Jasa Tirta I Public Corporation
River Basin Management Agency of the Brantas and Bengawan Solo River Basin
Jalan Surabaya No 2A Malang 65115

Current Status of Water Resources Management at Jasa Tirta I Public Corporation

Raymond Valiant RURITAN
Director for Technical Affairs

Visit of World Bank Mission
Jasa Tirta I Public Corporation and Japan Water Agency
Malang, East Java – 9 June 2014

Visit of the World Bank Mission

WATER RESOURCES IN INDONESIA

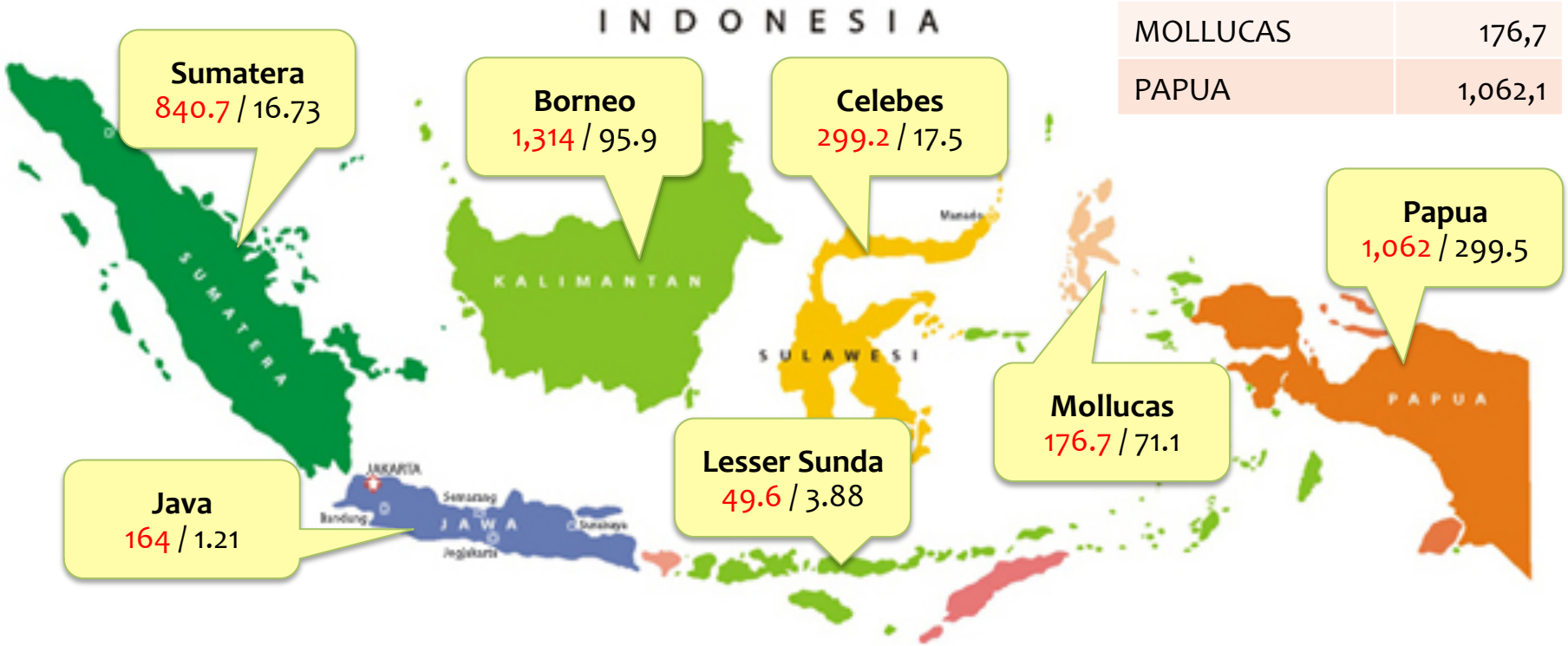
Raymond Valiant RURITAN

Indonesia: Abundant in Water

A vast archipelago along the equator with close to 17,000 islands, cross-roads between Asia dan Australia

INDONESIA	3.906,5
SUMATERA	840,7
JAVA	164,0
BORNEO	1,314,0
CELEBES	299,2
LESSER SUNDA	49,6
MOLLUCAS	176,7
PAPUA	1,062,1

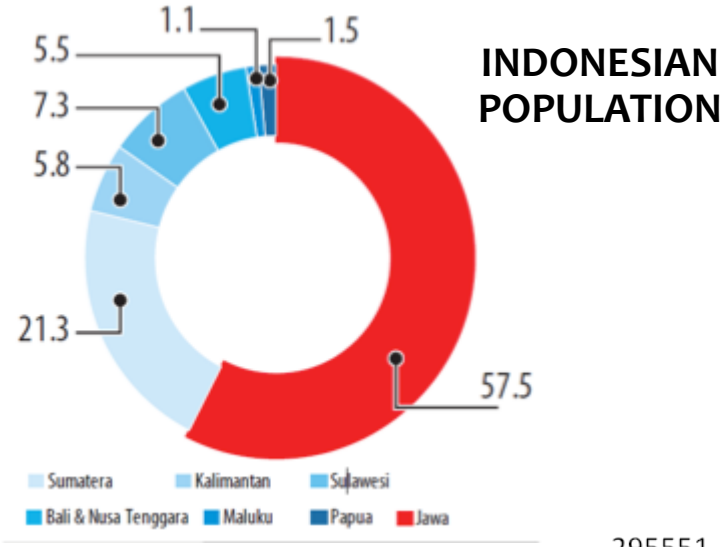
INDONESIA = 3,906 / 16.6
[km³ / 1.000 m³/capita]

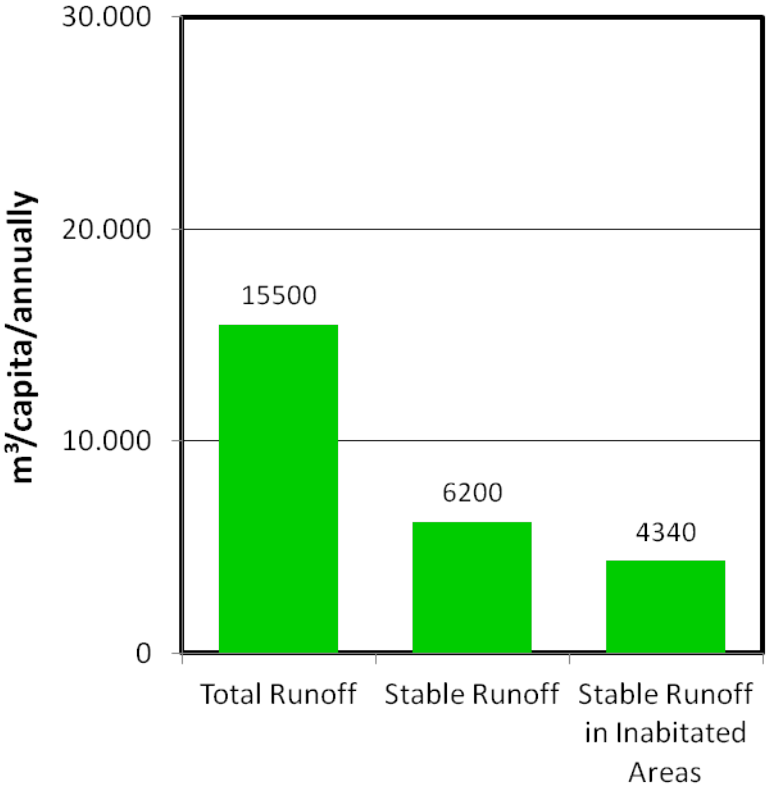


Blessed with the monsoon and dipole climate, fertile land due to geo-volcanic benefits, this archipelago hosts 237,64 million inhabitants (2012)

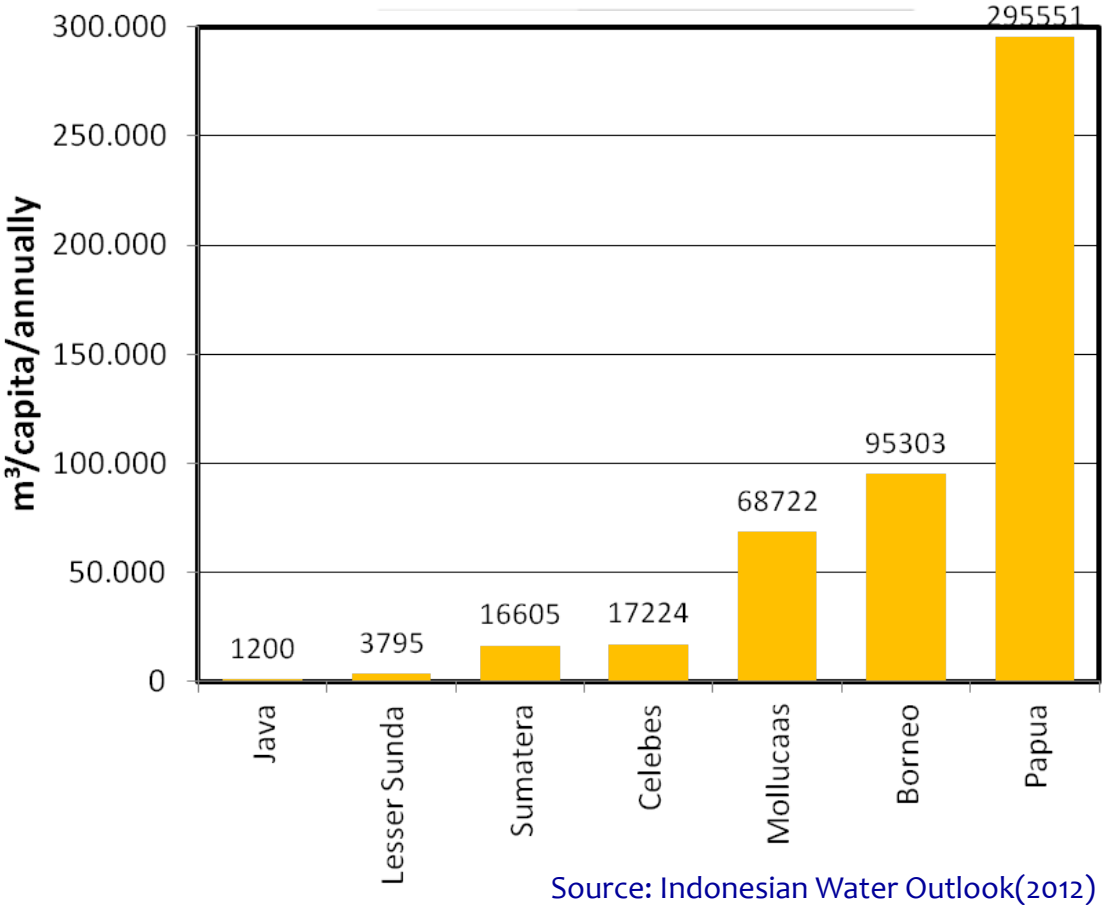
Water Distribution Problem

Even water is abundant, equality against time and space affected by the population distribution.





Source: Sarwoko & Anshori (2003) recalculated



Source: Indonesian Water Outlook(2012)

Water Resources Legislation in Indonesia

Institutons and Government Agencies in a River Basin

Water Resources Law No 7 / 2004

- The new water resources law (no 7 of 2004) was enacted to replace to older one (no 11 of 1974).
- Basic issues in the new water law that are addressed:
  - Equality and transparency
  - Water use right
  - River basin management
  - Water service fee, etc.

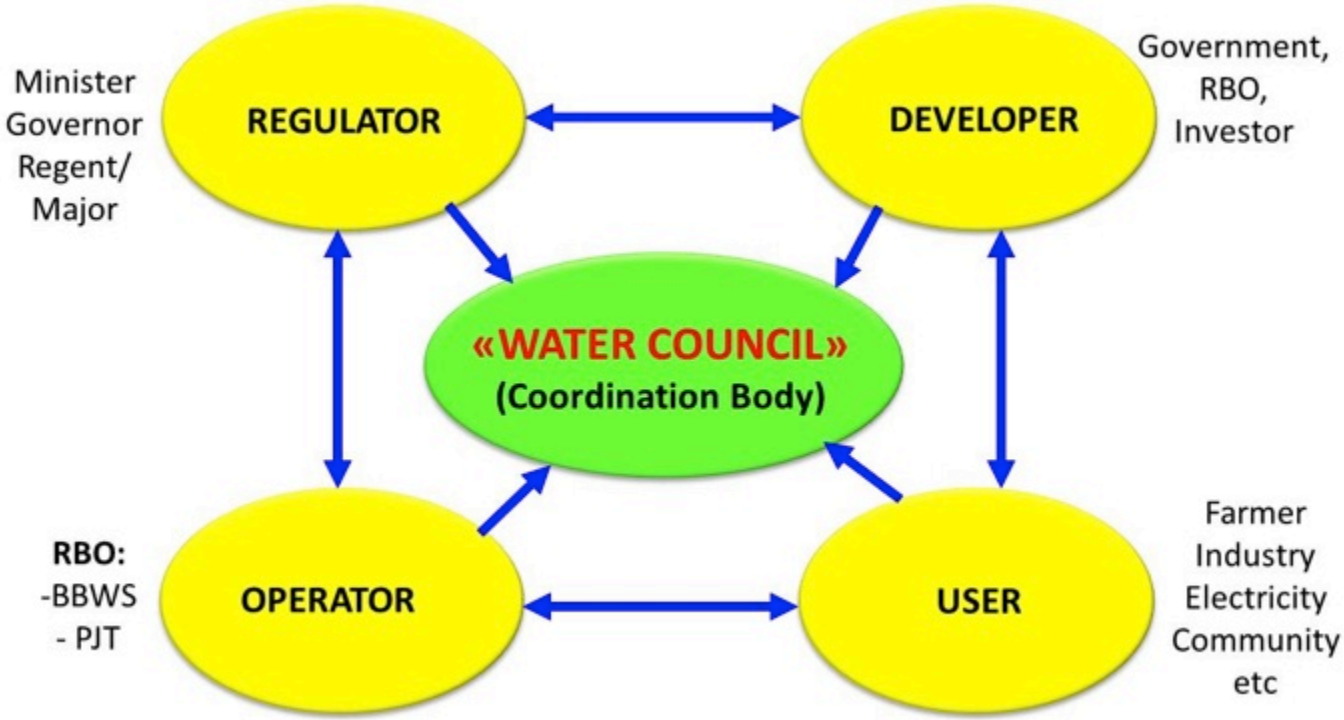
Gov't Regulation No 42 / 2008

- This regulation describes and stipulate implementation of the Water Resources Law No 7 of 2004.
- Various issues are regulated within this regulation:
  - Water management
  - Institutional set-up
  - Water allocation and licensing
  - Methods of water service calculation, etc.

Water Resources Legislation in Indonesia

Institutons and Government Agencies in a River Basin

In regard to the Water Resources Law the following schematic diagram show relationship between institutions and agencies within a river basin. A **coordination body** serves as a hub for the regulator, developer, operator and users to confer.



Coordination between Institutions in a River Basin

Jasa Tirta I Public Corporation

Main Tasks

- Jasa Tirta I Public Corporation is a corporate type of river basin organization.
- Responsible to manage water and its relate infrastructure in the Brantas & Bengawan Solo R. B.
- **Gov't Reg No 46 of 2010.**

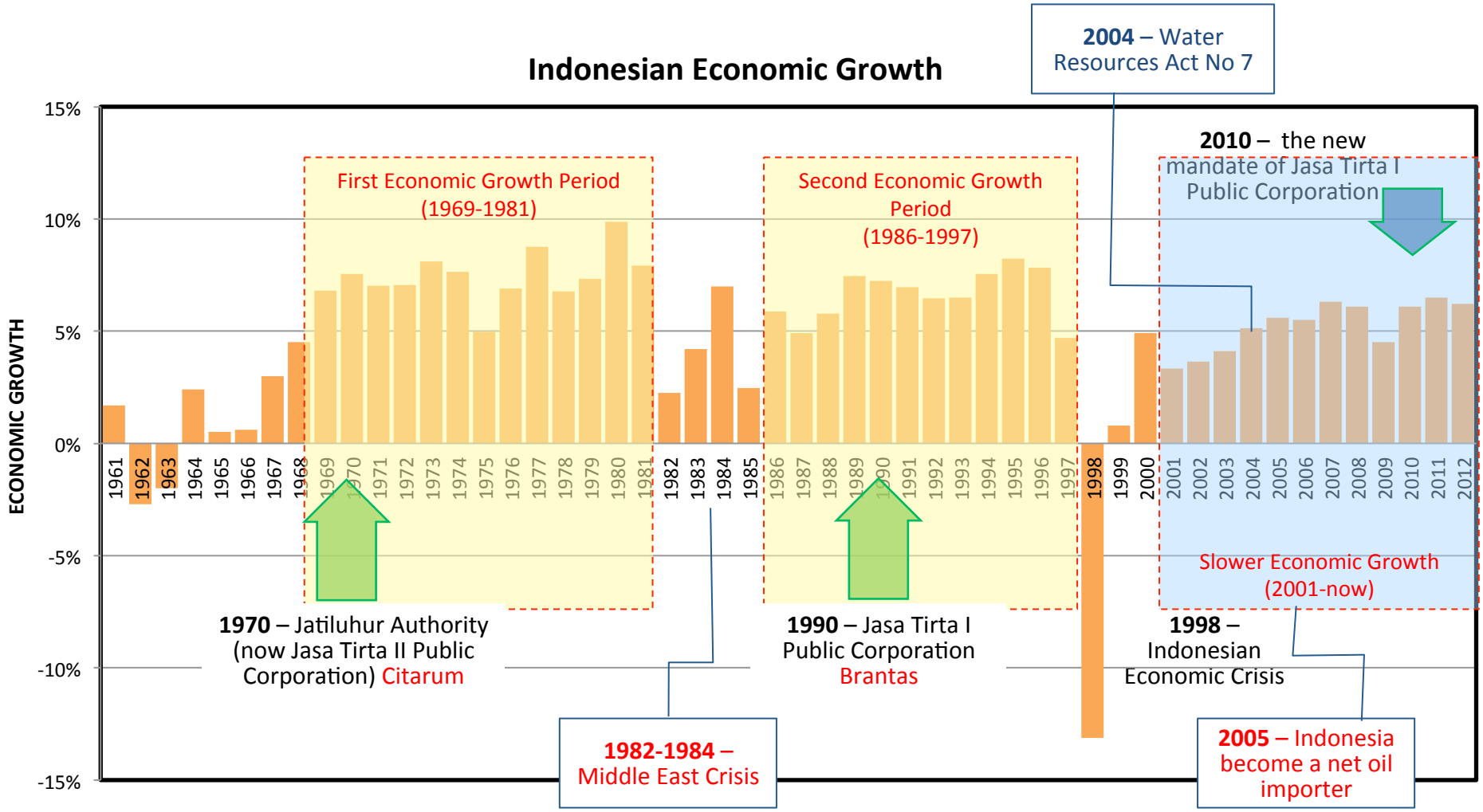
Dalam Angka:

- 2 R.B. (Brantas & B. Solo)
- 5 division
- 600 employees
- 1.200 million k-Wh of electricity served
- 407.000 ha of irrigation, whereas 150.000 ha in system
- 250 mill. m^3 industrial bulkwater
- 400 mill. m^3 domestic bulkwater

HEPP = 6 locations di Brantas R.B; 4 locations in Bengawan Solo R.B.

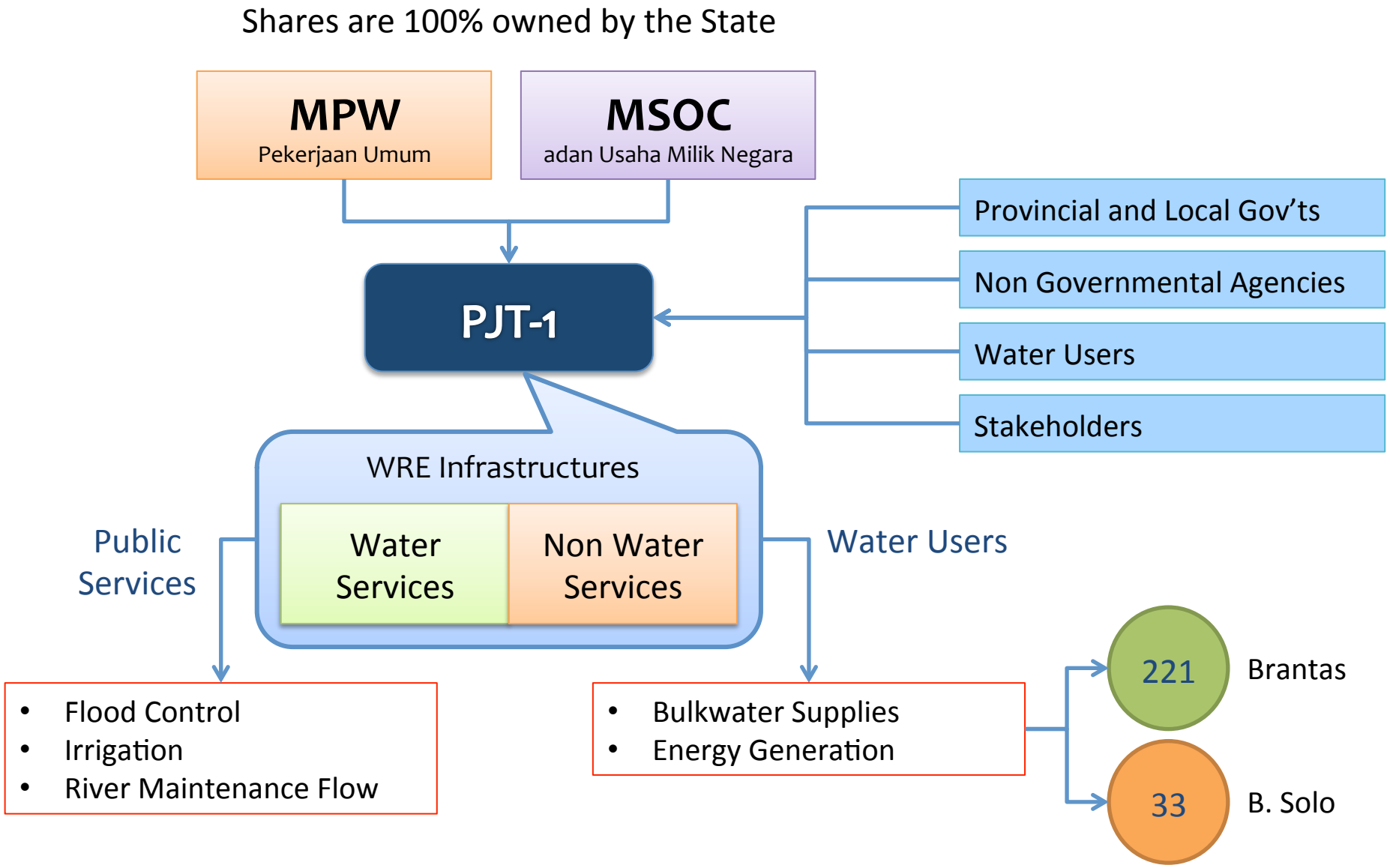
Jasa Tirta I Public Corporation

Jasa Tirta I Public Corporation was establishe a (basin-wide) **river basin organization** – on the purpose of rendering bulk-water services and operation-maintenance of the infrastructures. Establishment = **Government Regulation No 46 of 2010**



Source: World Bank (2013) and Index Mundi (2013) recalculated

PJT-I as a State-Owned RBO (Corporation)



Reservoir Bening

Barrage Gerak Mrican

Reservoir Selorejo

Barrage Wonorejo

Barrage Lengkong Baru

Barrage Lodoyo

Reservoir Wlingi

Reservoir Sutami

Reservoir Sengguruh

Rubber Dam Menturus

Reservoir Lahor

Tulungagung Tunnel (*Neyama*)

Barrage Gunungsari

Rubber Dam Jatimlerek

Rubber Dam Jati

Barrage Babat

Jabung Gate

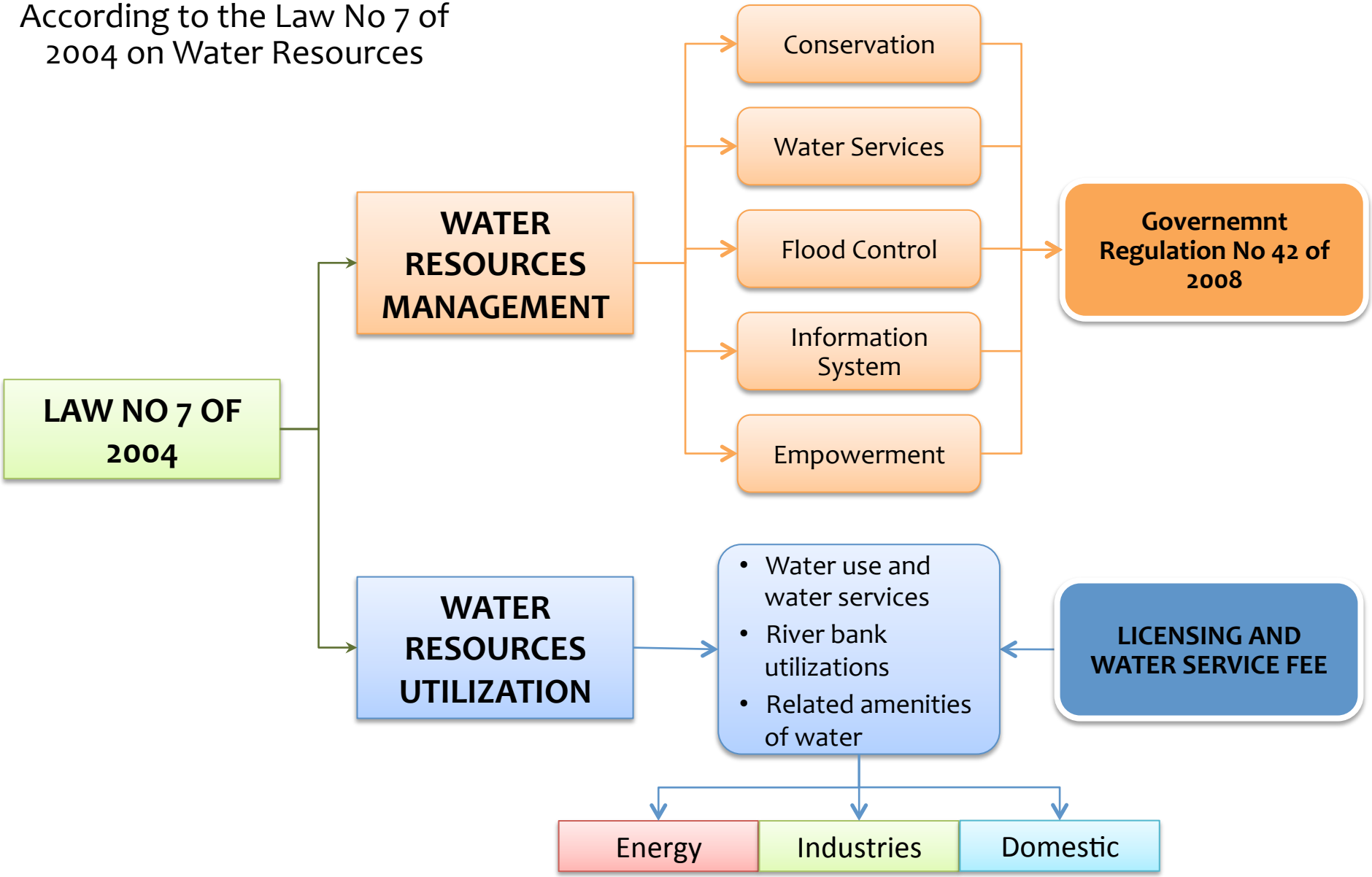
Floodway Pelangwot

Reservoir Wonogiri

Barrage Colo

Implementation of Water Resources Management

According to the Law No 7 of 2004 on Water Resources

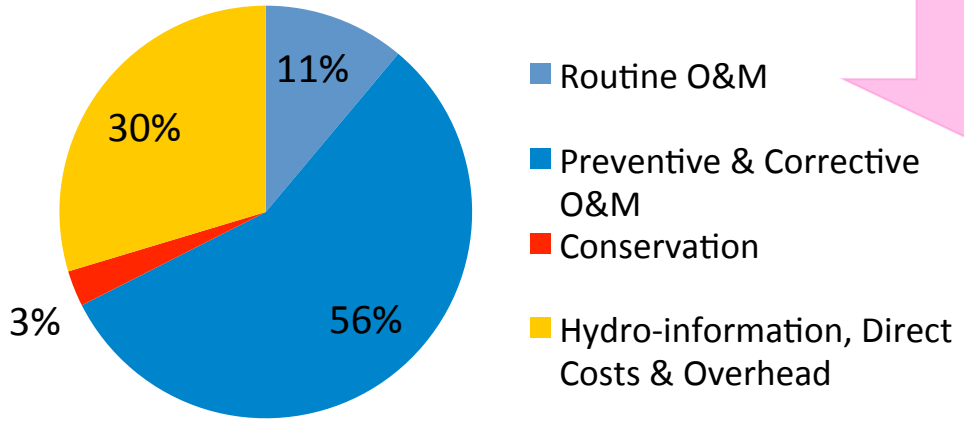


Financial Perspective

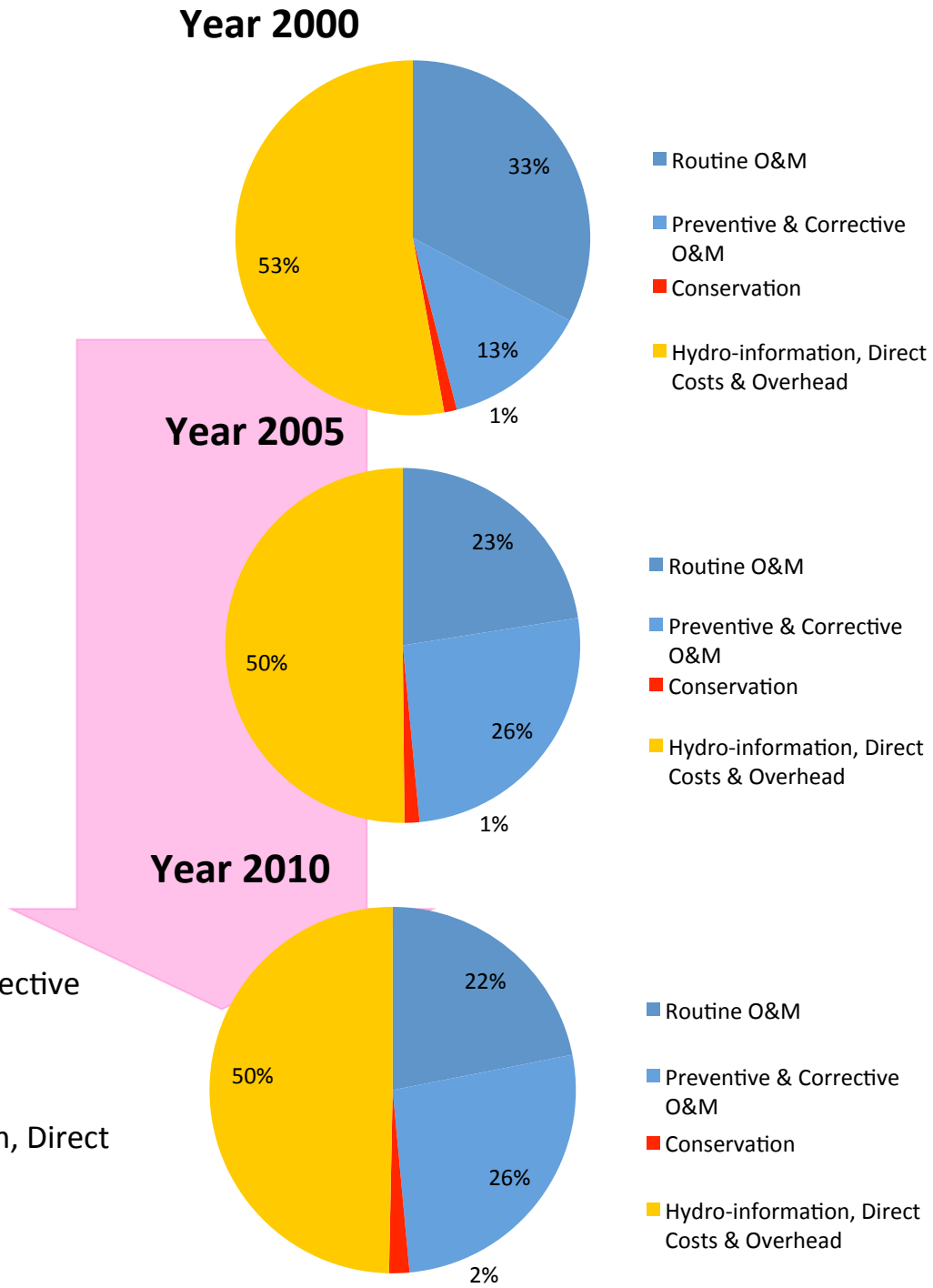
- Main services of PJT-1 consists of water service fee abstraction from commercial users.
- PJT-1 has also other non-water related business to improve its revenue.
- Most of the abstracted water service fee is used for rendering the water services and operation-maintenance of the managed infrastrucute

O&M Posting of 2012

Percentage Approximation



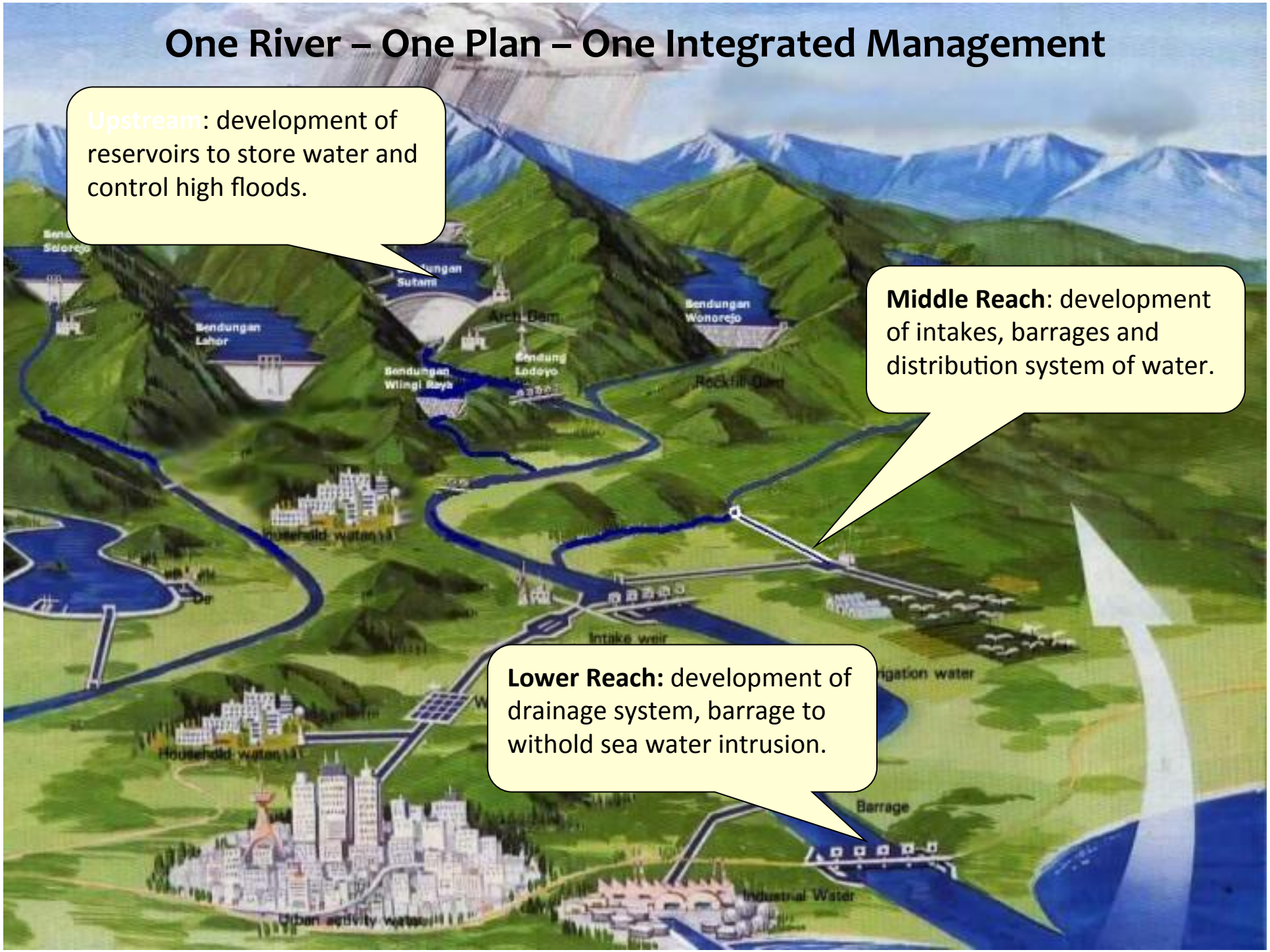
Source: audited report of 2012 of PJT-1



Visit of the World Bank Mission

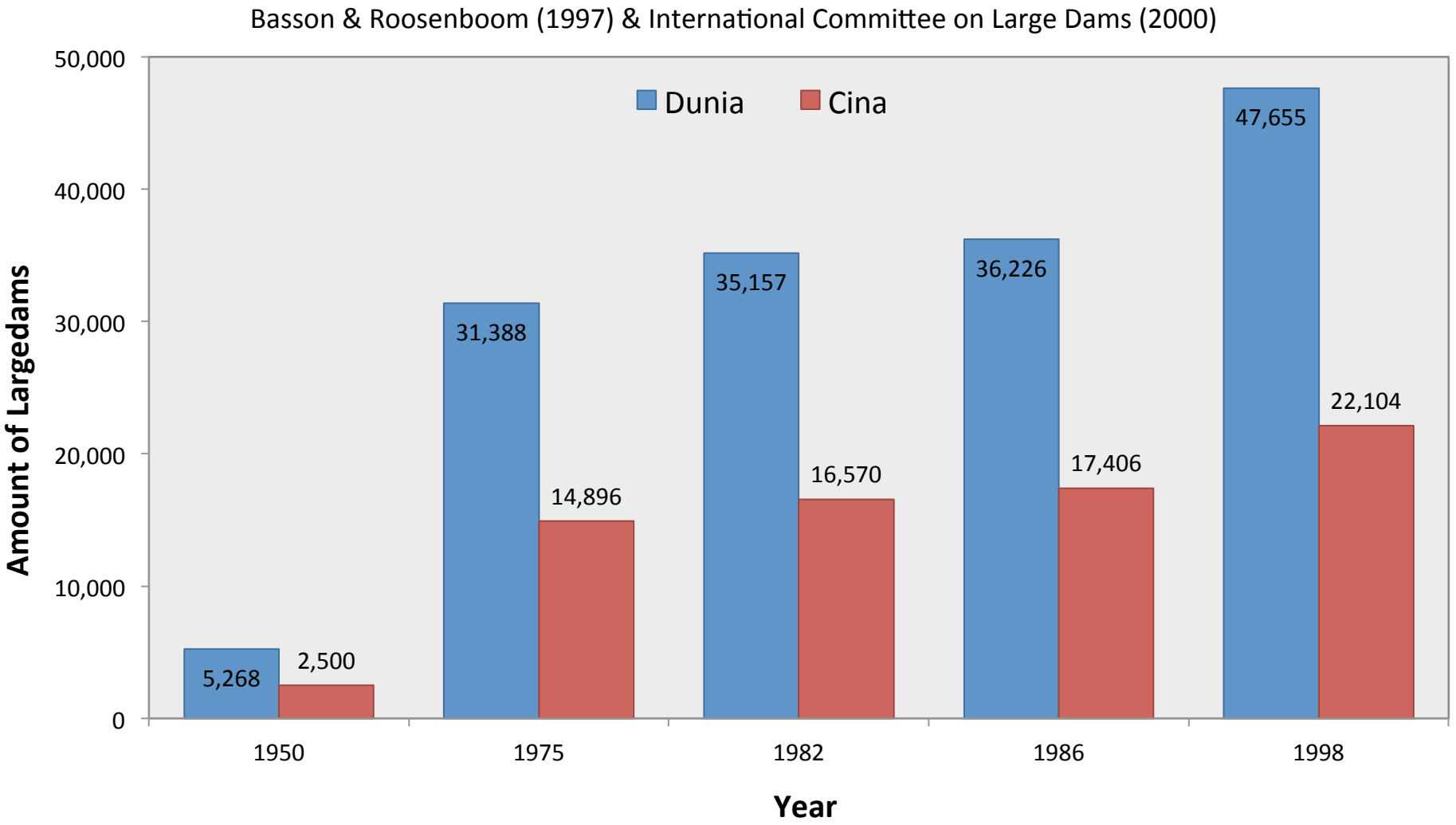
IMPLEMENTATION OF INTEGRATED WATER RESOURCES MANAGEMENT

One River – One Plan – One Integrated Management



Siklus Pembangunan dan Pengelolaan Prasarana Sumberdaya Air

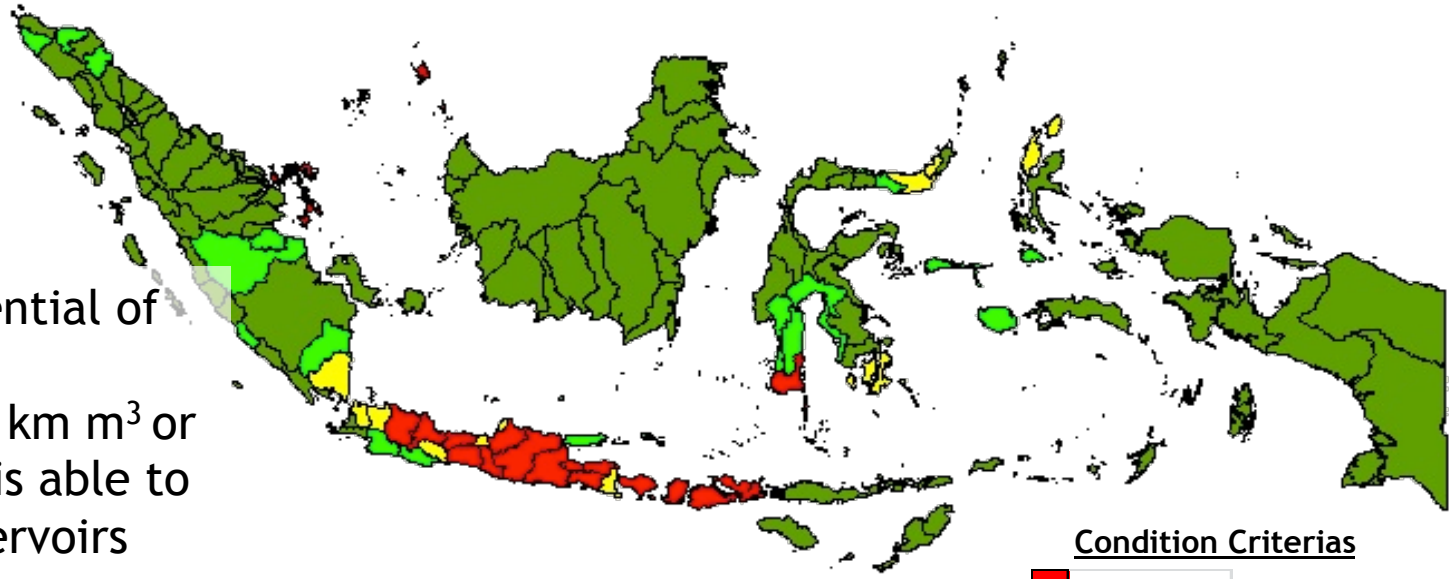
Reservoir Population in the World



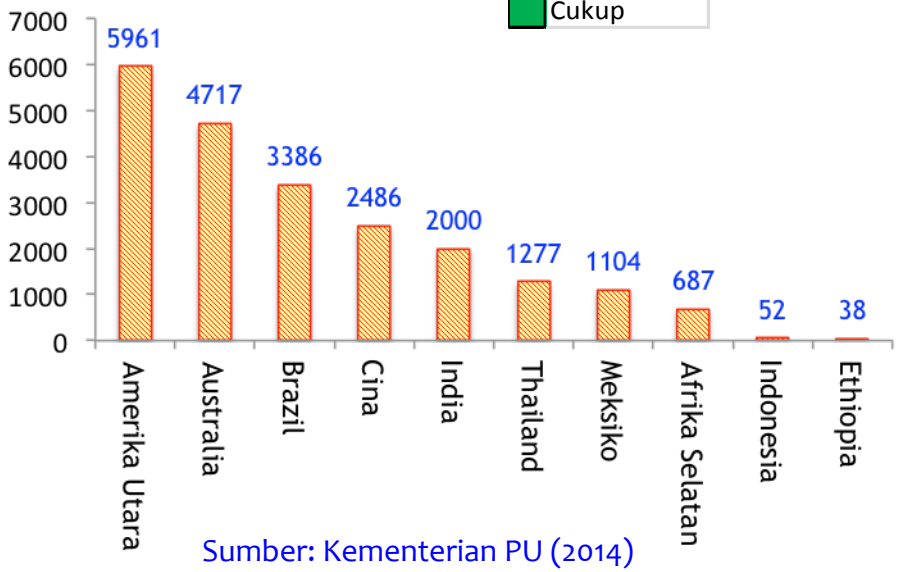
Large dams in Indonesia (2013) = **284 unit** (INACOLD) where **257** under the MPW

Water Management Issue in Indonesia

From the total potential of 3.900 km^3 water in Indonesia, only ±15 km m^3 or 63,5 m^3 per capita is able to be managed by reservoirs operations.



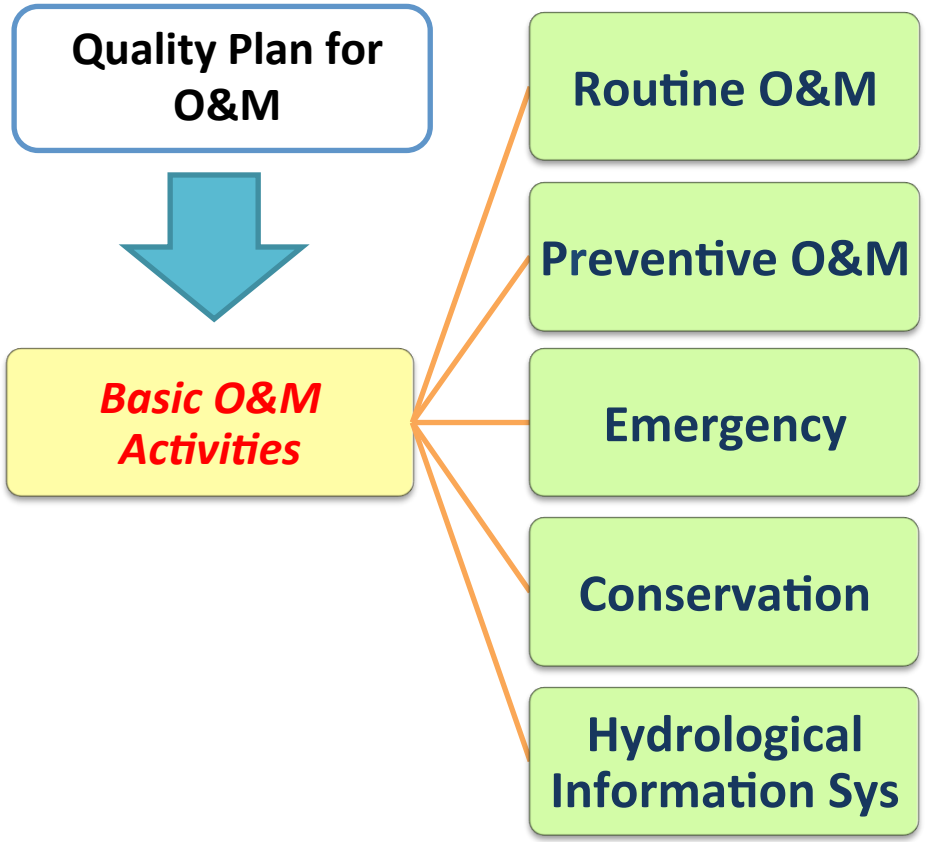
No	Pulau	Potensi (SID)		Proses Konstruksi	
		Unit	Volume (km^3)	Unit	Volume (km^3)
1	Sumatera	40	2,12	1	0.17
2	Jawa	81	1.40	16	1,94
3	Kalimantan	9	0,10	1	2,15
4	Bali & NT	16	0,17	7	0,13
5	Sulawesi	44	2,71	3	0,56
6	Maluku & Papua				
	Jumlah	**190**	**6,51**	**28**	**2,30**



Sumber: Kementerian PU (2014)

O&M of Water Resources Infrastructures

Quality Management System



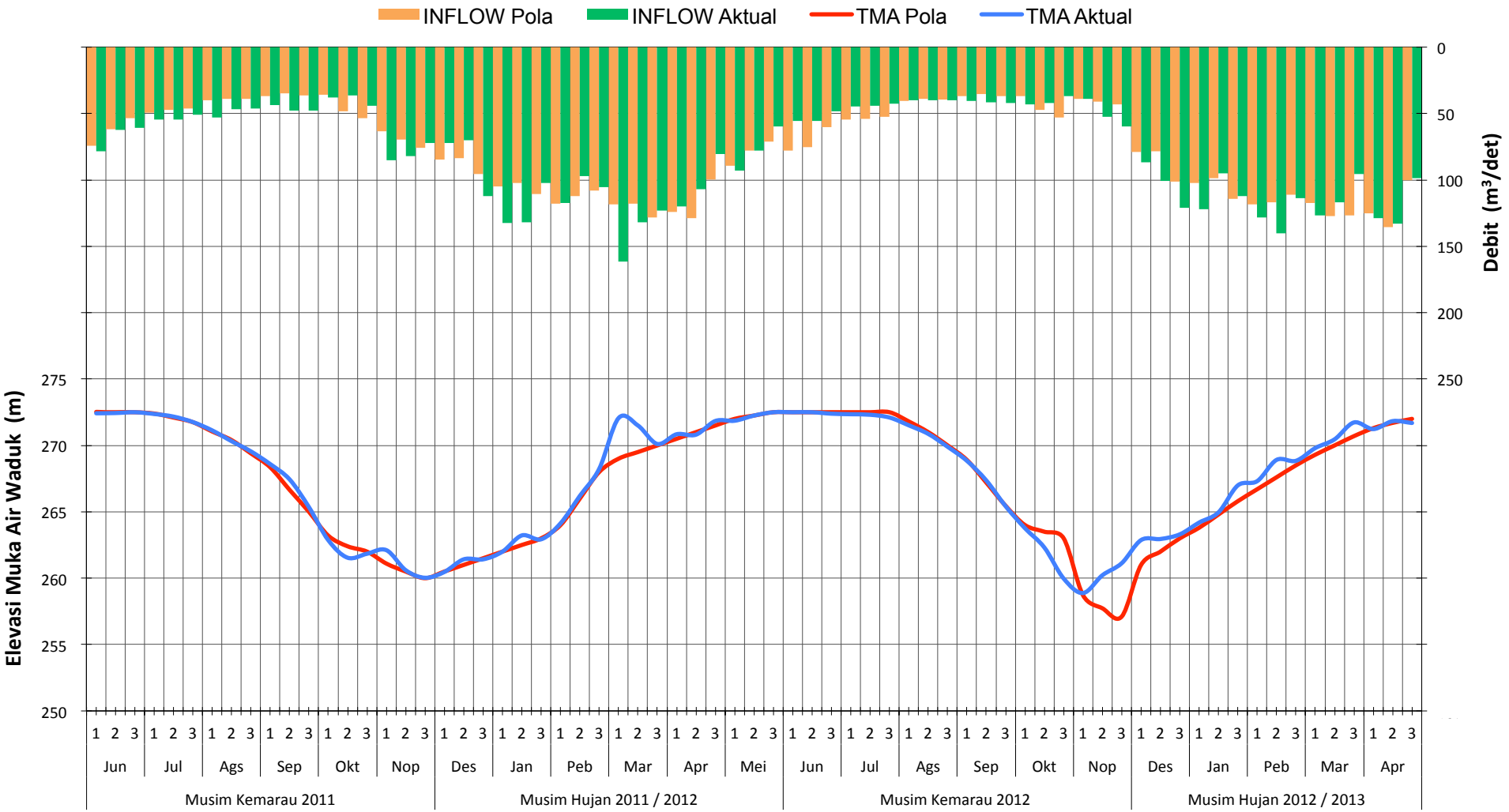
Financing O&M

- Jasa Tirta I Public Corporation is allowed to abstract biaya jasa pengelolaan sumberdaya air – BJPSDA (*water service fee*).
- Commercial users borne the O&M cost in form of the BJPSDA
- O&M plan is annually reviewed based on the stakeholders concern and consent.

Reservoir Operation Patterns

Reservoir Operation Pattern utilizes the storage approach:
S = change in storage; Q = outflow; I = inflow; t = time step

$$\frac{\partial S}{\partial t} = I - Q$$



Sutami Reservoir, East Java (*net storage* 174 juta m³)

Operation and Maintenance (Preventive Maintenance)

Small checkdams to address overland erosion

Eco-friendly gully plugs to control reel erosion

PJT-I conservation activities (2008-2012)

Year	Check-dam	Plantings
2008	38	229.660
2009	42	224.410
2010	60	769.820
2011	53	1.310.530
2012	66	1.983.970
Total	259	4.518.490

Reforestation and tree planting

Operation and Maintenance
(Dam Safety Monitoring and Evaluation)

Visit of World Bank Mission

CROSS CUTTING ISSUES

Water Service Fee as a Water User's Obligation

BJPSDA (*Water Service Fee*)

- As stipulated by the Water Resources Law (No 7 of 2004), Gov't Regulation No 42 of 2008, O&M activities within a specific river basin can be undertaken by a state-owned entreprise form of RBO = financed with the water service fee.
- Concept of water service fee within the Water Resources Law is as an ***ear-marked fund*** (from water back to water) in order to lessen up the financial inequalities.

Jasa Tirta I Public Corporation

- BJPSDA is quoted by Jasa Tirta I Public Corporation as stipulated by the Gov't Regulation No 46 of 2010, to the **commercial users**:
  - HEPP (power generating)
  - Domestic bulk-water
  - Industrial bulk-water
  - In-land fisheries etc.
- Jasa Tirta I Public Corporation as a corporate type of RBO works along with the Balai as a quasi-RBO representing the Ministry of Public Works.

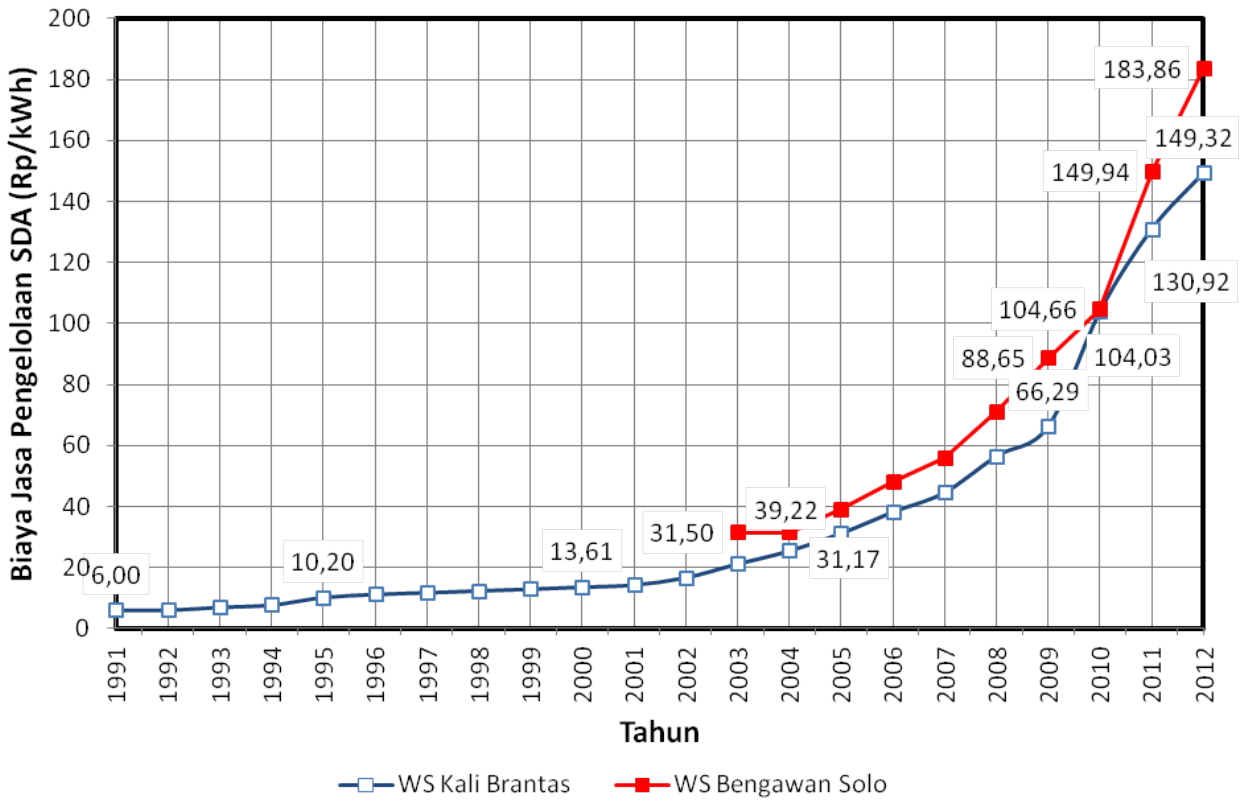
Comparing Water Service Fee to the Water Value

Comparaison of Electricity Cost (kWh)

Prime Mover	USD¢
HEPP (small scale)	5-6
HEPP (medium-large)	4-5
Wind (medium)	9-13
Wind (large)	8-11
Bio-mass	6-7
Bio-massa (gasified)	5-6
Solar (small-medium)	20-60
Geothermal (large)	5-6
Coal	4-5
Oil (MFO based)	22-28

Source: USAID (2007) recalculated

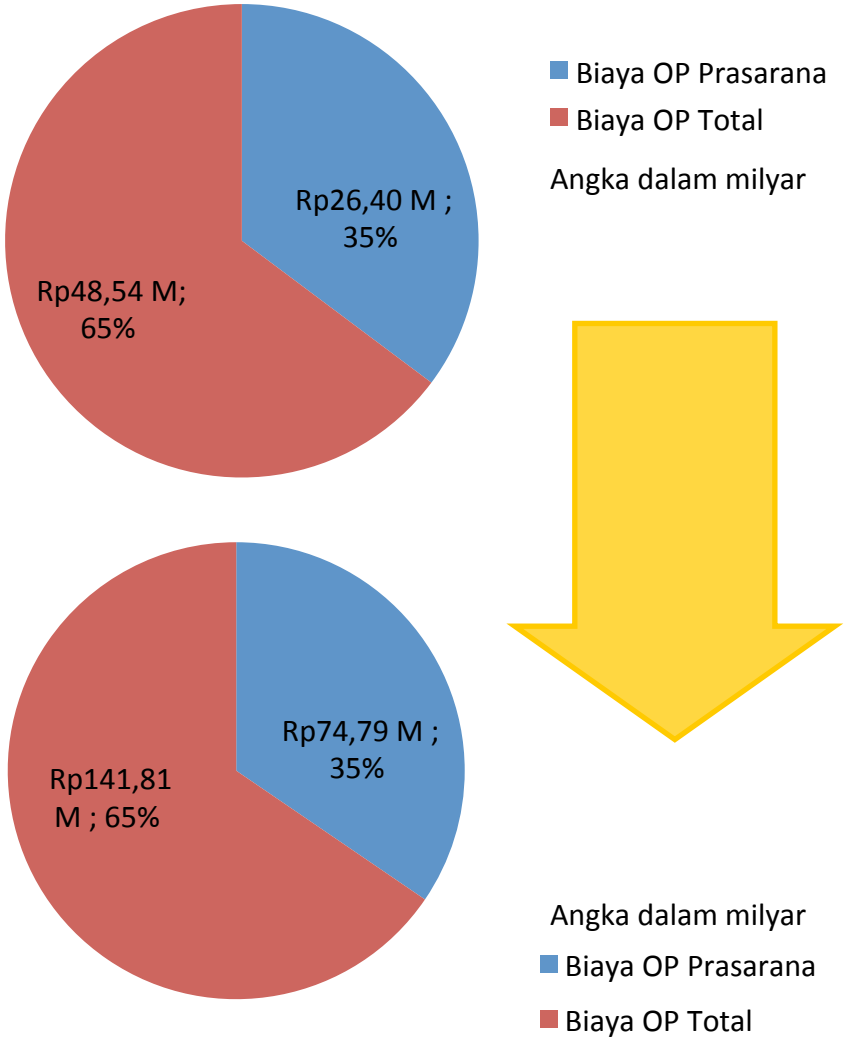
Water Service for HEPP (Brantas & B.Solo)



HEPP power buy by the *off-taker* = Rp 350; resale of power > Rp 650.
Economic cost of HEPP power = Rp 450-580 (medium) dan Rp 375-480 (large)
BJPSDA = Rp 183.86 (B.Solo) dan Rp 149.32 (Brantas) → **debated by the users.**

Consistency in Using the Water Service Fee is the Key Success for Sustainable O&M

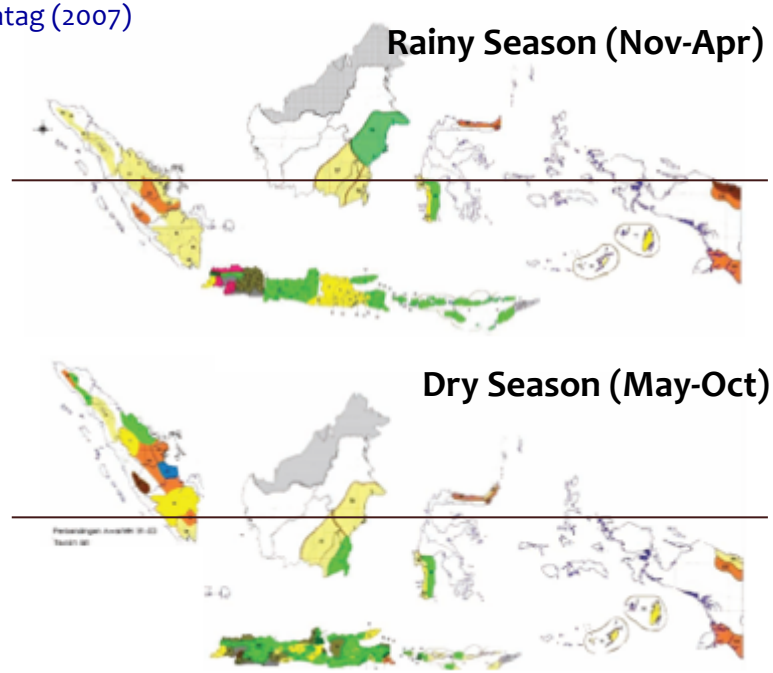
Percentage of O&M Cost as of 2007



Percentage of O&M Cost as of 2012

- O&M activities funded by the water service fee must be treated as an ear-marked fund – consistent allocation for O&M activities.
- One of the example is: dam safety.

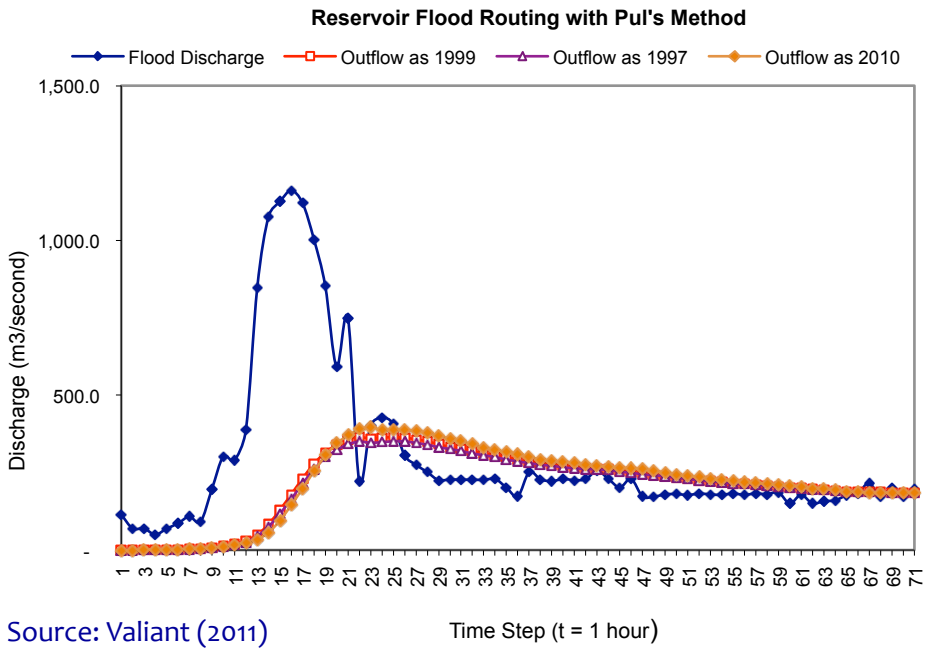
Source: Ratag (2007)



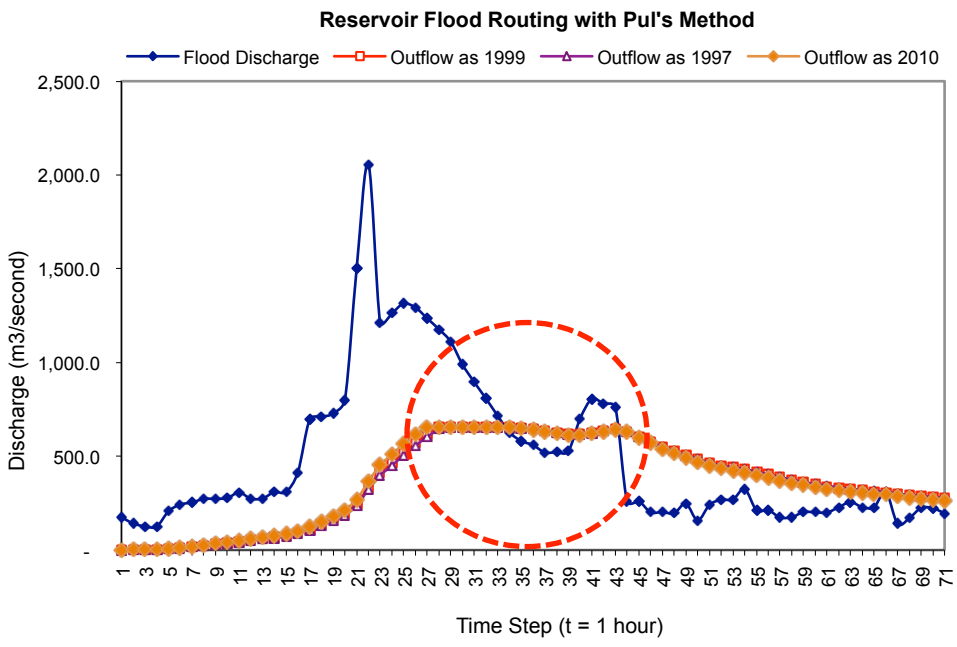
Adaptation to Reservoir Changes

- Flood routing shows increased risk whenever the reservoir receives a peak flood = sedimentation impose risk.
- Adapt = create a **control water level** (CWL) lower than the HWL during the rainy season.

Flood Routing at Sutami Reservoir (Q = 1,161 m^3/s) 29 Jan-2 Feb 2002

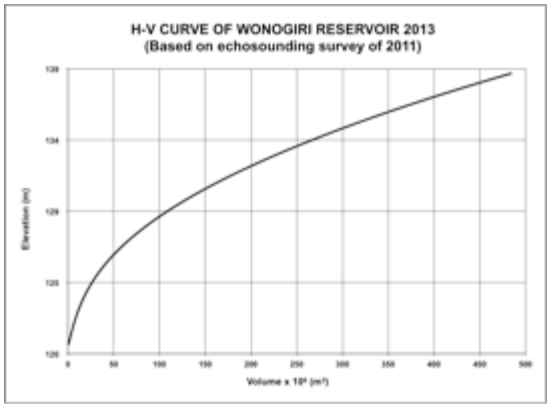


Flood Routing at Sutami Reservoir (Q = 2,057 m^3/s) 25-27 Dec 2002



Source: Valiant (2011)

Sedimentation Problems Related to Fluvial Aspects

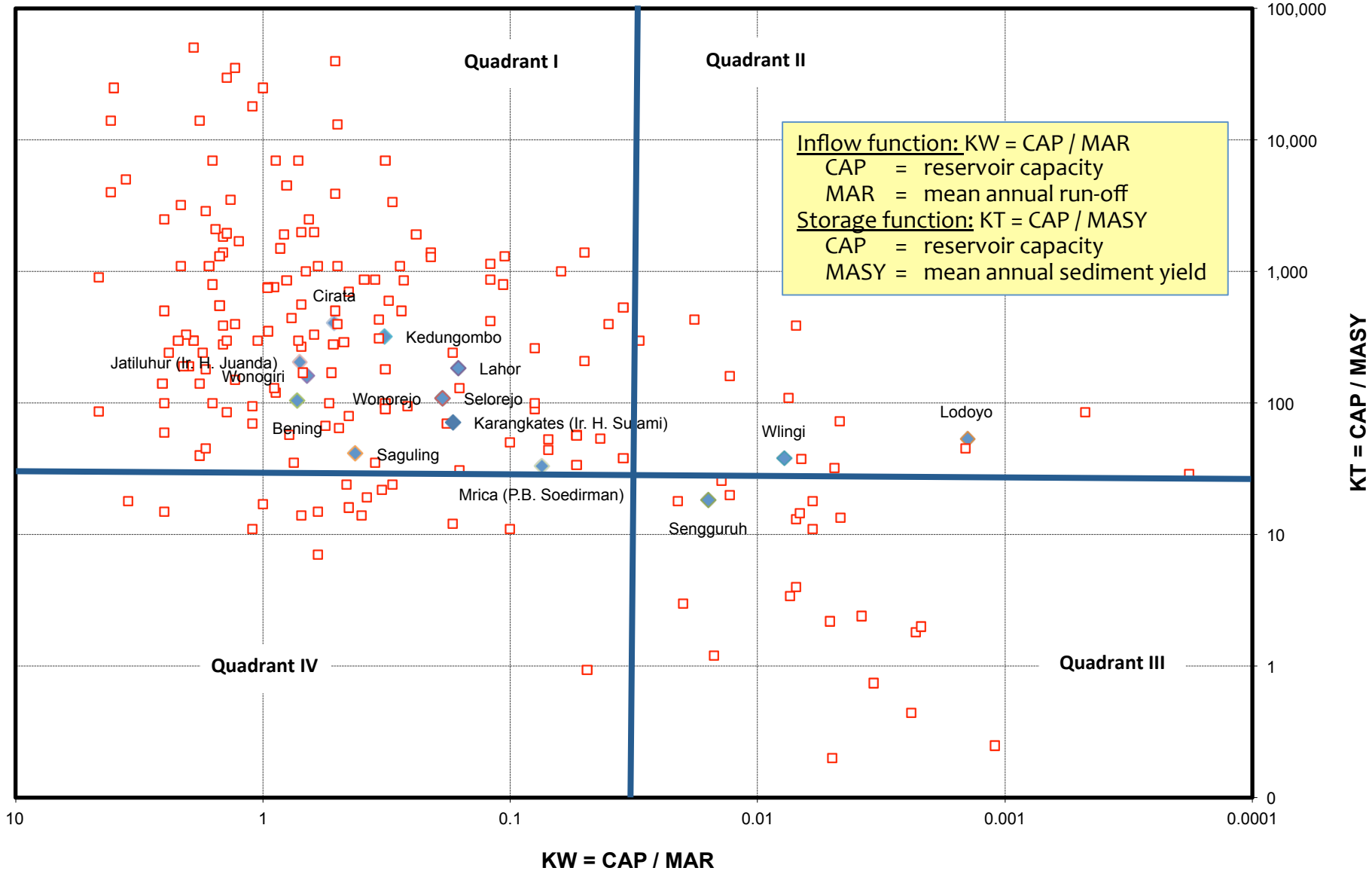


Wonogiri Reservoir, Central Java, Indonesia

- Sedimentation problem of Wonogiri is related to blockings to the intake.
- The Government of Indonesia has built an additional sediment by-pass.

Sedimentation Relation to Reservoir Characteristics

Reservoir sedimentation characteristics (Basson & Rosenboom, 1997)



Approach to Sediment Countermeasures

Sutami, Selorejo, Wonorejo, Wonogiri and Widas

Lodoyo and Wlingi

Sengguruh

First Quadrant

- Designed to withstand or receive a-50 to 100 years of sediment load.
- Because KW > 0,2 not enough water to flush.
- Dredging and mechanical approaches to secure against sedimentation

Second Quadrant

- Mean annual runoff is equally compared to sediment load.
- Sufficient mean annual runoffto conduct reservoir flushing.

Fourth Quadrant

- Proportional sediment load with annual runoff.
- Solely possible to control by means of sediment trapping in the upstream catchment area.
- Catchment area management.

Third Quadrant

- Reservoirs with sediment control purposes, KT < 100 and KW < 0.2
- Sufficient mean annual runoff to conduct reservoir flushing.
- Flushing is more suitable upon KW < 0.03

Reservoir	Sediment Removal Volume	
	Dredge (m^3)	Flush (m^3)
Sengguruh 1995–2012	3,795,461	-
Sutami 2004–2012	3,072,484	-
Wlingi 1995–2012	3,553,843	9,215,356
Lodoyo 2003–2012	600,953	3,601,097
Selorejo 2001–2012	1,024,428	-
Wonogiri 2006–2011	902,084	-
TOTAL	12,949,253	12,816,633

Flushing Activities at Sengguruh and Lodoyo Reservoir

Dredging Activities in the Jasa Tirta I Reservoirs