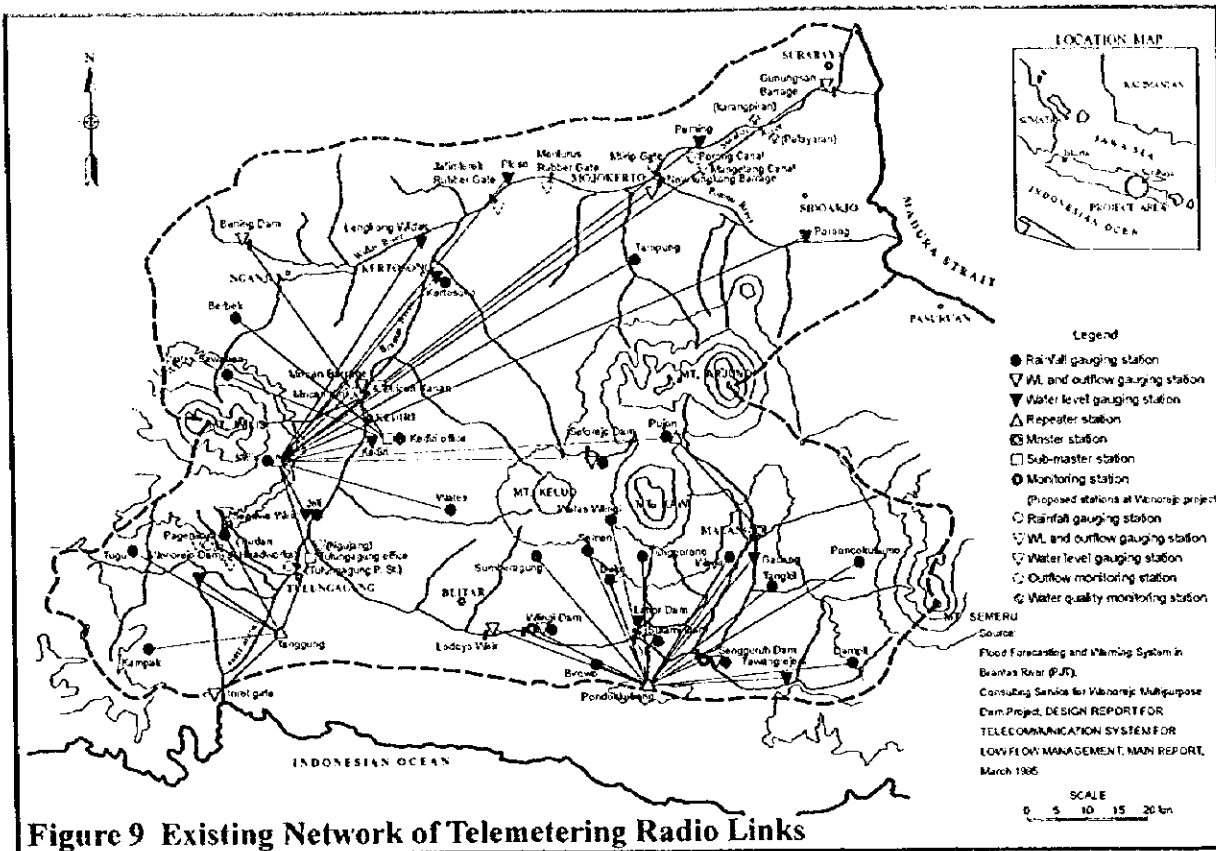


Figure 8
Location of Water Resources
Development Project



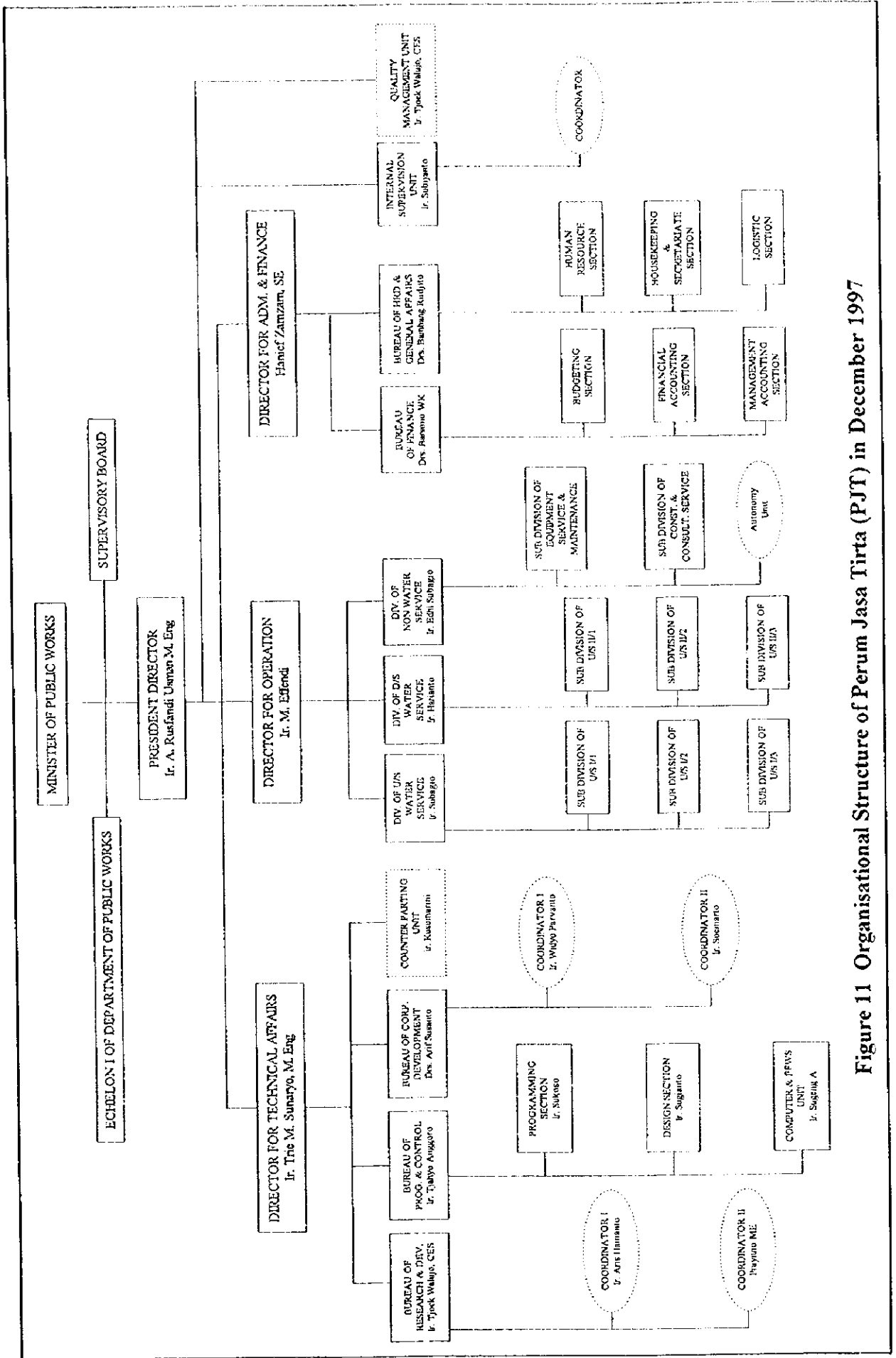


Figure 11 Organisational Structure of Perum Jasa Tirta (PJT) in December 1997

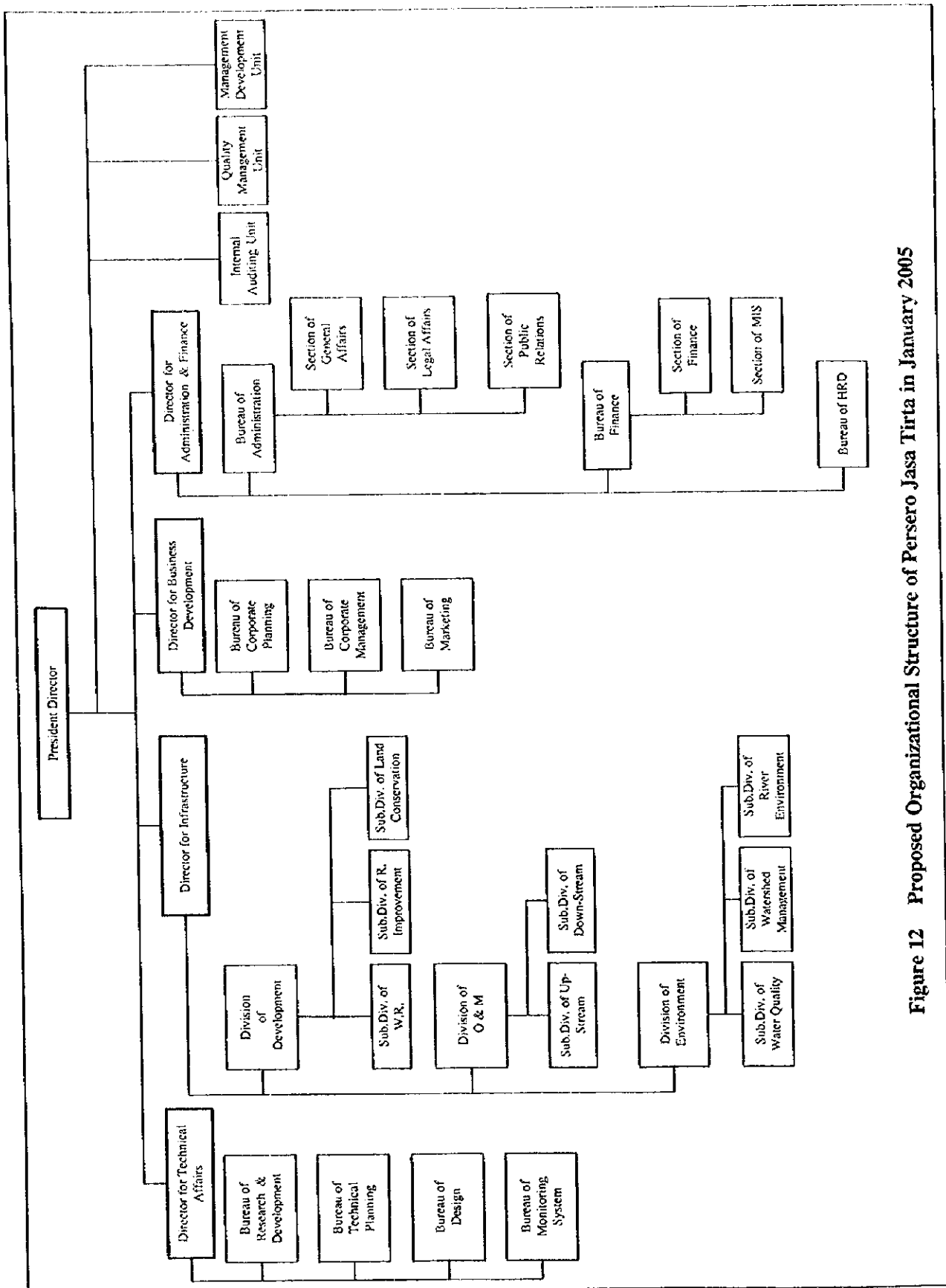


Figure 12 Proposed Organizational Structure of Persero Jasa Tirta in January 2005

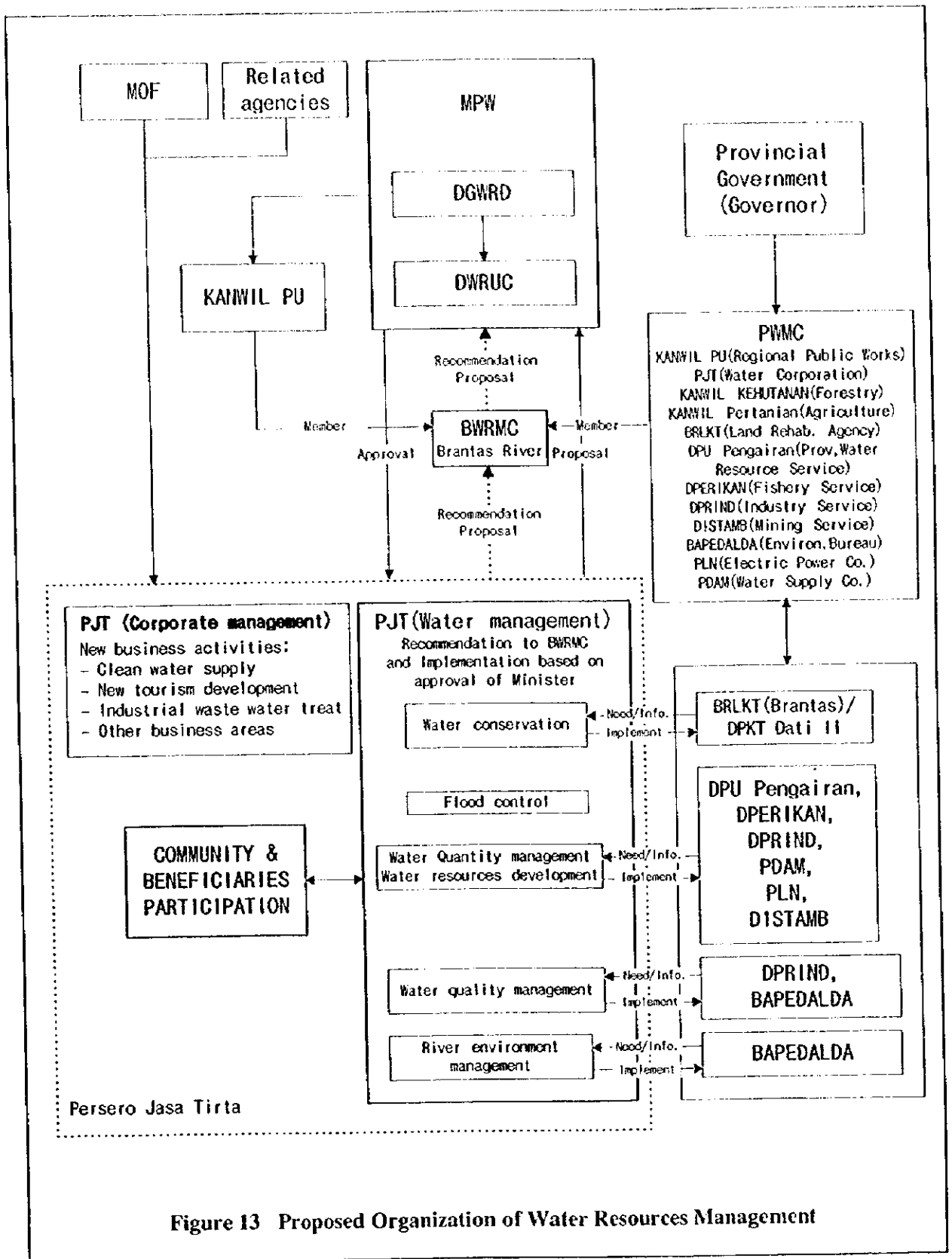
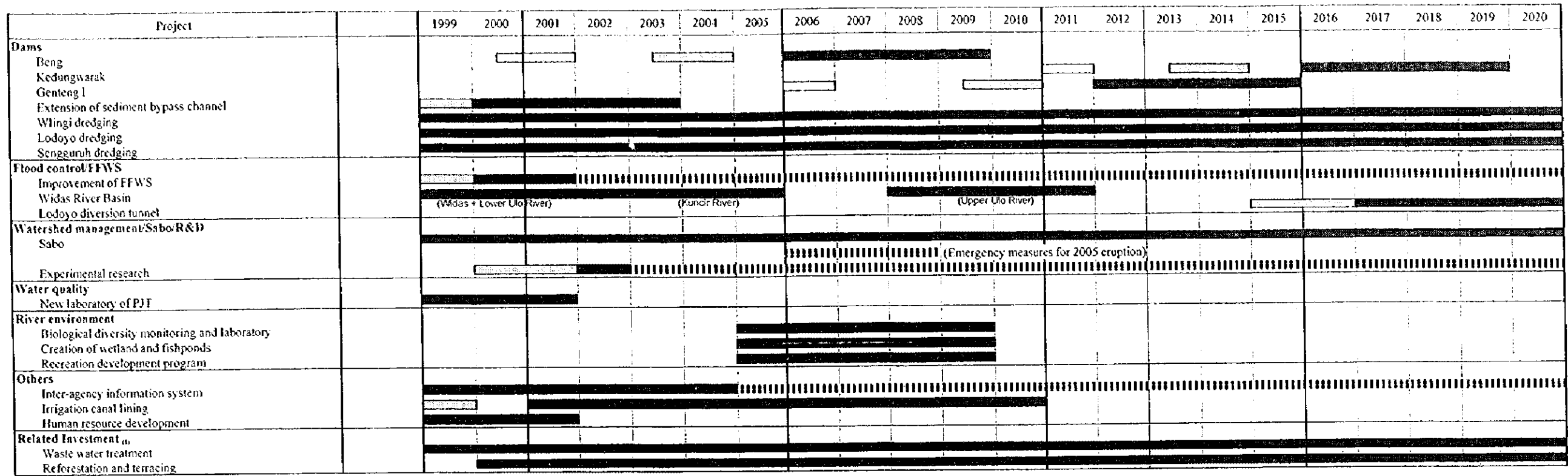


Figure 13 Proposed Organization of Water Resources Management

Figure 14 Implementation Schedule of Water Resources Management Master Plan for the Brantas River Basin



Legend: : Feasibility Study : Detailed Design : Construction/Installation

Investment Schedule

(Unit: million Rp. in 1997 price level)

Project	Total	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Dams																							
Beng	265,397	0	0	0	0	1,740	3,769	27,850	65,410	70,409	70,409	25,810	0	0	0	0	0	0	0	0	0	0	0
Kedungwarak	143,847	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,055	2,287	13,459	34,532	38,426	38,426	15,662	0
Genteng I	290,662	0	0	0	0	0	0	0	0	0	0	3,542	7,674	6,776	58,273	80,930	80,930	52,537	0	0	0	0	0
Extension of sediment bypass channel	50,729	1,209	12,380	12,380	12,380	12,380	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wlingi dredging	202,683	14,428	14,428	14,428	14,428	14,428	7,679	7,679	7,679	7,679	7,679	7,679	7,679	7,679	7,679	7,679	7,679	7,679	7,679	7,679	7,679	7,679	7,679
Lodoyo dredging	198,056	9,215	9,215	9,215	9,215	9,215	8,993	8,993	8,993	8,993	8,993	8,993	8,993	8,993	8,993	8,993	8,993	8,993	8,993	8,993	8,993	8,993	8,993
Sengguruh dredging	14,278	649	649	649	649	649	649	649	649	649	649	649	649	649	649	649	649	649	649	649	649	649	649
Total	1,165,652	25,501	36,672	36,672	36,672	38,412	21,090	45,171	82,731	87,730	87,730	46,673	24,995	24,097	75,594	99,306	100,538	83,317	51,853	55,747	55,747	32,933	17,321
Flood control/FFWS																							
Improvement of FFWS	56,667	7,617	8,016	446	0	0	856	61	61	1,086	6,133	6,989	5,108	61	0	0	856	61	61	1,086	6,133	6,989	5,047
Widas River	124,236	1,292	5,882	18,727	19,745	20,074	17,890	12,973	0	0	695	5,398	13,130	8,430	0	0	0	0	0	0	0	0	0
Lodoyo diversion tunnel	421,998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12,130	9,671	100,342	100,341	100,341	99,173	
Total	602,901	8,909	13,898	19,173	19,745	20,074	18,746	13,034	61	1,086	6,828	12,387	18,238	8,491	0	0	856	12,191	9,732	101,428	106,474	107,330	104,220
Watershed management/Sabo/R&D																							
Sabo	559,992	1,890	19,055	19,325	34,800	34,801	34,801	34,801	63,763	47,450	47,450	18,488	18,488	18,488	18,488	18,488	18,488	18,488	18,488	18,488	18,488	18,488	18,488
Experimental research	6,984	0	482	781	674	160	162	165	860	165	165	165	165	860	165	165	165	165	860	165	165	165	165
Total	566,976	1,890	19,537	20,106	35,474	34,961	34,963	34,966	64,623	47,615	47,615	18,653	18,653	19,348	18,653	18,653	18,653	18,653	19,348	18,653	18,653	18,653	18,653
Water quality																							
New laboratory of PJT	4,500	500	500	3,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
River environment																							
Biological diversity monitoring and laboratory	480	0	0	0	0	0	0	96	96	96	96	96	96	0	0	0	0	0	0	0	0	0	0
Creation of wetland and fishponds	44	0	0	0	0	0	0	9	9	9	9	9	9	0	0	0	0	0	0	0	0	0	0
Recreation development program	648	0	0	0	0	0	0	130	130	130	130	130	130	0	0	0	0	0	0	0	0	0	0
Total	1,172	0	0	0	0	0	0	234	234	234	234	234	234	0	0	0	0	0	0	0	0	0	0
Others																							
Inter-agency information system	17,714	42	191	241	2,583	2,608	67	0	0	1,997	1,997	0	0	0	1,997	1,997	0	0	0	1,997	1,997	0	0
Irrigation canal lining	160,365	4,719	1,976	15,691	15,691	15,691	15,691	15,691	15,691	15,691	15,691	15,691	15,691	0	0	0	0	0	0	0	0	0	0
Human resource development	18,000	6,000	6,000	6,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	196,079	10,761	8,167	21,932	18,274	18,299	15,758	15,691	15,691	17,688	17,688	15,691	15,691	0	1,997	1,997	0	0	0	1,997	1,997	0	0
GRAND TOTAL (without VAT)	2,537,280	47,561	78,774	101,383	110,165	111,746	90,557	109,096	163,340	154,353	160,095	93,638	77,577	51,936	96,244	119,956	120,047	114,161	80,933	177,825	182,871	158,966	140,194
VAT (10%)	253,728	4,756	7,877	10,138	11,017	11,175	9,056	10,910	16,334	15,435	16,010	9,364	7,758	5,194	9,624	11,996	12,005	11,416	8,093	17,783	18,287	15,897	14,019
GRAND TOTAL (with VAT)	2,791,008	52,317	86,651	111,521	121,182	122,921	99,613	120,006	179,674	169,789	176,105	103,002	85,335	57,130	105,868	131,952	132,052	125,577	89,026	195,608	201,158	174,863	154,213
Related Investment (1)																							
Waste water treatment	3,995,000	77,000	77,000	127,000	127,000	127,000	127,000	127,000	186,300	186,300	186,300	186,300	188,300	220,300	220,300	220,300	220,300	220,300	221,800	221,800	221,800	221,800	283,800
Reforestation and terracing	162,294	0	1,009	8,069	8,064	8,064	8,064	8,064	8,064	8,064	8,064	8,064	8,064	8,064	8,064	8,064	8,064	8,064	8,064	8,064	8,064	8,064	8,064
Total of related investments	4,157,294	77,000	78,009	135,069	135,064	135,064	135,064	135,064	194,364	194,364	194,364	194,364	196,364	228,364	228,364	228,364	228,364	228,364	229,864	229,864	229,864	229,864	291,864

(1) Related to Water Resources Management Plan, but not included in the program cost

Figure 15 Implementation Schedule of Pre-consolidation 3-year Program and Action Plan

	1999	2000	2001	2002	2003	2004	2005
	3 YEAR PROGRAM						
	<i>Action Plan</i>						
Establishment of New PJT							
PJT(Purum to Persero)							
3 YEAR PROGRAM							
Establishment of Water Resources Management System							
Establishment of MPW line							
Clarification of sector responsibility							
Establishment of BWRMC							
Preparation of Consolidation							
Development of Corporate Management							
Water charge system							
Assets management							
MIS improvement							
Reform of organization							
Human Resources Development							
Preparation of human resources development program							
Implementation of training program							
Staff selection and placement for establishment of New PJT							
Water Quality Control Program							
Establishment of new laboratory in Malang							
Water Resources Development							
Preliminary survey for Beng dam construction							
Maintenance of Existing River Facilities							
Ledgers of the rivers(including river facilities and water right) and O&M work demarcation							
Establishment of Inter-agency Information System							
Preparation of system introduction							
ACTION PLAN							
Preparation for Persero							
Watershed Conservation, Sabo, Flood Control							
Survey and monitoring of illegal sand mining							
Flood damage survey							
Preparation of flood control manual							
Preparation of flood hazard map							
Water Quality Control							
Establishment of water quality control system							
Institutional arrangement based on the Master Plan							
Preparation of waste water treatment map							
Pilot project of "Gappei Jokaso"							
Water Resources Development							
Survey for Beng Dam Project							
Selection of consultant, Detailed design etc. for Beng dam project							
Operation and Maintenance of River Facilities							
Stipulation of operation rule for all river facilities							
Establishment of authorized method of OMR budget estimate							
Consensus among beneficiaries about OMR cost allocation							
Effective Operation of Water Resources							
Tentative Operation Rule for Wonorejo dam Project Facilities							
Low flow forecasting system including Sutami and Woorejo dams							
Monitoring and Information System							
Introduction of inter-agency information system							







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