Brantas River Basin Case Study
Indonesia

Background Paper

Dr. Kikkeri V. Ramu, P.E.

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ACRONYMS

APBD	Regional Budget
APBN	National Budget
BPN	National Land Administration Agency
BUMN	Citarum River Basin Management Corporation
CAS	Country Assistance Strategy
DAU	Dana Alokasi Umum
DGWRD	Directorate General Of Water Resources and Development
DPR	House of Representatives
DPRDs	Provincial Parliaments
GBHN	State Policy Guidelines
IMF	International Monetary Fund
IMT	Irrigation Management Transfer Program
IUIDP	Integrated Urban Infrastructure Development Programs
JIWMP	Java Irrigation Improvement And Water Resources Management Project
KLH	State Ministry Of Environment
KTPA	District Water Resources Council
MOA	Central Ministry Of Agriculture
MOF	Ministry Of Finance
MoFEC	Ministry Of Forestry and Estate Crops
MoFEC	Ministry Of Forestry And Estate Crops
MPR	Peoples Consultative Assembly
PDAMs	Water Supply Corporation
PJT-I	Perum Jasa Tirta I (Brantas Basin Corporation)
PLN	National Power Corporation
POLRI	Police
PPTPA	Panitya Pelaksanaan Tata Pengaturan Air / Basin Water Resources Committee
PTPA	Provincial Water Resources Committee / Panitya Tata Pengaturan Air
SWS	Satuan Wilayah Sungai (River Territories)
TAP	MPR Decree
TNI	Armed Forces
UPTDs	Unit For Technical Management
WATSAL	Water Sector Loan
WISMP	Water Resources And Irrigation Sector Management Project
WRM	Water Resources Management
WUA	Water Users Association
WUR	Water Use Rights

1. COUNTRY PROFILE

Indonesia with over 17,500 Islands, large and small, and with a coastline of 84,000 km, is the largest archipelago nation in the world covering a land area of 1.92 million km^2. It stretches some 5,120 km along the equator and has the world's fourth largest island in Kalimantan (539,000 km^2). The other big and densely populated islands are Bali (5,560 km^2), Irian Jaya (422,000 km^2), Java (32,200 km^2), Maluku (75,500 km^2), Nusa Tenggara (83,000 km^2), Sulawesi (189,000 km^2), Sumatra (473,000 km^2). Most islands have mountainous areas of volcanic origin, and some have active volcanoes. Soils of Java and Bali are deep and fertile, while those of the other islands are less fertile and particularly sensitive to erosion as the forest and ground cover is destroyed. The country has many ecological zones with diverse flora and fauna, including 10% of world's flowering species, 12% of its mammal species, 17% of its bird species, and 25% of its fish species.

Indonesia has the world's fourth largest population (207.6 million according to the 2000 census) with over 92% being Muslim. The population is comprised of nearly 300 ethnic groups that speak about 538 different languages and dialects. The official language is Bahasa Indonesia, which is of Melayu origin. The population density nationally is 108/km^2, but it varies considerably from island to island. Java, the archipelago's most socially and economically progressive island, has 7% of its land area and 59% of the population, with a population density of 919/km^2. This has led to fragmented land holdings with average sizes of 0.25 to 0.40 ha per family. On the other extreme, the islands of Maluku and Irian Jaya have 25% of the nation's land area but only 2% of its population. The nation's drive to reduce population growth has been very successful. With the current annual growth rate of 1.7%, the population is expected to be 280 million by 2020. In the past decade urban population has grown at an average rate of 5%, straining the existing poor infrastructure such as roads, urban drainage, flood control, and urban services such as drinking water supply, solid waste removal, sewage treatment, etc. This has also resulted in both surface and groundwater quality degradation. It is estimated that by 2020 about 52% of the nation's population will live in urban surroundings, compared to 35% in 1995.

The nation's staple food is rice except in the drier eastern islands where maize and tubers (cassava) are consumed. The country achieved self-sufficiency in rice production in 1984, due in large measure to the expansion and rehabilitation of irrigation systems. However, since then rice production has declined partly due to drought, increase in the price of non-paddy crops relative to the price of rice, reduced subsidy and availability of inputs, conversion of paddy lands to urban use, poor maintenance of irrigation systems due to resource constraints resulting in the reduction of overall efficiency and competition for water, especially in parts of Java. Rice production has fallen from 48.8 million m.t. in 1995 (irrigated agriculture produced

79% of the rice production) to around 44.6 million m.t. in 2002. The country has imported rice to meet the food gap. Much of the rice production (65%) is on the islands of Java and Bali alone. Off Java (except in parts of Sumatra and Sulawesi) the principal agricultural activity is the cultivation of tree crops such as palm oil, rubber, coconut, coffee, cocoa, and some tuber crops.

In the non-agricultural sector, forest products (timber) from the islands off Java (Kalimantan, Sumatra) provide a major source of income to the nation. Much of the forest management is unregulated at the local level causing extensive damage to the watershed resulting in erosion and sedimentation, flooding, and water pollution as well as problems for human settlement and aquatic habitat. Apart from forest products, the country derives income from oil, gas, coal, copper, and gold from the islands off Java.

The key country statistics related to population, GDP, and rice production for 1970, 1990 and 2000 are presented in Table 1.

Table 1: Socioeconomic Data, Indonesia

Population			
Year	1970	1990	2000
National	119,470,000	179,322,000	205,841,000
Java	75,033,000	107,574,000	121,293,000
East Java	24,838,000	32,488,000	34,766,000
Brantas Basin	9,917,000	13,073,000	14,735,200

G D P			Unit: Rp. Billion
Year	1970	1990	2000
National	3,340	196,919.2	1,282,017.6
Java	1,670.9	106,963.7	678,309.5
East Java	623.9	29,160.9	177,273.8
Brantas Basin	330.5	16,038.2	89,011.2

G D P Per Capita			Unit: Rupiah
Year	1970	1990	2000
National	27,957	1,098,132	6,228,194
Java	22,269	994,327	5,592,322
East Java	25,119	897,590	5,099,057
Brantas Basin	33,327	1,226,819	6,040,719

G D P Non - Oil			Unit: Rp. Billion
Year	1970	1990	2000
National	na	159,701.5	1,097,770.6
Java	na	100,860.9	659,831.0
East Java	na	28,984.2	176,587.7
Brantas Basin	na	16,038.2	89,011.2

Total Rice Area			Unit: 1,000 ha
Year	1970	1990	2000
National	6,679	8,228	8,490
Java	na	3,644	3,329
East Java	1,129	1,171	1,160
Brantas Basin	314	325	328

Total Rice Production			Unit: 1,000 mt
Year	1970	1990	2000
National	26,392	45,179	51,899
Java	na	na	na
East Java	4,664	8,234	9,224
Brantas Basin	1,428	2,426	2,994

Source: Central Bureau of Statistics, Indonesia
Bureau of Statistics, East Java
Brantas PJT1 Report

2. LEVEL OF ECONOMIC DEVELOPMENT AND TREND

The nation's steady economic development growth over the six five-year plans (Repelitas), from 1969 to 1997 came to a dramatic halt in 1997-98 when the Southeast Asia crisis, coupled with the New Order Government' collapse, hit the country. The economy swung from rapid growth to rapid contraction, triggered by internal and external conditions, and moved Indonesia from foreign contagion to macroeconomic collapse. Indonesia's crisis was made much worse than other East Asia countries by its critically weak institutions, poor legal and regulatory systems, ineffective bureaucracy, and endemic corruption that could not withstand the high political uncertainty created by the New Order Regime's collapse and the regional economic downturn. Capital flight from the country added to the economic decline.

To mitigate the impact of the economic downturn the Government launched a four-pronged strategy of policy and institutional reform based on (i) managing the macro-economy, (ii) restructuring the financial and corporate structure, (iii) protecting the poor and preserving human assets, and (iv) reforming the economic instruments and institutions. Under an International Monetary Fund (IMF) led restructuring program participated in by other donors (WB, ADB, JBIC and bilateral) which began in fiscal year (FY) 1998-99, the country has gradually recovered. The IMF program terminated in December 2003 and has been replaced by a set of policies on economic recovery by the Indonesian Government.

Overall, the Indonesian economy has fared better than expected in the past four years. GDP growth, which had hit a low of –14.1% in FY 1998-99, has risen to 3.7% in FY 2002[1]. FY 2003 GDP growth was estimated to have been 3.5%. The inflation rate of 75.3% in FY 1998-99 has dramatically recovered to a level of 11.9% in FY 2002. The FY 2003 inflation rate was estimated to have been 6.5%. The exchange rate against the US dollar that plunged to a low of R_P 16,500 in July 1998, from R_P 2,300 in June 1997, is now holding steady at around R_P 8,500 to US$1. The FY 2004 budget approved by parliament anticipates 4.8% growth and a deficit target of 1.15% as compared to 1.9% in FY 2003. FY 2004 annual revenue is estimated to be US$40.7 billion. The country will no longer be eligible for debt rescheduling by the Paris Club, and hence the country's ability to increase development funding will be limited.

The World Bank Group's Country Assistance Strategy (CAS) for FY 2004 to FY 2007 has documented Indonesia's key social indicators and key economic indicators, presented here in tables 2 and 3. The social indicators (able 2) compare, based on available data, the magnitude for 1970-75, 1980-85 and for FY 2002. The economic indicators (table 3) provide data for the three years (FY 2000, FY 2001, & FY 2002), the FY 2003 estimate, and the Bank's projection for four years—FY 2004 through FY 2007. FY 2000 to FY 2007 GDP is projected to increase by 69% while per capita GNP will double.

[1] The fiscal budgetary year from April to March was shifted to the calendar year beginning in FY 2001.

In general Indonesia has regained macroeconomic and political stability. The debt-to-GDP ratio declined from 100% to 72% in FY 2002. The poverty incidence in 1996 was 15.7%, and it peaked at 27.1% in 1999. In FY 2003 the poverty incidence was down to 16% but still half the population are considered vulnerable to severe poverty. Based on a base case economic scenario, the World Bank's CAS predicts that, (i) GDP growth will reach 5% by FY 2006 up from 3.5% in FY 2003, (ii) inflation will drop to 5% by 2007, (iii) the poverty rate will fall to 11% by 2007, (iv) Government debt-to–GDP, which was at 67% at the end of FY 2003, will fall to 50% by the end of FY 2007, (v) external debt-to–GDP, which was at 76% in FY 2002, will decline to 40% in FY 2007, (vi) investment as a share of GDP will rise from 20% now to 22% in FY 2007, and (vii) a balanced budget to be achieved by year 2007.

Indonesia's economic progress is hindered by two major factors, (i) low investment, and (ii) weak service provision. In addition, governance and endemic corruption continue to be significant factors. The risks that can affect the gradual improvement in the economy over the next four years are factors such as: macroeconomic shocks from domestic or external factors, political and security instability, the long entrenched vested interests merging with nationalistic trends to subvert reforms, stalled decentralization, and continued public concerns about corruption. To some extent the political realignment and the presidential form of government in place since the Presidential election in September 2004 will have an impact on the country's further recovery.

Table 2: Key Social Indicators, Indonesia

	Latest single year				Same region/income group	
	1970-75	1980-85	2002		East Asia & Pacific	Low-income
POPULATION						
Total population, mid-year *(millions)*	132.6	163.0	211.7		1,826.0	2,511.0
Growth rate *(% annual average for period)*	2.4	1.9	1.3		1.1	1.9
Urban population *(% of population)*	19.4	26.1	43.0		37.3	30.8
Total fertility rate *(births per woman)*	5.0	3.6	2.3		2.1	3.5
POVERTY						
(% of population)						
National headcount index	..	..	16.0	1/	..	..
Urban headcount index	..	..	7.5	1/	..	..
Rural headcount index	..	..	23.1	1/	..	..
INCOME						
GNI per capita *(US$)*	230	530	710		900	430
Consumer price index *(1995=100)*	..	46	283		..	..
Food price index *(1995=100)*	..	40	323		..	..
INCOME/CONSUMPTION DISTRIBUTION						
Gini index	..	33.0	30.3		..	..
Lowest quintile *(% of income or consumption)*	..	8.0	8.4		..	..
Highest quintile *(% of income or consumption)*	..	42.1	43.3		..	..
SOCIAL INDICATORS						
Public expenditure						
Health *(% of GDP)*	..	..	0.6		1.8	1.1
Education *(% of GNI)*	2.8	2.0	1.2		2.3	2.8
Social security and welfare *(% of GDP)*	..	..	1.1		..	..
Net primary school enrollment rate						
(% of age group)						
Total	72	89	93	2/	93	..
Male	78	90	93	2/	92	..
Female	67	87	93	2/	93	..
Access to an improved water source						
(% of population)						
Total	..	39	78		76	76
Urban	..	60	90		93	90
Rural	..	32	69		67	70
Immunization rate						
(% under 12 months)						
Measles	..	26	68	3/	76	60
DPT	..	27	60		77	61
Child malnutrition *(% under 5 years)*	..	..	25	2/	15	..
Life expectancy at birth						
(years)						
Total	51	59	67		69	59
Male	50	57	65		67	58
Female	53	60	69		71	60
Mortality						
Infant *(per thousand live births)*	92	70	34		34	80
Under 5 *(per thousand live births)*	149	108	60	3/	44	121
Adult (15-59)						
Male *(per 1,000 population)*	478	368	227		184	312
Female *(per 1,000 population)*	405	308	175		129	256
Maternal *(per 100,000 live births)*	..	450	373	4/	..	..
Births attended by skilled health staff *(%)*	..	..	67		80	..

Note: 0 or 0.0 means zero or less than half the unit shown. Net enrollment ratios exceeding 100 indicate discrepancies between the estimates of school-age population and reported enrollment data. Group data are through 2001.

1/ World Bank Estimate

2/ Susenas 2002

3/ Susenas 1999

4/ Health Profile of Indonesia, Ministry of Health, 2002

Table 3: Key Economic Indicators, Indonesia

Indicator	<---------- Actual ---------->			Estimate	<---------- Projected ---------->			
	2000	2001	2002	2003	2004	2005	2006	2007
National accounts (% of GDP at market prices)								
Gross domestic product	100	100	100	100	100	100	100	100
Agriculture	17	17	17	17	17	16	16	16
Industry	46	46	44	45	46	46	46	46
Services	37	37	38	38	38	38	38	38
Total consumption	74	75	78	80	80	80	79	78
Gross domestic fixed investment	22	22	20	20	20	21	22	22
Government investment [a]	4	3	3	4	3	4	4	4
Private investment	18	19	17	16	17	17	18	18
Exports (GNFS) [b]	43	42	37	32	31	31	31	31
Imports (GNFS)	33	35	30	27	26	26	26	26
Gross domestic savings	26	25	22	20	20	20	21	22
Gross national savings [c]	18	21	19	17	16	17	18	19
Memorandum items								
Gross domestic product (US$ billion at market prices)	148	141	173	209	217	227	238	250
GNP per capita (US$, Atlas method)	570	680	710	820	930	1,020	1,050	1,080
Real annual growth rates (%)								
Gross domestic product	4.9	3.4	3.7	3.5	4.0	4.5	5.0	5.0
Gross domestic income	5.0	3.5	2.0	3.4	3.9	4.2	5.1	5.0
Real annual per capita growth rates (%)								
Gross domestic product	3.5	2.1	2.3	2.1	2.6	3.1	3.6	3.6
Total consumption	0.7	3.4	4.1	2.3	2.2	2.1	2.1	2.0
Private consumption	0.3	3.0	3.4	2.1	2.2	2.0	1.9	1.8
Balance of Payments (US$ Billion)								
Exports (GNFS) [b]	70.6	62.9	64.0	67.1	67.9	69.7	73.1	76.4
Merchandise FOB	65.4	57.4	58.8	61.4	62.0	63.7	67.0	70.3
Imports (GNFS) [b]	55.4	50.5	51.5	56.3	57.5	59.9	62.9	65.9
Merchandise FOB	40.4	34.7	35.6	40.2	40.9	42.7	45.0	47.4
Resource balance	15.2	12.3	12.5	10.8	10.4	9.9	10.3	10.5
Current account balance	8.0	6.9	7.5	5.2	3.3	3.7	2.7	2.0
Memorandum items								
Resource balance (% of GDP)	10.3	8.7	7.2	5.2	4.8	4.3	4.3	4.2
Public finance (% of GDP at market prices) [d]								
Total Revenues	19.8	20.6	18.6	19.1	17.4	17.8	18.2	18.6
Total Expenditures	21.0	23.6	20.4	21.1	18.7	18.7	18.6	18.6
o/w Current expenditures	18.8	20.7	16.9	17.4	15.3	15.1	14.8	14.6
o/w Development expenditures	2.2	2.9	3.4	3.7	3.4	3.6	3.8	4.0
Overall balance surplus (+) or deficit (-)	-1.2	-2.9	-1.7	-1.9	-1.3	-0.8	-0.4	0.0
Foreign financing (net)	1.1	0.7	1.0	0.2	-0.8	-0.9	-0.9	-0.7
Government debt/GDP (excl. IMF)	87.0	87.5	80.2	67.1	62.1	57.6	53.3	49.3
Monetary indicators								
M2/GDP	59.1	58.2	54.9	58.1	58.1	58.1	58.1	58.1
Growth of M2 (%)	15.6	13.0	4.7	16.7	10.2	9.7	10.3	10.3
Price indices(YR93 =100)								
Real exchange rate (US$/LCU) [e]	66.2	63.1	76.8	68.5	68.2	69.3	69.9	70.6
Consumer price index (% change)	3.7	11.5	11.9	6.5	6.0	5.0	5.0	5.0
GDP deflator (% change)	9.6	10.8	7.2	6.5	6.0	5.0	5.0	5.0

a. Central government investment while regional government investment is included in private investment.
b. "GNFS" denotes goods and non factor services.
c. Includes net unrequited transfers excluding official capital grants.
d. Central government.
e. "LCU" denotes local currency units. An increase in US$/LCU denotes depreciation.

3. INDONESIA'S GOVERNMENTAL SYSTEM

Since its independence, Indonesia's governmental system has been based on the 1945 constitution. The country is a republic with governance authority vested in the President but with parliamentary characteristics. The constitution provides for a limited separation of executive, legislative, and judicial powers. A constitutional reform process has produced several important changes since it began in 1999, following the demise of the New Order Government (the 'Soeharto Era') in 1998. There is a move to draft a new constitution, but it has not gained momentum.

The important constitutional changes are: (i) limiting President and Vice President to two five-year terms; (ii) electing President and Vice President by popular vote, and not having them appointed by the People's Consultative Assembly (MPR) as in the past. (The election of President and Vice President on a popular vote basis was implemented in September 2004), (iii) reconstituting the MPR and House of Representatives (DPR), and (iv) instituting checks and balances. As the highest state institution, MPR functions include amending the constitution, establishing broad state policy guidelines, and selecting the President and Vice President, which is limited to a censure role after 2004. The 695 MPR members include all 500 members of the House of Representatives (DPR), 130 regional representatives elected by the 30 provincial parliaments (DPRDs), and 65 appointed members from societal groups. The new DPR was elected in April 2004 and is the premier legislative institution. Its members are elected through a proportional/district representational system. The representation of armed forces (TNI) and police (POLRI) in the pre-2004 DPR has now ended. During the "Soeharto Era," the armed forces played a central role under the "dual function" doctrine (security and political). Military domination of both national and regional administration, a hallmark of the New Order Government, is gradually breaking down with new regulations prohibiting active duty military and police officers from holding political offices. By 2009 both societal group representation and TNI/POLRI representation in all legislative bodies will be eliminated.

The President presides over the state and appoints the Cabinet, which is organized into three functional groups: (i) security, (ii) social welfare, and (iii) economic, each headed by a Coordinating Minister. The ministries are organized as implementing ministries such as Public Works, Agriculture, Forestry, Finance, etc., and state ministries such as Environment, National Planning, and Research, etc. For the water sector the most important ministries are the Ministry of Public Works (MPW) for implementation function and State Ministry of National Planning (Bappenas) and Environment (KLH). The new President, inaugurated in October 2004, has used the Executive Branch approach somewhat similar to the way the US White House has organized its Executive Branch. The President has also instituted a 100-day Action Plan of important policy issues that includes action on some of the water sector reform work initiated by the previous Government.

The country is divided into 30 provinces, 315 districts (Kabupaten), and municipalities (Kota) that are large urban centers. Each of these entities has their own elected legislative assemblies. The provincial governors are selected by the provincial legislative assemblies and appointed by the President. The district heads (Bupatis') and chiefs of urban centers (Wali Kota) are selected by the district and city legislative assemblies, respectively, and appointed by the provincial governor. Thus, there is a three-tier government and public administration comprised of the national, provincial and district/municipality or local levels. The lowest level administrative unit is the village, which is headed by a village chief appointed by the Bupati. Three provinces (i) Metropolitan Jakarta (seat of the Government), (ii) Principality of Yogyakarta, and (iii) Nangroe Aceh Darussalam (Aceh) are given special status as provinces. The new revised Autonomy Law of 2004 issued in September provides for direct election of the Provincial Governors, Heads of Districts (Bupathis) and Townships (Wali Kota) beginning in July 2005.

4. RECENT CHANGES IN THE POLITICAL SYSTEM

Subsequent to the fall of the New Order Government in May 1998, the Parliament enacted two major reform laws: (i) the Law on Regional Government (Law # 22 /1999) and (ii) the Law on Fiscal Balance between the Center and the Region (Law # 25/1999) based on the principles of democratization, transparency, community empowerment, administrative decentralization, and reduction of both fiscal and functional roles of the center. Under these laws the prior central government functions and responsibilities—except for defense, foreign affairs, judiciary, and national finances—are devolved to the regional (province, district, municipality) governments. The center and provincial governments retain responsibilities for cross-border activities such as national or provincial roads, irrigation systems that span two provinces or districts, management of river basins that are inter-provincial or inter-districts, etc. These two new laws give authority to the regional governments to manage most natural resources and ability to raise and retain revenues. A large degree of autonomy is now given to the regional legislative assemblies to enact their own regulations, known as Perdas, which are in line with the national laws. The regional governments now have the authority to formulate their own plans, programs, and fiscal policies as well as authority over exploitation of natural resources including water resources.

The regional autonomy design has suffered because no serious assessment was done of all the things that could have been negatively affected by a hurried schedule for regional authority, for example, river basin water resources management, forestry management, oil and mineral resources management. Decentralization is about winning hearts and minds, and about having a common view of how to decentralize power. Because of the hurried nature due to political expediency, there was no serious assessment and discussion across the regions and provinces

as to what decentralization would mean for them and the appropriate level of decentralization. There is now a move to revise the autonomy laws to shift some of the district government roles back to the provinces and center. The regional governments are naturally resisting this move. The battle that will go on is to construct a common vision of what decentralization is about. More important in Indonesia is that the poorer provinces and districts see their existence in the nation (only two or three provinces are said to have a resource base to adopt full autonomy).

Under fiscal decentralization the regional governments' revenue share will be greatly increased. This includes new sources such as taxes, fees, and a variety of locally generated revenues from natural resources such as oil, gas, mining, forest products, and water. They will also receive national funds through (i) General Allocation Funds (Dana Alokasi Umum, or DAU) and (ii) Special Allocation Funds (Dana Alokasi Khusus, or DAK). National revenue sharing with the regions (provinces/districts/towns) is according to an equalization formula. The national DAU allocation is set at 28% of the annual national domestic revenue of which 10% will be allocated to provinces and 90% to districts and towns. The DAK allocation will vary and would include external development and sector support resources. Implementation of the fiscal decentralization policies is still in a preliminary stage as the implementing regulations and administrative details are being worked out. It is anticipated that beginning in FY 2005 fiscal decentralization policies will be gradually implemented in the water resources sector. Because of the large disparities in regional resources, including human resources and the development level, the degree of autonomy to be implemented is being rethought. The Central Government may through other laws and administrative procedures try to retain part of this authority from a view of national unity and social justice.

Realizing that the Law on Regional Government (#22/1999) and the Law on Fiscal Balance between the Center and Region (#25/1999) had some serious flaws related to autonomy and fiscal decentralization and its implementation, the Government after extensive deliberation issued revised laws in September 2004. According to these laws (i) functional responsibilities of the center, province and district have been revised to include obligatory and non-obligatory functions in the different sectors, (ii) all heads of subnational governments are to be elected by popular vote, (iii) Central Government develops and manages the regional civil service, (iv) the Ministry of Home Affairs to have a greater say on the natural resource revenue sharing and monitor/control the budget deficits of each region, (v) district/town level budget to be evaluated and approved by province and provincial level budget to be evaluated and approved by the center, (vi) center has responsibility to develop and supervise the regions while province coordinates development and supervision of districts/towns, (vii) regions are prohibited from establishing revenue sources that create high cost economy, (viii) the DAU , DAK and shared revenue formula have been revised, (ix) all external assistance to be channeled through the center, (x) puts limits on regional borrowing, (xi) new financial

management regulations for decentralized activities, deconcentrated activities and support activities (Tugas Pembantuan) have been formulated and (xii) a regional financial information system is to be established that that is compatible with the national accounting and finance management system. The new Government is now in the process of formulating downstream regulations to implement the revised laws on autonomy and fiscal decentralization.

5. PUBLIC ADMINISTRATION SYSTEM

The Indonesian public administration system under the New Order Government up until 1999 was primarily a hierarchical system under the direct authority and control of the president. It was an authoritarian regime with the formal trappings of democracy. Through the powers vested in the president to appoint governors, Bupatis, and senior administration cadre, the center exercised control over the regional public administration systems. The Peoples Consultative Assembly (MPR) set broad national policies termed State Policy Guidelines (GBHN) to guide the country's development. It meets once a year to prepare the MPR decrees termed 'TAP' that sets the annual national policy goals and the associated socio-political-economic principles. This MPR decree (TAP) guides the House of Representatives (DPR) in implementing the GBHN and sets the national budget. It is then left to the executive branch to interpret these guidelines and set up strategies, programs, and action plans for its public administration and developmental activities. The oversight by the national and regional peoples legislative assemblies (DPR/DPRDs) was very limited.

Subsequent to the fall of the New Order government in 1999 and formulation of MPR decree TAP/2000 and promulgation of autonomy law (No. 22/1999) and fiscal decentralization law (No. 25/1999), there has been both an increased role of the legislatures (both national and regional) and a high degree of autonomy for the regional governments (provincial and district). Both the national and regional legislatures (DPR and DPRD) now exercise a larger role in setting the policies, programs, and funding and have a broad oversight role. The MPR continues to meet once a year to set broad national policy and review Executive Branch performance but no longer is charged with appointing the President or Vice President nor in formulating development plans (GBHN). The legislatures (DPR and DPRDs) act independently of one another. In the executive branch, the center's role is primarily one of guidance, technical support, and broad supervision and monitoring of the regional governments with primary responsibility in the areas of foreign affairs, defense, security, justice, fiscal and monetary policy and religion. It is expected that in the future the executive branch roles both at the center and regions will follow the pattern of most democratic countries.

6. WATER RESOURCES SECTOR GOVERNANCE

The water resources sector administration system, as in the past, is governed under two systems: (i) a *de-concentrated* public administration system, and (ii) a *decentralized* public administration system. Under the de-concentrated system the governors and Bupatis act as regional representatives of the president and implement central government policies and programs under the supervision of the center. While the regions are consulted on the programs, it is left to the center to decide on the size, scope, and implementation modalities. These programs are funded out of the national budget (APBN). At the regional level these programs are implemented under the purview of regional sector agencies known as Dinas. The Dinas agencies operate under the regional governments and conform more or less exactly to the central implementing ministry and function as a line agency for deconcentrated activities. For example, the Central Ministry of Public Works (MPW), which has a Director General for Roads, Human Settlement and Water Resources, has a counterpart in a region (Province/District) known as Dinas Pekerjaan Umum (Department of Public Works or Dinas PU) in the areas of Roads (Dinas Bina Marga), Human Settlement (Dinas Cipta Karya), and Water Resources (Dinas Pengairan). While the Dinas PU organization is part of regional government structure, the central Ministry of Public Works technically guides them. For all de-concentrated activity, the regional Dinas agencies work under the supervision and guidance of the respective central ministries. The Dinas agencies manage their functions through branch offices known as Cabangs or UPTDs (Unit Pelaksanan Technis or Unit for Technical Management). In the case of the water sector, the provincial Dinas PU Pengairan (Provincial Water Resource Agency) have, beginning in 1998, gradually replaced the field offices (Cabangs) with Balai PSDAs (Basin Water Resource Management Units), which are a form of UPTD. These will be discussed in a later section.

The decentralized public administrative system handles those activities that fall under the responsibility of regional government. These programs are fully funded by the regional government budgets known as APBD. While central sectoral ministries may provide technical guidance the policies, strategies, and programs for the decentralized activities are the responsibility of the regional government. These programs are executed by the Dinas agencies under its authority with funding from regional budget.

In the water sector most of the development-type activities are being undertaken as de-concentrated activities under the central budget known as APBN while some of the smaller development activities are taken up as decentralized activities. In general most operation and maintenance (O&M) and irrigation system management are decentralized except for some major irrigation systems (for example, the Jatiluhur irrigation system of 240,000 ha) and new or rehabilitated irrigation projects that have not been transferred to local government. So far

most activities related to basin water resources management (WRM) are funded under APBN funding and are deemed to be de-concentrated activities. However, elements of WRM (hydrology measurement, licensing of water abstraction, O&M management of smaller river infrastructure, etc.) have been funded under APBD and thus follow the decentralized approach. In most cases the decentralized activities (local decision and regional funding) in water sector either complements or supplements the deconcentrated activities except in the case of irrigation system O&M. Most decentralized activities are based on relevant centrally established policies, regulations, and guidelines.

In the case of Human Settlement (Cipta Karya) much of the urban development related to urban roads, drainage, water supply, sanitation, solid waste disposal, and urban flood control have been executed as deconcentrated activities under the central agencies (Ministry of Public Works) program. However, the operation, maintenance, and management of these infrastructure and facilities are undertaken as decentralized activities with local funding under regional government authority but with guidance from the center.

Thus, in the pre-2000 public administration system, most decentralized functions in the water sector public services were limited to O&M-type activities and its management, while almost all development activities were handled as centralized, deconcentrated activities. A limitation in decentralized decision-making has been the lack of regional autonomy and authority and regional resource constraint. With the enactment of the autonomy and fiscal decentralization laws in 1999 and its revision in 2004, more and more sectoral activities and programs are expected to be handled under the decentralized approach. Also, the unitary system of government with central control has so far inhibited decision-making at the appropriate level. This is expected to improve as autonomy laws begin to be implemented.

7. PROJECT SYSTEM AND FUNDING MECHANISM IN WATER SECTOR

As mentioned earlier, water sector programs (development, operation, maintenance, and management) are funded under two streams of budgeting, (i) national budget (APBN) and (ii) regional budget (APBD). The national budget includes both internal and external resources and is funded through a ‘project system’ both for development and O&M of infrastructure through the DIP (Dafter Isian Proyek) process. The project system is an ad hoc system created to fast track program implementation under the management of the structural agencies (Direct General of Water Resources at the center assisted by the Dinas PU Pengairan in the region). This dual system of project management and program management was created in part to limit the size of the structural agency bureaucracy while retaining the ability to have flexibility in project implementation as program size varies. While the project system works well for infrastructure implementation, it is not suited to handle the routine activities such as operation,

maintenance, and management activities in WRM, a major flaw currently. The project approach is also being used for regional budgets (APBD). Currently efforts are being made to develop 'routine budget' for WRM and O&M activities and not fund these through the 'project system' approach.

To support autonomy and fiscal decentralization, future deconcentrated activities will be channeled through DAU (Dana Alokasi Umum) as block grants for mostly routine activities instead of the current centrally managed DIP (Dana Isian Pembangunaan) process. The regional governments, supervised by the regional legislative assemblies (DPRD), will then have full authority over the program, allocation, and management of these funds. For regional development activities (apart from national development activity through the DIP process), national funds will be channeled through DAK (Dana Alokasi Khusus) as block allocation for water sector infrastructure, roads, etc. With these two new budgeting processes, the current DIP process will be limited to only those activities for which the central government is responsible. As a transition from DIP to DAU and DAK a transitional arrangement DIPP (Daftar Isian Pembiayaan Pembangunan) is being used for external resources (loans and grants), which will be managed by regional authorities that will provide counterpart funds from the regional budget. This process will be discontinued once the administrative regulations for external resources through DAK and DUP are in place.

8. REGULATORY GOVERNANCE IN WATER SECTOR

By law the regulatory powers (issue of licenses, fixing of tariffs, enforcement, etc.) are vested in the President and with the regional heads (Governors, Bupatis, and Mayors). These regulatory powers are implemented by the respective Ministry or Dinas as part of their normal functions. These agencies, in essence, have the dual regulation and operation function. Institutionally these functions are not clearly separated, resulting in a weak regulatory mechanism that is not independent and subjected to operational decisions. For example, with WRM, the regulatory function is with the Dinas PU Pengairan (water resources agency), which it exercises through its field offices (Cabangs, UPTD's, Balai PSDA's), which are also responsible for the operation and management aspects of water resources. Regulatory function monitoring is also with the same organization. Thus, there is no organizational or institutional demarcation between the regulatory and operation and management functions. In the regulatory process (for example, licensing of abstraction or determination of tariffs), steps are built in to obtain agreement with concerned agencies, groups, or ad hoc committees of stakeholders before decisions are made by the concerned authorities. However, this process lacks the independence, fairness, and transparency that regulatory mechanisms should have. In river basins where there are water resource quantity and quality constraints, the operating agencies find it difficult to implement regulatory governance.

9. WATER RESOURCES CONDITION AND PROBLEMS

Indonesia's surface water potential is provided by over 5,590 rivers, big and small. In general, rivers originate from volcanic mountains and have a distinct upper reach where the bed slopes are steep, a short middle reach with moderate bed slopes, and a meandering lower reach where bed slopes are flat. Because of high rainfall intensities and watershed erosion, most rivers carry large quantities of sediment, which results in river regime problems as well as river mouth problems. In many river catchments volcanic eruptions add to the sediment problems. Except for rivers in Kalimantan and a few rivers in Java, most rivers have short lengths and are subjected to flash floods. The longer rivers (Brantas River, for example) experience flooding in the lower reaches because of flat slopes and inadequate carrying capacity due to encroachment and sedimentation.

The 5,590 rivers are grouped into 90 river territories termed Satuan Wilayah Sungai (SWS) by a ministry regulation in 1969. The SWS normally form the region for river basin planning, development, and management. Of the SWS, 73 are fully located in one province and are known as provincial SWS, while 17 are either inter-provincial river territories or are of strategic importance and are called national SWS. In the past five years many provinces have used the river territory or SWS as the region for water resources management and structured the institutional arrangements accordingly.

The Brantas SWS has 1,555 rivers of order 2, 3, and 4 and is fully located in the East Java province. The order of the river represents the level of the tributary to the main stem of the river (order 1). Because of the large investments by the central government and its economic importance, it is classified as a national SWS. The new Water Resources Law (Undang Undang Sumber Daya Air-UUSDA) Number 7/2004, issued in March of 2004, has provision to change the SWS boundaries to suit regional aspirations by a presidential decree based on the recommendation of the National Water Council.

The nation's average rainfall is over 2,500 mm/year, of which 80% falls during the rainy season (October to April). However, large regional variations in the rainfall exist over the country, varying from 5,000 mm in the West (Sumatra) to 1,000 mm in the East (Maluku, Nusa Tenggara and parts of Sulawesi). Also in Java the rainfall intensity decreases from west to east due to orographic effects, with an average rainfall around 2,600 mm. Once every few years drought occurs because of El Nino events, followed by flooding in the subsequent years. The annual renewable water resources of Indonesia are estimated to be about 3,085 km^3 (97,825 m^3/s) while the total estimated fresh water demand in 2000 was only about 2,732 m^3/s, of which irrigation demand amounted to 90.8%.

The surface water potential and the available low flow for the year 1990 for some of the more important island groups are indicated in Table 4. The irrigation and DMI (domestic, municipal, and industrial) water demand for 1990 and those projected for 2000 and 2015 are also indicated. On an island basis, the estimated low flow in Java is not adequate to meet the demand, indicating irrigation shortages in the dry season, unless adequate storage facilities are available. In general water tends to become a limiting factor in socio-economic development of a country when water withdrawals exceed 20% of the total renewable water resources. For Java and Sulawesi islands, the ratios are about predicted to be 29.8% and 21.3% respectively by 2015 (see Table 4), indicating the need for better water resources planning and management. Looking at water resource availability per capita, for FY 2000 population figures, the average annual surface water potential for Indonesia is about 15,165 m^3/capita, while for individual islands it varies from 1,582 m^3/capita for Java and Bali at the lower end to 418,803 m^3/capita for Irian Jaya. The demand in 2000 for irrigation and DMI for Java/Bali was about 480 m^3/capita, which is about 30% of the surface water potential.

Table 4: Surface Water Resource Potential and Demand by Island, Indonesia

Island	Area (1000 km^2)	Estimated Surface Water Potential (m^3/s) 1990	Estimated Low Flow (m^3/s)	Irrigation + DMI Demand			Yr. 2015 Water Resource Utilization %
				1990 (m^3/s)	2000 (m^3/s)	2015 (m^3/s)	
Java / Bali	139	6,199	786	1074	1777	1878	29.8
Sulawesi	187	2,488	561	126	365	529	21.3
Sumatra	470	23,660	4704	297	497	693	2.9
Kalimantan	535	32,279	6,956	73	93	193	0.6

Source**:** UNDP / FAO Study 1992 and DPP (Directorate of Planning & Programing)
Note**:** Irrigation demand is in the range of 87% to 95% of the total demand.

A UNDP/FA0 study in 1994 looked at the estimated 2020 demand for irrigation, DMI, fishponds, livestock, and river maintenance and compared it with the estimated natural basin discharge. For Java and Bali (56% of population) nearly 60% of the natural basin discharge is required in 2020 to meet the demand, while for Kalimantan (1.8% of population) it is only 1% of the natural basin discharge.

Groundwater potential in Indonesia is very limited. There are no extensive groundwater basins. Groundwater exploitation, both shallow and deep aquifer, is limited to urban water supply use and some industrial needs. In Java, only the eastern part (East Java) has some

groundwater irrigation, amounting to about 41,000 ha. Many of the eastern islands such as NTB, Timor, and Maluka depend on groundwater because of surface water limitation. Groundwater potential estimates for some of the islands are**:** Java, 95 m^3/s; Sulawesi, 44 m^3/s; NTB, 21 m^3/s; and Maluku, 9 m^3/s.

Much of the surface water is used to irrigate agriculture. Currently over 5.5 million ha is provided with technical irrigation and another 1.6 million hectares as village irrigation. The infrastructure involves over 12,500 diversion structures and 40 reservoirs of various sizes. In addition, 3.3 million ha of swampland has been developed by providing drainage while 18,000 ha of fish ponds in Aceh, North Sumatra, and Sulawesi is provided with supplemental water supply. In the municipal water supply sector, raw water is provided to the extent of about 100 m^3/s for rural and urban drinking water supply. Water resources also support generation of 2,200 MW of hydropower (20% of the country's generating capacity) mostly in Java.

10. WATER RESOURCE ISSUES

The primary issue in balancing water supply and demand is related to seasonal and annual variation in river flows. The spatial and temporal variation in supply as discussed above and the high ratio of demand-to-supply on the island of Java and some parts of Sumatra and Sulawesi is a major constraint. Coupled with this is the extreme erosion in the densely populated watersheds of these basins. Most demands are met by run-of-river schemes and are thus subjected to the vagaries of river flow. While the wet season (October to March) flows are adequate to meet the demand in most important basins, dry season shortages adversely affects irrigation and non-irrigation demands. While a number of reservoirs in Java river basins (Citarum, Serayu–Bogowonto, Solo, Jratunseluna, and Brantas) have been constructed, the total storage capacity amounts to only 5% to 6% of the river flows. Construction of reservoirs to meet the dry season demands is constrained by lack of good reservoir sites, the high density of watershed population requiring large resources for relocation and resettlement (estimates vary from 28% to 40% of costs), ecological impacts due to high rate of erosion, and pollution problems from upstream rural and urban sewage and solid waste, for example, the three reservoirs in Citarum).

11. IRRIGATION

In the irrigation systems the supply-demand problems, apart from the resource problems stated above, relate to (i) poor management at the river basin level of bulk water supply and its allocation, (ii) lack of good and reliable hydrologic data, (iii) absence of a water-rights systems to base allocation among users, (iv) inadequacy in irrigation system maintenance and

its operation, (v) conflicts in use of irrigation canal supplies because of abstraction for non-agricultural purposes (for example, Jatiluhur irrigation system in the Citarum basin, irrigation system in Jratunseluna basin, Brantas basin), (vi) conversion of agricultural land to urban use thus increasing demands on water supply, (vii) lack of a measurement system to manage demand, resulting in excess use of water for irrigation and lower irrigation efficiencies, (viii) lack of resources for proper operation and maintenance of the irrigation systems, (ix) inadequate contribution from the irrigators, and (x) an institutional arrangement that does not provide for a participatory approach of the beneficiaries. Considering that the bulk use of water for agriculture amounts to 80% to 90% of the demand in the basin, there is a need as well as the scope to improve the institutional, management, and resource aspects of irrigated agriculture.

12. MUNICIPAL AND INDUSTRIAL WATER SUPPLY

In the municipal and industrial water supply sector the problems of supply and demand have gradually compounded over the past 10 to 15 years and in some locations are becoming critical. Lack of adequate groundwater resources in urban areas and population growth is resulting in a large demand for raw water for municipal needs. Also, the industrial development in the northern belt of Java (Serang, Jakarta, Cirebon, Semarang, and Surabaya) along the coast, all located in the lower reaches of the rivers, has resulted in an increase in industrial water demand resulting in competition for water. Though, the total quantity for DMI compared to irrigation is less, the location, supply system, need for a continuous supply, real time conflicts, quality of water, and lack of enforceable water rights have contributed to the supply and demand problems. This has, in some cases, triggered socioeconomic conflicts in parts of the river basins. The economic disparities between user segments (tourism, golf courses, industrial sectors, service sectors, drinking water supply entities, and irrigators) in the absence of a properly structured regulatory and institutional system have aggravated the supply and demand problems.

13. MEASURES TO RESOLVE SUPPLY AND DEMAND ISSUES

Programs to improve the supply-demand situation have been implemented over the past three decades by the Ministry of Public Works through its Director General of Water Resources and field units and the regional governments through the Dinas PUP (Water Resource Agencies) and field units. In the 1970s the emphasis was more on planning and improvement of small irrigation systems. In two river basins (Citarum and Brantas) major infrastructure investments were made. In the 1980s the emphasis was on rehabilitation and expansion of most irrigation systems and urban and industrial raw water supply in Indonesia with continued investments for river improvement, flood protection, and attention to O&M of the irrigation

system. It is only after the 1990s that aspects of sustainability in irrigation, cost recovery, farmer participation, better O&M, river basin management, and institutional reforms have been addressed. Beginning in the late 1990s there was a move to introduce major reforms in the water sector (legal, institutional, and financial) through a program known as 'Water Resources Sector Reform Project', or WATSAL, that was supported by a World Bank loan to Indonesia for budgetary support.[2] Measures that have been taken to address supply and demand both directly and indirectly are**:** (i) integrating planning in 35 river territories (SWS) to address supply-demand situation, (ii) constructing and improving diversion structures, (iii) lining canals to reduce seepage and improve stability, (iv) desilting canals and improving canal structures up to tertiary level to provide for better water distribution, (v) adding storage where possible, (vi) introducing a rotation system at the tertiary and quaternary levels where flow through system existed, (vii) allocating increased resources for O&M of irrigation systems, (viii) introducing the beneficiary pay principle based on ability to pay to augment resources, (ix) introducing bulk water allocation in quasi real-time, (x) improving the hydrology institutional setting and network (still in its infancy), (xi) setting up of river basin management units, and (xii) strengthening and empowering water users association (WUA/P3A) in the irrigation service areas and their federation. While these measures have contributed to some extent to improving the supply-demand situation, it is hoped that once the water sector reform work is completed and implemented the institutional, operational, and resource situation will improve.

14. WATER QUALITY ISSUES

Water quality concerns have surfaced as a major issue in most urban and metropolitan areas in many of the river basins in the past two decades. Urban centers such as Bandung, Jabotabek (Jakarta, Bekasi, Bogor, and Tangerang), Semarang, Surabaya, Medan, Makasar, and many other towns suffer from poor drinking water quality. Both raw water supply from rivers and groundwater are subject to high levels of pollution.

Surface water pollution is primarily due to discharge of urban raw sewage and lack of sewage treatment, poor sanitation, urban surface pollution entering the drainage system and rivers, solid waste ending up in water bodies, intermixing of urban and industrial polluted water in reservoirs and canals (for example, Cirata/Saguling reservoir, West Tarum canal, Surabaya River), and sedimentation. During dry season the raw water pollution at intakes in some urban areas is so high that treatment facilities are unable to cope with it, as in Surabaya, Jakarta. Much of the fecal material enters into water bodies that seasonally result in health problems. In many locations untreated or inadequately treated industrial wastewater enters bodies of

[2] For greater detail, see T. Herman, (2000).

water. Textile and process industries generate large amounts of wastewater that are partially treated. In the lower reaches of the rivers, where urban centers are located, the dilution capacity in the rivers is reduced in the dry season because of heavy demand in upstream areas and lack of allocation for environmental needs. In the urban areas groundwater pollution, especially of the shallow groundwater, is due to septic tank leakage, entering of small- to medium-size industry waste through percolation, water percolation from improperly developed solid waste dumps, and over abstraction resulting in the release of pollutants from organic deposits in the coastal regions. In many locations seawater intrusion into groundwater bodies due to over abstraction of deep groundwater aquifers has resulted in salinity levels that render groundwater unusable, such as in Jakarta, Semarang, and Surabaya.

Previous laws and regulations on pollution control (water quality) have been inadequate. The regulatory institutions are institutionally very weak and lack resources to monitor and enforce regulations. The emphasis on economic development and support of export related industries has been a disincentive in enforcing regulations on pollution control. Rapid urban growth and lack of resources to address sanitation, sewage, and solid waste have resulted in increased urban pollution.

Beginning in the 1980s the country launched an industrial pollution abatement program called PROKASIH (Clean River Program), which aims at improving surface water quality through reducing industrial pollution. Under this program 37 rivers in 17 provinces have been targeted involving nearly 1,275 industrial plants. Through incentives and the regulatory approach, reasonable success has been achieved in improving water quality of effluent from high polluting industries such as paper and pulp industries, textile industries, and some leather industries. In the next phase of the program a more integrated approach encompassing all regions of the rivers' watershed will be attempted.

Abating urban pollution and improving water quality in the major drainage systems and urban reaches of rivers continues to be a problem. Under the Integrated Urban Infrastructure Development Programs (IUIDP) efforts have continued for the last 15 years to improve urban sanitation drainage and solid waste disposal. However, investment in sewage treatment is minimal. The regulatory laws are weak, and there is a lack of political will to invest in sewage and sanitation improvement. Cost recovery has been a major issue. As part of the water sector reform the government has issued a new regulation (No. 82/2001) on water quality management that for the first time harmonizes the water resources and environmental (water quality) management and brings under its purview urban and municipal water pollution. Water quality management at the basin level is being strengthened through a more effective, enforceable, and sustainable regulatory and financial framework. The river basin management agencies are being strengthened to improve water quality monitoring and, in cooperation with other regional agencies, gradually improve basin level water quality management.

15. FLOOD CONTROL

Flooding of low lands and in urban areas has been a perennial problem in many of the river basins. Both large river basins and small river basins experience severe flooding conditions due to**:** (i) increase in flood peaks due to changing land use and severe deforestation, (ii) inadequate capacities of the river channel in the middle and lower reaches, (iii) high levels of sedimentation impacting the river morphology and causing river mouth problems, (iv) lack of flood plain and its encroachment both in rural and urban areas, (v) lack of land-use zoning and enforcement of land-use controls, (vi) inadequate urban drainage and disposal of solid waste into river channels, (viii) urban land subsidence due to over abstraction of groundwater (Jakarta, Surabaya, Semarang), (viii) poor maintenance of flood infrastructure and lack of funding, and (ix) institutional weakness in flood management.

Of the 5,590 rivers, about 600 rivers cause significant flooding to about 1.4 million ha comprising urban and rural communities, industrial and agricultural areas, and all types of transportation facilities. On average, about 100,000 ha of rice fields are flooded annually. Current flood infrastructure is comprised of about 2,600 km of dike (8% of total required) and 1,500 km of river normalization (10% of total required), which protects about 420,000 ha (30% of flood-prone area) with return periods varying from 5 to 25 years. Resource constraints permit construction annually of only about 300 km of dikes and 300 km of river normalization, which is a fraction of the infrastructure required.

Many major urban centers in Java, Sumatra, and Sulawesi located near the coastal areas experience flooding annually, do to both the lack of drainage facilities and flood flows from upstream. The extent of the flood problem can be gauged from the events in the flood season of 2002-2003. Torrential rains during the 2002 rainy season caused severe floods, especially on Java Island. Around 90 people were killed or missing, 380,000 people had to be evacuated, some 400,000 ha of urban area were partly flooded and 48,000 ha of agricultural land were submerged. The total damage was estimated at US$200 million. On other islands flooding caused around 189 deaths, 122,755 people to be evacuated, 12,300 ha of urban area, and 88,400 ha of agricultural land to be inundated. The damage to public facilities alone was estimated to be around US$110 million. In the 2003 flood season devastating floods have occurred in North Sumatra (November 2, 2003 floods in Bohorok north of Medan) where about 125 people died as well as in Central Java (districts of Banyumas and Cilicap), in South Lampung and in East Java causing losses to property and life. Disruption of transportation due to flooding has been a major problem.

In a number of river basins (Brantas, Solo, Cimanuk, Citanduy, Jratunseluna, Deli, Serayu – Bogowonto) and urban centers (Jabotabek, Bandung, Semarang, Surabaya, Makasar, Medan), flood control infrastructure has been implemented to provide flood protection for return periods of 10 to 25 years. Much of this infrastructure was implemented in the two decades

from 1975 to 1995. However, the level of investment since then for flood protection has tapered off. In Java, the North Coast and South Coast flood projects (funded by ADB loans) provide for flood works in some of the smaller river basins.

In the past (1970s and 1980s), flood control programs primarily consisted of developing infrastructure for large river basins to protect the rice fields and major urban centers. This required large investments. Since then, lack of a structured O&M program and its funding has resulted in deterioration of the infrastructure. The institutional aspects of flood management remain weak. Flood protection was deemed to be a social service and hence cost recovery (direct or indirect) policies were not instituted. The subsector remains fully subsidized. This coupled with a non-existent O&M program has adversely affected flood control and its management. Non-structural measures such as flood zoning, establishing river corridors, flood proofing, flood warning, and flood fighting were not given adequate attention.

Since the mid-1990s the emphasis in flood control has gradually shifted to strengthening the institutional aspects (hydrology, flood fighting, flood warning, flood management); albeit these aspects are still weak. The importance of O&M, river channel improvement, and a strong basin-wide organization to manage floods has been recognized. The urban programs address managing solid waste and improving the micro and major drains in urban areas, thus helping flood alleviation. However, the country has not come to grips with the deforestation and watershed erosion issues, a major cause of flooding. In major urban centers efforts are being made to improve the river channels and river mouths through dredging, removing settlers from the flood plain, and preventing solid waste from entering the river channels. The implementation of non-structural measures is still in its infancy.

A major constraint is the lack of available resources for the flood program. Funding levels for O&M and flood management remain poor. Lack of a betterment levy or other forms of direct cost recovery or any form of tied, indirect cost recovery, such as a flood cess from a property or land tax has limited the investment in this subsector.

16. AGRICULTURE SECTOR GOVERNANCE

Since the achievement of self-sufficiency in rice production in 1984, there has been a gradual shift in agricultural sector policy towards decentralization of agricultural programs and activities. A measure of relaxing state control over agricultural production subsequent to achieving rice self-sufficiency was reflected in the fact that the cropping pattern in irrigated agriculture was no longer dictated by the government but left to the farmers to decide. Similarly, much of the decision-making related to agricultural inputs, crop production, post harvesting, marketing, and other related issues was left to the local government and farmer groups to decide. However, policies and programs related to input subsidies, floor price for

crops, food import, and distribution remained with the state. As in other sectors, the recent changes in the political system (May 1998 onwards) and the enactment of the laws on government and fiscal decentralization (1999 and 2004) have created the necessary condition for shifting decision-making to the appropriate lowest level and strengthening of the fiscal resources at the local government levels to fund the programs for which they are responsible.

The big bang decentralization that began altering the fiscal and administrative relations between the central and local governments in 1999 is influenced by (i) regulatory systems in the sector having difficulty maintaining nationally coherent frameworks for lack of decentralized implementing capacity and (ii) the public and private roles being reassessed for crop production, extension, marketing research, animal husbandry services, and others. The Ministry of Agriculture (MOA) is strongly supportive of decentralization while changing its role from decision maker to one of facilitator and is beginning to develop tools such as fiscal incentives through budget mechanisms (the DAK or earmarked transfer of fiscal resources) to enable it to work collaboratively with local governments to maintain national systems where these are critical to farmer welfare but are unlikely to be handled adequately by local governments (district level) individually. The MOA has also moved to create the incentive mechanism through decentralization of its budget. For example, in FY 2002 it provided fiscal support to over 100 district level governments for implementing a unified agency model for extension delivery.

Local governments at the District level are playing an increasing influential role across elements related to rural agricultural productivity. Rapid decentralization has not yet resulted in clear gains on responsiveness to local constituencies while additional burdens are emerging due to additional fees, taxation, and local regulations. Efforts are underway to assist districts make proper choices in agricultural development strategy and expenditure as well as to strengthen local government decision-making and transparency.

An important element of agriculture sector reform is the decentralized authority of land management (Government Regulation 34/ 2003). According to this regulation nine activities are now with the local governments. These are: (i) issuing location permits; (ii) appropriating land in the public interest; (iii) settling cultivated land disputes; (iv) determining compensation for land appropriated for development; (v) distributing and compensating for land held in excess of standards; (vi) determining and resolving ulayat land problems; (vii) resolving un-utilized land; (viii) providing land opening permits, and (ix) planning land use under local government jurisdiction. This regulation also defines the responsibilities between BPN (National Land Administration Agency), a central agency that reports directly to the president through a network of provincial offices in every province, land offices in 293 kabupaten/ kotamadya, and some representatives at the sub-district level. Land title certification is still carried out by BPN, but the 10 activities listed above are now with the local governments.

These functions have been transferred without transferring personnel, buildings, and other assets to local governments to undertake these functions fully and effectively. The new proposed World Bank Land Management and Policy Development Implementation Project will support the implementation of this regulation and provide support to a few local governments to undertake their new functions.

Indonesia in the past concentrated on broad based growth in rural agricultural productivity through public sector research and extension institutions. These are facing severe challenges to remain viable under pressure from staff and budget decentralization, demands for greater client orientation, and increasing need to accommodate commercial pressures. The central government is now aiming at a greater role for private participation, an increased reliance on rural producer organizations, and decentralization of authority and budget responsibility. Despite over 30,000 public extension agents, Indonesia's national extension system was not reaching farmers. The basic reform that began in 1999 combined the five separate commodity defined technical services into a single unified district level extension agency which would take a farming systems approach to meet farmers' extension needs. Initially 20 of the nation's more than 350 districts would pilot the new approach. The District Extension Committees, each with a majority of non-government members, are expected to improve comprehensive extension planning (of both public and private capacities), as well as transparency of public resource use.

Market weaknesses are also pervasive for small farmer activities. Insurance instruments for managing production risks are non-existent. There is significant unmet demand for rural and microfinancing due to information asymmetries, lack of legal and regulatory framework, distortions caused by government interventions (subsidies, debt-forgiveness), and rural producers have limited access to information and technology due to poor performance of these elements. The Ministry of Agriculture is moving strongly to improve the environment for small- and medium-scale enterprises, simplify taxation, regulate, and license, access to market information and availability of financial services. The emphasis will be on farming within competitive marketing and agribusiness linkages. Strengthening of agriculture sector governance requires identifying and communicating the objectives more clearly to lower level agencies and farmers, ensuring cost-sharing with district budgets, enabling districts to establish practical plans for achieving shared outcome of objectives, and for credible monitoring of results. Overall the decentralization effort in the agricultural sector has moved forward much faster, and much of the decision-making is left to the district level governments with some input from farmer organizations.

17. FORESTRY SECTOR GOVERNANCE

Indonesia has one of the largest forestry resources of any nation. The 1997 estimate of gross forest area nationwide amounted to 100 million ha (52% of the land area of the country). Of this, the three islands of Sumatra, Kalimantan, and Sulawesi account for 69 million ha. Prior to 1997, resource related exports from the natural forest were an engine of economic growth. Forest based exports rose from around $200 million in the early 1980s to about $20 billion, or 10%, of GDP in 1997. Royalties and other government revenues from forest operation exceeded $1.1 billion per annum. Forest related employment is estimated to be about 800,000 jobs in the formal sector, and many more are engaged in the non-traded forest products sector. Previous governments' efforts to bring production forests under sustainable management have been weak. Theft and destruction of tree crops and industrial timber plantations (about US$3 billion of losses in 1998), disastrous forest fires (1997-98), inadequate planning, lack of consultation with stakeholders, poor regulatory system and enforcement, widespread social unrest in forest communities as well as endemic collusion and corruption in forest land conversion has resulted in a management that is anything but sustainable.

The basic problem in the forestry sector is the country's high rate of deforestation. Outside of Java, well over 20 million ha of forest have been lost over the past twelve years as indicated by new maps completed by the Ministry of Forestry and Estate Crops (MoFEC) for Kalimantan, Sumatra, Sulawesi, and Irian Jaya. The current average deforestation rate of 1.7 million ha /year is substantially higher than the previously accepted deforestation rate of 0.6 to 1.3 million ha /year (World Bank, 1994). Kalimantan, which has nearly 40% of the forest land (40 million ha), is now estimated to have about 31 million ha. It is estimated that only 66% of the production forest in the country has forest cover. Both Sumatra and Sulawesi islands have been affected the most as they are more accessible, have the greatest potential for plantation and other large-scale development and were impacted by the transmigration program.

The production forest management by concession (Hak Pengusaha Hutan or HPH) and the oversight of that management by government has not achieved the goal of sustainability. Of the 60 million ha of forest land currently or formerly under HPH, 16% of land under management of concessionaires has been mismanaged, nearly 5% has been converted to other uses, and only for 40% of the area the HPH concession has been renewed. Illegal logging is one of the main causes of the rapid deforestation. For example, in 1997 total consumption of timber was estimated to be 86.5 million m^3 (Mario Boccucci, 2003). The officially reported timber harvest for that year was only 30 million m^3. Pulp imports and domestic waste paper recycling was estimated to be about 15.5 million m^3. Thus, the shortfall of 41 million m^3 (47% of demand) would have been met by illegal logging. Over capacity of the wood processing industry also contributes to illegal logging.

Forestry Management: The forestry sector management and the authority in decision-making have undergone changes over the past half-century. From the mid-1950s until late in the 1960s, authority to manage forest resources was vested in the provincial governments. Based on Law 1/1957 and government Regulation 64/1957, provinces had the authority to administer both production and protection functions including (i) issue of forest exploitation and extraction permits; (ii) levy taxes on permit holders; (iii) regulate and implement forest protection; and (iv) regulate the transport of forest products. Central government was limited to formulating plans to guide provincial government.

With the advent of the New Order Government (1965), the authority for managing the forestry sector was moved to the center. Based on Law 5/1967, the authority over planning, administering, exploiting, and protecting forests was brought under the control of the Ministry of Forestry (MoF) in the center. The forest classification and planning by the center was made on an ad hoc basis without proper consideration given to ecological, economic, social, and cultural functions in a top-down manner. The central government's authority to grant permits and allocation of concessions for exploitation without local input or control marked the beginning of massive exploitation of the forestry resources to satisfy political and economic needs. As conflicts between local communities and concessionaires emerged, the center devolved to the provincial governments some control (such as granting harvesting rights for an area of 100 ha of forest) albeit very little over a span of 30 years. In 1985 (Government Regulation 28/1985), the center gave the provinces authority to carry out forest protection, but the center kept control over the policy aspects, leaving the technical functions of forestry protection to the provinces. Prior to the enactment of the autonomy laws (1999), the center granted some areas (Government Regulation 1998) of governance in the forestry sector to the region. The center's desire to retain control over the most lucrative aspects of the forestry sector was clear in the limited powers that were devolved to the provincial and district levels.

Following the enactment of the decentralization laws (Law 22/1999 and Law 25/1999), the center rushed through a new forestry law (Law 41/1999), which limited the actual decentralization to marginal functions contrary to the spirit of Law 22/1999. It provides for no decentralization of planning and management functions. The new government Regulation 34/ 2002 is considered by many as the most blatant attempt to re-centralize forest management. The regions' district levels are now openly contesting their authority in the forestry sector and are claiming their rights to forestry resources. There has been no follow up of fiscal decentralization, thus, preventing regions from the issuance of levies and taxes on forest lands and forest products. However, some regions have been de facto taking steps to levy taxes on wood products, wood transportation and forest use rights. It is expected that the new government to be installed in 2004 will have to address the decentralization issues in forestry sector.

Spatial Planning and Conflicts: So far all land classified as forest falls under the control of the Ministry of Forestry and Estate Crops. Despite efforts since 1992 to harmonize the forest boundary with provincial spatial plans, forestry sector officials made virtually all the decisions regarding the designations of land. The decision rarely took into account the views of the local communities. More often the rights to manage were given to parties outside the local communities causing dissatisfaction. The top-down approach in spatial planning has resulted in many forest use conflicts. The Dayak Benitian community revolt in the late 1990s is an example of top-down planning when an established land use management system under which the community derived cash income from fruit trees, rattan, honey, and timber was shifted in 1993 to become a transmigration colony and allowed to be developed as an industrial timber plantation. The conflict was suppressed by force.

Unlike the agricultural sector or even the water resources sector, the forestry sector has remained fully under the authority of the central government for the past 40 years. While some technical management has shifted to lower level governments, the policy, program, and decision-making authority continue to be vested in the center under the MoFEC. The 1999 autonomy and decentralization movement has had little impact so far. Lack of local inputs and decision-making at the appropriate levels coupled with the vested interest of the business sector has largely prevented the efforts to decentralize authority to the regions. The new government formed in the later part of 2004 needs to address the forestry sector governance and fiscal decentralization issues in a more rational manner.

18. RIVER BASIN MANAGEMENT

The concept of “One River, One Plan, One Management” was conceived in the mid-1970s but its implementation nationally had to wait for two decades. Prior to the country’s independence (1945), water resources development was primarily for irrigation (technical, semi-technical, and village) systems, which were mostly of the run-of-the-river type. Water management was limited to irrigation management as water demand for other purposes in the basin was negligible.

Over the generations Indonesia had developed traditional irrigated farming and water management systems, such as the Subak in Bali, Mitra Cai in West Java, Dharma Tirta in Central Java, Keujreun Blang in Aceh, Tua Banda in West Sumatra, Raja Bondar in Northern Sumatra, Montiri Siring in South Sumatra, ili-ili in Lampung and Tudang Sipulung in South Sulawesi. In fact these traditional water management practices for irrigation are still applied and maintained by the present day farmers, especially in the non-technical irrigation systems in many parts of the country.

In 1969, Indonesia established the first river basin agency, called the Jatiluhur Corporation, in the Citarum River basin in West Java, on the pattern of the Tennessee Valley Authority (TVA) in the United States. This state owned company (BUMN), now known as the Citarum River Basin Management Corporation or Perum Jasa Tirta II (PJT-II), was established to construct and operate the Jatiluhur multipurpose dam, the hydropower plant, the nation's largest irrigation system to irrigate 240,000 ha of rice fields, supply of raw water to Jakarta (currently 18 m^3/s) the nation's capital, for reservoir fisheries and tourism. In 1990, the development role of the corporation was shifted to a project organization thus leaving PJT-II to operate, maintain, and manage the entire infrastructure in the Citarum basin downstream of the Jatiluhur Reservoir.

The central government set up a second public sector corporation for the Brantas basin in 1990 to operate, maintain, and manage all of the major infrastructure constructed in the previous three decades and to manage water resources in the Brantas River and 40 of the basin's major tributaries. This corporation, now known as Perum Jasa Tirta I (PJT-I), has no role in developmental activity and acts as a basin manager under the supervision of the Ministry of Public Works. The corporation's role and management issues are discussed in later sections of this paper.

Parallel to this, in 1969 the government established nine river basin development agencies under the Directorate General of Water Resources and Development (DGWRD), Ministry of Public Works, known as "Proyek Induks", for some of the more important river basins (Citanduy, Citarum, Jratunseluna, Solo, Cisadane, Ciujung-Ciliman, Way Seputih-Way Sekampung, Bili-Bili, and Cimanuk). These center-managed agencies were created to accelerate development based on the river basin approach and to address river basin management issues. Master plans were developed, and projects (reservoirs, flood control, river improvement, hydropower, new irrigation system and rehabilitation of old irrigation systems, and improvement of watershed) were implemented in a phased manner with most from external assistance. A primary goal was to achieve rice self-sufficiency (achieved in 1984) through irrigated agriculture and improvements in agricultural systems. The central government undertook planning activities in coordination with provincial agencies such as the Provincial Planning Board (Bappeda), Provincial Public Works (Dinas PUP) and other related agencies. The center fully funded the program of planning, design, and development. While the decision on development was the central agencies' responsibility, the provincial and district level agencies were part of the decision-making process. Direct beneficiary input was limited, except in the area of tertiary irrigation systems. Though the central agencies undertook the development, the operation, maintenance, and management of the irrigation systems remained with the provincial agencies and their field organizations known as Cabangs. All other management aspects (river management, flood management, etc.) remained with the Proyek Induk. In basins that did not have a Proyek Induk-type

organization, central programs in water resources were implemented through a project system. Provincial agencies also implemented small-scale programs, primarily in irrigation, funded from their resources through the Cabangs or projects.

With the slowing down of basin development activities in the mid-1990s due to lack of resources and the desire of the provincial governments to take on a greater role in water resources development and management through deconcentration and decentralization processes, these large basin agencies became operators of the infrastructure that they were responsible for implementing or rehabilitating. In recent years the central funding of the Proyek Induks for O&M has further decreased, and these agencies find it difficult to manage the basin infrastructure resulting in a gradual deterioration of the infrastructure and its operation. Gradually this infrastructure is being transferred to the provincial Dinas PUP organizations. The shifting of the irrigation sub-sector to the autonomous district level governments since 2000 and the enhanced role of provincial agencies in basin WRM, except in a few cases, where self-financing public sector corporation (central or regional) exists, will further diminish the role of these centrally managed basin agencies, or Proyek Induks.

Beginning in the mid-1990s there has been a gradual awareness in the water sector of sustainable WRM based on an integrated approach to manage both quantity and quality of basins' water resources. This was necessitated due to seasonal water shortages, conflicts between users and types of users, greater demand for non-agricultural uses, degradation of water quality due to urban and industrial pollution, and need for improved flood management. Both the central and provincial governments undertook initiatives to come up with a new institutional and organizational framework for basin WRM. The need to shift from a developmental mode to a management mode in water sector was recognized. The importance of participatory irrigation management in arresting the deterioration of the irrigation system and improving the resource base through farmer contribution was identified. These concepts took shape as a result of the Cisarua International Water Resources Conference held in 1992. To support these initiatives a water sector loan from the World Bank for the Java Irrigation Improvement and Water Resources Management Project (JIWMP) was negotiated in 1994. The important reform that came out of the policy initiative related to the WRM institutional aspects under this project were**:**

(i) The establishment of provincial and basin level coordinating institutions for water resource policy, strategy, and program; and

(ii) River territory (SWS) based provincial level management agencies under the provincial Dinas PUPs known as river basin agencies or Balai PSDAs as managers of basin surface water resources.

Necessary central and provincial legal instruments were established to launch these institutions. What started as pilot agencies in selected SWS in 1995 have by the end of 2003 spread to all of the SWS in Java (five provinces) and to the SWS in six Off-Java provinces (North Sumatra, South Sumatra, West Sumatra, Lampung, South Sulawesi and Nusa Tengara Timur). All of these provinces have established the provincial level coordinating bodies known as Panitya Tata Pengaturan Air (PTPA, or Provincial Water Resource Council) and a number of SWS-level coordinating bodies known as Panitya Pelaksanaan Tata Pengaturan Air (PPTPA, or Basin Water Resource Council). There are now 23 Balai PSDAs covering all of the river basins in Java and 19 Balai PSDAs in the five off-Java provinces. A Dutch Grant under the Indonesia Water Resources and Irrigation Reform Implementation Project (IWIRIP) supports the off-Java WRM activities. The Balai PSDA agencies currently are focusing on a few of the WRM activities such as (i) hydrology, (ii) database and GIS, (iii) water allocation, (iv) water quality management, (v) flood management, and (vi) river management. The type and level of management activities are decided by local initiatives and are funded both by central and provincial resources. Greater importance is being given to the human resource development and program management functions.

19. WATER RESOURCES SECTOR REFORM

In a continuing desire to improve water sector performance, in 1999 the government initiated a major sector reform program that embodies four main objectives under the Water Sector Loan (WATSAL) project supported by the World Bank. This loan is part of the IMF recovery package for Indonesia and was terminated by the end of 2004. The four main objectives are**:**

(i) Improved policy, legal, and institutional approach and an MIS/Database framework,

(ii) Improved river basin management institutions,

(iii) Improved water quality management institutions, and

(iv) Improved irrigation management institutions based on farmer participatory approach.

The centerpiece of the reform is the new Water Law No.7/2004, which was debated in Parliament for over eight months, for the first time addresses issues related to water rights, beneficiary participation, cost recovery, basin planning and management based on an integrative approach, regional authority over basin, formation of central or regional public sector corporations that are self-financing, formation of a National Water Council and Regional Water Councils with stakeholder participation, etc.

A major drawback of the new water law is related to irrigation management and its cost recovery. The water sector reform under Government Regulation 77/2001 envisaged launching the Irrigation Management Transfer Program (IMT) under which part of the

management of the irrigation system and associated decision-making would be transferred to the farmers association known as Water Users Association (WUA) or GP3A. This would not only permit WUA/Farmer Federations to invest in rehabilitation, upgrading, and O&M of the primary, secondary, and tertiary systems but also permit them to undertake civil works through contracts, or self-help (Swaklola). The new water law has, however, reversed this by restricting farmer associations' role to the tertiary system while giving the authority for funding and management of primary and secondary systems to the government. It has further restricted the decentralization approach by allocating all authority for irrigation systems larger than 3,000 ha to the center and for irrigation systems from 1,000 ha to 3,000 ha to the provincial governments. Only irrigation systems below 1,000 ha will be under the authority of the district level governments. The Ministry of Public Works is now in the process of revising the Government Regulation on Irrigation 77/2001 to correspond to the new water law, which permits a participatory approach by the WUA/GP3A as against an IMT approach. Many of the district level governments, farmers' organizations, and NGOs are voicing their concerns at this reversal of the reform process. World Bank discussions held in November- December 2004 with the Ministry of Public Works indicates that the revised Government Regulation on Irrigation will ensure a significant role for the WUA/GP3A in the irrigation system management under the principle of participatory approach. The issue of this Government Regulation has been delayed because of the ongoing review of the Water Law 7/2004 by the Constitutional Court.

The new water law exempts all sustenance farmers (farmers having less than 2 ha and growing food crops) from paying the WRM and service fees. It also exempts all public irrigation systems from obtaining license making water use rights (WUR) an administrative issue. Since in 90% of the public irrigation systems the land holdings are less than 2 ha, this will exempt a major segment of water users from paying service charges. Without cost recovery, the government may find it difficult to fund upgrading and O&M for public irrigation systems at a sustainable level.

A number of government regulations have been drafted to support the new water law and are in the process of being finalized. Issuance of this Government Regulation was made part of the 100 day action plan of the new President inaugurated in October 2004. However, as mentioned earlier, this has been delayed due to the review of the water law by the Constitutional Court. For details of the sector reform and the institutional framework that is underway reference should be made to the paper on "Development of Effective Water Management Institution – Indonesia", August 2002.

20. BRANTAS RIVER BASIN

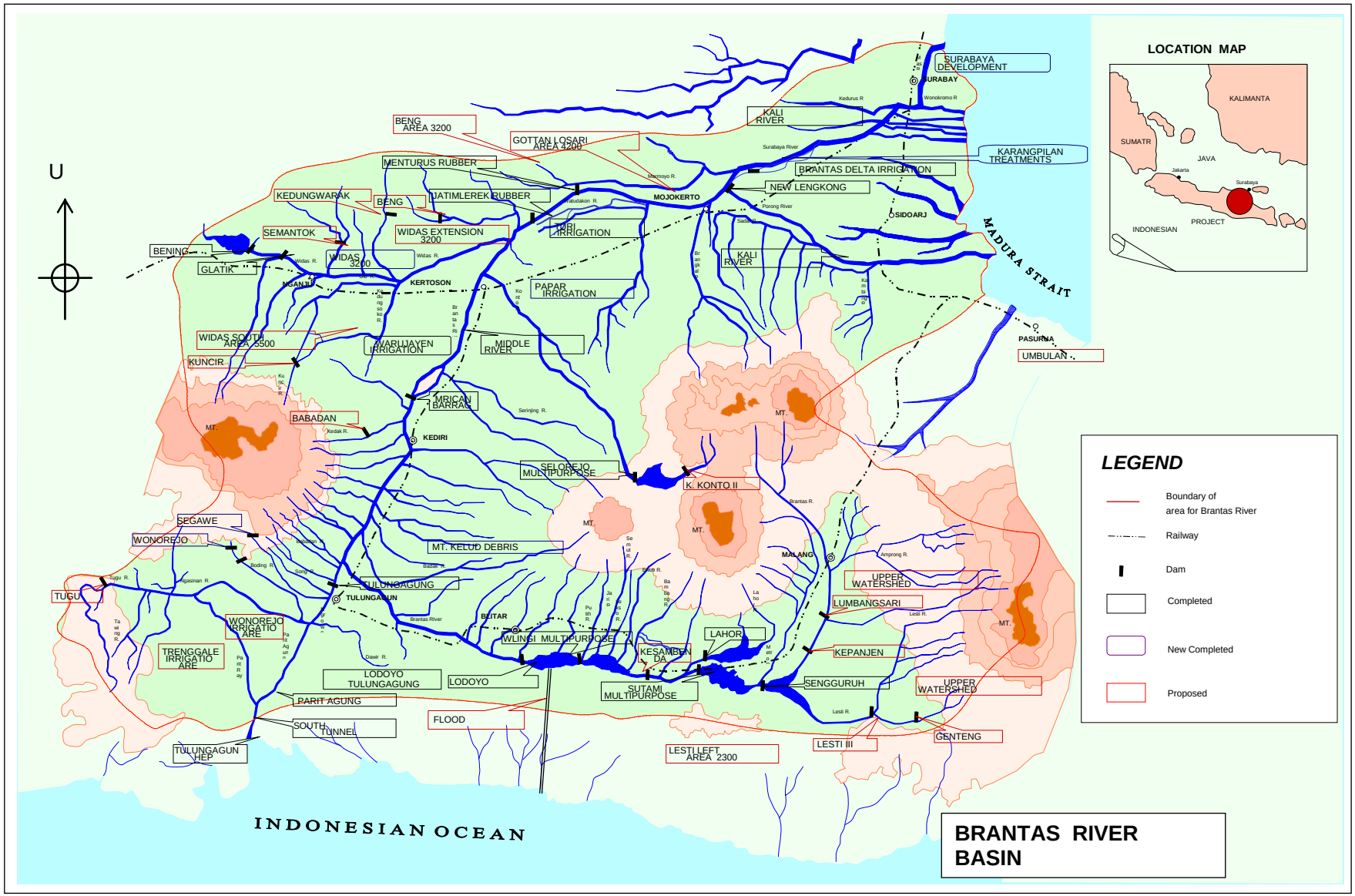
The Brantas River basin is located in East Java province on the island of Java, Indonesia and lies between 110^o 30' and 112^o 55' east longitude and 7^o 01' and 8^o 15' south latitude. The basin is bounded by Mt. Bromo (2,393 m) and Mt. Semeru (3,676 m) in the east, a series of low kidul ridges (elevation 300 to 500 m) in the south, Mt. Wilis (2,169 m) and its ridges in the west and Kedung low ridges with the Madura Strait in the north. In the middle of the basin is the Arjuno mountain complex consisting of Mt. Arjuno (3,339 m), Mt. Butak (2,868 m) and Mt. Kelud (1,731 m). The basin covers nine regencies or districts: Sidoarjo, Mojokerto, Malang, Blitar, Kediri, Nganjuk, Jombang, Tulungagung, Trenggalek and five urban centers or municipalities; Surabaya (capital of East Java), Mojokerto, Malang, Kediri, Blitar. These regencies and urban centers are now decentralized and autonomous regions under Law 22/1999 and Law 25/1999. The basin has two active volcanoes, Mt. Semeru on the eastern boundary and Mt. Kelud in the center. Mt. Semeru erupts frequently, but much of the ashes fall outside the basin. Mt. Kelud has had major eruptions in 1901, 1919, 1951, 1966 and 1990 in the 20^{th} century causing considerable loss of human life and property damage. The large amount of volcanic debris and ash has caused aggradations of river beds and reservoir sedimentation. The average cycle of eruption is estimated to be 15 years and average amount of erupted material is estimated to be about 200 million m^3.

Brantas River has a watershed area of about 11,800 km^2 and stretches 320 km from its spring at Mt. Arjuno to the point where it branches into two rivers, the Surabaya River and the Porong River, both of which drain into the Madura Strait. The Brantas River (see Figure 1) flows clockwise with Mt. Arjuno and Mt. Kelud as its center. At the end of its southward journey, the Brantas River joins the Lesti River on the left bank and Metro River on the right bank at a point where it starts its westward flow and upstream of the Sutami multipurpose dam. The total catchment area at the Sutami dam site is about 2,050 km^2 including 625 km^2 of the Lesti River basin. The average river bed slope in the upper reaches is around 1 in 200. The Brantas River, where it turns north-northwestward, joins with the Ngrowo River where the catchments area is around 3,600 km^2. As a result of past drainage works (to reduce flood flows in Brantas), water from about 1,300 km^2 of the Ngrowo basin drains into the ocean to the south. Only about 177 km^2 of the Ngrowo River basin now drains into the Brantas River. At this point the river slope is of the order of 1 in 1000. The tributaries in this reach originating from the southern slope of Mt. Kelud carry large amounts of sediment load erupted from Mt. Kelud.

After joining the Ngrowo River, the Brantas River flows in a northwesterly direction up to Kertosono and then turns eastward up to Mojokerto, where it branches into the Porong and Surabaya Rivers. The Brantas River catchment area at this location (Lengkong Dam site) is

about 8,650 km^2. In this reach the tributaries are Widas, Konto, and others originating from Mt. Arjuno. The average bed slope here is about 1 in 2000. The Porong and Surabaya Rivers flow through a flat plain at an elevation of 25 m. Porong River acts as a flood diversion channel while Surabaya River provides the water supply to Surabaya City and acts as the main drain for the urban area. The details of the Brantas basin are presented in Figure 1.

Figure 1: Brantas River Basin Index Map



In all there are 1,555 rivers and tributaries of order 1, 2, 3 and 4 in the Brantas Basin. The basin consists of six main sub-basins with catchment areas Table 5 below.

Table 5: Sub-Basins with Corresponding Catchment Area Size, Brantas River Basin

Sub-Basin	Catchment Area (km^2)
Lesti Basin	625
Konto Basin	687
Widas Basin	1,539
Brantas Basin	6,719
Ngrowo Basin	1,600
Surabaya Basin	631

The climate in the basin is dominated by tropical monsoons. The rainy season is normally from November to April, and the dry season is from May to October. The annual mean temperature in the basin ranges from 24.2C to 26.6C. The average rainfall over the basin is around 2,000 mm of which more than 80% occurs in the rainy season. Variation of rainfall is large. In wet years it is around 2,960 mm, and in dry years (one in three years on average) it is around 1,370 mm. The average rainfall in the higher elevation, especially in the southern and western slopes of Mt. Kelod is between 3,000 mm and 4,000 mm. The yearly mean relative humidity ranges from 75% to 82%.

The average annual surface water potential in the Brantas basin is estimated to be approximately 12 billion m^3 while the average annual flow that can be regulated is estimated to be about 3 billion m^3 or 25% of available surface water. The average annual and monthly discharges in the Brantas River basin are presented in Table 6. The average annual flow in the upstream reach is around 823 m^3/s, midstream 3,859 m^3/s and downstream is 5,300 m^3/s (total of Surabaya and Porong river gages).

Table 6: Average Annual Monthly River Discharge (1997-2000), Brantas River Basin (in m^3/s)

	River Basin (Station)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Brantas River	Brantas U/S (Gadang)	1380	1071	1045	1111	790	544	487	431	412	576	922	1110	823
	Brantas Mid (Kediri)	4293	4620	6764	6426	4232	2765	2407	1900	1800	2669	4615	3793	3857
	Brantas D/S (Porong)	5926	6741	8273	7172	3143	1502	1261	752	1002	1470	4037	4072	3779
Tributaries	Lesti (Tawangrejeni)	380	429	537	565	454	338	290	257	251	341	407	340	382
	Widas (Lengkong-widas)	2244	2892	2922	2440	938	631	659	406	236	613	1099	1624	1392
	Surabaya (Perning)	2228	2406	2286	1844	1306	1106	1091	927	889	1074	1436	1659	1521
	Ngrowo (Bendo)	606	352	733	477	519	348	363	195	306	463	696	464	460

Source: Brantas PJT1 Hydrology Database.

Groundwater potential, though not extensive, is much larger compared to the other regions of Java. Much of it is in the regencies of Madura, Surabaya, and Madiun. In all about 1,683 tube wells (shallow/medium/deep) exist in East Java irrigating about 41,000 ha. In the Brantas basin there are 447 deep wells irrigating around 25,730 ha. The 2002 monitoring survey indicates that 48% of these wells are damaged. Rural water supply in much of the basin is from shallow groundwater while the large municipalities (Surabaya, Mojokerto, Kediri, Malang, etc.) have a significant portion of the water supply from deep wells. There are 38 deep wells for raw water and nearly 27,600 shallow wells in rural areas.

The Brantas basin has eight large reservoirs with a total gross storage capacity of 647 million m^3 and effective storage capacity of 479 million m^3. Because of sedimentation the gross and effective storage are now down to 405 million m^3 (62.6%) and 343 million m^3 (71.6%) respectively. Table 7 presents the year these reservoirs were constructed and the initial and present capacities in million m^3. Also indicated in Table 7 are the major infrastructure such as barrages, pumping stations, diversion gates, and tunnels. The net asset value of this infrastructure in 2000 Rupiah value is R_P 7.384 trillion (US$869 million).[3]

[3] US$1.00 = R_P 8,500

Table 7: Major Infrastructure, Brantas River Basin

No.	Name of Infrastructure			
			Gross	
		Yr	Capacity mcm	
A	**Reservoir**	Constructed	Initial	Now
1	Sengguruh	1988	21.5	3.52
2	Sutami	1972	343	176.31
3	Lahor	1977	36.1	32.01
4	Wlingi	1977	24	3.97
5	Selorejo	1970	62.3	42.69
6	Bening	1981	32.9	24.16
7	Wonorejo	2001	121.5	121.48
8	Lodoyo	1980	5.8	2.03
B	**Barrage, Gate, Tunnel and Pumping Station Barrage**			
1	Lodoyo			
2	Mrican			
3	Jatimlerek			
4	Menturus			
5	Lengkong Baru			
6	Gunungsari			
7	Jagir			
8	Gubeng			
9	Segawe			
10	Tiudan			
	Gate			
11	P.A. Mlirip			
12	P.A. Wonokromo			
	Tunnel			
13	Terowongan Tagung Selatan			
	Pump Station			
14	Pump Station Tulungagung			

Note:
1. Net Asset Value of Major Infrastructure in Brantas Basin in FY 2000 Rupiah Value is Rp. 7.384 trillion.
2. Effective storage of reservoir now is estimated to be 71.7% due to sedimentation.

21. BRANTAS BASIN DEVELOPMENT

The Brantas River originating from a spring in Sumberbrantas village has been subjected to the erratic and frequent eruptions of Mt. Kelud (recorded as far back as 1000 AD) that has affected the river morphology but has created a fertile basin that supports agriculture. The availability of abundant water supply and the fertile area resulted in rapid development, first in

the downstream area, which gradually spread upstream. As early as the end of the 19th century, Surabaya River started having difficulty in terms of navigation during the dry season. The 16 or so sugar cane factories established since the middle of the 19th century and the Brantas delta irrigation area that was developed (Lengkong barrage, 1857) to cultivate sugar cane and the navigation system started facing water supply problems. The small irrigation systems were gradually integrated into larger irrigation systems. Dikes, which were constructed to minimize local flooding, were gradually unified and extended to cover reaches from the estuary to the middle stream. At the time of Indonesia's independence (1945) the Brantas basin was the most developed river basin for irrigated agriculture and flood protection.

Recent developments in the Brantas basin began with the help of the Japanese government as part of the war's reparations assistance. Under this assistance in 1961 a tunnel to drain the Ngrowo River basin water (tributary to the Brantas River) to the south was constructed to protect the Tulungagung area from flooding. It was then realized that future Brantas basin development had to be based on a "One River, One Plan, One Management" approach. In line with this, comprehensive basin plans were developed starting in 1961. These were periodically reviewed to take up further development in the basin. The planning and implementation phases undertaken so far are**:**

Master Plan-I (1961) that emphasized flood control by developing dams in the upper reaches and river improvement to increase channel capacity;

Master Plan-II (1973) that emphasized irrigation development to support government policy on rice self sufficiency by developing reservoir, barrages, and technical irrigation systems;

Master Plan-III (1985) that emphasized water supply for domestic and industrial users to support the government policy on industrialization and urban development through development of raw water systems and reservoirs; and

Master Plan-IV (1998) that emphasized conservation and basin water resource management to face the environmental and pollution problems through implementation of institutional approaches for proper water governance.

Japanese reparations, Yen loans, and OECF and JBIC grants supervised by OTCA and JICA supported all of the above plans and their implementation. While Nippon Koei, Co. Ltd., provided the survey, planning, design, and supervision capabilities; the Kajima Corporation offered construction guidance. In addition bilateral assistance for water quality management has been provided by the French and Austrian governments and by multilateral donors such as the World Bank and Asian Development Bank for improving the irrigation systems, its management, and basin water management.

The total development in the basin over the past four decades has resulted in the construction of eight reservoirs, four river improvement schemes, four barrages, three rubber dams and a number of irrigation system construction projects and improvements. Table 8 provides a list

of water resources infrastructure with its year of construction, river on which it is located and the purpose for which it is used.

Table 8: Dams and Barrages & Their Purpose, Brantas River Basin

No.	Structure		River	Purpose
A.	**Large Dams**			
	Selorejo Dam	(1970)	Konto	Water supply for irrigation, and additional supply for hydro power plants at the D/S[*)], hydro power
	Sutami Dam	(1972)	Brantas	Water supply for domestic, irrigation, industry, hydro power generation, flood control, recreation
	Lahor Dam	(1975)	Lahor	Water supply for domestic, irrigation, industry, flood control
	Wlingi Dam	(1978)	Brantas	Afterbay of Sutami Hydro power, water diversion for irrigation, hydro power generation, flood control, recreation
	Bening Dam	(1984)	Widas	Water supply for irrigation, hydro power generation, flood control, recreation
	Sengguruh Dam	(1988)	Lesti	Sediment control to Sutami reservoir, hydro power generation
	Wonorejo Dam	(2000)	Bodeng Song	Water supply for domestic, hydro power generation, flood control
B.	**Barrages**			
	New Lengkong	(1974)	Porong	Water diversion for irrigation, domestic, and industry
	Gunungsari	(1981)	Surabaya	Water diversion for irrigation
	Jagir (Rehabilitation)	(1981)	Wonokromo	Water diversion for domestic
	Lodoyo	(1983)	Brantas	Afterbay of Wlingi hydro power, hydro power generation
	Tulungagung Gate	(1986)	Ngrowo/Parit Agung Canal	Water regulation for domestic, hydro power, and flood control
	Wonokromo	(1990)	Mas	Flood control
	Mrican	(1992)	Brantas	Water diversion for irrigation
C.	**Rubber dams**			
	Gubeng	(1990)	Mas	Water diversion for domestic
	Jatimlerek	(1993)	Brantas	Water diversion for irrigation
	Menturus	(1993)	Brantas	Water diversion for irrigation

[*)] There is an existing hydropower plant in the downstream of Selorejo Dam (i.e., Mendalan & Siman HEPP).

22. WATER USES WITHIN THE BRANTAS RIVER BASIN

Present water use in the Brantas River basin is primarily for (i) irrigation, (ii) domestic water supply, (iii) industrial water supply, (iv) hydropower generation, (v) brackish water fish ponds, (vi) recreation and tourism, and (vii) river maintenance flow. The total average annual water utilization for the above uses is estimated to be 2,934 million m^3 and varies from 20% to 25% of the total available water. However, seasonal variations of the availability of water cause water supply shortages in some locations.

22.1 IRRIGATED AGRICULTURE

Irrigated agriculture is the largest water consumer in the Brantas basin. Table 9 provides details of the irrigated area (technical, semi-technical and village systems) in the Brantas basin under each of the sub-regions and in East Java as a whole. Of the 907,700 ha irrigated in East Java around 387,100 or 42.6% is in the Brantas basin. Of this nearly 84,000 ha is supplied from the Brantas River while the rest is served from its tributaries. The main crops in the irrigated area are paddy, sugar cane, maize, soybeans and peanuts, the later three crops grown primarily in the dry season are known as the polowijo crop. The total amount of water diverted for irrigation varies from 2,298 million m^3 per year to 2,448 million m^3 per year. In the dry season a very large proportion of the river flow in the rivers is diverted to irrigation schemes. In all about 70% to 80% of water use is for irrigated agriculture. A schematic of the irrigation schemes in the Brantas basin is presented in Figure 2.

Table 9: Irrigated Area, Brantas River Basin

Branch Irrigation Service Office	Type of Irrigation Area (ha)			
	Tech.	Semi - T.	Non - T.	Total
Malang	13,623	1,433	745	15,801
Kepanjen	16,493	5,420	5,303	27,216
Kediri	20,547	2,060	7,680	30,287
Tulungagung	15,585	6,072	1,747	23,404
Trenggalek *1	6,257	2,395	3,721	12,373
Blitar	23,984	2,880	6,086	32,950
Jombang	22,785	-	810	23,595
Mojoagung	22,070	-	1,509	23,579
Pare	18,700	-	1,072	19,772
Nganjuk	33,725	2,864	2,079	38,668
Mojokerto	20,877	7,353	3,315	31,545
Sidoarjo	27,073	765	602	28,440
Wonokromo/Surabaya	744	725	-	1,469
Basin Total	242,463	31,967	34,669	309,099
East Jawa Total	715,494	94,116	98,058	907,668
Basin/East Jawa	33.9%	34.0%	35.4%	34.1%

Source : Dinas PUP, East Java, 1996 Data from Records.

Note :

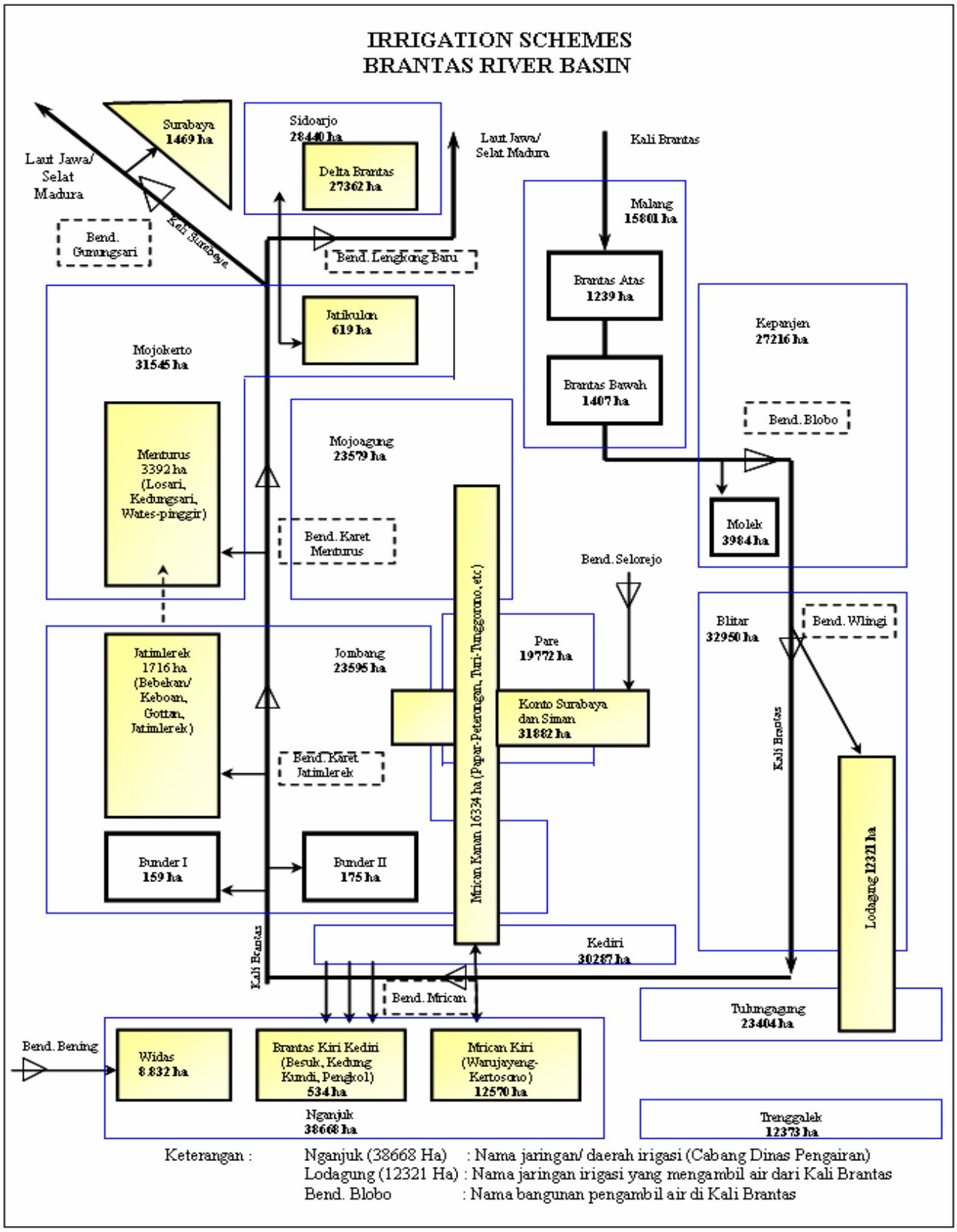
Technical : Technically designed headworks and canal system.

Semi Technical : Technically designed canal system with temporary diversion structure.

Non - Technical : Village irrigation system.

The total irrigated area has remained the same for about 20 years.

Figure 2: Irrigation Schemes, Brantas River Basin



The primary impact of development in the basin as it relates to agriculture is in the transformation from low-intensity agriculture to high-intensity agriculture. The cropping intensity in 1960 was around 0.8 but by 2000 had increased to 2.2 (see Table 10) while the area cultivated under irrigation increased from about 247,000 ha in 1970 to around 387,100 ha at present. The following table (Table 11) provides a comparison of the irrigated area and rice production in the years 1970 and 2000.

Table 10: Benefit Comparison, Brantas River Basin

	Benefit	Unit	Yr 1960	Yr 1990	Yr 2000
1	**Irrigation Water**				
	Cropping Intensity	per year	0.8	1.8	2.2
	Irrigated Area				
	Mainstream	ha	na	na	84000
	Total in Basin	ha	na	na	304000
2	**Domestic Water**	MCM / year	73	125	206
3	**Industrial Water**	MCM / year	50	115	129
4	**Electricity**				
	Installed Capacity	MW	31	233.7	240.2
	Production	Million kWH / year	170	910	1200
5	**Fisheries**	na	na	na	na
6	**Flood Control** [1]		Every Year [2]	None	None
7	**Water Quality**				
	BOD Average / year	mg / liter	na	12.0 - 16.0	3.6 - 14.6

[1] Flooding in the main Brantas river and its 40 major tributaries.
[2] Flooding estimated to be 60,000ha annually.

Source: From Brantas PJT1 Reports.

Table 11: Irrigated Agriculture Development, Brantas River Basin

Description	Unit	Year				Comparison			
		1970s		2000s		Brantas/E.Java		2000s/1970s	
		E. Java	Brantas	E. Java	Brantas	1970s	2000s	E. Java	Brantas
Rice									
a) Productions	Mill. Ton	4.66	1.43	9.22	2.99	0.31	0.32	1.98	2.10
b) Irrigated areas	10^3 ha	1,129.00	246.85	1,158.12	387.11	0.22	0.33	1.03	1.57
c) harvested area	10^3 ha	1,129.00	314.28	1,713.75	546.61	0.27	0.31	1.51	1.74
d)Yield per ha	Ton/ha	4.13	4.55	5.38	5.47	1.10	1.02	1.30	1.20

Source: Central Bureau of Statistics, Indonesia.

It is seen that in the three decades both the cropping intensity and per-hectare yields have increased due to improvement in rice variety, increased agricultural inputs, and provision of assured water supply in the dry season.

22.2 IRRIGATION MANAGEMENT

Irrigation management and decision making has primarily been a provincial subject. While the center has been investing in irrigation development and improvement activities, much of the water management and cropping pattern decisions are left to the district/provincial levels. At the lower end, the water user association (WUA) manages the water distribution and the O&M aspects in the tertiary blocks (50 to 150 ha in size) while the field offices (Cabangs) of the provincial agency were responsible up until 2000 for the water management aspects in the irrigation system, including its O&M. Since 2000 this responsibility has shifted to the district level agencies. The irrigation committee (consisting of various agencies but no stakeholders) at the district level decides on the cropping pattern for the next cropping season and the pattern of water allocation. In the case of the Brantas basin, the Provincial Water Resources Committee (PTPA) decides on the water allocation among various users from the resources, which determines the rule curve for operating the storages. In the absence of a water rights system, decisions on water diversion to irrigation systems is left to the water resource agency based on historical operation procedures and PTPA/PPTPA guidance. Conflicts among users in the irrigation system (upstream-downstream conflicts, conflicts between uses) are normally handled by the water agency through negotiations. In some cases there have been examples of exchange of water use rights between users and types of uses.

In the past three years East Java has implemented, on a pilot basis, the Irrigation Management Transfer program (IMT) in which part of the management and associated decision making is transferred to the Federation of WUA (GP3A). Stream level committees, known as Induks, work with the water agencies in deciding on the water allocation, O&M program, and management of the system. The GP3A in some cases have taken on small maintenance works. Currently there are about 11 Induks, 144 GP3A, and 963 WUA in East Java that are participating in this program. In the Brantas basin presently there are 2 Induks, 39 GP3A, and 286 WUA covering 33,362 ha that are functioning based on IMT principles. It is hoped that with the spread of the IMT program all irrigation systems and irrigation management will be fully decentralized so that the farmer organization in partnership with the district level water agencies makes all the decisions on the investment, operation, maintenance, and management aspects. This is also helping increase the farmer contribution towards O&M costs. However, as discussed earlier, the new Water Law (No. 7/2004) can set back the irrigation reform program in the Brantas basin.

22.3 DOMESTIC WATER SUPPLY

In the Brantas basin, raw water for domestic purposes is provided for fourteen regional water supply enterprises known as Perusahaan Daerah Air Minimum (PDAMs) that provide treated drinking water to urban areas. The domestic raw water supply in 1960 was around 73 mcm, which by 2000 increased to 206 mcm (See Table 10). In 2002 the total volume of water taken from the Brantas basin for domestic purposes was around 243 mcm. The two major PDAMs are the Surabaya and Malang PDAMs where piped water supply coverage is about 35.4% and 36.8%, respectively, with per capita consumption of 224 l/day and 147 l/day, respectively. The domestic water supply demand is rapidly increasing in Surabaya, and this may result in higher diversion from the Surabaya River, thus encroaching on the minimum river flows required during the dry season. Currently the Surabaya River's water quality (due to urban pollution) has been a limiting factor.

Domestic water supply is a fully decentralized activity. The PDAMs are managed as public corporations under the authority of the district government. The East Java Dinas PUP is the responsible agency (on behalf of provincial governor) for issuing licenses for raw water abstraction based on the recommendation of PJT-I while the Brantas Basin Corporation (PJT-I) is responsible for water allocation. On average, the Ministry of Public Works decides the the raw water tariff once every two years by the Ministry of Public Works, based on the recommendation of the provincial governor and is approved by Ministry of Finance. Currently the tariff is R_P 45/m^3 as against the computed cost of R_P 96.5/m^3. The conflict resolution role primarily rests with PJT-I.

22.4 INDUSTRIAL WATER SUPPLY

Due to reliability of water supply in the Brantas basin for industrial use and the port facilities in Surabaya, investment in industrial development has increased sharply. Total industrial production has increased from R_P 41.9 billion in 1970 to R_P 7,723 billion in 2000 and currently accounts for over 77% of East Java's industrial production. The industrial water demand in 1970 was around 50 mcm, and in 2000 it was 129 mcm (see Table 9). In 2002 around 141 mcm of industrial water was supplied from the Brantas River to over 120 registered industries. The biggest industrial consumers are the sugar factories, which take 33% of the total industrial demand. Since much of the sugar cane crushing takes place in the dry season, during low flow years, irrigation supplies are diverted to meet the industrial demand resulting in crop losses.

The industrial water supply is regulated by licenses issued by the provincial Dinas PUP on the recommendation of the PJT-I, which has responsibility for allocating water. The water tariff is normally revised at two-year intervals based on a tariff formula and decided by the Ministry of

Public Works based on the recommendation of the provincial governor. Currently the industry pays R_P 80/m^3 as against the computed cost of R_P 99.8/m^3. Much of the decision-making and authority in water allocation and tariffs rests with the provincial agencies.

22.5 HYDRO POWER

The total installed hydropower capacity in the basin has increased from 31 mw (170 million kwh/year) in 1970 to around 240.2 mw (1,200 million kwh/year.) in 2000. Table 12 below provides a list of hydropower plants in the basin.

Table 12: Hydropower Installations, Brantas River Basin

Power Station	Start Up	Installed Capacity (MW)	Production Average (Million kWh) Per Year
Selorejo	1972	4.5	29.8
Karangkates Phase-I	1973	70.0	318.2
Karangkates Phase-II	1975	35.0	159.1
Wlingi Phase-I	1978	27.0	86.7
Wlingi Phase-II	1979	27.0	86.7
Lodoyo	1983	4.5	37.4
Bening	1984	0.7	0.54
Sengguruh	1988	29.0	91.9
South Tulungagung	1991	36.0	164
Wonorejo	2002	6.5	19.5
Total:		240.2	993.84

The hydropower plants are owned and operated by the National Power Corporation (PLN) while PJT-I operates the dams and provides the water for hydropower production. PLN pays PJT-I a tariff for water supply, which is reviewed each year and is approved by the Ministry of Public Works based on the recommendation of the Ministry of Finance (MOF). This process takes a long time. The current PLN tariff for water supply for hydropower generation is R_P 21.18/kwh generated as against the computed value of R_P 52.7/kwh. Currently there seems to be little or no conflict in water use between hydropower needs and other consumers/users.

22.6 FLOOD CONTROL

An extensive flood protection scheme has been implemented in the Brantas basin. Flood protection has been one of the main components in all the three Master Plans (1961, 1973 and 1985) that have been implemented. The schematic of the Brantas River flood and drainage scheme that has been implemented is presented on Figure 3. The three reservoirs—Lahor, Karangkates (Sutami), Wlingi—and the two retarding basins—Ngrowo (45 mcm capacity) and Widas (28 mcm capacity)—along with the Lengkong flood gates to divert water into the Porong River to reduce flood flows in Surabaya River and protect the town of Surabaya coupled with the dike system have prevented flooding in the mainstream of the Brantas River

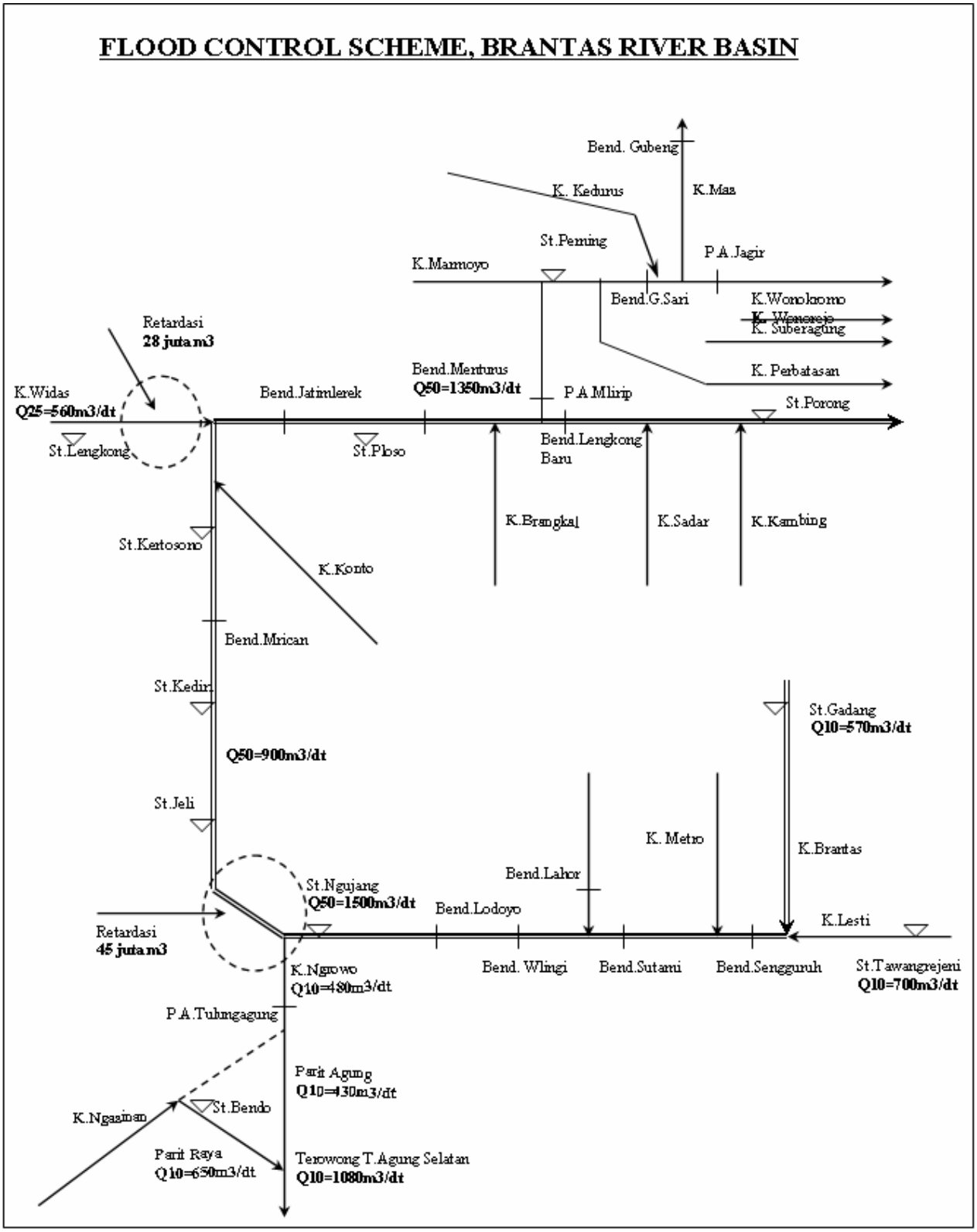
since 1990. A flood warning system provides early warning for operation of the floodgates at the various locations. Prior to implementation of the flood scheme nearly 60,000 ha used to be inundated annually and the town of Surabaya experienced flooding frequently. PJT-I is responsible for O&M of the early warning system and the major flood infrastructure.

22.7 WATER QUALITY

The existing water pollution sources are primarily from domestic and industrial wastewater while agricultural and other sources also contribute to water quality degradation. Of the pollution loads, domestic wastewater from the Malang and Surabaya urban areas generate the maximum amount of pollution load. In dry season this exceeds the assimilative capacity of the river. The industrial pollution is mainly from pulp and paper factories, sugar factories, chemical industries, textile factories, and the food processing industry. The two top industry producing biochemical oxygen demand (BOD) are 5 factories of yeast and derivatives (158 t/day) and 10 sugar factories (128 t/day). Although return flows from the irrigated area are low in the dry season, fertilizer and agrochemicals pollute the rivers and reservoirs. Livestock pollution in some reaches is prevalent. Solid waste and seepage from solid waste dumps produce significant quantities of organic pollutants.

At present the Surabaya River along the Surabaya city organic pollutants heavily pollute area and Brantas River along Malang city area. BOD in these reaches is about 10 to 20 mg/l and 8 to 15 mg/l, respectively. Chemical oxygen demand (COD), ammonium (NH_4), and nitrogen dioxide (NO_2) also exceed the water quality standards in the mainstream and tributaries of the river year round. In most of the reservoirs, eutrophication is in progress because of nutrients flowing into the body of water. High values of phosphorus and low transparency have been recorded. The water quality in the reservoirs monitored shows BOD levels of 5.6 to 63.2 mg/l and COD varying from 13.7 to 128.9 mg/l as a monthly average. Ambient water quality standards have been set for the different reaches of the rivers. The Brantas River from Widas River confluence, Surabaya River, and Porong River are classified as ‘B’ class (fit as raw water for drinking) and all other rivers as ‘C’ class (fit for fishery and husbandry purposes).

Figure 3: Flood Control Scheme, Brantas River Basin



As part of water quality management an extensive water quality monitoring system has been set up and operated by the Brantas Basin Corporation. The total water quality monitoring points set up under various programs is around 191. These include ambient water quality monitoring stations in the rivers and reservoirs and monitoring of point sources from industrial and urban outfalls. On the Brantas River and its main tributaries there are 23 real time water quality monitoring stations and 62 manual water quality monitoring stations. Figure 4 indicates the location of these stations. The monitoring parameters include physical, chemical, microbiological, and heavy metals and are monitored on a regular basis. The average annual concentration of BOD, COD and DO for the Brantas River and Surabaya River is presented on Figure5, Figure 6, and Figure 7 respectively for 1970 and 2002. Current water management calls for a minimum river flow of 7.5 m^3/s in the Surabaya River to keep pollution loads within limits. During the dry season attempts have been made to release flows from upstream reservoirs as slug flow to flush out pollutants. This has proved to be expensive. Over the 10 year period there has been considerable water quality improvement, although the BOD, COD and dissolved oxygen (DO) values are still higher than the standard ('B' Class) in the downstream reaches of the Brantas and Surabaya Rivers. The total BOD load of 330 t/day comprises of 205 t/day (62.1%) due to domestic waste and 125 t/day (37.9%) due to industrial waste. The PROKASIH plan for 2000 to 2005 is to reduce these loads by 50%.[4]

[4] For greater details of the water quality issues reference should be made to the 'Surabaya River Control Action Plan Study' of March 1999.

Figure 4: Water Quality Monitoring Stations, Brantas River Basin

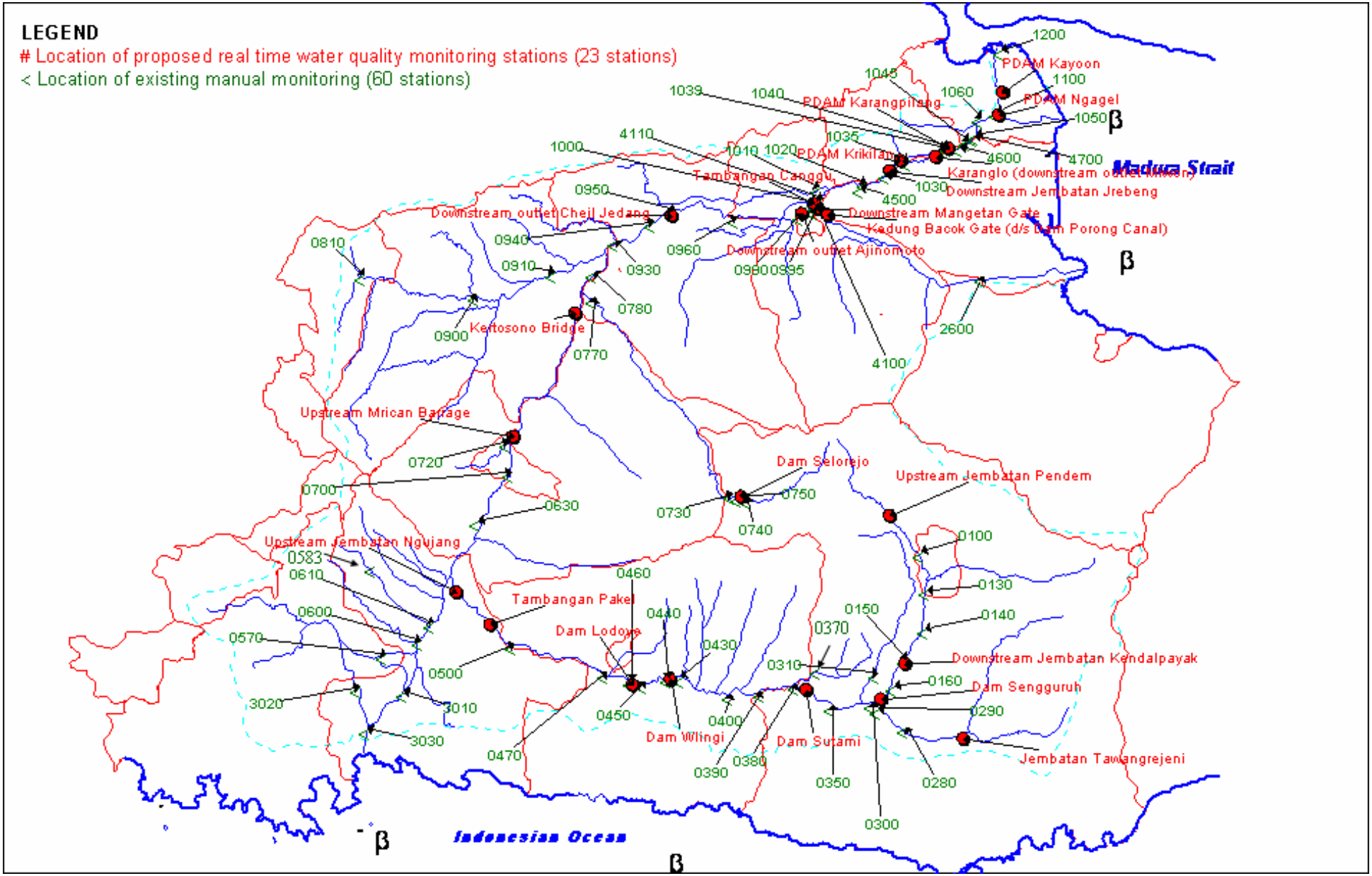


Figure 5: BOD Concentration Along Brantas River (1991 and 2002)

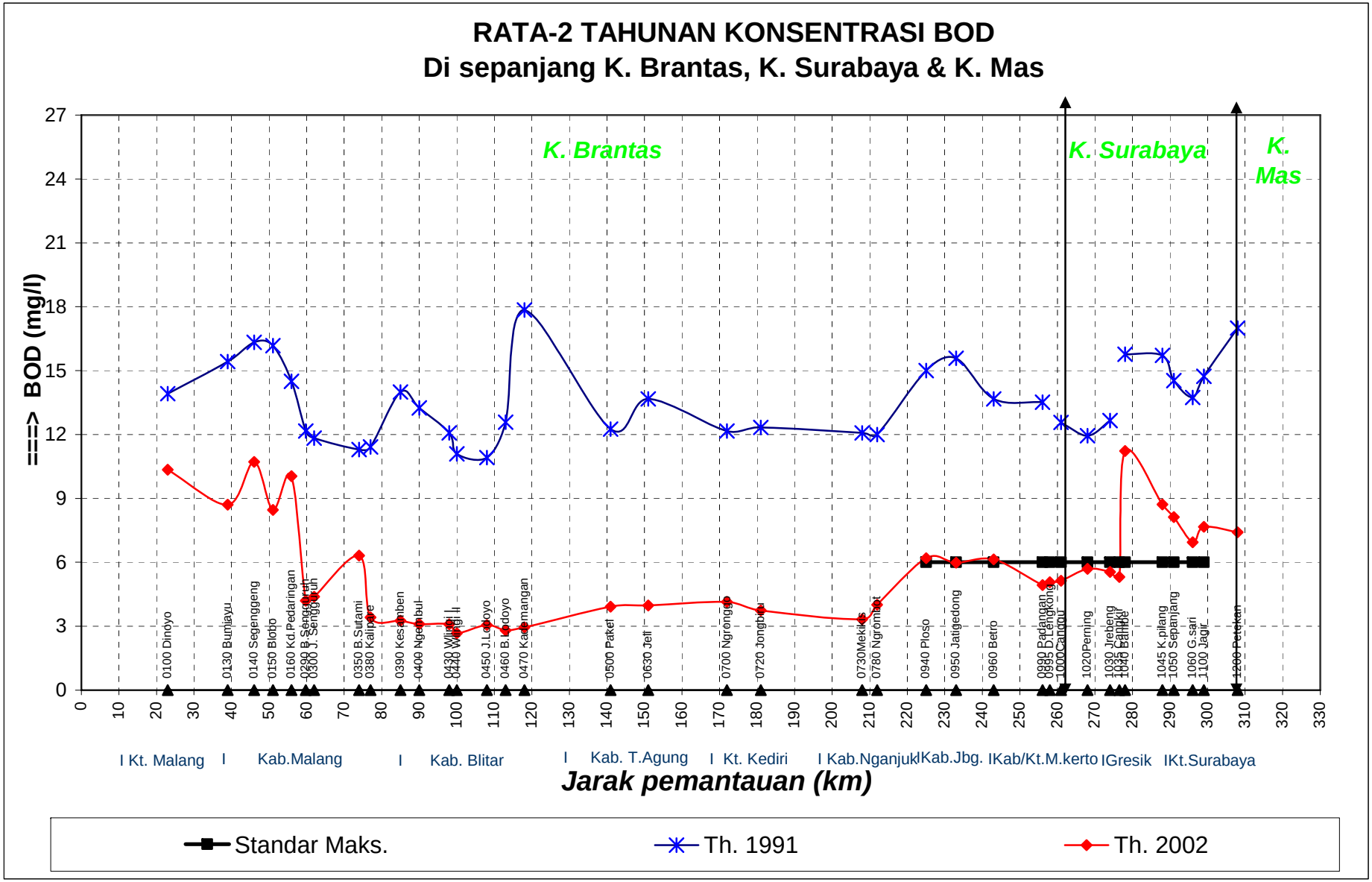


Figure 6: COD Concentration Along Brantas River (1991 and 2002)

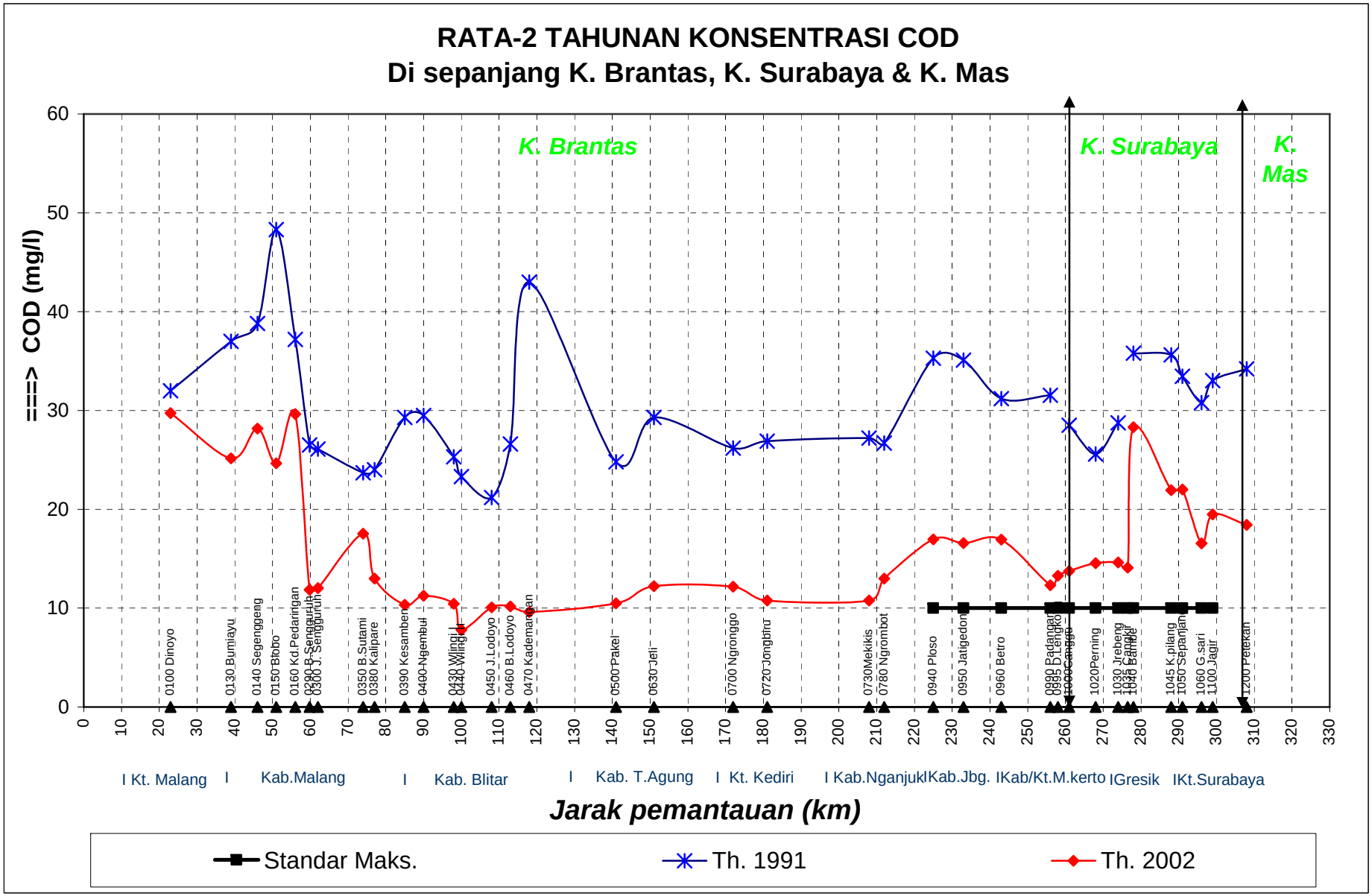
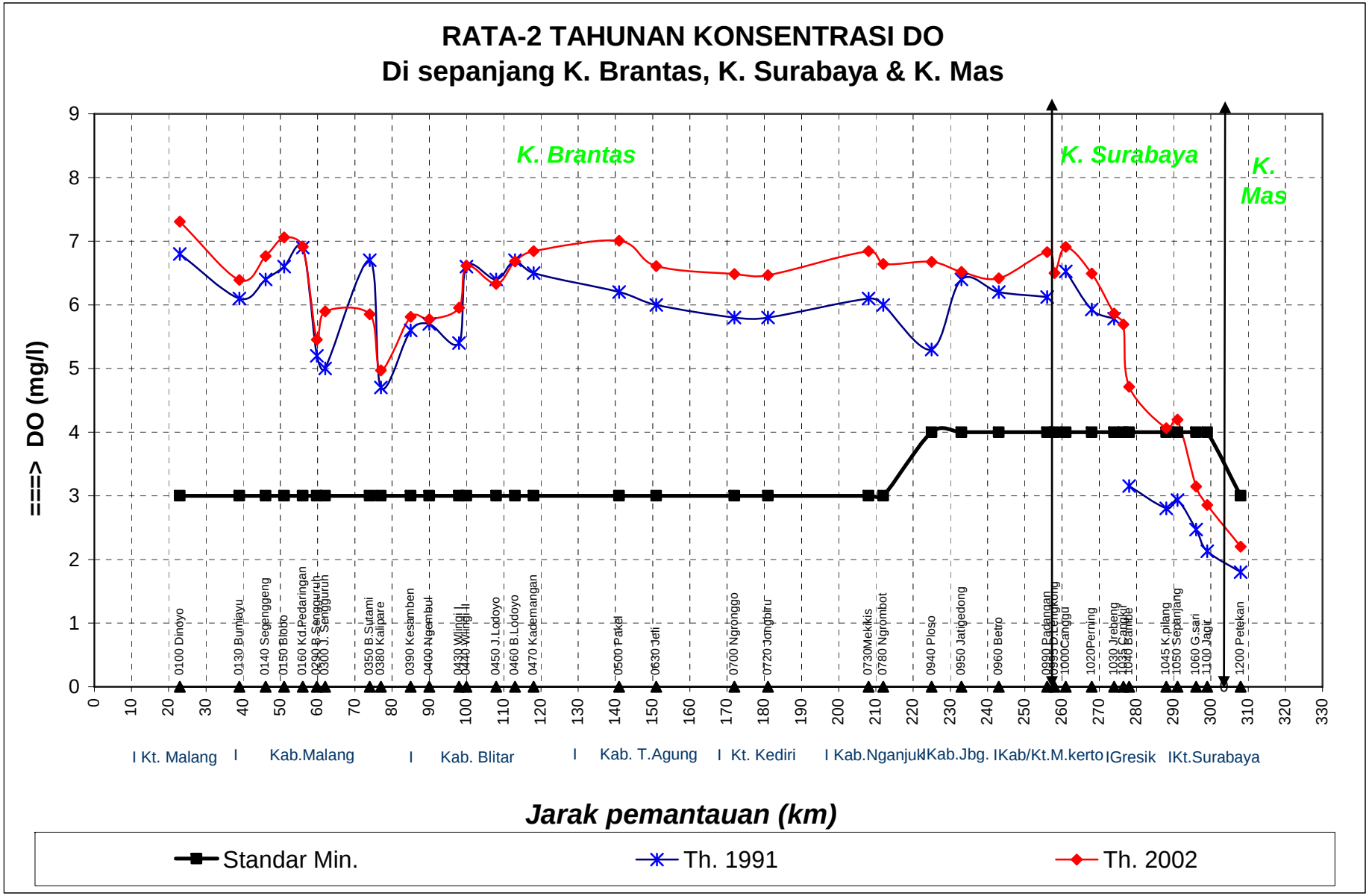


Figure 7: Concentration Along Brantas River (1991 and 2002)



22.8 BRACKISH WATER FISH PONDS

Brackish water fishponds for fish and shrimp cultivation are mainly located in the delta's coastal areas. The fresh water for fishponds is taken from drainage canals in the irrigation area. The existing total area of brackish water fisheries in East Java in 1997 was approximately 60,000 ha, of which 54,000 ha is under extensive culture and only 6,000 ha under intensive culture (introduced in 1985). Now the total brackish water fishery area in the Brantas Delta is approximately 15,730 ha based on the extensive cultivation method. Water demand is estimated to be about 1.29 m^3/s, supplied from irrigation drainage water.

22.9 SOCIOECONOMIC PROFILE

The Brantas basin is Indonesia's most developed river basin in terms of water sector investment and water resource utilization, next to the Citarum River basin in West Java. It is also Indonesia's best-managed river basin for water resources, and over the past ten (10) years a holistic approach to basin water resource management has been adopted. Investment in flood control and water infrastructure has helped develop the industrial belt in the downstream Surabaya-Gresik area and has increased agricultural output of the basin. In the past three decades, rice production has doubled while there has been a ten-fold increase in non-rice crops. Hydropower generation capacity has increased from 4.5 mw in 1972 to 240.2 mw in 2002, and energy generated has increased 33 fold.

The demographic data is presented in Table 13. The population of the Brantas basin, which has an area of 24.6% of the total area of East Java, is 42.4% of East Java population according to 2000 census data. The population density is 1,248.7 inhabitants/km^2 as compared to Java population density of 918.9 inhabitants/km^2 and East Java population density of 7,24.3 inhabitants/km^2. The basin population has increased by 53.4% over the past 30 years. Surabaya city at the downstream end of the basin has a population of 2.45 million according to the 2000 census and is the second largest city in Indonesia.

Table 13: Demographic Data
A. Population (2000)

Location	Area (km^2)	Population	Density (Per km^2)
Indonesia	1,920,000	207,600,000	108.1
Java	132,000	121,293,000	918.9
East Java	48,000	34,766,000	724.3
Brantas Basin	11,800	14,735,200	1,248.7
Surabaya City	300	2,445,000	8,150.0

Note: Brantas Basin has 42.4% of East Java Population
Source: Central Bureau of Statistics, Indonesia

B. Population by Religion (2001)

Location	Islam	Christian	Hindu	Buddhist	Others
East Java	32,753,063	929,056	178,601	136,753	4,312
Brantas Basin	14,190,000 (96.3%)	402,300 (2.73%)	78,100 (0.53%)	58,940 (0.4%)	4,900 (0.04%)

Source: Department of Religious Affairs, East Java.

The main religion followed by the people in the basin is Islam. About 96.3% are Muslims, followed by Christian (2.7%), Hindus (0.5%) and Buddhist (0.04%). These religious affiliation patterns are similar to those of Java. The cultural influence of Islam on the society is strong and its consensus-building approach through frequent gathering in the place of worship has helped develop an informal framework for stakeholder input and bringing in societal awareness in some water management issues.

The land use data (Table 14) indicates that the Brantas basin has 23% of East Java's forestland and 55.8% of the arable land although it is only 24.6% of East Java's area. The Brantas basin has around 33% of the irrigated area of Java and produced 32% of the rice crop, according to 2000 data. Yield per hectare in the basin (5.47 tons/ha) is slightly higher compared to all of East Java (5.38 tons/ha).

Table 14: Land Use Data

Unit: Hectare

Location	Forest	Plantation	Agricultural Land	Homestead	Others	Total
East Java	1,346,500	859,600	1,157,100	564,960	864,038	4,792,198
Brantas Basin	309,400	31,400	645,800	170,100	23,300	1,180,000

Source: Land Use Plan, East Java.

The Brantas basin has no proven oil, gas, or mineral resources. The non-oil gross domestic product for Indonesia, Java, East Java and the Brantas basin for the years 1970, 1980, 1990 and 2000 are presented in Table 15. Over 30 years the GDP for the basin including Surabaya has increased 225 fold in Rupiah terms. Combined with Surabaya City, it provided 56% of East Java's GDP in 2000. The industrial production in the basin was of the order of R_P 7.724 trillion in 2000 which was 77% of East Java's industrial production. The trend of GDP in East Java and the Brantas Basin is shown in the Figure 8 below. The share of the Brantas Basin in major crop production and in industrial production is presented in Table 16 and Table 17 respectively.

Figure 8: GDP Trend in East Java and Brantas Basin

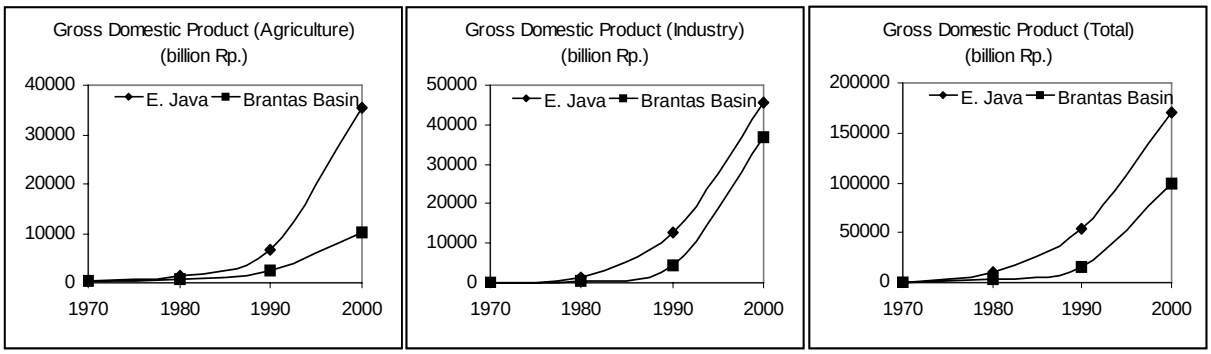


Table 15: Non-Oil Gross Domestic Product

Unit: R_P. Trillion

Location	1970*	1980	1990	2000
Indonesia	3.34	3.72	15.970	1,097.77
Java	1.67	20.63	100.86	659.83
East Java	0.62	5.27	28.98	176.59
Brantas Basin	0.33	3.18	16.04	68.08
Surabaya City	0.11	1.01	4.31	30.73

Note: * This includes GDP for Oil.
Source: Statistical Year Book-2001, Central Bureau of Statistics.

Table 16: Production of Major Crops

Unit: 1,000 mt

Location	1970	1980	1990	2000
Rice				
Indonesia	26.39	29.77	45.18	51.90
East Java	4.66	6.28	8.23	9.22
Brantas Basin	1.43	2.29	2.43	2.99
Maize				
Indonesia	2.60	4.01	6.73	9.68
East Java	1.05	1.69	2.58	3.49
Brantas Basin	0.03	0.40	0.49	1.12
Cassava				
Indonesia	10.69	13.53	15.83	16.09
East Java	3.33	4.03	3.71	3.62
Brantas Basin	0.09	1.03	0.86	0.95

Source: Statistical Year Book-2001, Central Bureau of Statistics.

Table 17: Industrial Production

Location	East Java		Brantas Basin		Brantas/East Java Ratio 2000
	1970	2000	1970	2000	
Production (R_P. Trillion)	0.079	10.024	0.042	7.724	0.77
Employees	341,930	2,141,870	30,000	959,330	0.45

A socioeconomic sample survey conducted in 2001 indicates that 70% enjoy benefits from water sector projects, 46.7% from irrigation, 22% from flood control, 49.3% increase in income, and 20.7% indicate improvement in living condition.

22.10 BRANTAS RIVER BASIN MANAGEMENT

There are a number of agencies, both structural and non-structural (project status), that are involved either fully or partially and directly or indirectly in water resource related functions in the basin. A 1998 study[5] lists 35 organizations that have a role in water resource development and management. It also lists the tasks and duties of these organizations in WRM. The generic institutional framework for basin management is presented in Figure 9, which is also applicable to the Brantas basin. This framework indicates the national, provincial, and district level institutions that have primary or significant roles and responsibilities in the planning, development, operation, management, and regulatory aspects of basin WRM. Broadly, the roles of the primary institutions are as follows (See table 18)**:**

[5] Nippon Koei Co (1998), "The Study on Comprehensive Management Plan, Brantas River Basin", October 1998, Final Report.

Table 18: Roles of Primary Institutions in WRM

Macro and Program Planning	:	National, Provincial and District Planning Boards (Bappenas/Prov. Bappeda/Dist. Bappeda)
Supervision & Guidance	:	Ministry of Public Works (MPW,DGWR, Directorates)
Development	:	National or Provincial Projects
Regulatory	:	Provincial Water Resources Agency and Basin Water Resources Agency (Dinas PUP, Balai PSDAs)
Water Management including Operation and Maintenance	:	Brantas River Basin Corporation (PJT-I) (a national public sector corporation)
Irrigation Management	:	a) District Water Resource Agency (Kab. Dinas PU) for irrigation systems inside a district. b) Provincial Basin Water Resource Agency (Balai PSDA) for irrigation systems that are inter-district.
Coordination	:	a) Ministerial Coordination Team (Tim Kordinasi) at the national level, which is expected to be replaced by National Water Council with stakeholder representation. b) Provincial Water Resources Committee (PTPA) at the provincial level, which is expected to be replaced by Provincial Water Council with stakeholder representation . c) District Water Resources Council (KTPA) to be setup with stakeholder representation. d) Basin Water Resources Committee (PPTPA) at the SWS level, which is expected to be reorganized with stakeholder representation .

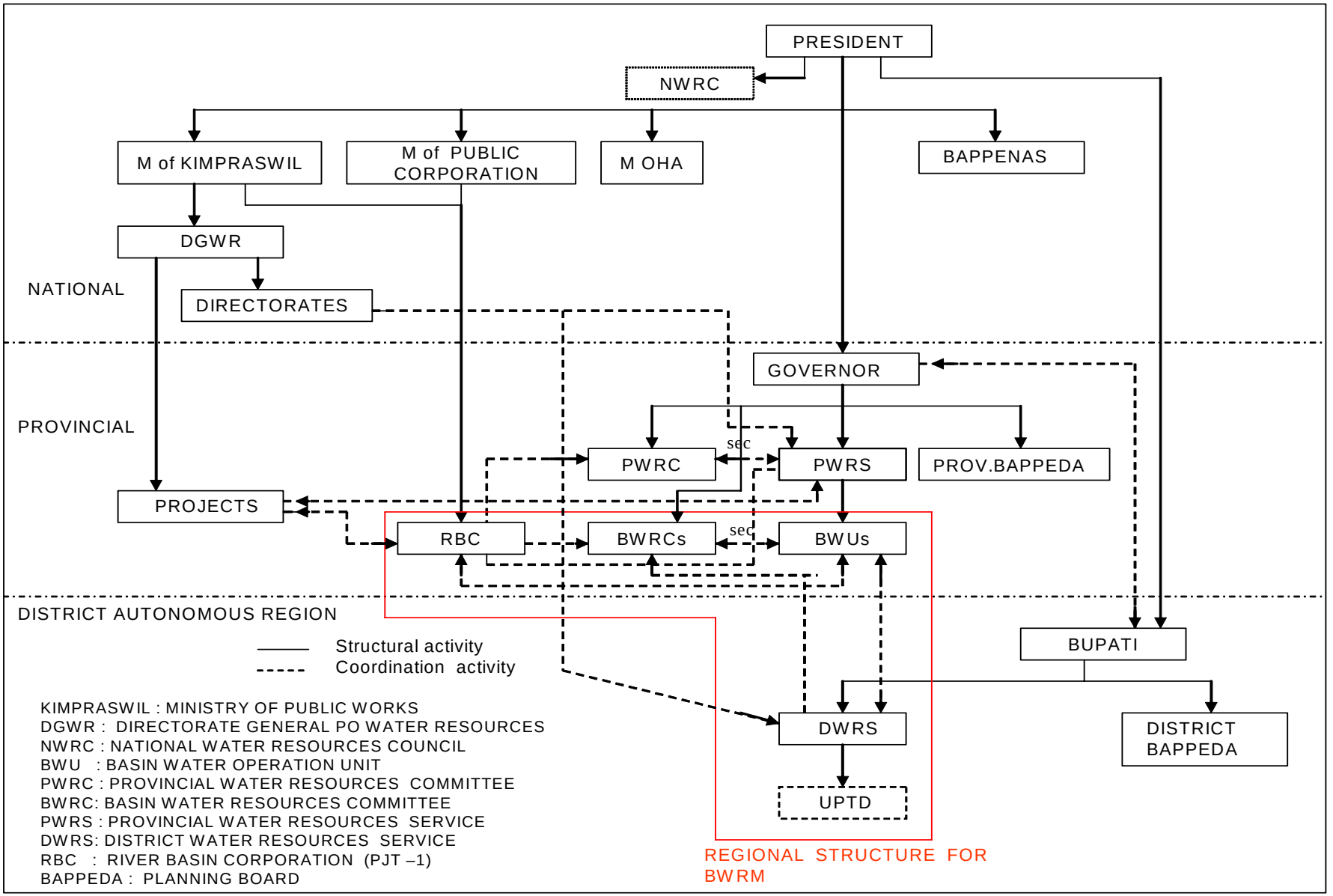
Until 1998 all aspects of water resource management in the Brantas basin were managed by a dual system of management. The center through DGWR and its projects was responsible for most developmental activities while the Brantas Basin Corporation (PJT-I), a national public sector corporation, managed the infrastructure on behalf of the central ministry. The provincial government through its Provincial Water Resource Agency (Dinas PUP) and field offices exercised the regulatory role of water abstraction licensing, sand mining licensing, land use licensing, water quality regulation, and O&M of all irrigation systems in the river basin. The PJT-I acts as a bulk water operator and a monitor of all water withdrawals. The district level agencies had no direct authority in basin water management including irrigation or its development except in land use area. The local level inputs were solicited either through normal administrative channels or through coordinating committees such as the District Irrigation Committee and Provincial Irrigation Committee. The concept of ad hoc bodies, comprised of representatives from related agencies from all levels (for example, a task force

for water quality management, flood management, watershed management), was used to provide recommendations to the provincial or central authorities to act upon. Stakeholder input was mostly through a consultative process, and formal representation in committees and task forces was limited to government agencies such as forestry, agriculture, industry, environment agencies. Much of the water resource functions were undertaken directly by the center or by the province through the deconcentration principle. Only irrigation management functioned on the decentralization principle at the provincial level with the farmer's organization (WUA) treated as objects rather than subjects.

The country's democratization process that began in 1998, resulting in the laws on decentralization and autonomy to districts in 1999, has now created the necessary environment for basin water management activities to be decentralized to the appropriate levels of administration. This process has started and with the completion of the water sector reform in the near future will decide on how decentralization will function. The new water law (March 2004) has limited the role of farmers to the tertiary level (a setback) and has left the participation of WUA in primary and secondary canal management functions to the discretion of the government. Currently the central Ministry of Public Works , based on the concern that farmers may be asked to share more of the cost burden, is backtracking on some of the irrigation decentralization policies and Irrigation Management Transfer (IMT) principles that may be against the spirit of the nation's decentralization law.

East Java province has been a forerunner in irrigation management and now, since 1998, in basin WRM. Also, the province had some success in reducing industrial pollution through the PROKASIH program. The province is taking steps to implement the autonomy and decentralization law in the water sector through (i) setting up of an umbrella memorandum of understanding between the East Java governor and district heads (Bupatis) that will facilitate implementation of decentralization, (ii) sharing a role in hydrology and water management functions in the basin (a pilot program was undertaken), (iii) transferring the Cabang (field offices) to the districts along with the human resources, (iv) transferring the irrigation systems that lie fully within the district to the district agencies, (v) cooperating with the district water agency in the management and O&M of inter-district irrigation systems, (vi) involving district agencies in processing of abstraction licenses, and (vii) having district representation in the provincial river basin water resources committees (PPTPA).

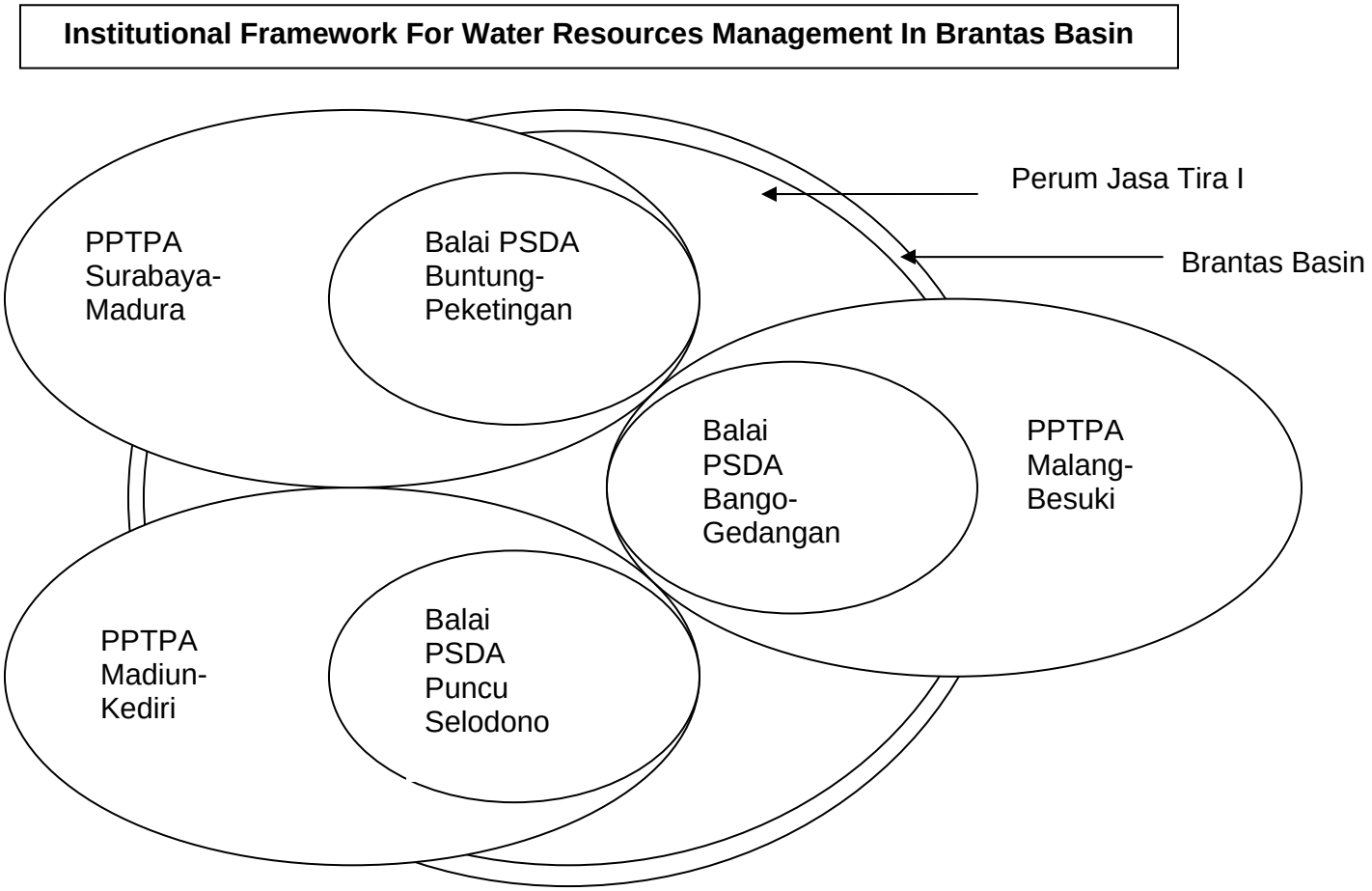
Figure 9: Institutional Framework for River Basin Management



23. WATER MANAGEMENT INSTITUTION IN THE BASIN

The three main institutions in the basin that have direct responsibility in river basin WRM are: (i) the three provincial water agencies – (a) Balai PSDA, Bango Gedangan, (b) Balai PSDA Madiun-Kediri, (c) Balai PSDA, Buntung–Peketigan: (ii) the Brantas Public Corporation (PJT-I); and (iii) basin coordination committees (a) PPTPA, Malang-Besuki, (b) PPTPA Madiun-Kediri, and (c) PPTPA Surabaya-Madura. The primary institutional framework for the Brantas basin is shown diagrammatically in Figure 10. The irrigation systems that lie within the nine districts are fully managed by the district water agencies. The provincial water resources agency (Dinas PUP) acts as the regulator for the Brantas basin WRM activities and manages the provincial funded program in water sector in the basin. The Provincial Water Resources Coordination Committee (PTPA) set up in 1994 provides the policy direction for the Brantas basin water resource development and management. Given below is a short description of the primary institutions with their role and responsibilities in the basin.

Figure 10: Institutional Framework for WRM in Brantas Basin



23.1 PROVINCIAL BASIN WATER MANAGEMENT UNITS (Balai PSDA)

These agencies were set up in 1998 (on the transfer of the provincial field offices—Cabangs to districts) as part of decentralizing basin WRM from the center to the provinces and basin. They operate, maintain, and manage the infrastructure and the water resources in the rivers that are not under the jurisdiction of PJT-I. They manage mostly the second, third, and fourth order rivers (around 1,510 rivers) in the Brantas basin that do not have major infrastructure or do not have major water benefits except irrigation. These agencies manage the inter-district irrigation system and are the field regulatory arm of the Dinas PUP.

Unlike other Java provinces, where one Balai PSDA agency was set up for each SWS (river territory), East Java setup its Balai PSDAs based on the size of the SWS. The three Balai PSDAs are organized to manage the upstream, middle stream and downstream portions of the basin. By regulation, the Balai PSDAs have ten main WRM functions. Since these are new institutions still under development their current focus in water management centers around management of (i) hydrology, (ii) database and GIS, (iii) water allocation, (iv) water quality, (v) flood, (vi) inter-district irrigation system management, and (vii) river management. All major infrastructures in the basin are with PJT-I, and hence the Balai PSDAs manage mostly the smaller sized irrigation infrastructure. These agencies are the lowest level agency where input for regulatory decisions (abstraction licensing, effluent discharge licensing, flood plain use, etc.) is made. Balai PSDAs act as the field offices of the Dinas PUP and provide the operational support.

Balai PSDAs act as the Secretary of the PPTPA (the basin WRM coordinating bodies) and in that role can bring the views and opinion of the various agencies (representing stakeholders in the basin) to bear upon the decisions regarding aspects of WRM. This has shifted much of the role of the center and Dinas PUP to the basin level and has thus strengthened decision making at the basin level. Current constraints in decentralization taking hold in terms of WRM are due to the significant portion of central funding (APBN) for the Balai PSDA activities, which prevents exercise of all decision making authority at the basin level. With increased funding from the provincial resources and implementation of fiscal decentralization policies (expected to begin from FY 2005) the ability to give more authority to the basin level agencies would be strengthened.[6]

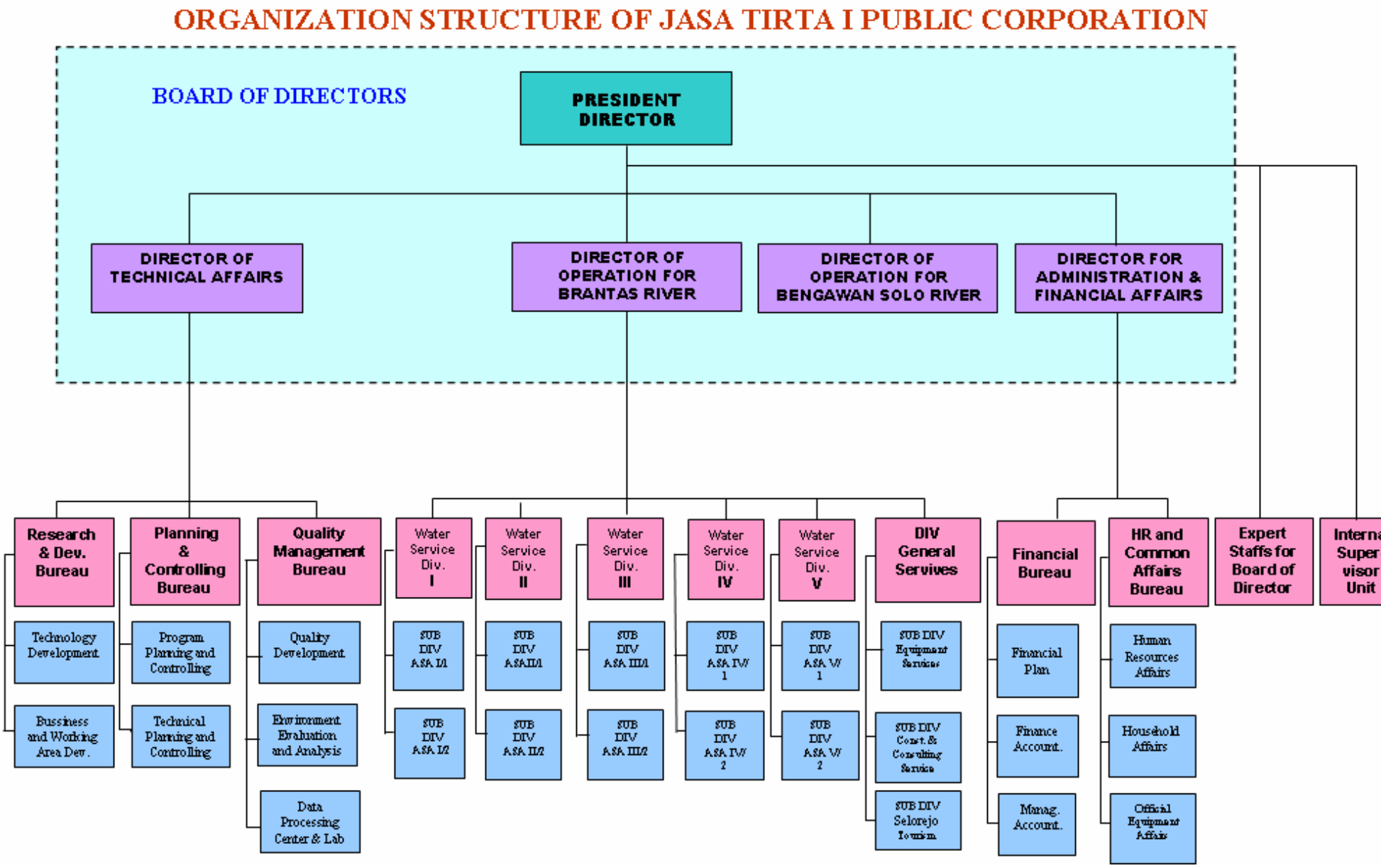
[6] For a greater understanding of the Balai PSDA and its function reference should be made to the World Bank's "Project Appraisal Document for the Water Resources and Irrigation Sector Management Project (WISMP)", May 2003.

23.2 BRANTAS BASIN CORPORATION (PERUM JASA TIRTA, or PJT-I)

The Brantas Basin Corporation established in 1990, based on Government Regulation No. 5/1990 (later replaced by Government Regulation No. 93/1999 to strengthen the organization and permit its jurisdiction to extend to other basins), is charged with managing the water resources in 40 of the more important benefit producing rivers (including the Brantas River) of the basin and to operating, maintaining, and managing the major infrastructure in these rivers. The Corporation has no role in irrigation management in the basin except to provide bulk water supply to the irrigation systems. It provides comprehensive water resource development (mostly non-structural) and utilization service to fulfill all types of surface water demand, water resources protection, water quality monitoring, flood operation, O&M of water infrastructure, conservation and providing information, recommendations, public campaigns and technical guidance. The activities of the corporation cover (i) bulk water supply for irrigation systems, (ii) raw water for M&I, (iii) water supply for hydropower plants, (iv) sand mining, (v) tourism in its working area, and (vi) consulting services. In 2000, the Brantas Corporation was authorized to undertake WRM in 25 rivers of Bengawan Solo River Basin (an inter-provincial SWS lying in Central Java and East Java). A new Presidential Decree to be issued after the Constitutional Court clears the Water Law 7/2000 will strengthen PJT-I to become fully self-supporting by improving its revenue base through cost recovery for water abstraction, wastewater discharge, and basin water management fees.

The Brantas Basin Corporation is supervised by a supervisory board composed of central and provincial government representatives and is managed by a board of directors headed by a president director. The organization structure of PJT-I Corporation is presented on Figure 11. Being a national corporation, the authority to oversee the management and functioning of PJT-I lies with the center through the Ministry of Public Works , with the Ministry of Finance (MoF) exercising a fiscal oversight role. The Minister, who draws his powers from the water law, has supervisory control. The supervisory board has five members representing the Ministry of Public Works, Finance, Energy, Agriculture, and local government (with three-year terms) and undertakes general supervision of the corporation's program, work plan, and budget. This is the only institutional setting in which the provincial government of East Java (for Brantas basin) and Central Java and East Java (for Bengawan Solo basin) can directly interact with the work of the corporation and influence the WRM in the basin, apart from the authority it exercises through other agencies in the basin. To a large extent the central ministries' (Public Works and MoF) role overshadows the supervisory board's functions in the operation of the corporation.

Figure 11: Organization Structure of Brantas Basin Corporation



The day-to-day management of the corporation is with an executive board composed of a President Director, a Director for Technical Affairs, a Director for Administration and Financial Affairs, a Director of Operations for the Brantas River and a newly created (2002) Director of Operation for the Bengawan Solo River (see Figure 11). Five regional units in the Brantas basin manage the field operations and special units undertake research, planning, and quality management.

The main functions of PJT-I are (i) water quantity management, (ii) water quality management, (iii) flood control management, (iv) river environment management, (v) watershed management, (vi) water resources infrastructure management, and (viii) research and development. In carrying out these activities, the corporation coordinates with stakeholders such as PLN (Electricity Corporation), PDAMs (Water Supply Corporation), private and public sector industries, NGOs, and experts. As mentioned earlier, the corporation is not responsible for irrigation system management but provides bulk water. In cases where water supply is made from the irrigation system for non-irrigation functions (water supply to industry), the corporation coordinates with the concerned irrigation agency. Thus, much of the management decisions are based on a consultative process through a proactive approach. The corporation is authorized to make most of the technical policy decisions and some policy decisions related to WRM, such as release of reservoir water for flushing, changes in water allocation during times of shortage, reservoir operation, awareness campaign. The corporation, however, has no policy power in areas such as basin planning, basin infrastructure development and investment, off-stream water quality improvement, tariff fixing etc. In these areas where it is not permitted to make policy decisions, PJT-I works through the administrative and consultative channel to influence decisions. As an organization PJT-I has been very effective in most aspects of the WRM decision-making, coordination, improving resource base, and working with other basin agencies and stakeholders by adopting a proactive management style and having a good working relationship with both formal and informal institutions.

All of the capital invested in the corporation is from the central Ministry of Finance (MoF). The agency is not permitted to raise money from outside sources nor through profit on sales. All assets (97%) managed by PJT-I are given to the corporation at no cost, and the corporation is not required to provide for interest, amortization, and depreciation costs. The corporation is to a large extent self financing and receives its revenue primarily from M&I water supply and water supply for hydropower generation. Setting of tariff is in the hands of the provincial and central government (a political process). It receives neither revenue for irrigation bulk water supply nor a subsidy from the irrigation sector. The corporation is forced to show a budget surplus to be a healthy corporation (at the cost of adequate maintenance). The surplus is partly allocated to central government development funds (55%) and the corporation's general reserve fund (20%), benefit fund (20%), and reserves (5%). The annual budget has to be

approved by the MoF, thus ensuring government's oversight over its finances. The consolidated financial statement of the Brantas Basin Corporation for the years 1992 to 2002, the estimated value for FY 2003 and FY 2004 planned value is presented in Table 19. The revenue has gradually increased and covers around 80% to 83% of expenditures.[7]

[7] For more information on the PJT-I, see "River Basin Management Corporation – An Indonesian Approach" (Ramu, Kikkeri (1999).

Table 19: Consolidated Financial Statement, Brantas Basin Corporation

(billion rupiah)

No.	Item	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003 [1]	2004 [2]
I	**COMMERCIAL**													
1	**Revenue**	**11.77**	**13.07**	**14.64**	**18.77**	**21.05**	**21.74**	**28.68**	**28.79**	**31.02**	**33.9**	**37.68**	**47.36**	**52.58**
a	Water Service	9.41	10.26	11.52	16.34	17.71	19.06	26.12	26.99	28.62	29.08	32.97	37.40	46.6
b	Non - Water Service	2.36	2.81	3.12	2.43	3.33	2.68	2.56	1.80	2.40	4.82	4.71	9.95	5.98
2	**Expenditure**	**9.89**	**11.52**	**12.91**	**16.39**	**18.06**	**18.52**	**24.65**	**27.48**	**26.67**	**30.97**	**33.28**	**44.5**	**48.67**
a	Water Service	9.81	10.95	11.74	15.62	16.66	17.22	23.15	26.65	25.74	29.2	31.14	38.32	45.29
b	Non - Water Service	0.08	0.57	1.17	0.76	1.40	1.29	1.50	0.83	0.93	1.77	2.14	6.18	3.38
3	**Profit**	**1.88**	**1.56**	**1.73**	**2.38**	**2.99**	**3.22**	**4.03**	**1.31**	**4.35**	**2.93**	**4.41**	**2.86**	**3.91**
a	Water Service	(0.40)	(0.69)	(0.22)	0.71	1.05	1.83	2.98	0.34	2.88	(0.12)	1.83	(0.91)	1.31
b	Non - Water Service	2.28	2.24	1.95	1.67	1.93	1.39	1.06	0.97	1.47	3.05	2.57	3.77	2.60
II	**NON - COMMERCIAL**													
1	Revenue	1.35	1.55	1.57	1.63	1.78	2.10	3.86	5.19	2.53	2.92	2.99	2.95	1.94
2	Expenditure	0	0.06	0.05	0	0.18	0.67	1.69	0.17	0.25	0.36	0.34	0.26	0.30
3	Profit	1.35	1.50	1.51	1.62	1.61	1.43	2.17	5.03	2.28	2.56	2.65	2.69	1.64
III	**TOTAL**													
1	Revenue	13.12	14.63	16.20	20.39	22.83	23.83	32.54	33.98	33.55	36.82	40.67	50.31	54.52
2	Expenditure	9.89	11.57	12.97	16.39	18.24	19.18	26.34	27.65	26.92	31.33	33.62	44.76	48.97
3	Pre Tax Profit	3.23	3.05	3.24	4.00	4.59	4.65	6.20	6.34	6.62	5.49	7.05	5.55	5.55
4	After Tax Profit	1.80	1.56	1.81	2.90	3.48	3.29	4.90	5.33	4.81	3.97	4.52	4.52	4.52

US$ 1.00 = Rp. 8.300,- (November 2003)

Note: Water Service includes water supply to industrial municipal and hydro power needs and tourism.

Non - Water Service includes rent, land lease, technical services etc.

No revenue for irrigation water supply.

[1] Estimated for FY 2003.

[2] Planned for FY 2004.

23.3 BASIN COORDINATING COMMITTEES (PPTPA)

Three Basin Water Resources Committees for the Brantas SWS have been functioning since 1997. Unlike other river territories (SWS) where a single PPTPA is set-up, East Java has set up the basin WRM coordinating bodies based on the administrative jurisdiction of provincial regencies known as Korvil. The administrative head of the regency (Vice Governor) is the designated chairman of the PPTPA and members are drawn from the various provincial agencies in the basin and from the district government. There are currently no NGOs or direct beneficiaries on the committee. Having three PPTPAs for a single basin (SWS), though administratively prudent, does not provide a single platform to coordinate WRM issues in an integrated manner and is runs contrary to the institutional principles of basin WRM. The respective Balai PSDAs in the regency act as the secretary of the PPTPA and provide the secretarial support.

Prior to the setting up of these committees, all decisions related to WRM were handled by the respective structural organizations that are vertically managed. Thus, the decision process had to depend on the informal administrative approach with the stakeholders and other agencies. PPTPA's current mandate is still weak in terms of coordinating decision making, implementation, and monitoring. Lack of stakeholder, NGO or resource person representation on the committee has prevented input from the non-governmental sector. The strong structural role of the agencies has so far denied the PPTPA the opportunity to take on a more effective role.

The water sector reform process that is underway has recognized the role of stakeholders and NGOs in WRM decentralized decision process. When the new Water Law is implemented, it will transform these committees to a stronger basin institution by having more balanced stakeholder representation. It is also planned that these committees will be given a guidance and monitoring role not only in water management but also in watershed management.

24. NGO INVOLVEMENT IN BRANTAS BASIN

The NGO movement in the water sector has been rapidly gaining momentum since the early 1990s. Prior to that the major NGO organization involved in the water sector was the farmer organized Water User Association (WUA) that had responsibility for the irrigation management and O&M of the tertiary blocks. As discussed earlier, the role of the WUA and its federation (GP3A) is being enhanced through the Irrigation Management Transfer (IMT) program that was launched in 2000. Through this program the farmers association will be able to participate in the decision process related to irrigation system management as partners with the irrigation agencies (Kabupaten Dinas PUP). As noted earlier, the IMT program is to be

replaced by the Participatory Program once the new Government Regulation on Irrigation is issued, most probably in FY 2005.

The second NGO movement in the water sector is in the environmental area and is primarily involved in social-watershed-pollution aspects. A number of universities participate in the water sector decision making process through expert advice or providing consultancy. The water sector reform process, which began in 1999, has generated interest in the policy and legal aspects among some NGOs. The NGOs LP3S and WALHI have played a major role in providing input to the water sector reform movement and have conducted public consultation and surveys to solicit input from stakeholders and the public.

In the Brantas Basin a number of NGOs and institutions participate in aspects of WRM (primarily environment related) and work with the provincial and basin level agencies. A list of the NGOs and Institutions that are participating in the Brantas basin water issues is given in Table 20. Though these NGOs have no institutional authority in decision-making they are playing an important role in bringing public awareness, monitoring water quality, managing solid waste and domestic sanitation, and promoting transparency in WRM activities.

Table 20: NGOs and Academic Institutions Involved in Brantas Basin

No.	NGO / Institution	Address	Area of Work
1	Raditya Lestari	Jl. Semarang No.4, Malang Tel./Fax (0341) 551287	Environmental Education
2	FKLH Warugunung	Raya Warugunung No.1, Surabaya Tel. (031) 766 9670	Environment
3	YLI (Yayasan Lingkungan Indonesia)	Surabaya	Environment
4	E C O T O N	Jl. Karang Wismo III / 6A, Surabaya Tel. (031) 503 1621	Environment
5	PPLH Seloliman	Seloliman Trawas Tel. (0321) 618 752	Environmental Education
6	HIMAPALA UNESA	Kampus UNESA, Surabaya	Environment
7	Komisi Lingkungan FKS	Jl. Ngagel Tama VI, Surabaya Tel. (031) 372 9237	Environment
8	Siklus ITS	Kampus ITS, Surabaya Tel. (031) 599 7786	Environment
9	LBH Surabaya	Jl. Kidal 6, Surabaya Tel. (031) 592 1745	Legal Assistance
10	MAPALAS	Kampus UMITOMO, Surabaya	Environment
11	Forum Kota Surabaya	Jl. Ngagel Tama VII, Surabaya Tel. (031) 501 1474	Environment
12	POSKO IJO	Jl. Raya Bambe 115 Driorejo Tel. (031) 750 8837	Environment
13	WALHI Jawa Timur	Jl. Gubeng Kertajaya IX/G 17, Surabaya Tel. (031) 501 4092	Environment
14	Komisi Lingkungan Hidup (Komnas LH)	Jl. Raya Losari 345, Singosari, Malang Tel. (0341) 458016	Environment
15	RHEIP University	Malang	Watershed Mgmt.
16	Brawijaya University	Malang	Water Quality

25. CONCLUSIONS

The unitary system of government with state control of the water sector created a decision making process in basin WRM that was more vertically structured than horizontally integrated. All major investment in the sector was from central funds, and it exercised its authority and decision-making powers through centrally managed basin agencies (Proyek

Induks), centrally funded basin corporations (BUMN), or central controlled projects. Provincial agencies functioned as representatives of the president and his implementing ministries on a public administration system known as 'deconcentration'. However, in this process the structural agencies ensured local level inputs through informal or formal institutional mechanisms. The provincial agencies exercised authority in regulatory aspects (as a delegation of authority from the president) in areas of licensing, monitoring, and enforcement. They undertook some activities on a decentralized basis using local resources or block grants (also known as Impress) from the center. The main decentralized activity in the water sector is related to irrigation O&M and management. In other water sector activities the provincial decentralized program formed complementary and/or supplementary programs to those of the center. The district level agencies had little direct input in the water sector prior to 2000 except to channel local aspirations to provincial and central authorities.

With the enactment of decentralization and fiscal autonomy laws in 1999 and its revisions in 2004 a far-reaching decision has been made to shift a major portion of the center's authority to the district and provincial levels; the modalities of which are still being worked out. Accordingly, much of the water sector activities to manage water resources (except major and medium size development) is to be vested in the regional level governments with the center and to some extent the provincial governments acting as facilitator, supervisor, and guide. With the enactment of the Water Law (#7/2004) and completion of the water sector reforms in the near future the stage is set for decentralization of authority in basin WRM. An important first step in decentralizing basin management through public basin corporations will be when the regional governments are ready to set up Regional Basin Management Corporations (BUMDs). The Balai PSDAs have brought in the same magnitude of decentralization in basin WRM, but the institutional framework is still weak.

The new Water Law 7/2004 that replaced the old Water Law 11/1974 has strengthened WRM by giving a role to the stakeholders and improving the regulatory and administrative mechanisms. It has strengthened the cost recovery concepts from water users except from public sector irrigation users. A major weakness of this law is the reversal of the decentralization process in the irrigation subsector and failure to promote explicitly the irrigation management transfer (IMT) to the farmers' organization.

Of the forestry, agricultural, and water sectors, the forestry sector remains the least decentralized while in the agricultural sector decentralization has taken hold. The decentralization of decision making in the water resources sector is still evolving with the center continuing to support policies that inhibit shifting of authority to the appropriate lowest level because of concerns relating to national self sufficiency in food production, burdening of the farmers as a result of shifting of management authority to farmers organizations and future conflicts in water use among the regions.

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