WATER – FOOD – ENERGY NEXUS

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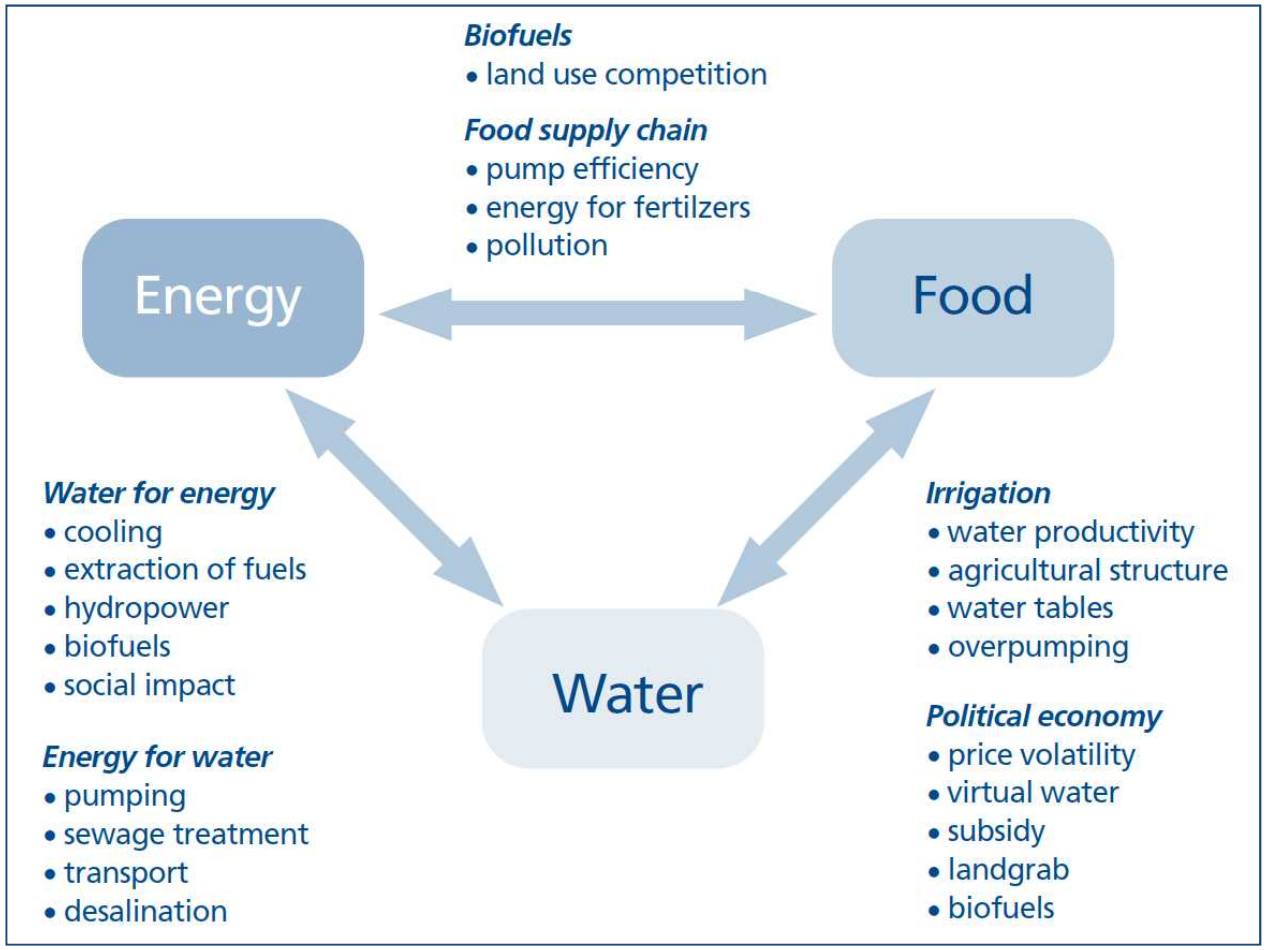
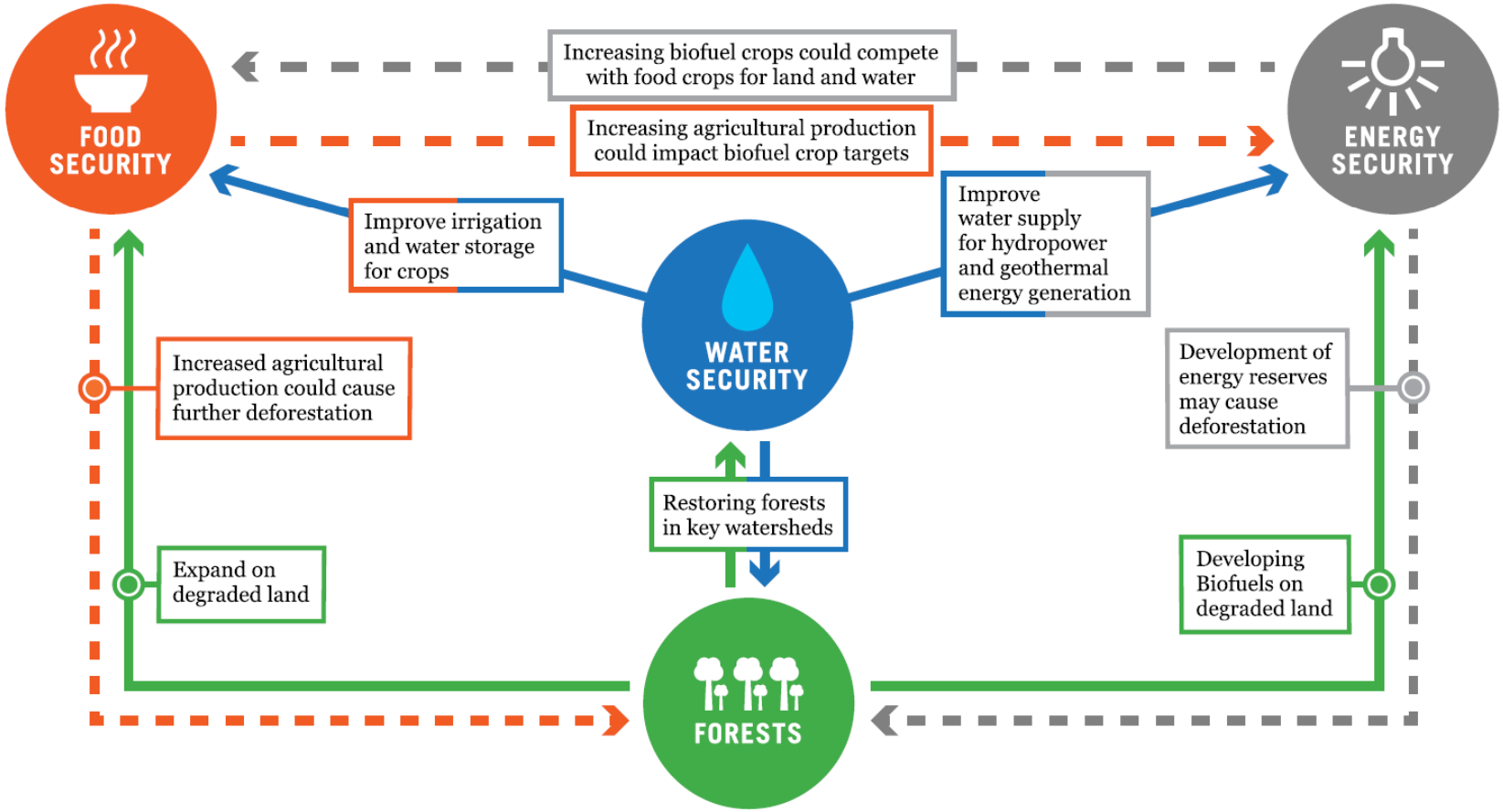
WATER – FOOD – ENERGY (WFE) NEXUS

- Economic and population growth will increase the need for "water, food and energy".
- The need for water, food and energy will also increase along with changes in lifestyle and social status
- Climate change may have an impact on the availability of water.
- Pressure on the environment, requires energy for sanitation



EXPLORING THE 'NEXUS'

- The water-food-energy nexus is a useful approach for identifying and evaluating resource trade-offs across different sectors.
- In Indonesia water is at the heart of this nexus, critical to both food security (agriculture & fisheries) and energy security (hydropower, biofuel, and cooling in thermo-power stations)
- Both water quality and quantity are dependent on forest ecosystem services

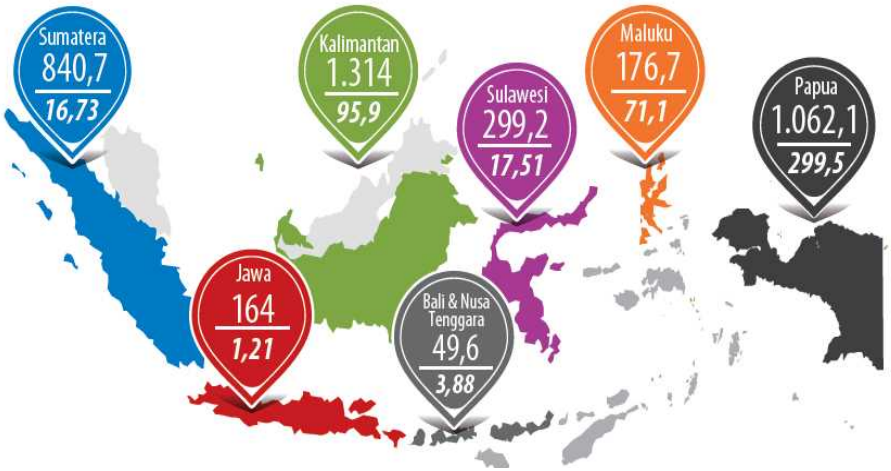


COHERENCE OF WFE OBJECTIVES

Strategic priorities for achieving water, food and energy objectives:

	**Investing in water infrastructure**	**A strategic priority in Indonesia's national mid-term development plan**
		Development & rehabilitation of irrigation is vital for Indonesia's food security
		Investing in water storage is a shared goal across sectors (multipurpose dams)
	Conserving forests as 'natural' water infrastructure	Sustainable forest management, restoration and conservation in upstream
		Forest and peat land conservation , climate mitigation and adaptation
	Utilising degraded lands to reduce pressure on forest	Bioenergy, staple food crops (oil palm) will require more land
		Prioritising production on degraded land would reduce
	Optimising land use across competing demands	The agriculture area for rice production has tend to decrease due to conversion
		Hydro power potential and bioenergy is concentrated in forest area

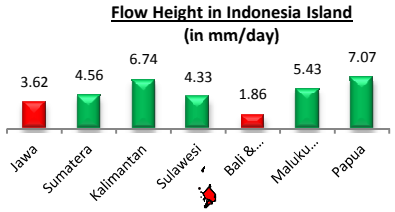
WATER AVAILIBILITY

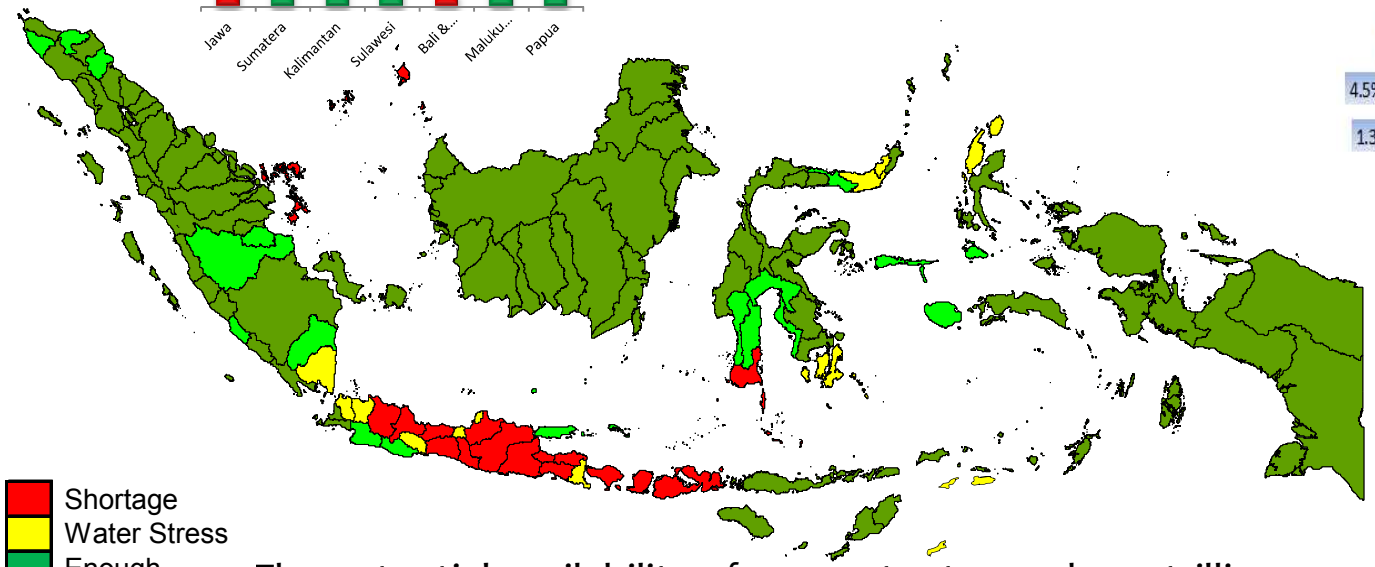


Indonesia (total)

3.906,5 / 16,6

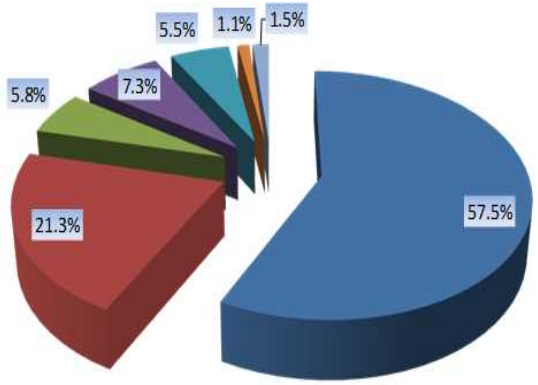
Maluku 176,7 / 71,1 — Total potential (bllion m³/yr); Per Capita (1000 m³/cap/yr)



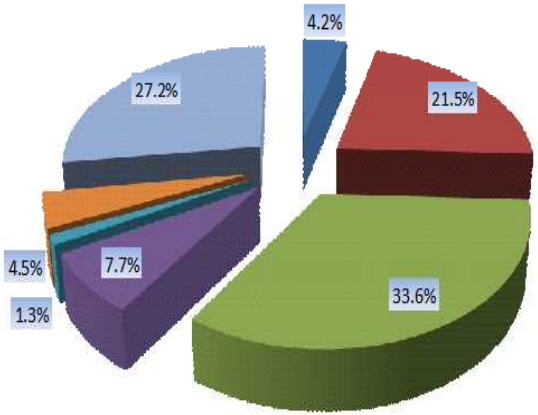


Shortage
Water Stress
Enough

POPULATION AND WATER DISTRIBUTION



Population



Water distribution

Jawa
Sumatera
Kalimantan
Sulawesi
Bali dan Nusa Tenggara
Maluku
Papua

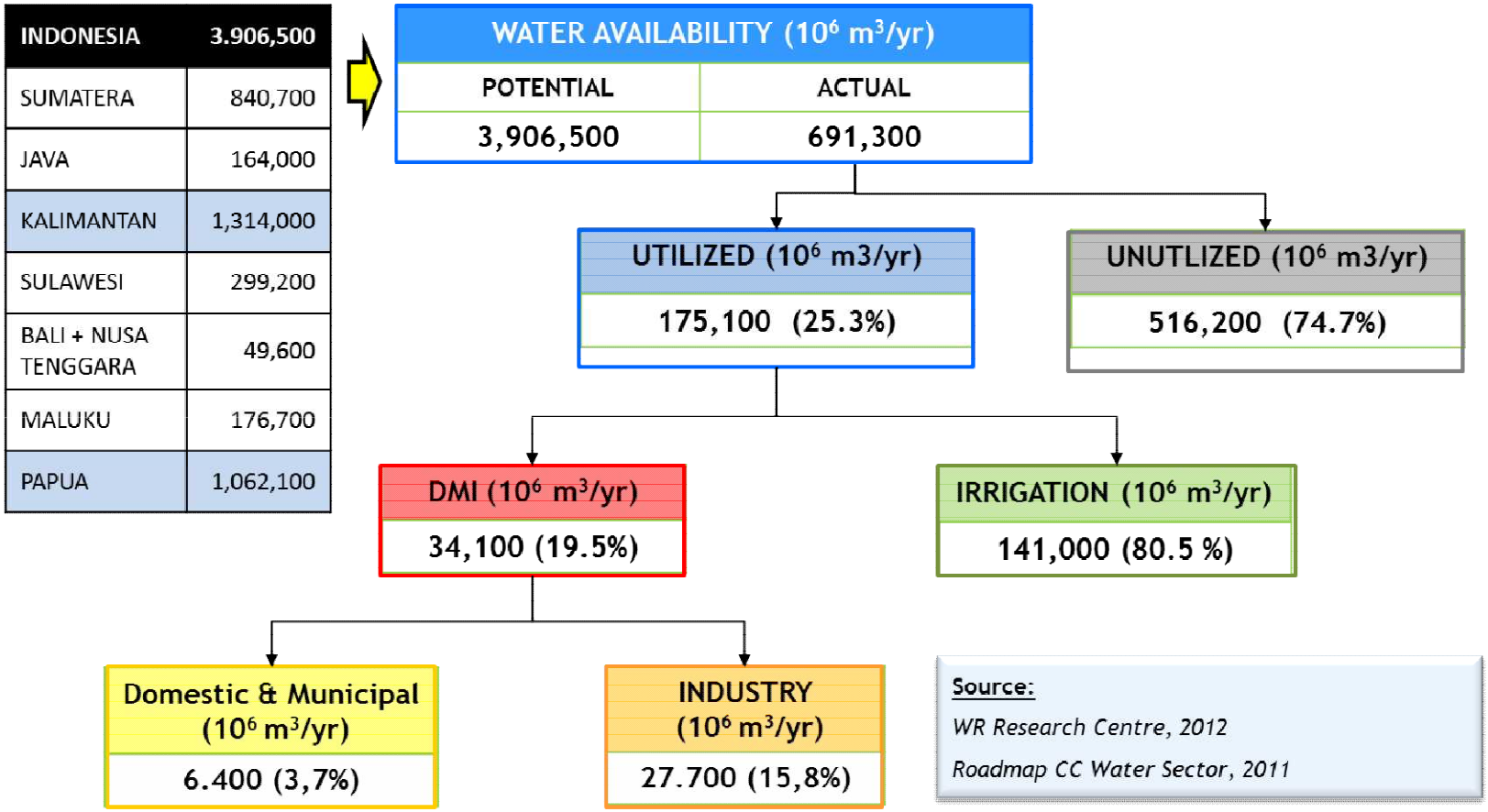
The potential availability of raw water to reach 3.9 trillion m3 with an uneven distribution

(Source: Center for SDA 2012)

WATER AVAILIBILITY

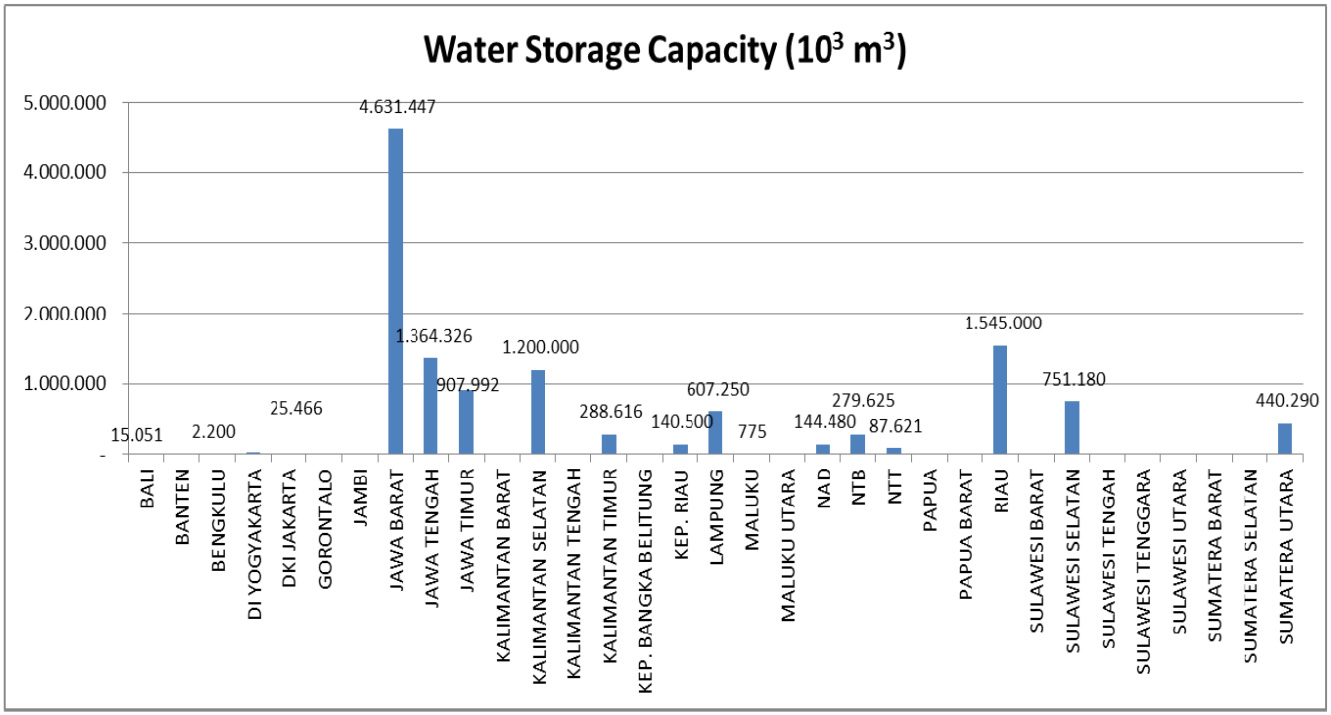
DISTRIBUTION

INDONESIA	3.906,500
SUMATERA	840,700
JAVA	164,000
KALIMANTAN	1,314,000
SULAWESI	299,200
BALI + NUSA TENGGARA	49,600
MALUKU	176,700
PAPUA	1,062,100



- Only about 3.9% of raw water which can be exploited that have been utilized. Most of the raw water used for irrigation (80%).
- Geographic distribution and climatology potential raw water unevenly

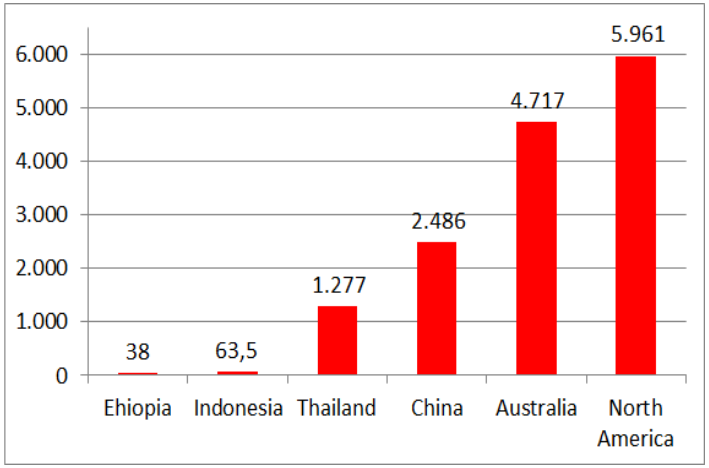
WATER SECURITY (STORAGE)



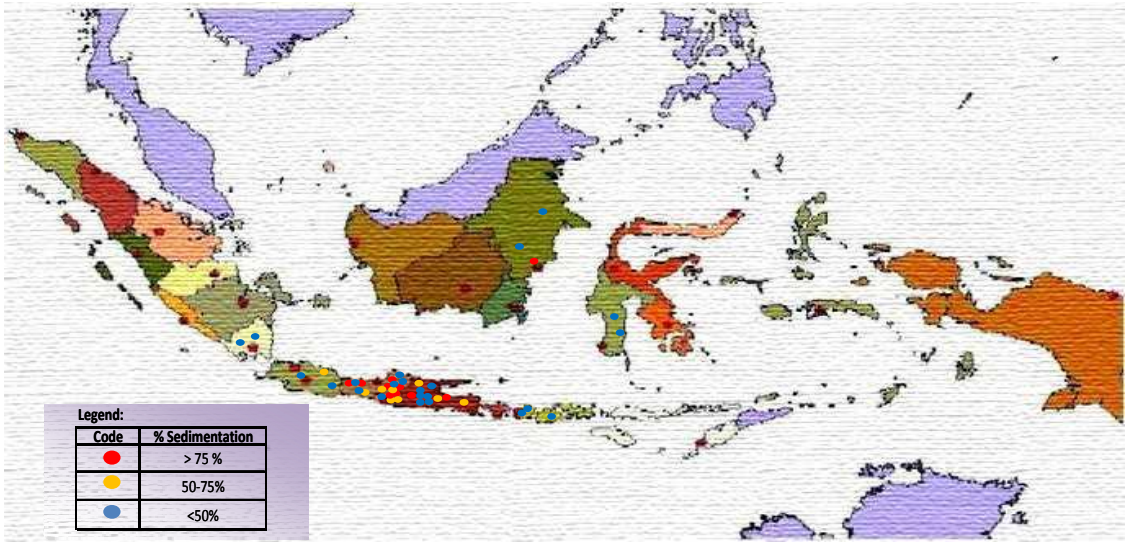
- total potential of 3.9 trillion m3 of water in Indonesia, only ± 15 billion m3 or 63.5 m3 per capita which can be managed through the reservoir, much lower than Thailand (1,277 m3 / capita) and **one level above Ethiopia (38 m3 / capita).**

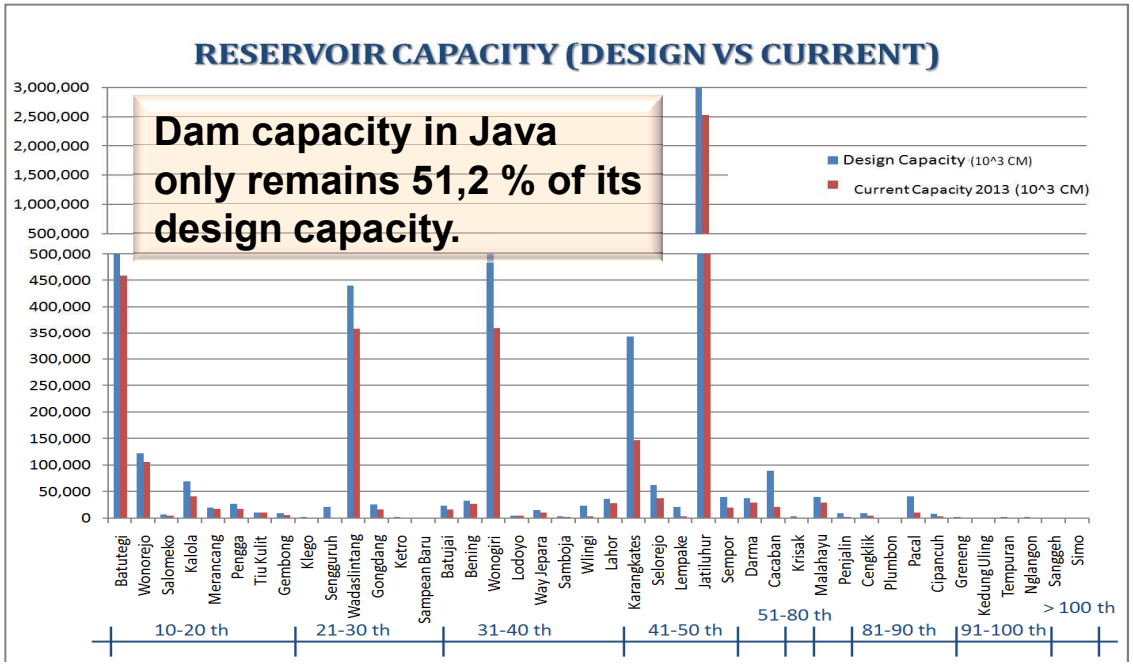
Benefit of existing Dams in Indonesia

Irigation	**: 800,000 Ha**
Storage/capita	**: 63.5 m^3/capita**
Flood Control	**: 30 % reduction of peak flow in several river**
Power	**: ±3,900 MW**



DAM SEDIMENTATION





Wonogiri Dam

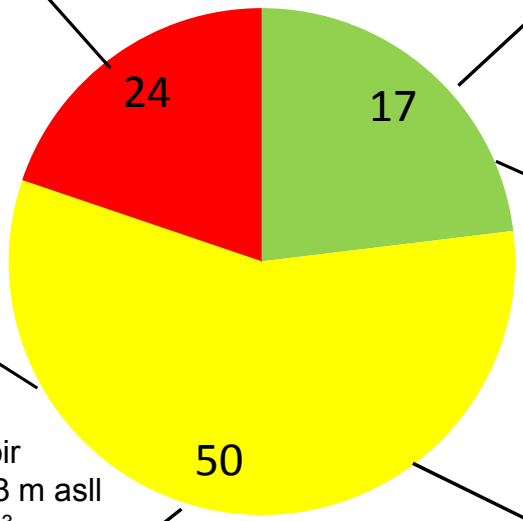
- Sediment Rate = 3,2 x 10^6 m^3 /Year
- Dam Capacity 440 x 10^6 m^3 (1980) → 375 x 10^6 m^3 (2005)

overall loss of reservoir storage due to sedimentation in Java is over 1% per year.

STATUS OF WATER ELEVATION AND VOLUME in 91 Reservoirs

Setu Patok Rservoir
El.Water +23,39 m asl
Vol. 2,03 MCM

Ponre-Ponre Reservoir
El.Water +209,13 m asl
Vol. 31,54 MCM



Gapit Reservoir
El.Water +30,3 m asll
Vol. 0,7 juta m^3

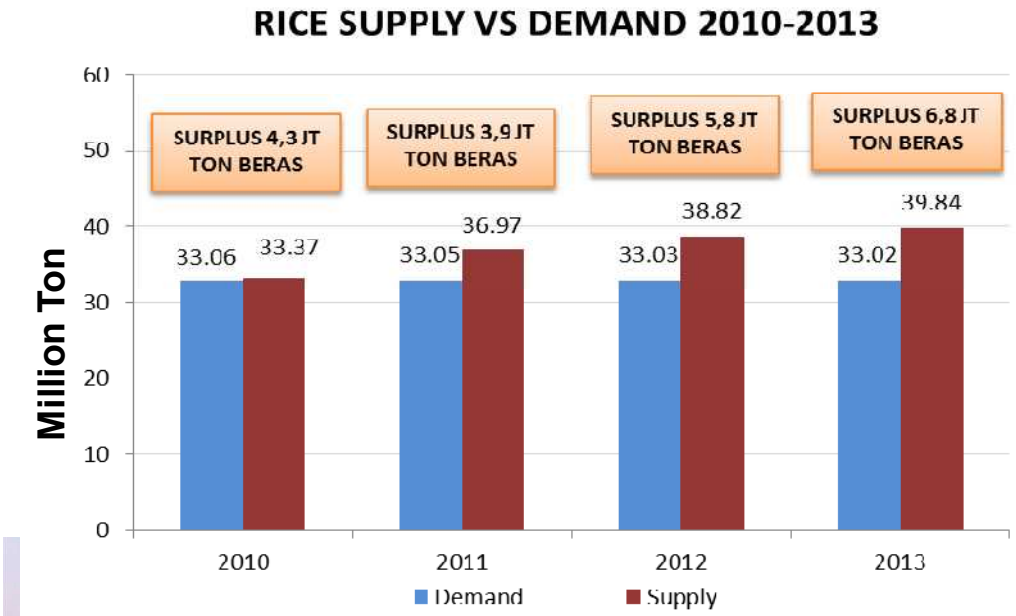
Wlingi Reservoir
El.Water +163 m asl
Vol. 1,28 MCM

Malahayu Reservoir
El.Water + 51,56 m asl
Vol. 12,05 MCM

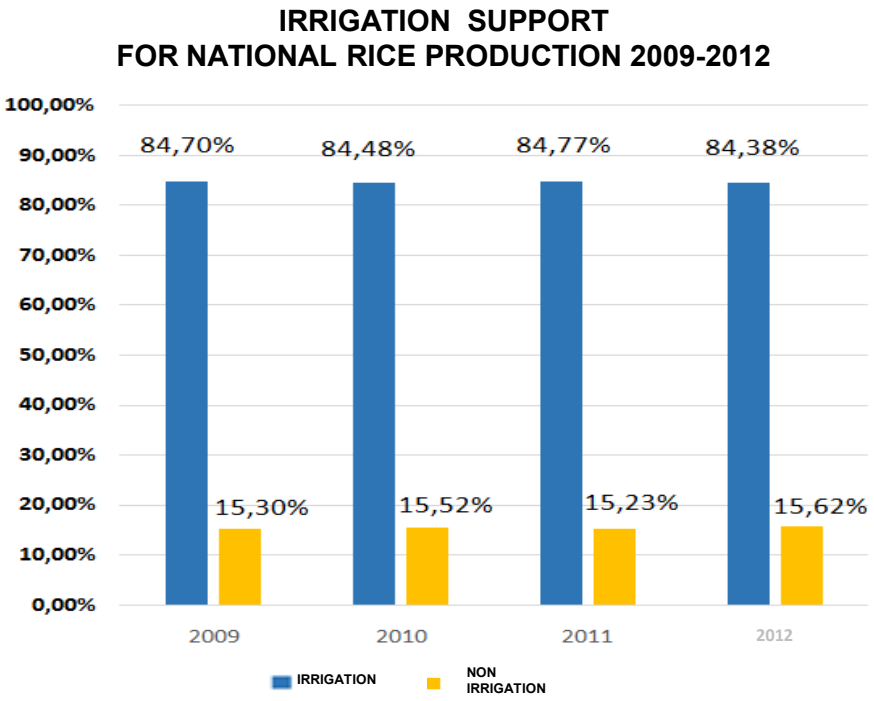
Dawuhan Reservoir
El.Water +77,05 m as
Vol. 0,81 MCM

Status per 9 August 2015

FOOD SECURITY

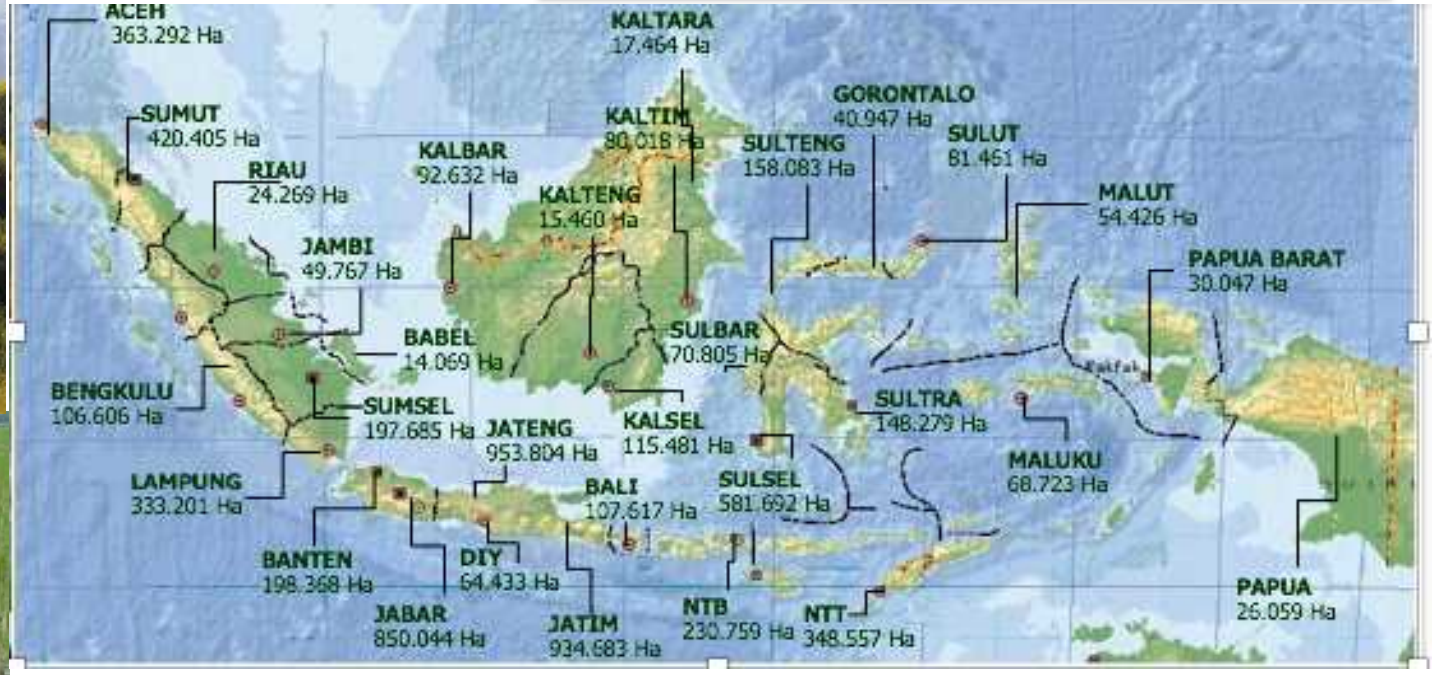


Dam development will increase from 1.4 (average) to over 2.0 cropping intensity of irrigation system

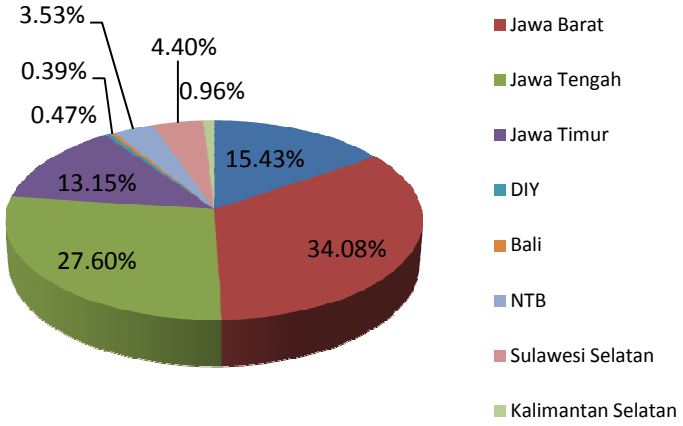


FOOD SECURITY

Irrigation : 7.145.168 Ha



DAM IRRIGATION



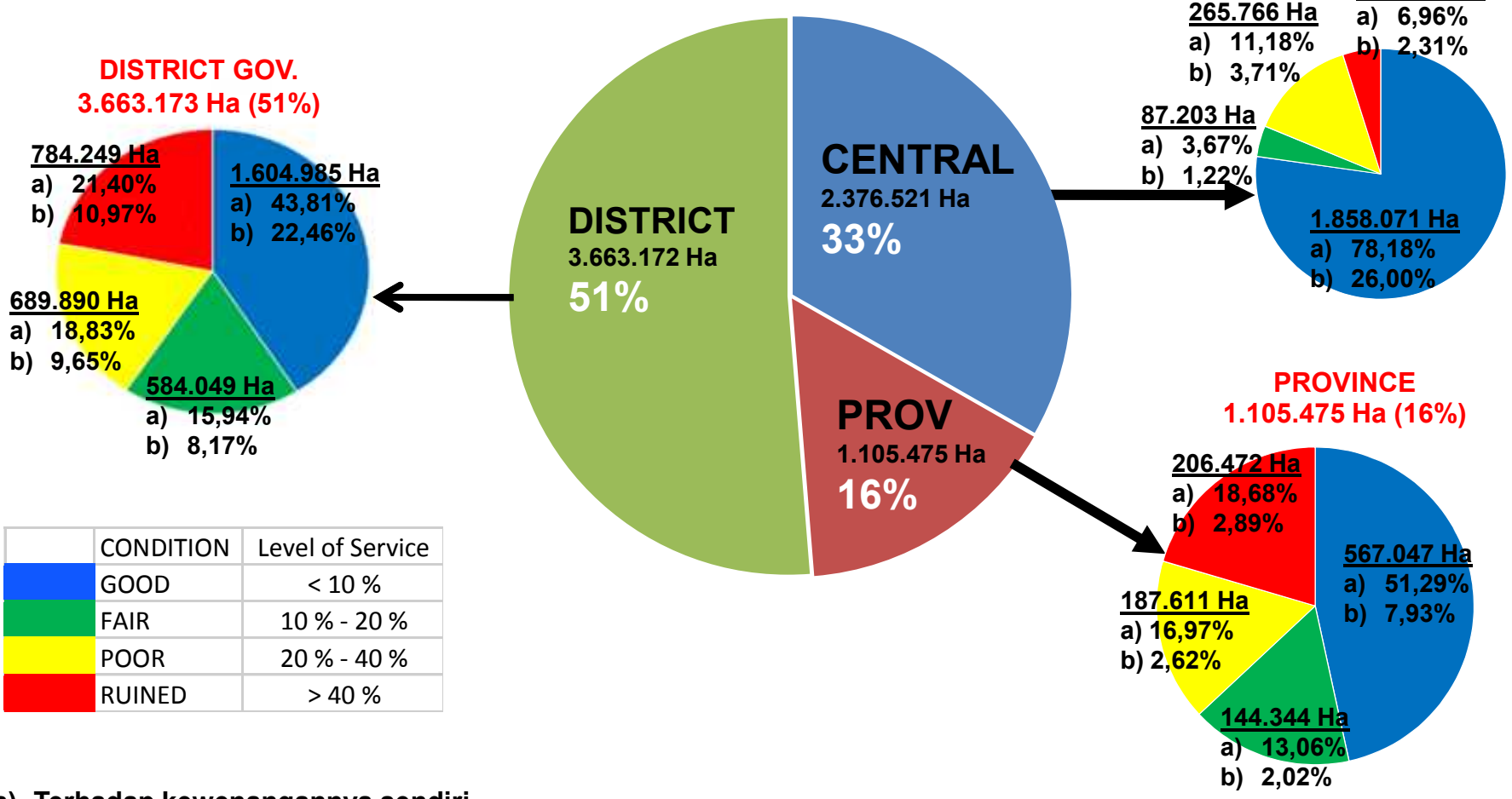
± 11% of Indonesia's irrigation areas are secured by reservoirs.

FOOD SECURITY

IRRIGATION SYSTEM

7.145.168 Ha

GOOD 54% - POOR 46%

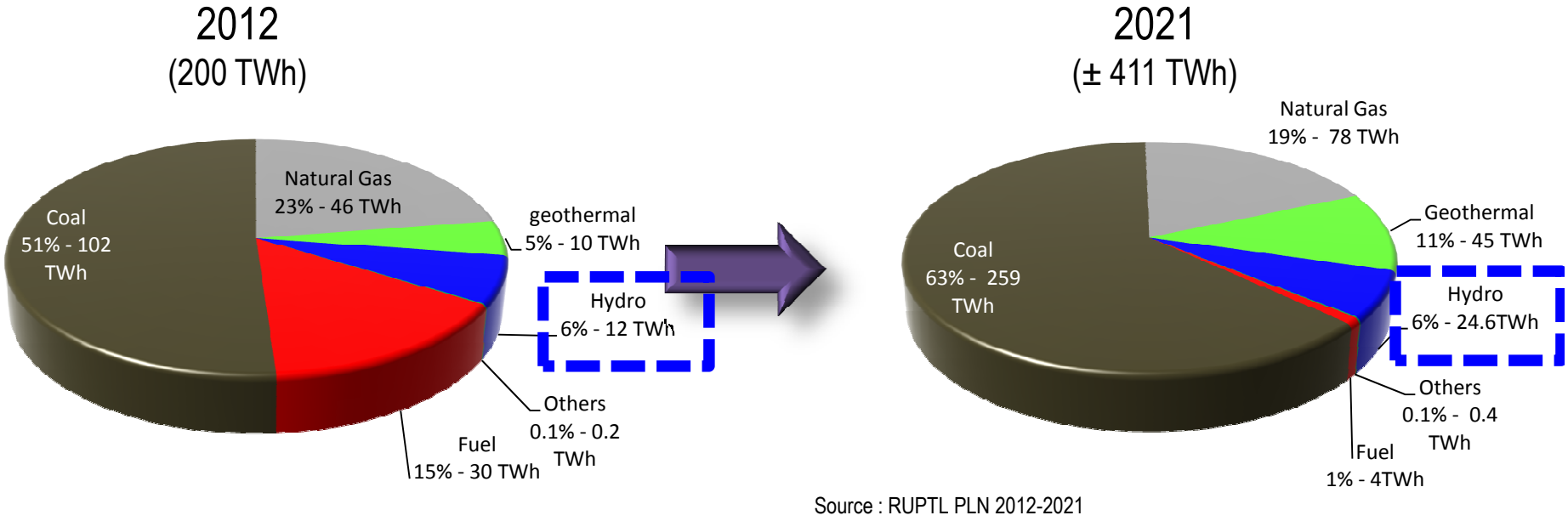


	CONDITION	Level of Service
	GOOD	< 10 %
	FAIR	10 % - 20 %
	POOR	20 % - 40 %
	RUINED	> 40 %

a) Terhadap kewenangannya sendiri
b) Terhadap Luasan Nasional

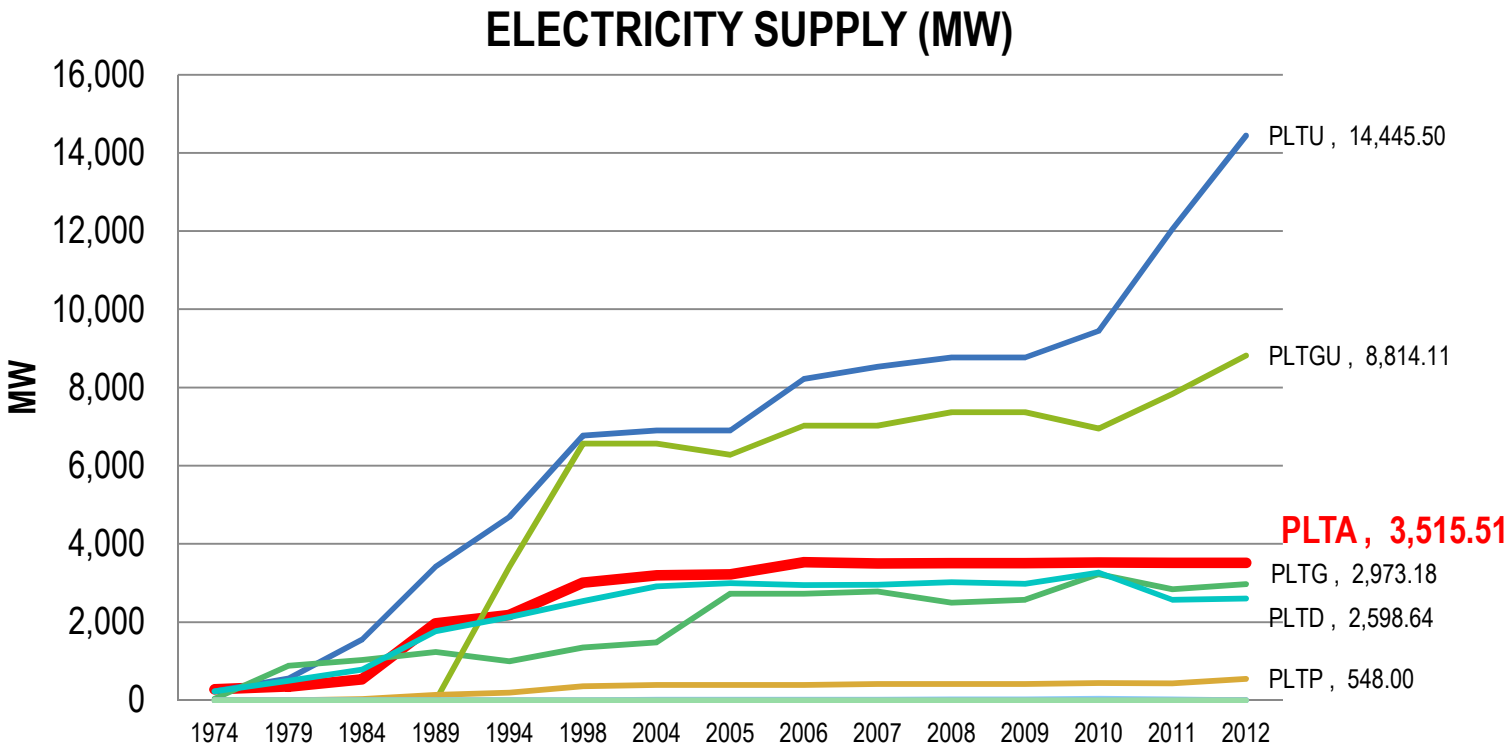
ENERGY SECURITY

Hydropower Contribution in Electricity Supply



Source : RUPTL PLN 2012-2021

ENERGY SECURITY



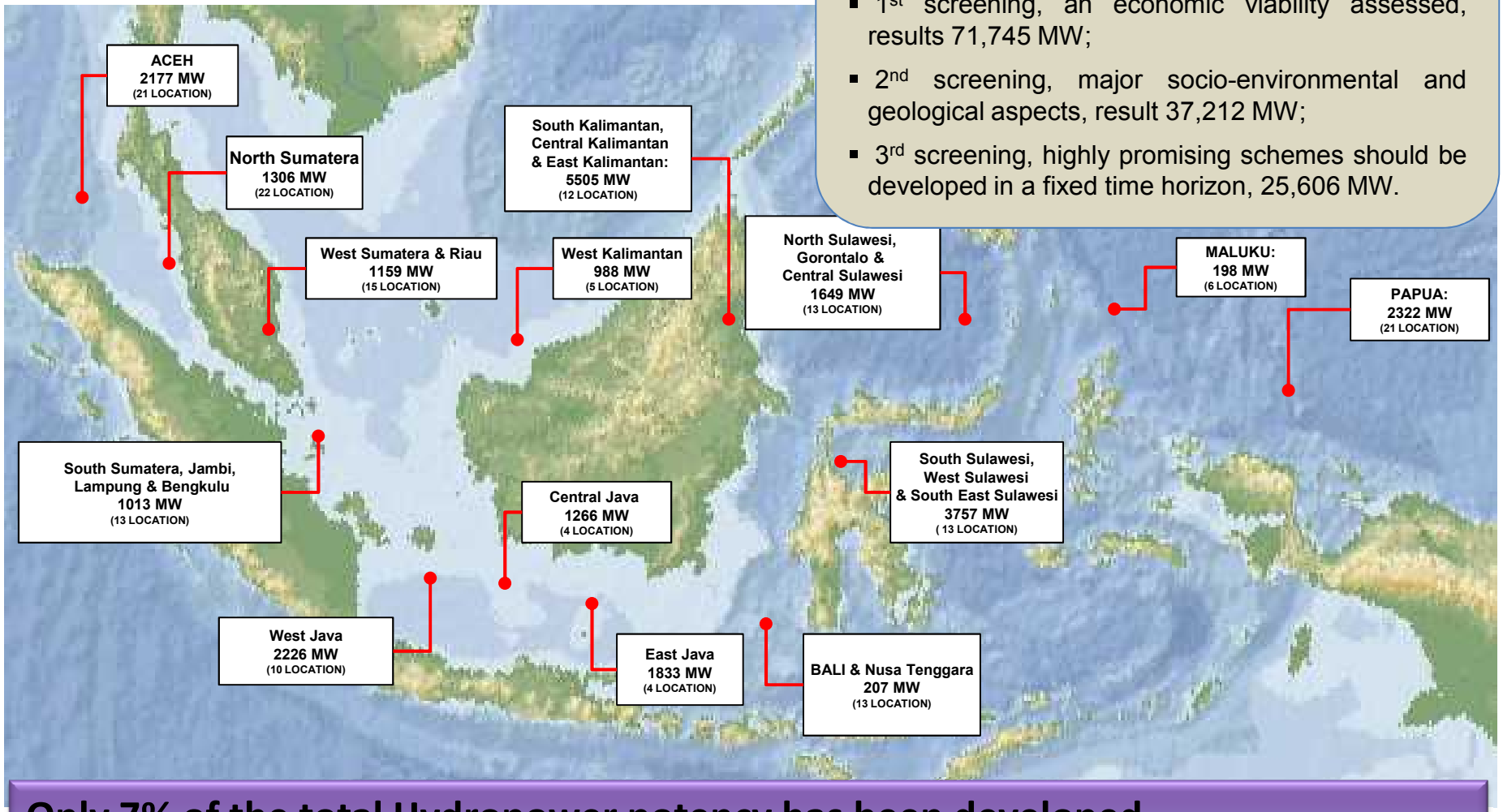
Hydropower which has been developed to the stage of operation are only 3,515 MW
(**only 6 % of the country power generating capacity)**

Source: RUPTL PLN 2012-2021



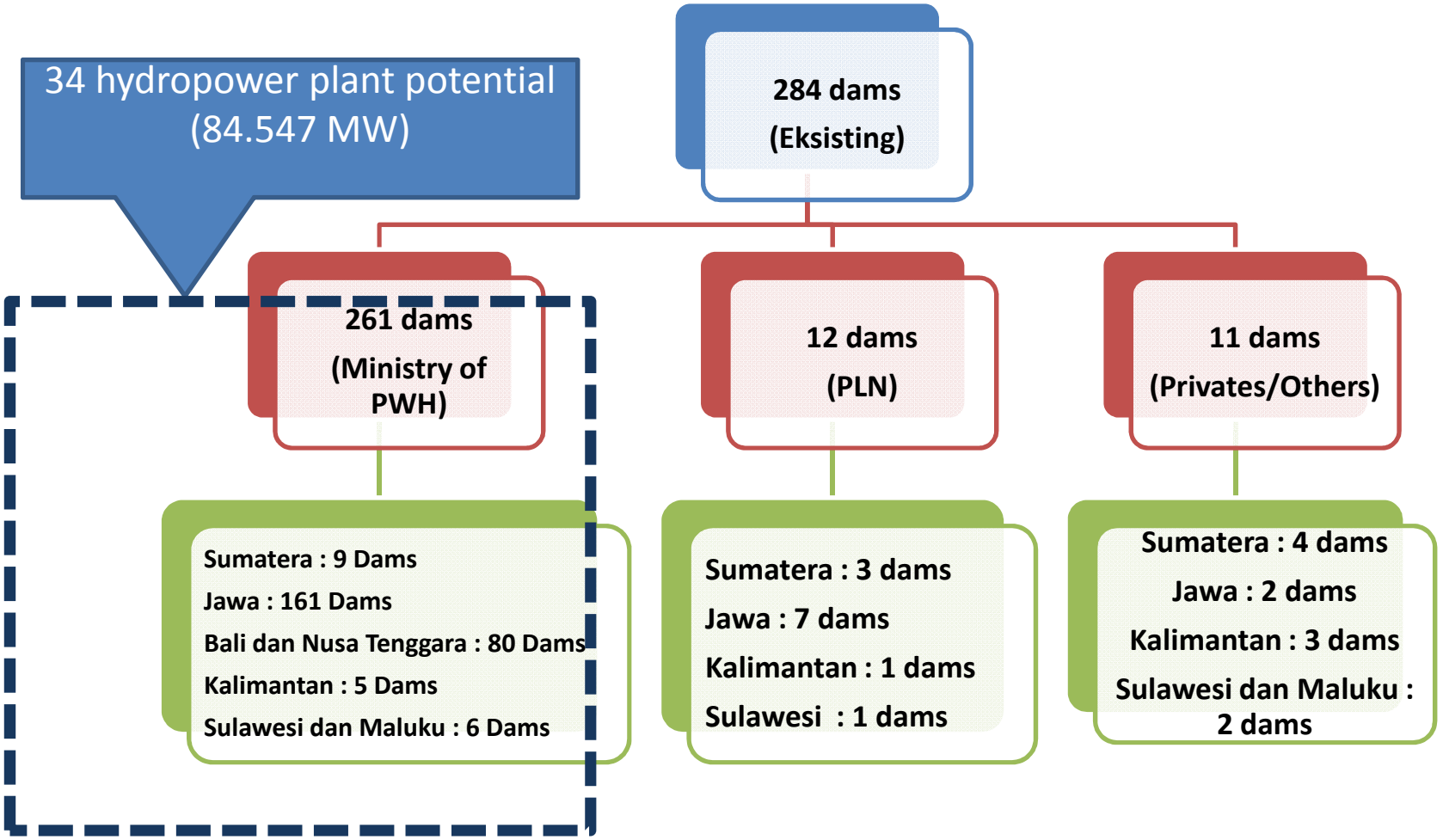

HYDROPOWER POTENTIAL MAP (25,606 MW)

- The potential study is carried out by selection of initial **75,000 MW** potential;
- 1st screening, an economic viability assessed, results 71,745 MW;
- 2nd screening, major socio-environmental and geological aspects, result 37,212 MW;
- 3rd screening, highly promising schemes should be developed in a fixed time horizon, 25,606 MW.



Only 7% of the total Hydropower potency has been developed,
contributes only 6 % of the country power generating capacity

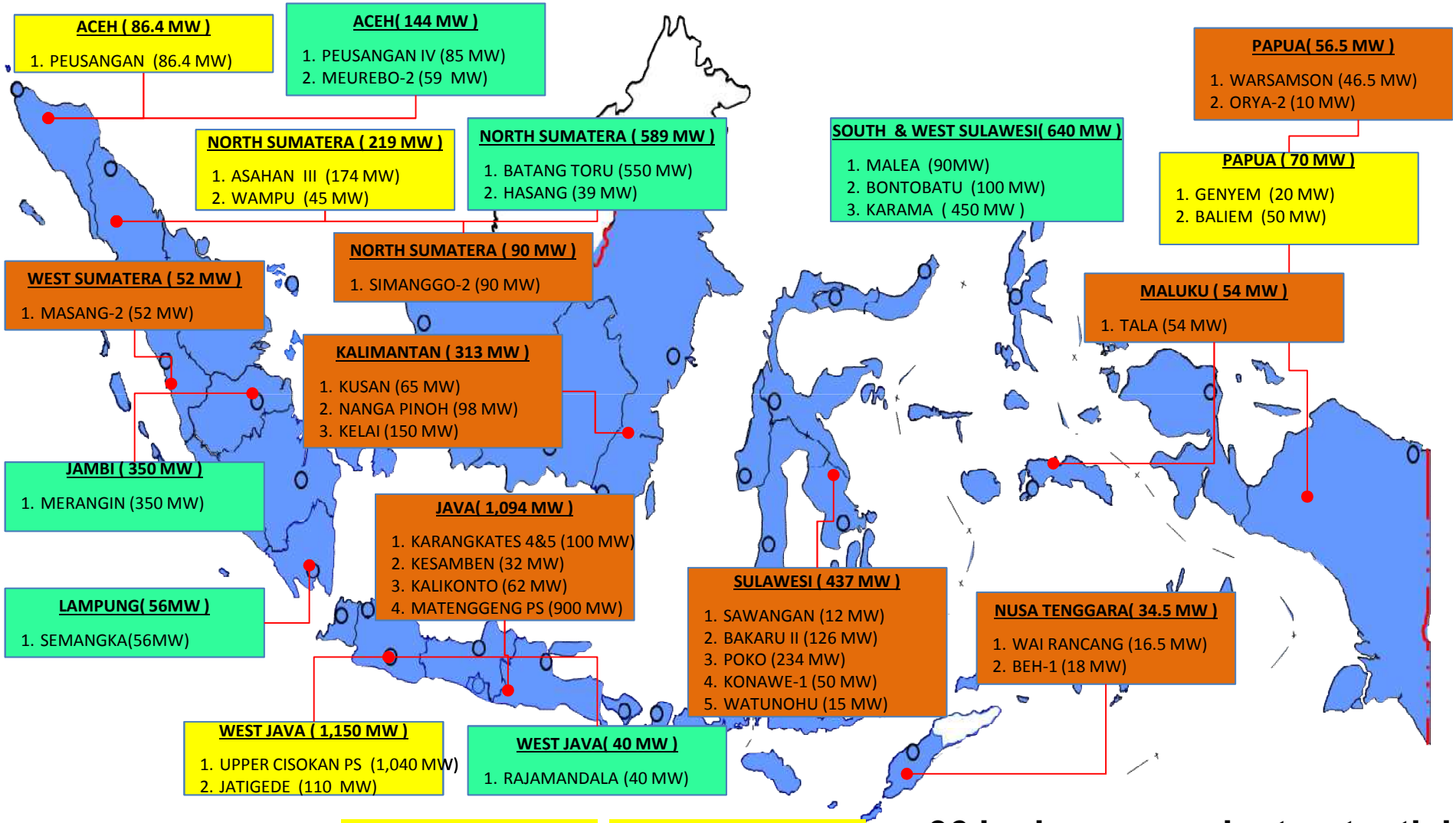
HYDROPOWER POTENTIAL FROM EXISTING DAMS



Hydropower plant potential (MOPWH) :Keuliling, Rajui (Aceh); Batutegi (Lampung); Sermo (DIY); Darma, Pongkor (Jabar); Ketro, Malahayu, Cacaban, Penjalin, Klego, G. Rawo, Gembong, Pacal, Pondok, Gondang, Jatibarang (Jateng); Jatimlerek, Lengkong Baru, Menturus, Mrican, Turi, Wlingi (Jatim); Benel, Grokgak, Telaga Tanjung, Titab, Tukad Unda 1 dan 2 (Bali); Sumi, Pandanduri (NTB); Batu Bulan (NTT); Ponre-ponre, Salomekko (Sulsel); Martebe (Sulut)

ENERGY

On–Going Hydropower Development



UNDER CONSTRUCTION	1.525 MW
PPA NEGOTIATION	1.819 MW
UNDER STUDY / DESIGN	2.131 MW

- **36 hydropower plant potential**
- Total Capacity : **5,475 MW**

Sumber: RUPTL PLN 2012-2021

THE NAWACITA TARGETS

DAM CONSTRUCTION PLAN

16 *ON-GOING*

49 NEW

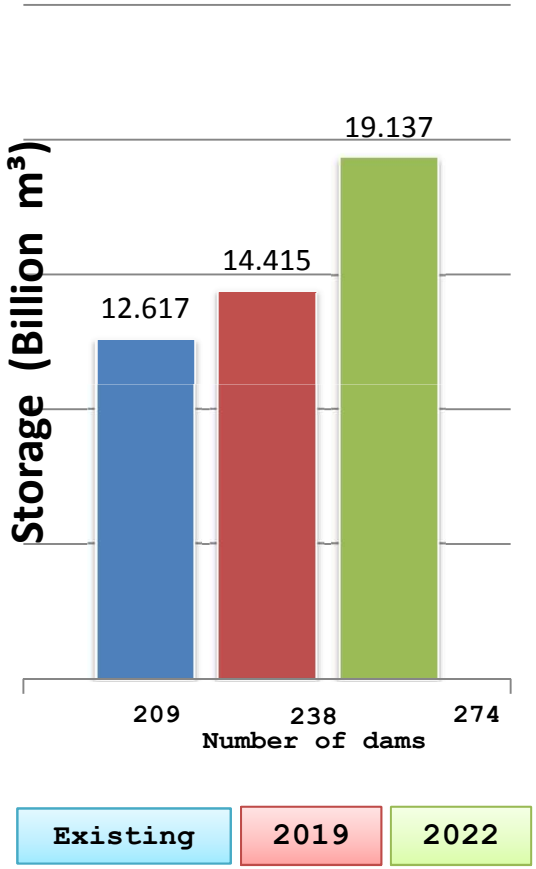
65 Dams

Completed in 2019 : 29 Dams

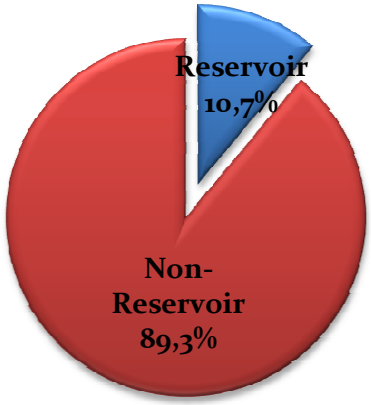
Increasing irrigated area by r**eservoirs** from **11** % (0.76 million hectares) to **14.5**% (1.03 million hectares)

2015 - 16 on going	Rajui (Aceh), Jatigede (West Java), Bajulmati (East Java), Nipah (East Java), Titab (Bali), Payaseunara (Aceh), Marangkayu (East Kalimantan), Kuningan (West Java), Bendo (East Java), Gongseng (East Java), Tukul (East Java), Tugu (East Java), Gondang (Central Java), Pidekso (Central Java), Teritip (East Kalimantan), Karalloe (South Sulawesi)
2016 - 8 dams	Ciawi (West Javat),Sukamahi (West Java), Kuwil Kawangkoan (North Sulawesi), Sukoharjo (Lampung), Cipanas (West Java), Leuwikeris (West Java), Ladongi (South East Sulawesi), Napunggete (East Nusa Tenggara)
2017 - 8 dams	Way Apu (Maluku), Baliem (Papua), Lausimeme (North Sumatera), Sidan (Bali), Pamukkulu (South Sulawesi), Komering II (South Sumatera), Bener (Central Java), Temef (East Nusa Tenggara), Rukoh (Aceh)
2018 - 11 dams	Sukaraja III (Lampung), Semanto (East Java), Telagawaja (Bali), Mbay (East Nusa Tenggara), Manikin (East Nusa Tenggara), Riam Kiwa (South Kalimantan), Randugunting (Central Java), Sadawarna (West Java), Tiro (Aceh), Bolango Hulu (Gorontalo), Meninting (West Nusa Tenggara)
2019 - 8 dams	Jragung (Central Java), Matenggeng (Central Java), Lambakan (East Kalimantan), Rokan Kiri (Riau), Pelosika (South East Sulawesi), Jenelata (South Sulawesi), Bagong(East Java), Kolhua (East Nusa Tenggara)

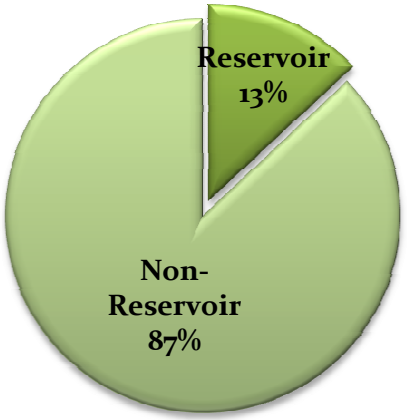
BENEFIT OF RESERVOIRS



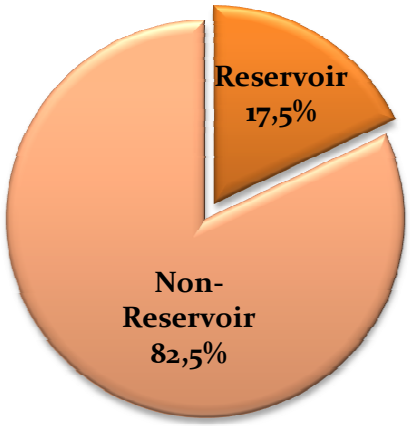
CURRENT SITUATION → **AFTER 29 DAMS CONSTRUCTED** → **WITH 65 DAMS COMPLETED**



Reservoir : 761.542 Ha
Non reservoir : 6.383.626 Ha



Reservoir : 761.542 +
172.991 = 934.533 Ha
Non reservoir : 6.210.635 Ha

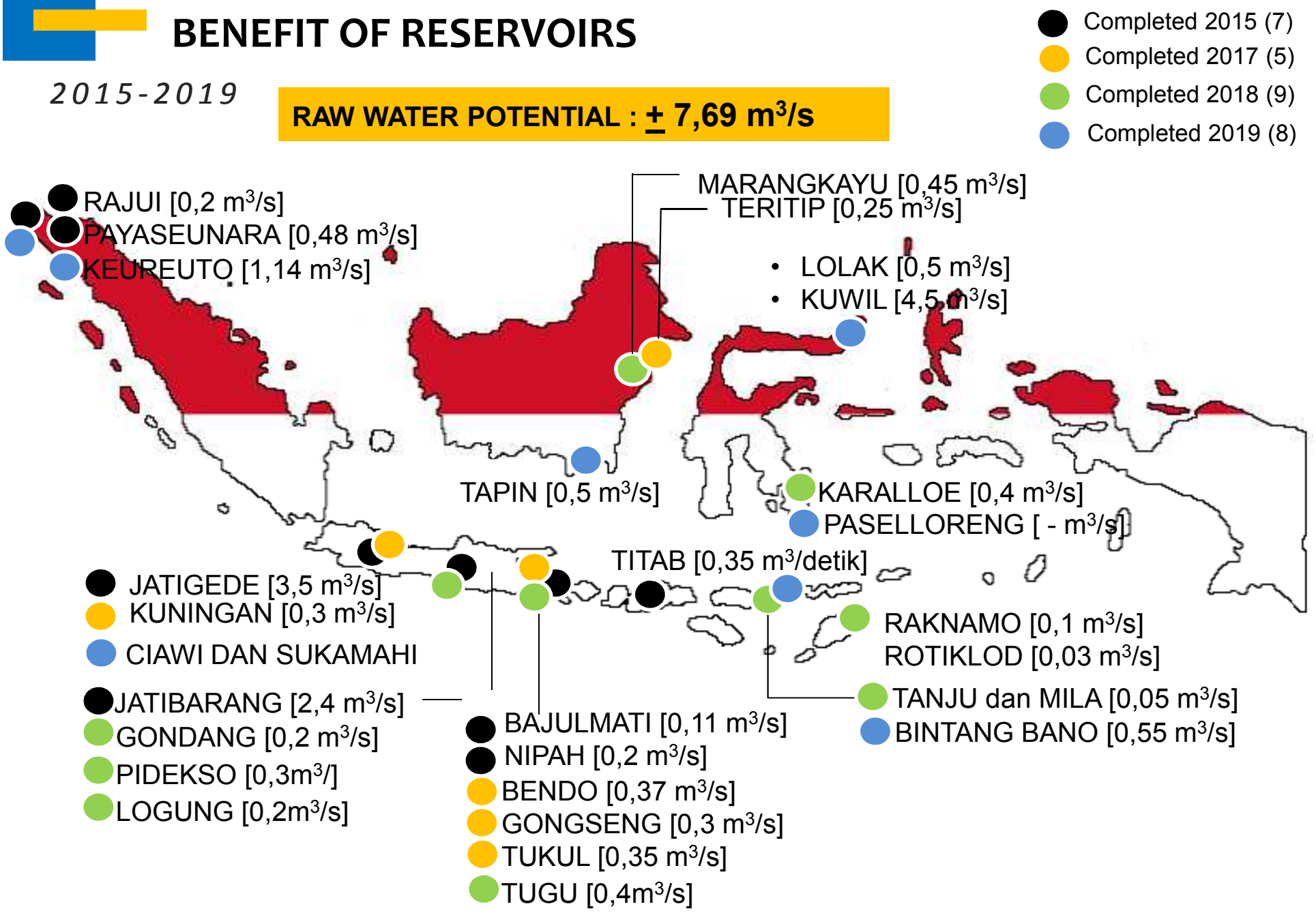


EXISTING	2019	2022

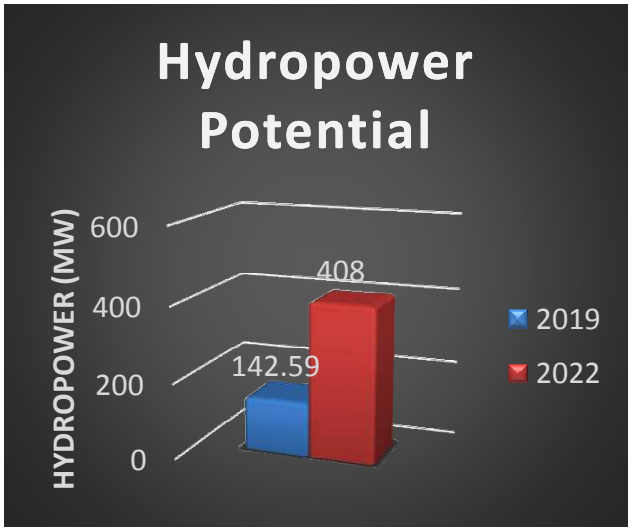
BENEFIT OF RESERVOIRS

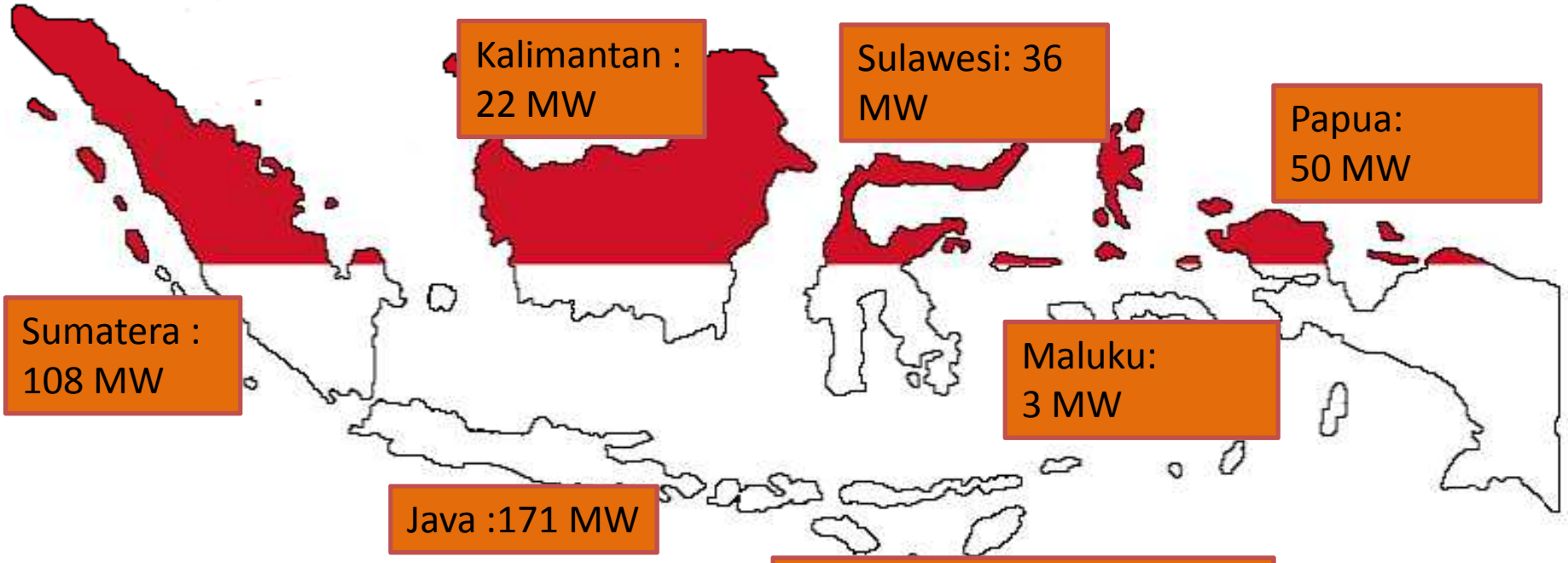
2015-2019

RAW WATER POTENTIAL : ± 7,69 m³/s



BENEFIT OF RESERVOIRS





IRRIGATION

2015-2019

New Development

1 million ha

- Surface irrigation **769 ribu ha**
- Lowland **238 ribu ha**
- Fishpond irrigation **115 ribu ha**
- Ground water irrigation **19.673 ha**

Rehabilitation

3 million ha

- Surface irrigation **1,9 jt ha**
- Lowland **1,07 jt ha**
- Fishpond irrigation **112 ribu ha**
- Ground water irrigation **34.282 ha**

STRATEGIC PROGRAM

2015-2019

New Development Irrigation

ACEH
- DI Lhok Guci (18.542 Ha)

SUMATERA UTARA
- DI Batang Batahan (16.000 Ha)

SUMATERA BARAT
- DI Batang Sinamar (3200 Ha)

SUMATERA SELATAN
- DI Lematang (3025 Ha)

KALIMANTAN SELATAN
- DI Batang Alai (5.000 Ha)

SULAWESI SELATAN
- DI Baliase (28.000 Ha)

PAPUA BARAT
- DI Wariori (3.450 Ha)

LAMPUNG
- DI Jabung (7.288 Ha)

JAWA BARAT
- DI Leuwi Goong (5.313 Ha)

JAWA TENGAH
- DI Slinga (6.696 Ha)

Nusa Tenggara Barat
- DI Rababaka Kompleks (14.062 Ha)

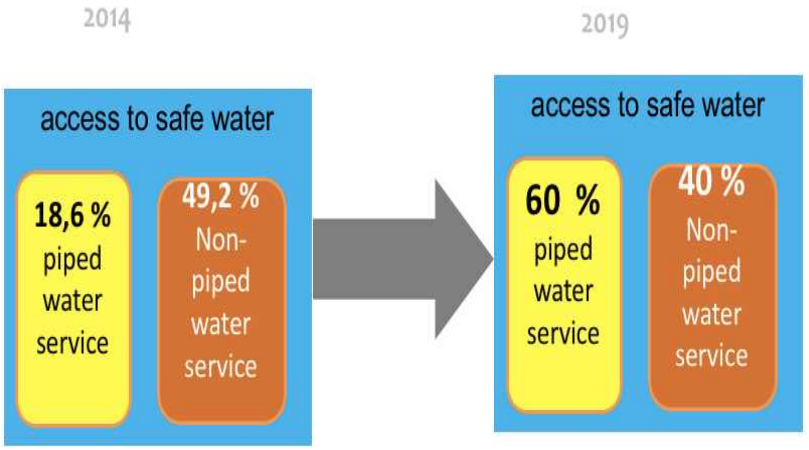
STRATEGIC PROGRAM

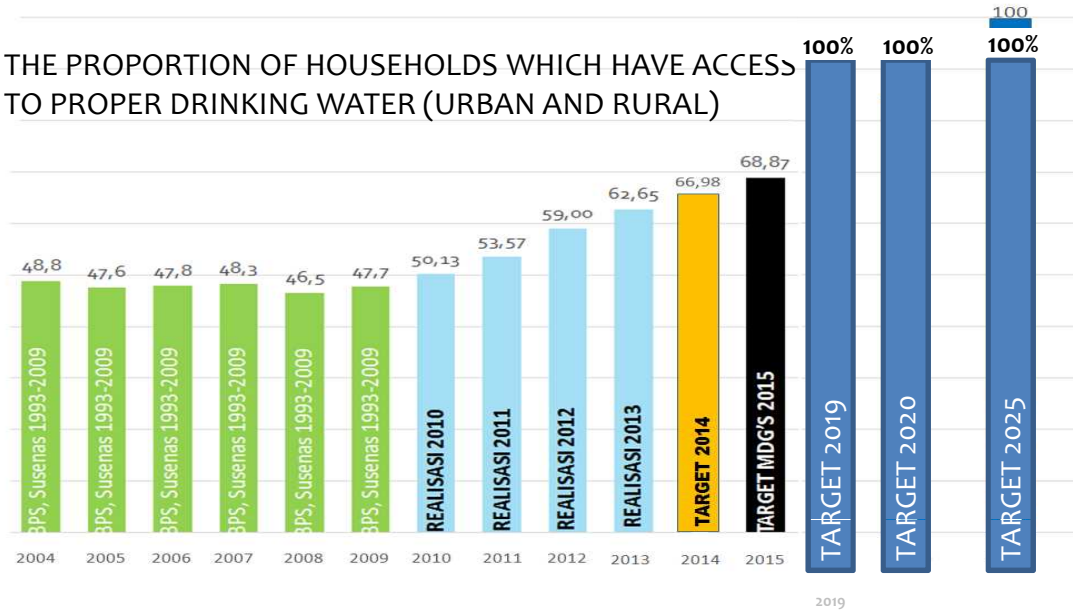
2015-2019

Rehabilitation Irrigation

RAW WATER SUPPLY

2015-2019





2014

- raw water capasity = 9.135 m^3/s
- IPA capasity = 2.915 m^3/s

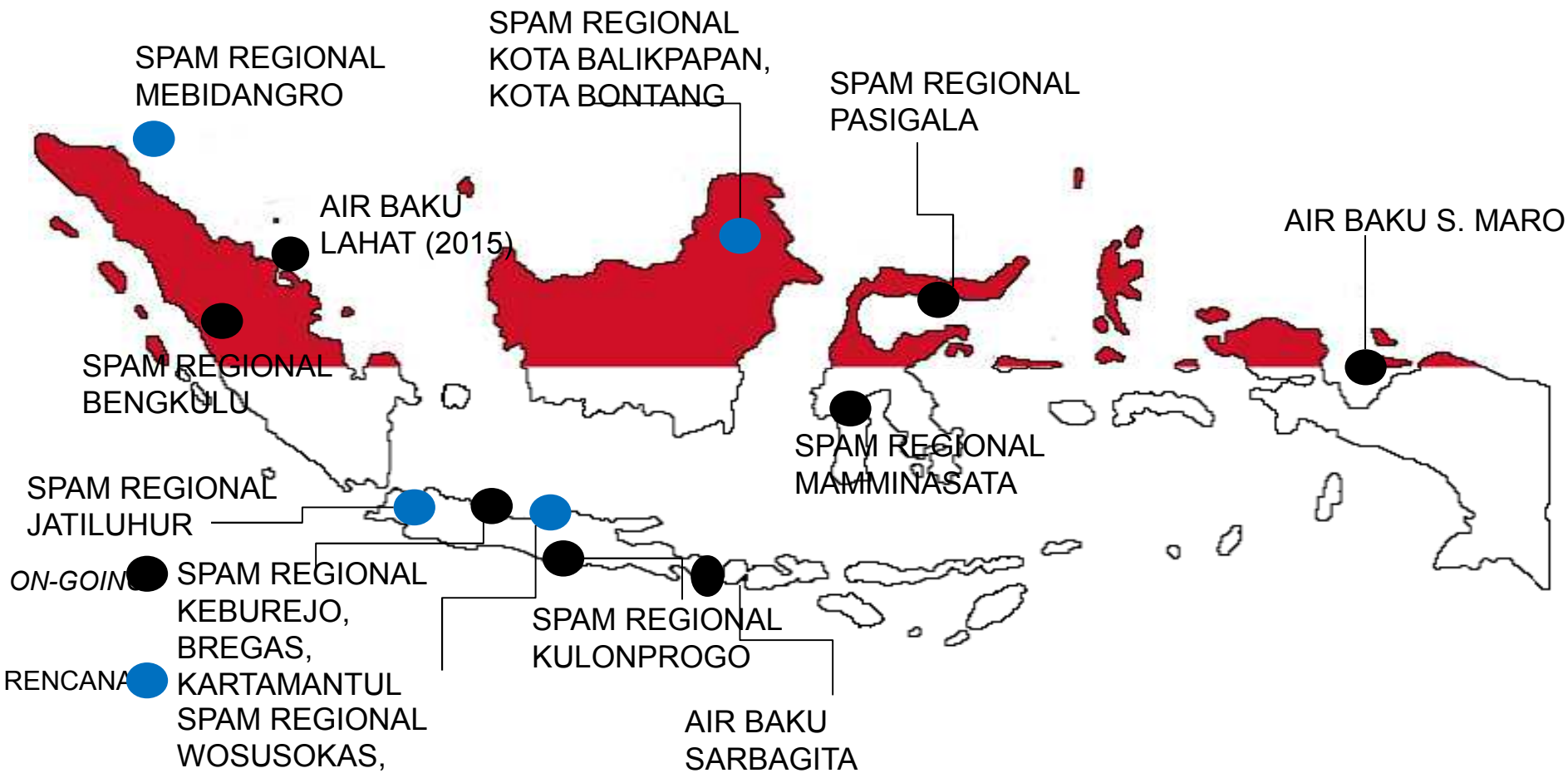
- **Idle capasity (IPA)= 6,3 m3/s**
- **Idle capasity (raw water = 0,18 m3/s)**
- **Backlog** (supporting for MDG'2015)**= 4,56 m3/s)**

STRATEGIC PLANNING

- ❑ **Aiming to support the coverage of clean water supply** 100 % in 2019
- ❑ **Increasing the raw water supply from** 56 m^3/s to 118,96 m^3/s (67,52 m m^3/s)
  - **New development = 67,52 m3/detik**(well groundwater, small reservoir, intake & raw water transmission pipeline)
  - **Rehabilitatio = 22 m3/detik** (well groundwater, small reservoir, intake & raw water transmission pipeline)
- ❑ Managing **"idle capacity"** of raw water supply

RAW WATER SUPPLY

2015-2019



Raw water capasity : **± 13,79 m3/detik**

Thank You







Bekerja Keras – Bergerak Cepat – Bertindak Tepat