Management for Water Related Disaster (Flood) and Water Demand Case Study in Brantas River 1)

Symposium on River Environment and Water Resources Management

1- 2 December 2007 in Beppu City, Japan

FLOOD DISASTER
Present Condition

- Recurrence of floods increasing because of more hard surface / watershed degradation (illegal logging, agricultural practices without paying attention to land and water conservation).
- Losses/damages also increasing because higher population density and economic development

FLOOD DISASTER
Present Condition

Rapidly deteriorating situation due to:

- Population growth and urbanization
- Economic development
- Poor maintenance of infra structure, accelerated deforestation & degradation of upper watershed
- Climate change
- Institutional capacity constraint (decentralization)

Increasing frequency & magnitude of flood
→urgent action required

FLOOD DISASTER
Strategic

- **Structural**

  Rehabilitation on Water Resources Structural (reservoir dredging/ flushing, rehabilitation of canals, make a retarding basin, heigtening river leeves)

- **Non Structural**

  - Flood planing zoning (structuring flood plain and flood area zoning).
  - Flood Forecasting and Warning System
  - Public Education
    a. Formal (public school curriculum)
    b. Nonformal (disseminate disaster risk reduction and strengthen capacity trough training to youth center)
  - Prepare disaster legislation, regulations and standard operating procedures.

WATER DEMAND
Present Condition

- The increases of population and socio-economic activities have escalated the water demand for various purposes.
- The increase of population also increases the need of human space for settlement, agriculture, and industries. This cause the land use change from forests to low vegetated area ⇒ dependeble flow decrease
- Water demand increase the other hand the water available is relatively still the same, and even in some rivers has been deteriorated.

WATER DEMAND
Present Condition

Decreasing Water Quantity due to :

- Watershed degradation that lead to decreasing of river base flow.
- Erosion and sedimentation problem that lead to decreasing the capacity of the reservoir.

The result is the conflict between water user sectors, water users.

WATER DEMAND
Present Condition

Decreasing Water Quality due to :

- Water pollution that lead to degradation of water support capacity.
- The increasing of domestic and industrial waste that lead to increasing water pollutant.

The result is the conflict between water user sectors, water users.

WATER DEMAND
Strategic for Water Quantity

1. **Structural**
   - Supply Management (canal rehabilitation to reduce water losses at irrigation system)
   - Demand Management (maintenance of the tertiary irrigation system)
2. **Non Structural**
   - Supply Management (controlling water distribution)
   - Demand Management (to develop “economic instrument” by applying progressive tariff system, applying insentive system to farmers that use System of Rice Intensification/SRI)

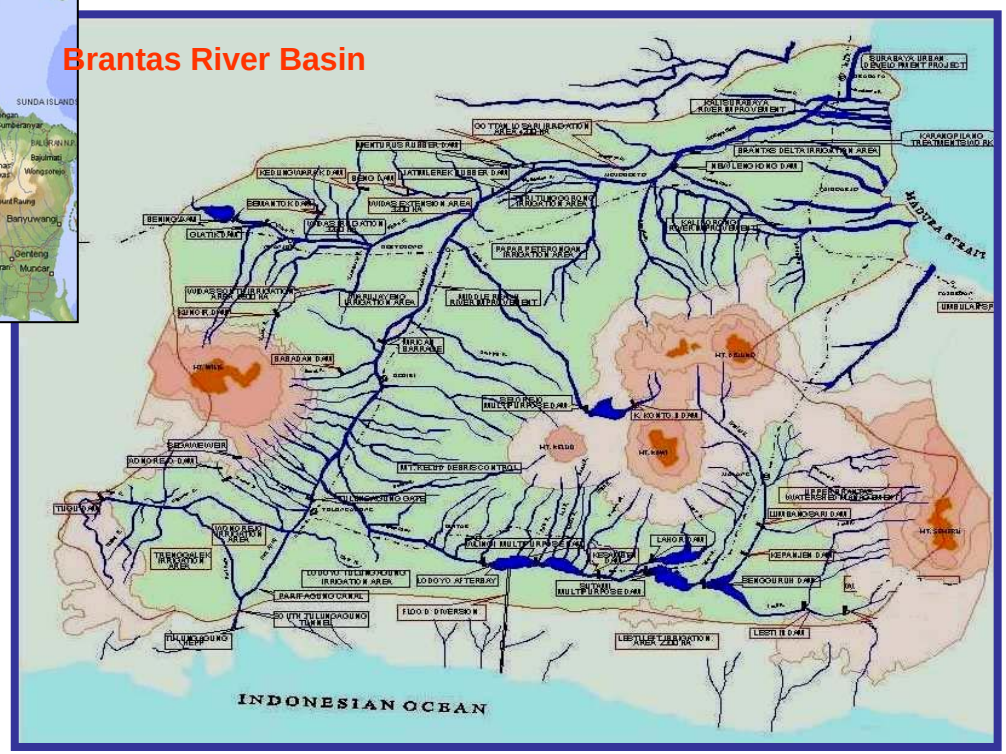
WATER DEMAND
Strategic for Water Quality

1. **Structural**
   - Supply Management (technology development to regain good water quality by constructing water cascade structure across the river, aeration)
   - Demand Management (waste water treatment plant for industrial users, communal waste water treatment plant for domestic users)
2. **Non Structural**
   - Supply Management (increasing of water to maintenance flow in the river)
   - Demand Management (to applicate “polluters pays principle” to decreasing water pollution)

Case Study in Brantas River Basin

Description of Brantas River Basin

- Basin Area : 11,800 km^2 (25% of E. Java)
- Population (2005) : 15.5 million (43% of E. Java)
- Average Rainfall : 2,000 mm/year
- Water Potentials : 12 billion m^3/year
- River Length : 320 km

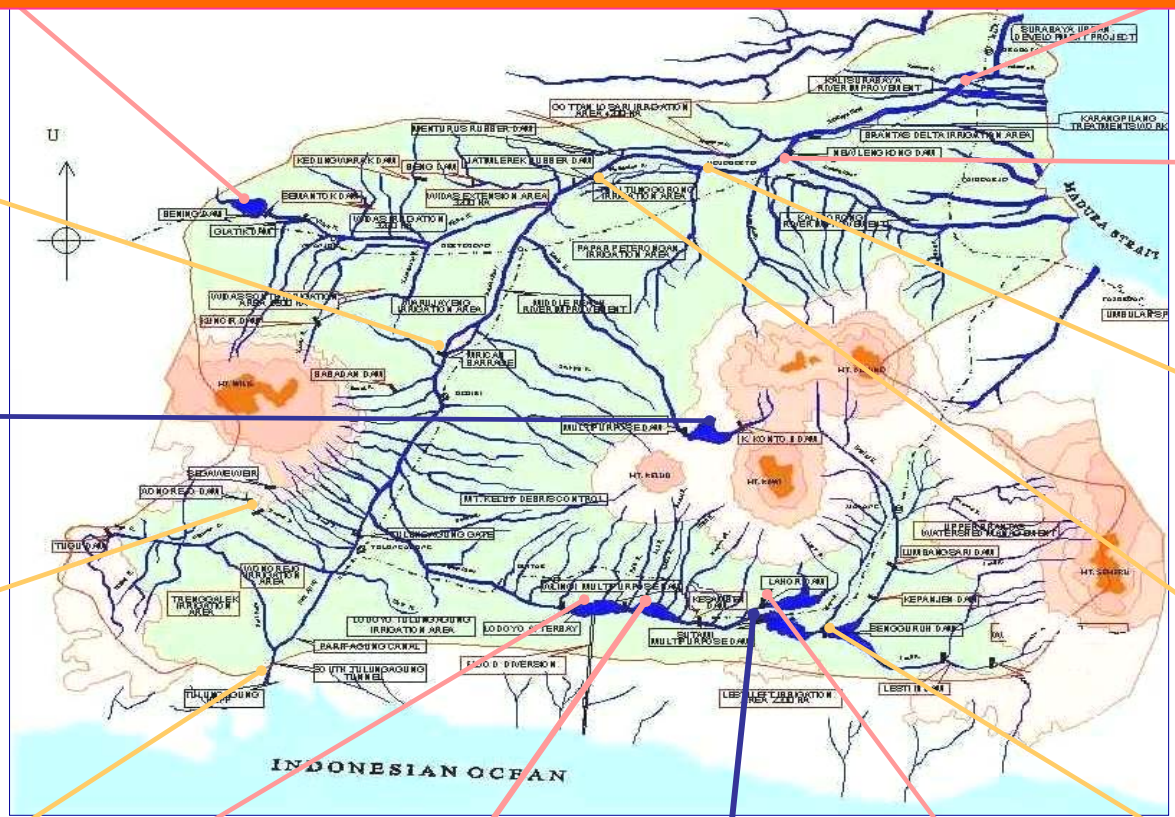


- Active volcanoes: Mt. Kelud & Mt. Semeru
- Land Use (2004) :
  - paddy field 39.0%
  - dry land 12.0%
  - plantation 22.0%
  - forest 11.0%
  - settlements 12.0%
  - others 4.0%

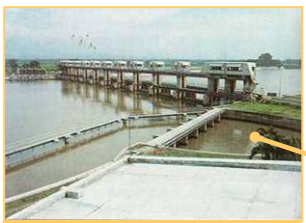
Development of Brantas Basin

Master Plan I (1961 - 1973) | **Master Plan II (1974 - 1985)** | **Master Plan III (1986 - 2000)**

Total investment (1960-2001) : 7.3 trillions Rp.
(US $ 0.097 billions, ¥ 78,8 billions, 258.9 billions Rp.)

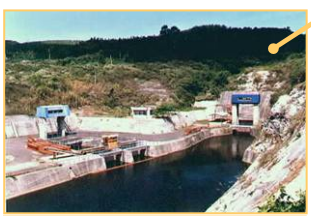



Bening Dam (84)


Waru-Turi B. (92)


Selorejo Dam (72)


Wonorejo Dam (00)


T.Agung Tunnel (91)


Lodoyo Dam (83)


Wlingi Dam (78)


Sutami Dam (72)


Lahor Dam (77)


Sengguruh Dam (88)


Gunungsari B. (81)

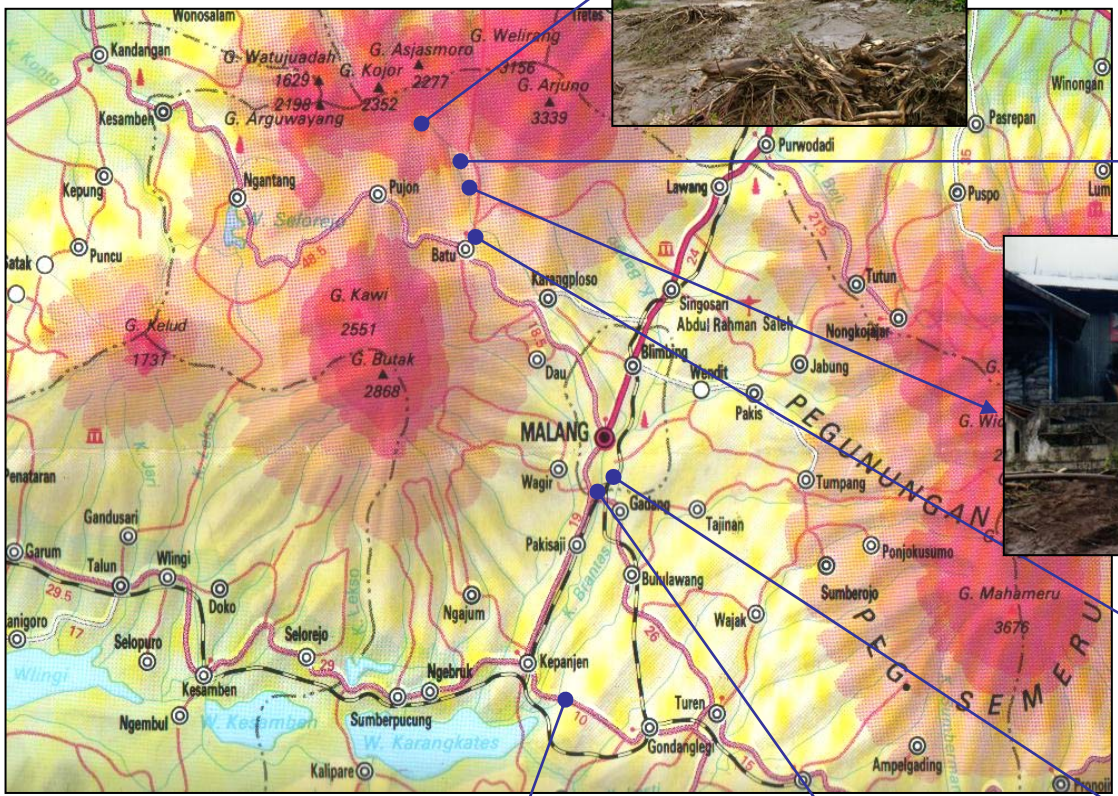

New Lengkong B (74)


Menturus R.D (93)


Jatimlerek R.D (93)

FLOOD DISASTER IN THE BRANTAS UPPER REACH ON 3–4 FEBRUARI 2004

ORIGIN OF SPRING BRANTAS RIVER



To cope with flood disaster

✓ Structural → improving river flow capacity by dredging, riverbank aligning etc

✓ Non-Structural →Flood zooning

Implementing Flood Forecasting and Warning System (FFWS)

promoting coordination among related agencies in mitigating flood hazard

- Implementation of Flood Forecasting and Warning System

FFWS master station

Rainfall gauging station

Water level gauging station

FLOOD DISASTER

Countermeasure → Structural

RESERVOIR DREDGING

RIVER DREDGING

REVETMENT REHABILITATION

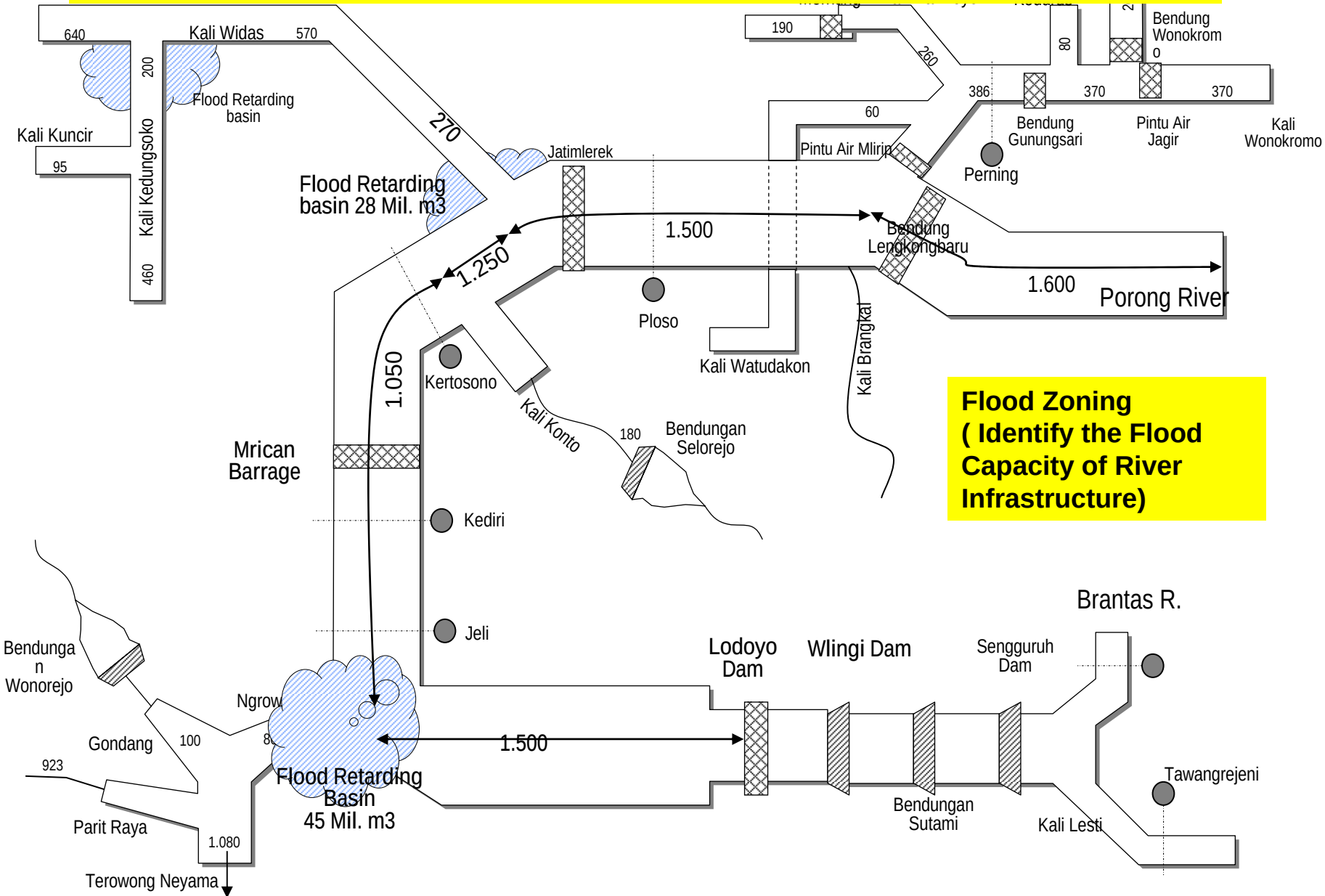
REHABILITATION OF TUNNEL

REHABILITATION OF WEIR

Action to maintain or increase the functions of infrastructures

FLOOD DISASTER

Countermeasure → Non-Structural Strategic



Flood Zoning (Identify the Flood Capacity of River Infrastructure)

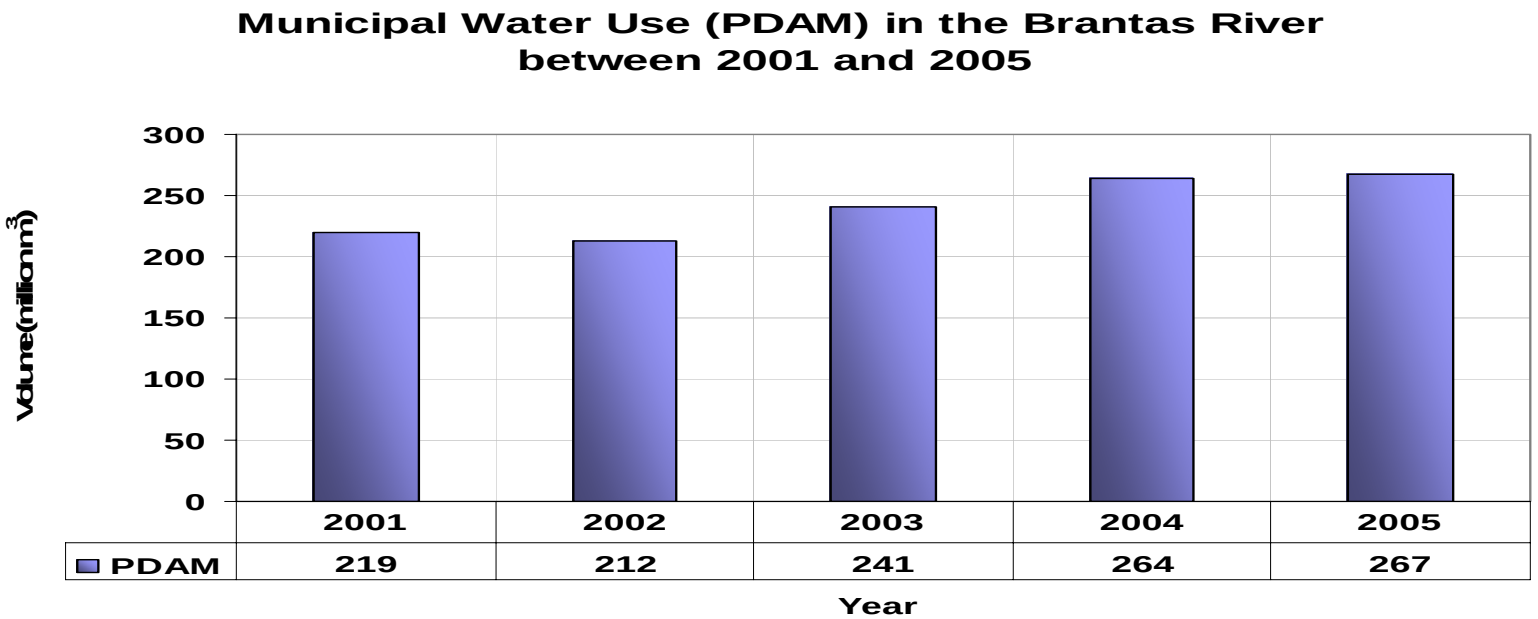
FLOOD DISASTER

Countermeasure → Non-Structural

Flood Forecasting and Warning System Facilities

Flood Warning System

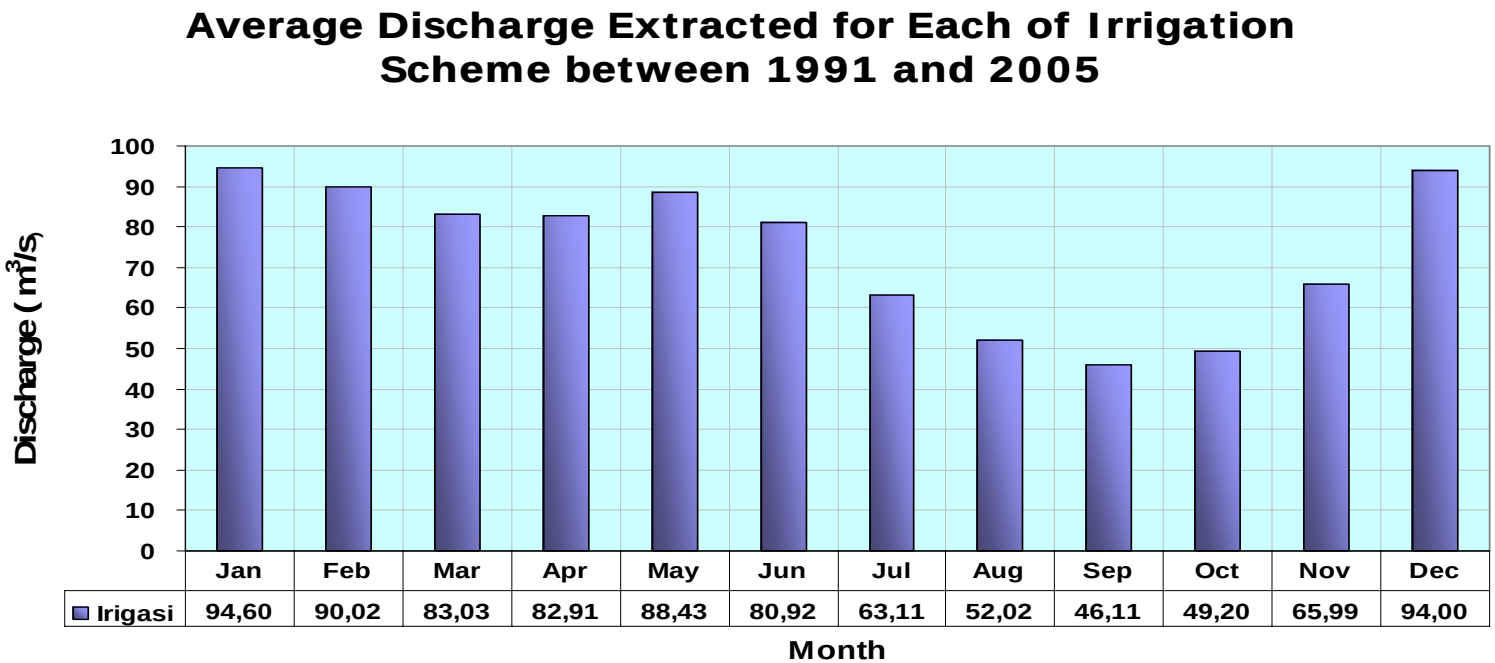
Present Municipal Water Use and Projection



Total Municipal Raw Water Demand (PDAM Demands) in the Brantas River Basin

Item	Unit	Year			
		2005	2010	2015	2020
(1) PDAM Surabaya, PDAM Sidoarjo and PDAM Gresik	m^3/sec	8.38	9.11	10.96	13.39
(2) Other 3 PDAMs	m^3/sec	0.10	0.10	0.12	0.15
Total (=(1)+(2))	m^3/sec	8.48	9.22	11.08	13.54
	10^6 m^3/year	267.4	290.7	349.5	427.0

Present Irrigation Water Use and Projection



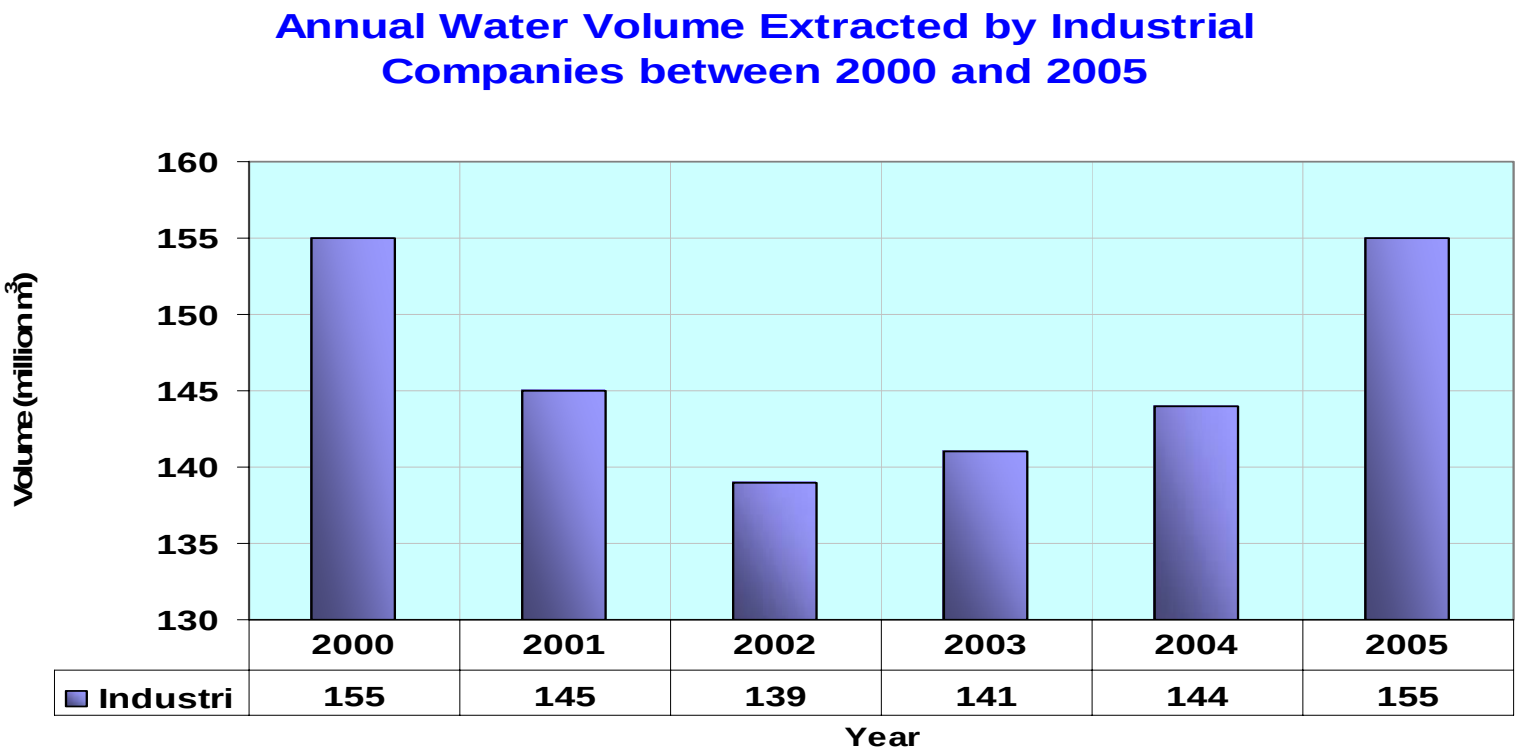
Irrigation Water Demand in 2020 for the Eight (8) Irrigation Schemes

Case	Irrigation Water Demand in 2020	
	(m^3/sec)	(10^6 m^3/year)
(1) Case-1 : Continuous flow	58.06	1,831
(2) Case-2 : Rotational flow*	45.10	1,422
Difference (=(1) - (2))	12.96	409

Note

The Rotational irrigation is planned to be practiced in the draught period when the available water is smaller than that in the hydrological standard year.

Industrial Raw Water Demand



The estimated industrial raw water demands at an interval of 5 years up to the year 2020 are shown in the following table:

Item	Unit	Year			
		2005	2010	2015	2020
Industrial raw water demand	m^3/sec	4.92	5.57	6.52	7.73
	10^6 m^3/year	155.14	175.6	205.5	243.7

To cope with limited water availability

- ✓ Introducing appropriate water service fee for hydropower generation, domestic and industrial water supply
- ✓ Promoting efficient use of water on any sectors
- ✓ Implementing transparent and fair water allocation to decrease potential conflict between sectors and users
- ✓ Improving existing telemetry system to support real time water allocation
- ✓ Proposed to construct new water storage (Beng Dam: 9.5 m^3/sec and Kedungwarak 3.5 m^3/sec in 2010 and 2015 in order to meet the water demand in 2020)

To cope with water quality degradation issue

- ✓ reviewing Water Quality and Pollution Control Master Plan
- ✓ initiating public awareness in environment issues
- ✓ improving monitoring facilities (real-time system and laboratories facilities)
- ✓ implementing waste water discharge license
- ✓ controlling major industrial pollution sources strictly
- ✓ constructing small scale centralized domestic waste water treatment plant in selected urban area

- Water Quality Monitoring and Restoration



Conclusion

- Some issues are identified regarding watershed degradation, limited water availability, water quality degradation, flood hazard, threatened river environment, water resources infrastructure degradation, financial support, funding, community awareness, education, and participation.
- Government should finance social services like flood control, irrigation water service, water quality control, and water resources conservation as the implementation of Government Obligation Principle.
- Water demand will increase significantly while the supply remains limited in the future due to the pressure of the population growth and squeeze of the industrialization pace. It is important to develop new sources of surface water.
- It is necessary to strengthen the legal aspect in order to establish an effective water resources management in the Brantas Basin.

Key Word

1. Public Education
2. Public Awareness
3. Water Everybody Business
4. Positive Public Participation