







# ***“INDONESIA: WATER SECURITY FOR SUSTAINABLE WELL BEING”***

Presented in  
Engineering Month Webinar Mulawarman University  
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# OUTLINE

-  **Indonesia's Water Resources Conditions**
-  **Challenges Regarding Water Resources**
-  **Strengthening Water Governance**
-  **The Vision on Strategic Projects**

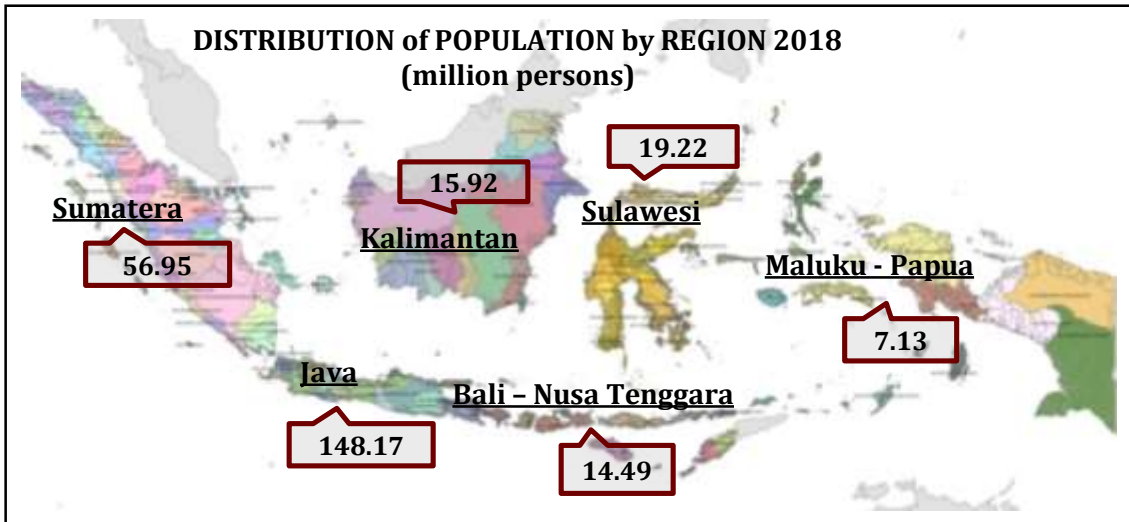


# INDONESIA'S WATER RESOURCES CONDITION

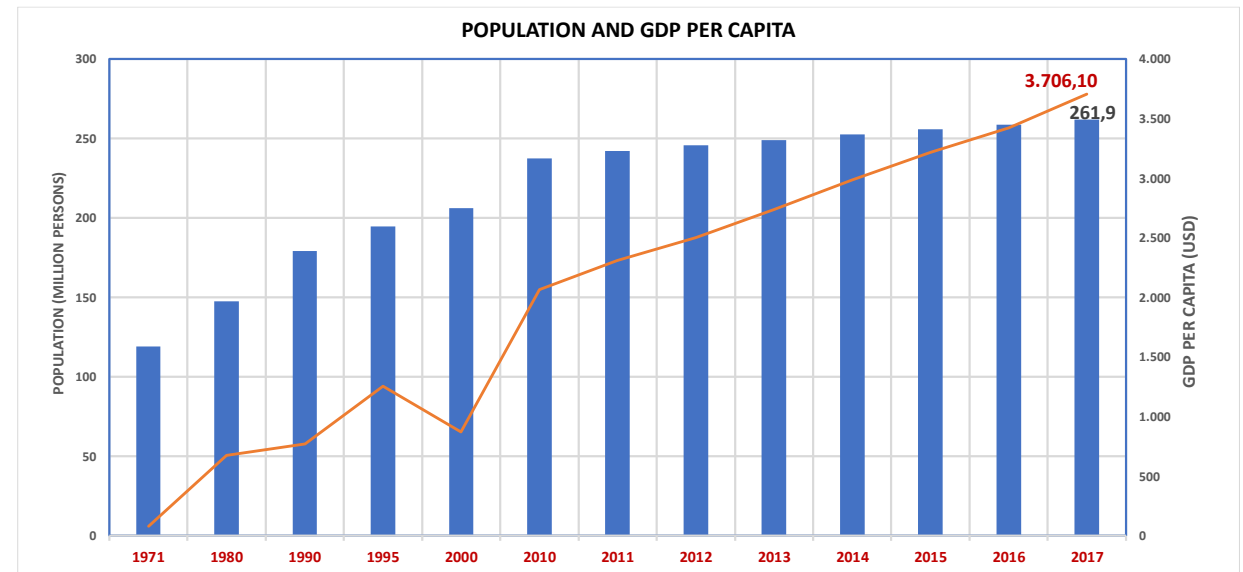


# DEMOGRAPHIC CONDITION

need to provide clean and sufficient water

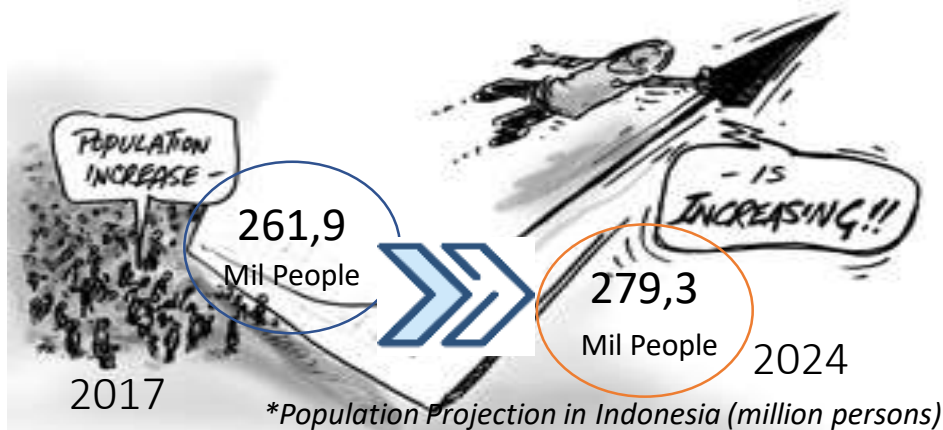


Source: BAPPENAS, processed from Statistics Indonesia 2019



Source: BAPPENAS, processed from Statistics Indonesia (various years)

## POPULATION INCREASING → WATER COMPETITION



- Increasing population (1.36% per year in 2010-2016) → **Need more water for live**
- Java : inhabited by nearly 60% of total population.
- 148.173.100 people live in Java in 2018 with average population density of more than 500 people/km<sup>2</sup> (*Statistic Indonesia, 2018*)



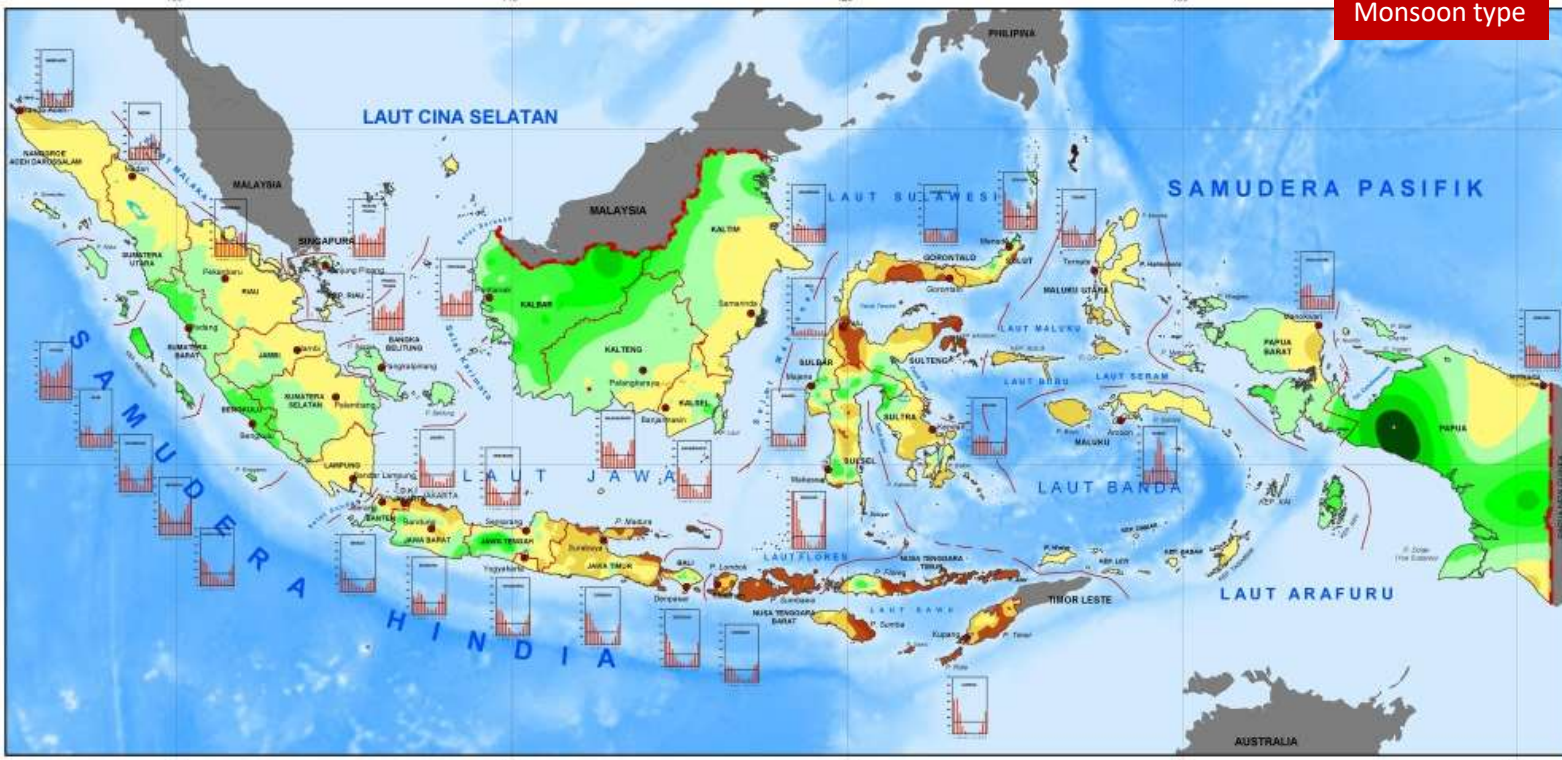


# ABUNDANT SURFACE WATER

attention : most of region in Indonesia has monsoon type rainfall which is relatively vulnerable to climate change



Monsoon type



Indonesia has abundant of water resources; Yearly precipitation **2700 mm** make Indonesia **rank-9** for country with the highest precipitation in the world.

Country Precipitation, mm per year, 2014 (mm per year, Source: FAO)



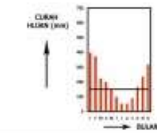
Map of Yearly Precipitation Period 1981-2010 INDONESIA



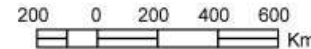
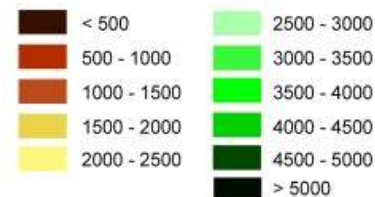
BADAN METEOROLOGI KLIMATOLOGI DAN GOFISIKA

KETERANGAN

- Kota Propinsi
- Batas Propinsi
- - - Batas Negara
- ☁ Danau



CURAH HUJAN (mm)



Sumber Data :  
1. Peta Rupabumi BAKOSURTANAL Skala 1 : 250.000  
2. Data Curah Hujan Bulanan Periode 1981 - 2010 BMKG

Islands	Water Availability (million m <sup>3</sup> /year)		
	Qaverage	Q80%	Q90%
Java	164	88.909	69.791
Sumatera	840.737	571.703	485.732
Sulawesi	299.218	184.478	154.561
Kalimantan	1,314,021	900.381	727.301
Bali and Nusa Tenggara	49.62	35.632	32.165
Maluku	176.726	132.103	117.296
Papua	1,062,154	794.496	716.443
<b>Total Indonesia</b>	<b>3,906,476</b>	<b>2,707,702</b>	<b>2,303,289</b>

Source: Country Water Assessment, ADB, 2016



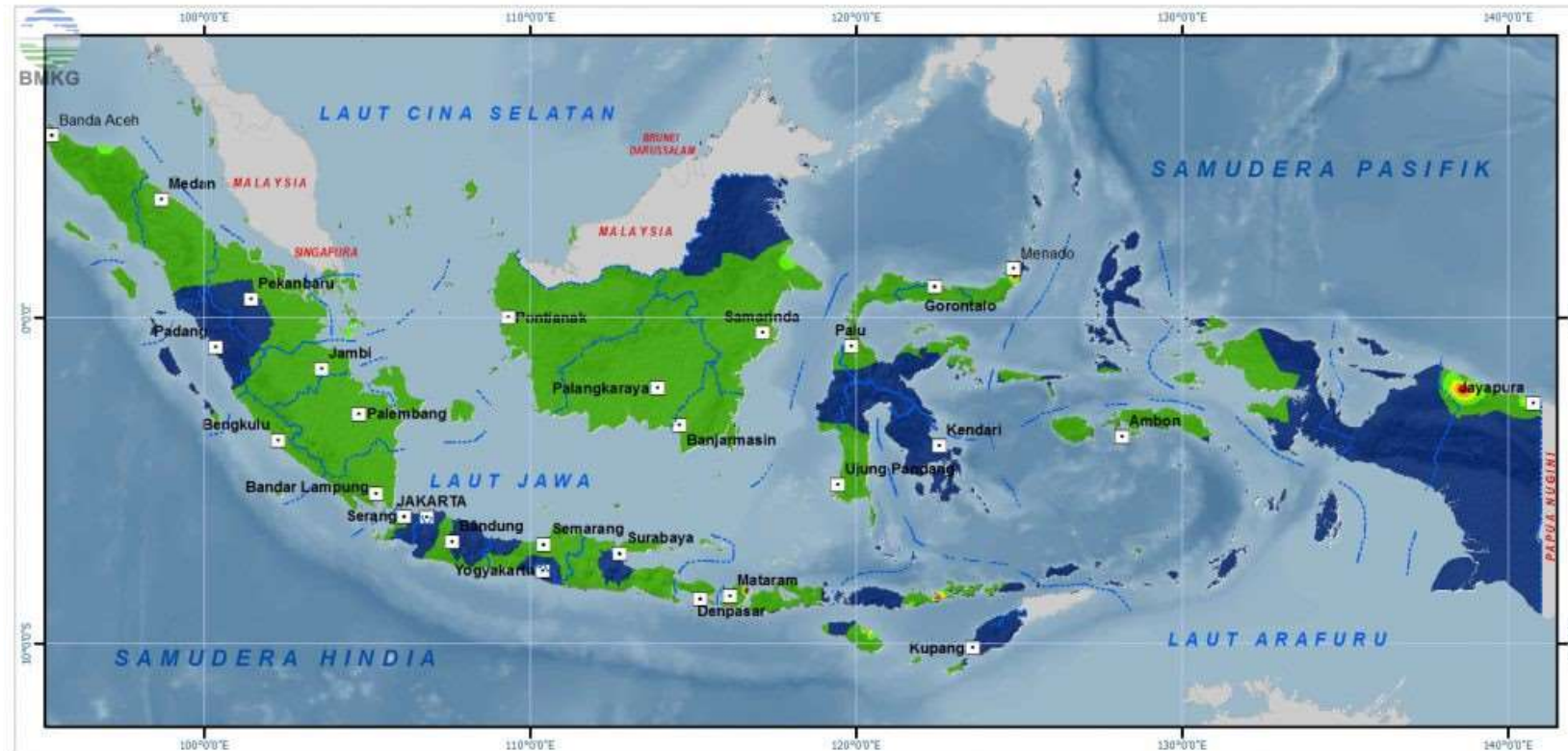


# GROUND WATER SAFE YIELD

attention : put more stress on ground water may increase drought and land subsidence



the **most productive groundwater basins** can be found toward the north of Java and Sumatera, and toward the south of Kalimantan and Sulawesi.



## TINGKAT KETERSEDIAAN AIR TANAH SOIL WATER AVAILABILITY

MARET 2017

INDONESIA



Badan Meteorologi Klimatologi dan Geofisika

### KETERANGAN / INFORMATION :

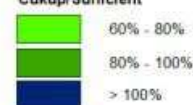
Kurang/Deficit



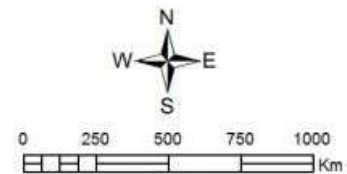
Sedang/Moderate



Cukup/Sufficient



- Ibukota Propinsi  
Province Capital
- Ibukota Kabupaten  
District Capital
- Batas Propinsi  
Province Boundary
- Batas Kabupaten  
District Boundary
- Water  
(Rivers, Lakes)
- Badan Air  
(Sungai, Danau)



Sumber Data :  
1. Data Curah Hujan dan Evaporasi BMKG  
2. Peta Rupabumi BIG Skala 1 : 250.000

Permutakhiran berikutnya: 06 Mei 2017

Region	Number of basins	Area (km <sup>2</sup> )	Quantity (million m <sup>3</sup> /year)		
			Unconfined	Confined	Safe Yield
Sumatera	65	272,843	123,528	6,551	39,024
Java and Madura	80	81,147	38,851	2,046	12,269
Kalimantan	22	181,362	67,963	1,102	20,720
Sulawesi	91	37,778	19,694	550	6,073
Bali	8	4,381	1,577	21	479
West Nusa Tenggara	9	9,475	1,908	107	605
East Nusa Tenggara	38	31,929	8,229	200	2,529
Maluku	68	2,583	11,943	1,231	3,952
Papua	40	26,287	222,524	9,098	69,487
<b>Total</b>	<b>421</b>	<b>907,615</b>	<b>496,217</b>	<b>20,906</b>	<b>155,137</b>

Source: Country Water Assessment, ADB, 2016

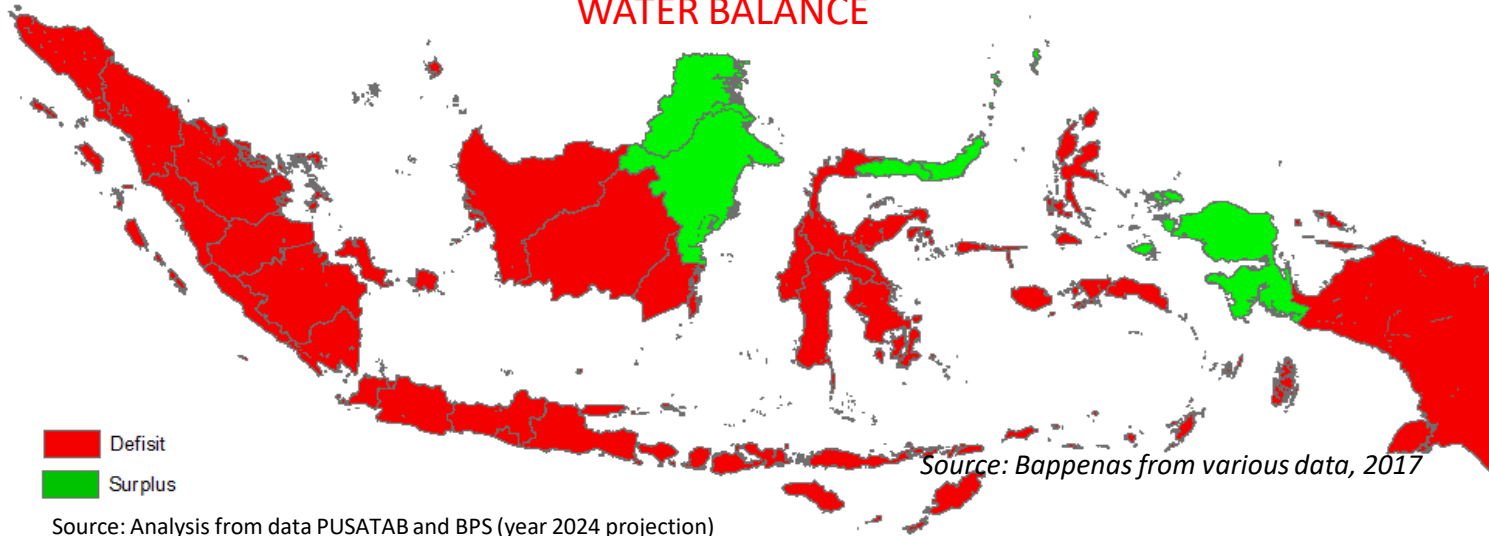


# WATER USAGE AND UNEQUAL DISTRIBUTION

attention : dominated by irrigation, need to vary the purpose of water, hence, the value added



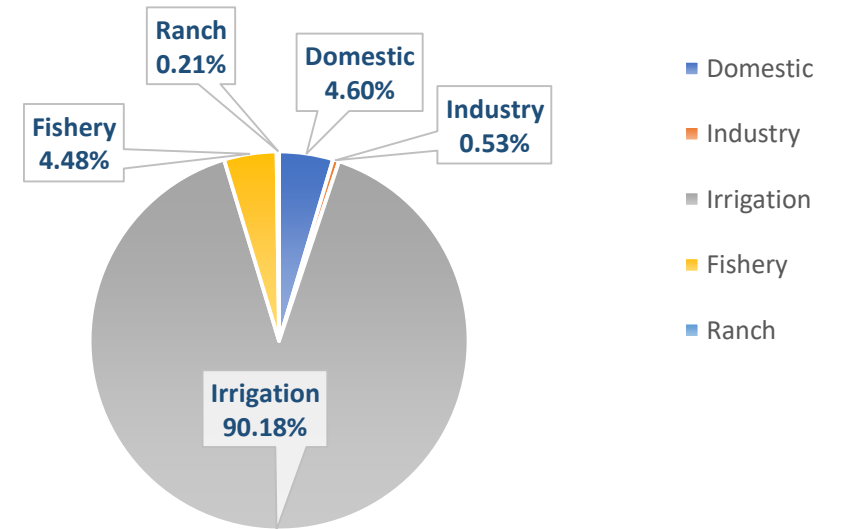
## WATER BALANCE



Defisit  
Surplus

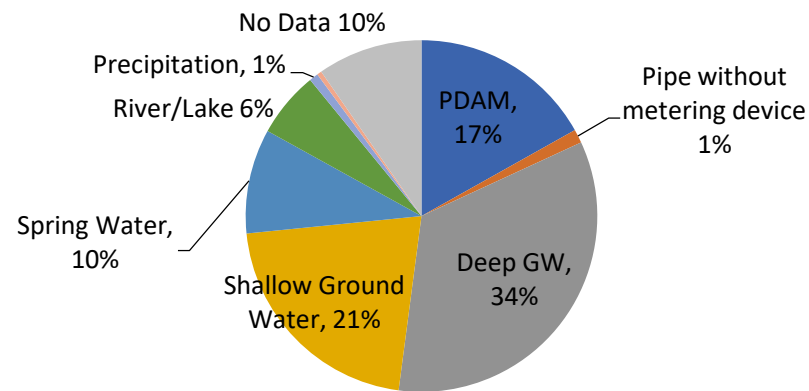
Source: Bappenas from various data, 2017

## Water Usage of Surface Water

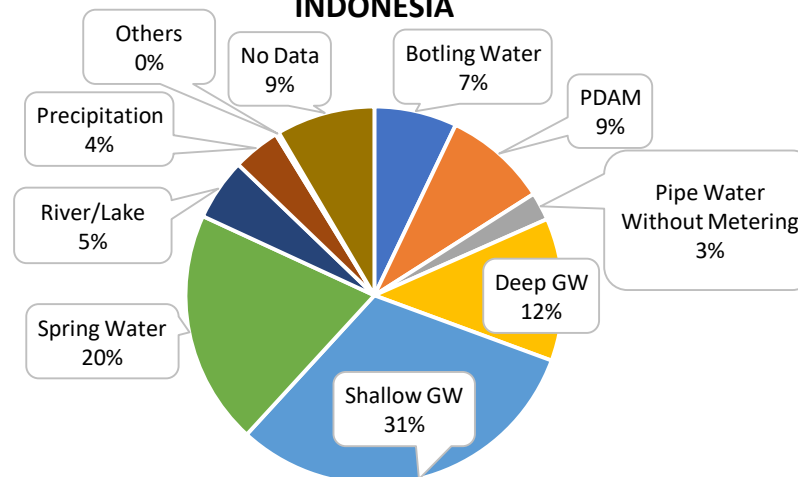


Source: Bappenas from various data, 2017

## % of WATER SOURCE FOR DOMESTIC USE IN 10 URBAN AGLOMERATION AREA



## % of WATER SOURCE FOR DRINKING WATER IN INDONESIA



Source: Analysis from data PODES 2014

smart water management and modernization of irrigation have the important role toward efficiency and effective of water utilization. more than 40-55% of people in Indonesia use Ground Water to fulfill domestic and drinking water needs

Source: Analysis from PODES 2014

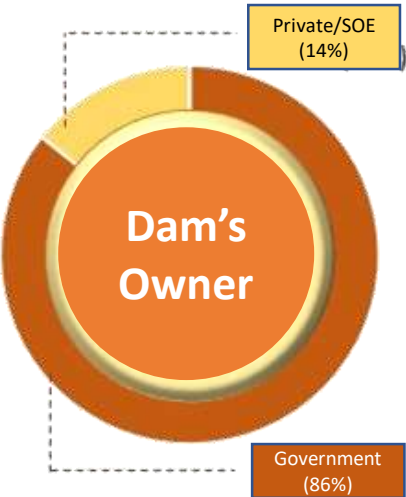


# STORAGE PER CAPITA

attention : considered as lowest compared to other countries



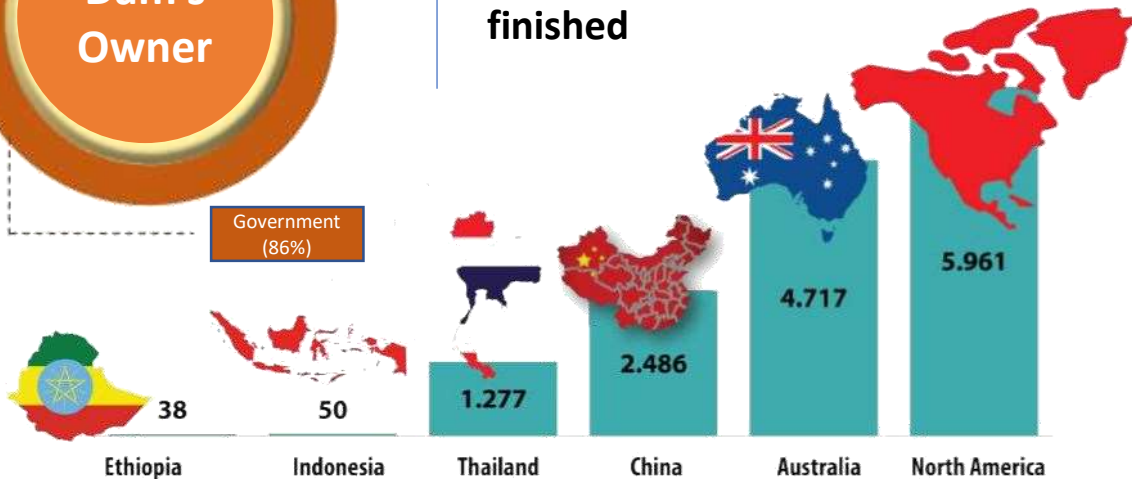
**224** Number of Existing Dam



**Total Volume:**  
14,1 billion m<sup>3</sup>

**Storage per Capita:**  
54 m<sup>3</sup>/person

**Storage per Capita projected to be increase into 66 m<sup>3</sup>/capita after development of 65 dams finished**



**Irrigation:**  
913.423 ha



**Water Supply:**  
40,9 m<sup>3</sup>/s

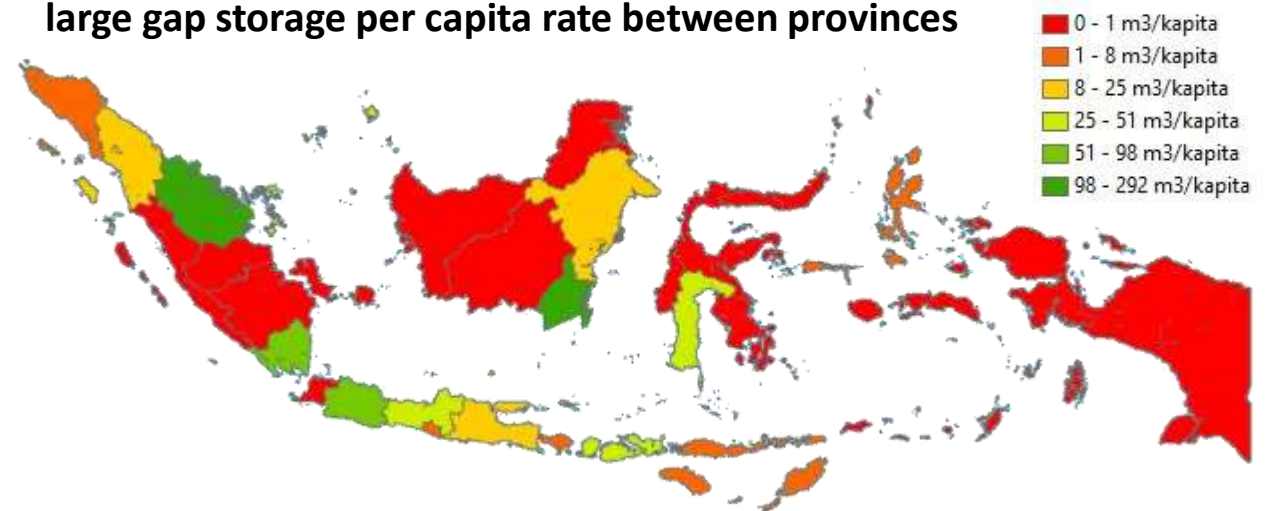


**Hydropower:**  
4059,3 MW

**9 DAMS** finish constructed in period 2015 – 2017  
Source: Pusbend, 2018



**The existing dam is not spread evenly; there are large gap storage per capita rate between provinces**

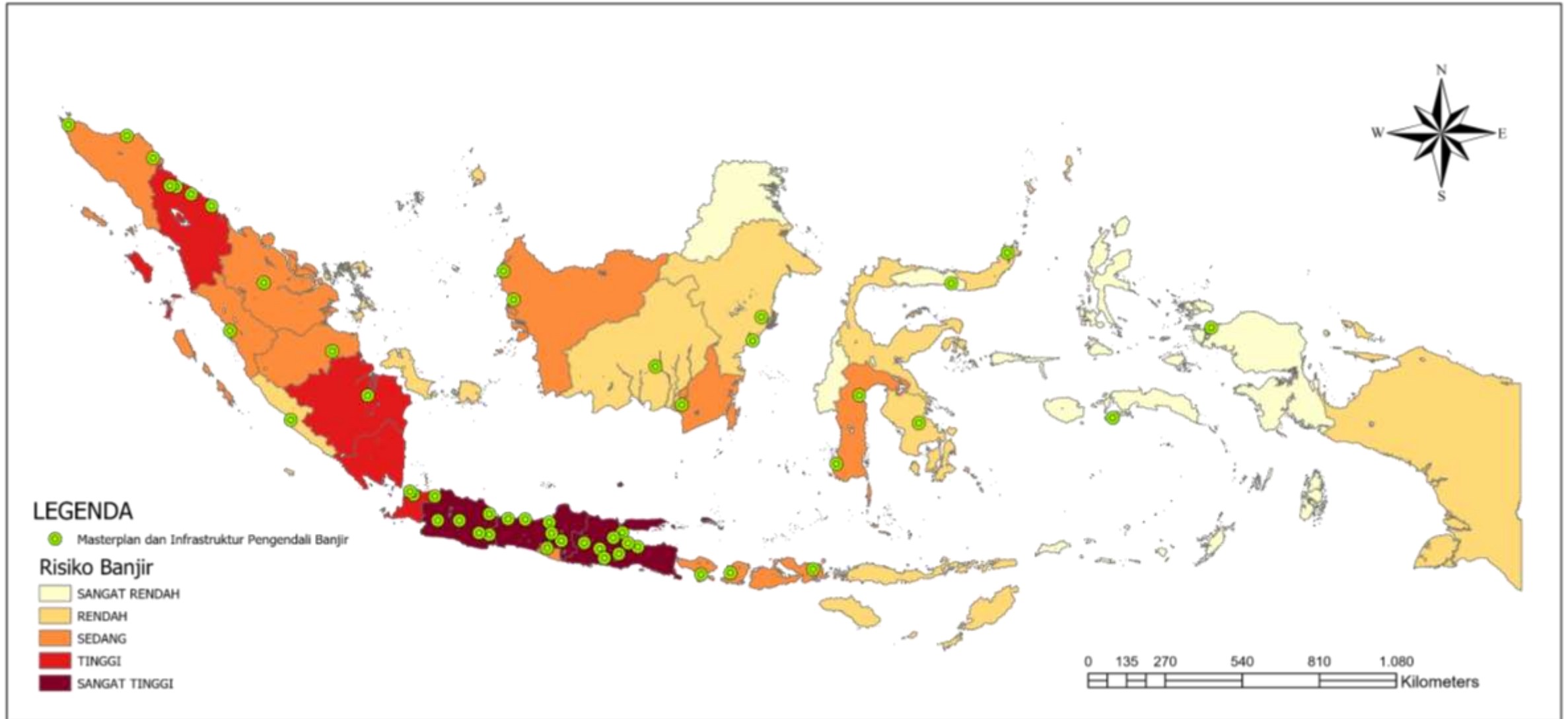






# HIGH FLOOD RISK

attention : strengthening flood resilience especially in Java Island





# ACHIEVEMENTS IN WATER RESOURCES DEVELOPMENT

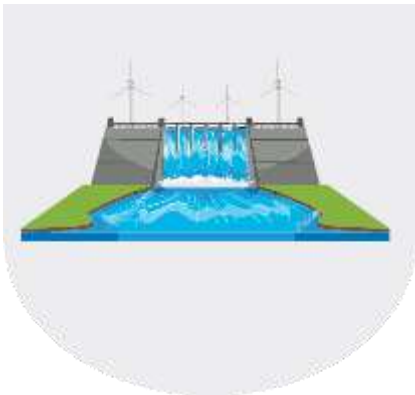
RPJMN 2015-2019



“Infrastructure development is one of the priorities that have been emphasized in the RPJMN 2015-2019”

**16** NEW DAMS

**45** ON-GOING DAMS



**24,9** m<sup>3</sup>/s

ADDITIONAL RAW WATER CAPACITY



**1** MILLION Ha OF NEW IRRIGATED LAND

**3** MILLIONS Ha OF IRRIGATED LAND IS REHABILITATED



**1.485** Km OF FLOOD AND ABRATION CONTROL

**266** SEDIMENT CONTROL





# CHALLENGES REGARDING WATER RESOURCES



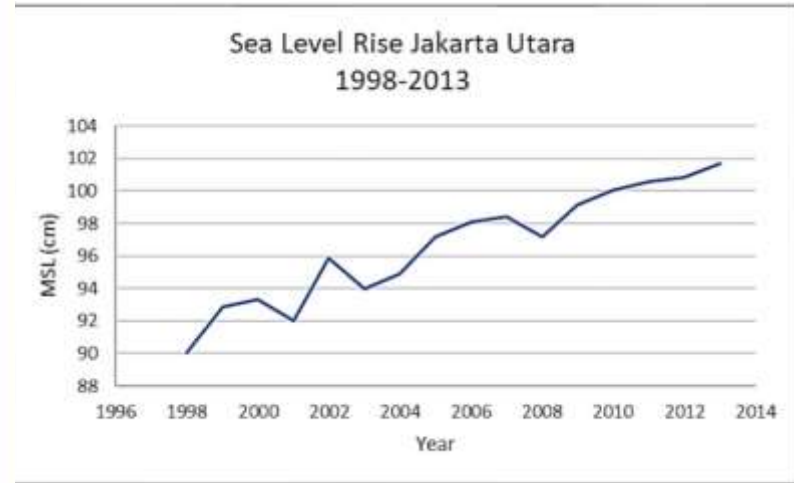
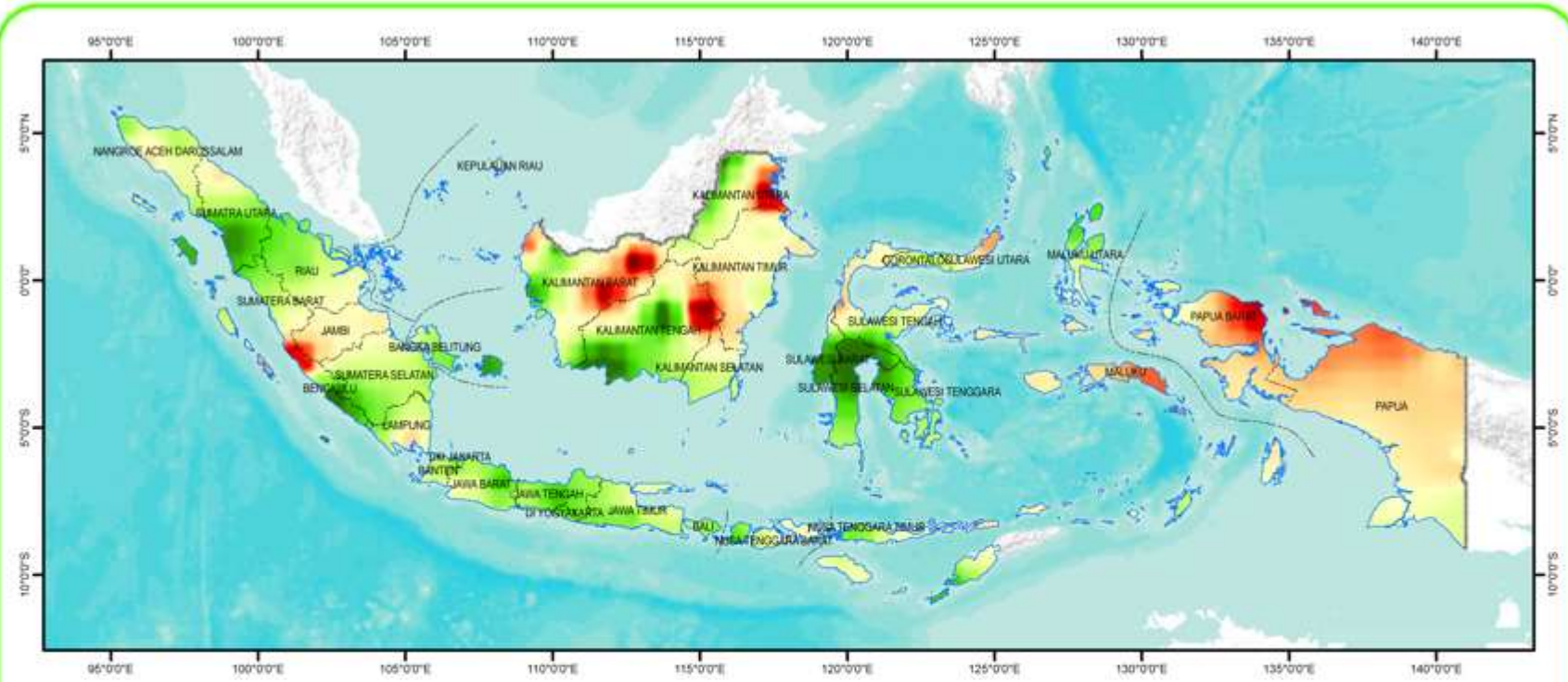


# CLIMATE CHANGE

Big cities in coastal areas are threatened by sea level rise due to global warming



The results of the BMKG analysis show that rainfall in Papua and Kalimantan **tends to decline**, while Java, Sumatra and parts of Sulawesi **tend to increase**. Management of water resources that are not optimal can lead to floods and droughts in the territory of Indonesia in the future.



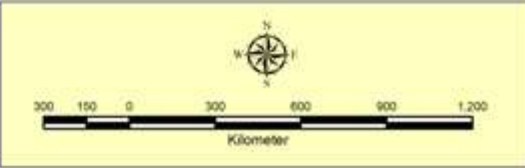
**Normal Changes of Yearly Precipitation in Period 1991-2010 compare to Period 1971-1990 INDONESIA**

Badan Meteorologi Klimatologi dan Geofisika



**NOTE:**

- Country Boundary
- - - Province Boundary
- Coastal Line



Location of cities threatened by **sea level rise in North Coastal of Java**

Source: Analysis from MPWPH, 2016





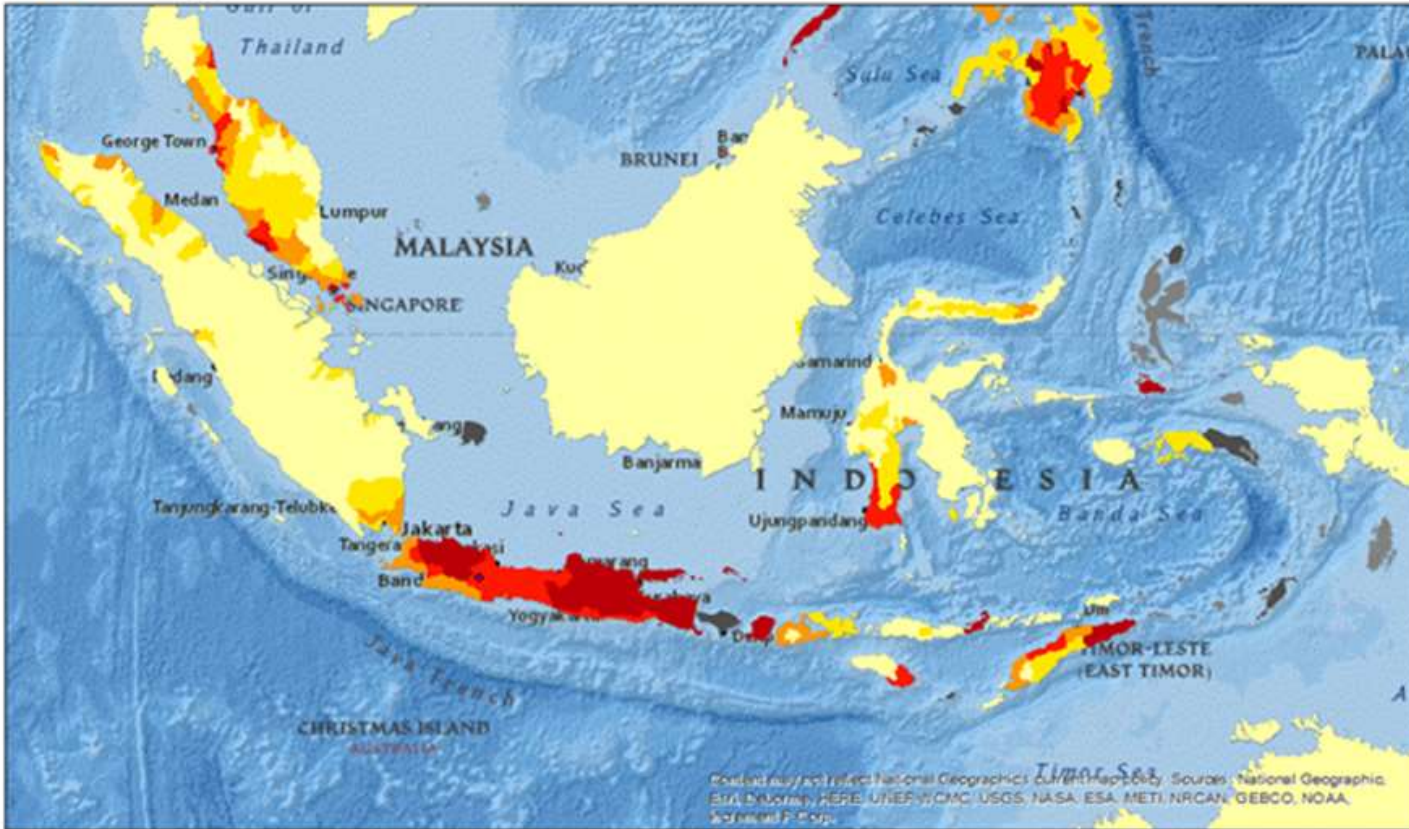
# WATER STRESS

the new 10 agglomeration areas will increase the water stress and 6 areas are located in Java Island



## AQUEDUCT

Wednesday, January 4, 2017

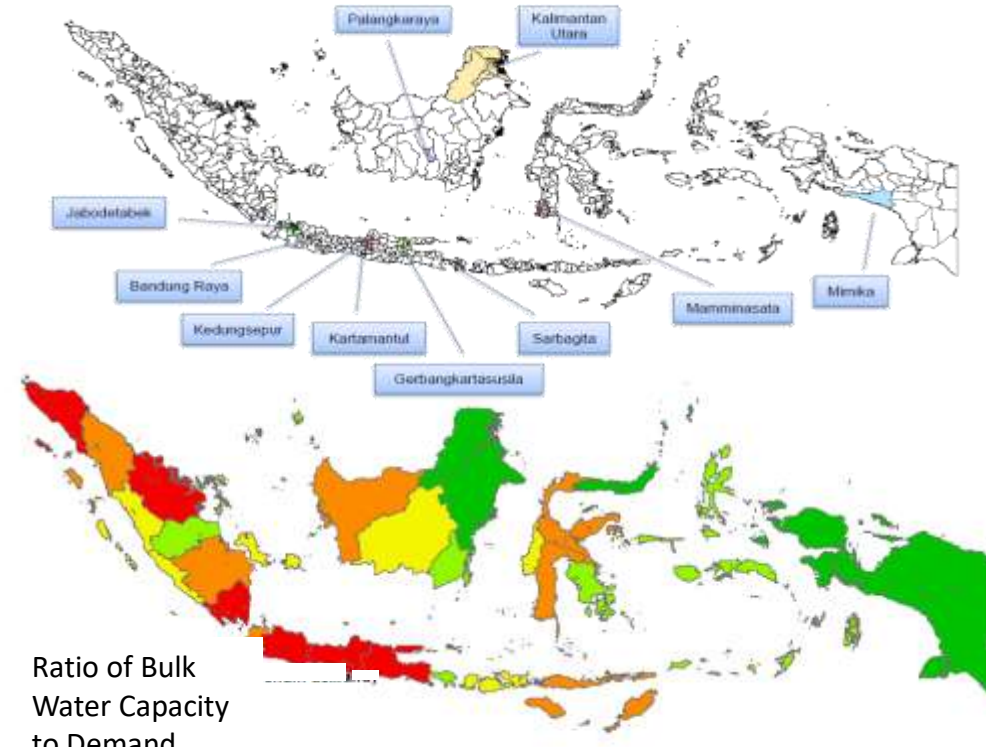


Projected change in water stress (Value in year 2040 business as usual)

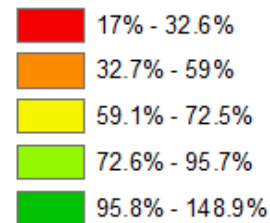
Legend:



## Location of 10 Agglomeration Area



Ratio of Bulk Water Capacity to Demand



**Water Stress** is an indicator of competition over water resources and is defined informally as a ratio of community water needs divided by water availability.



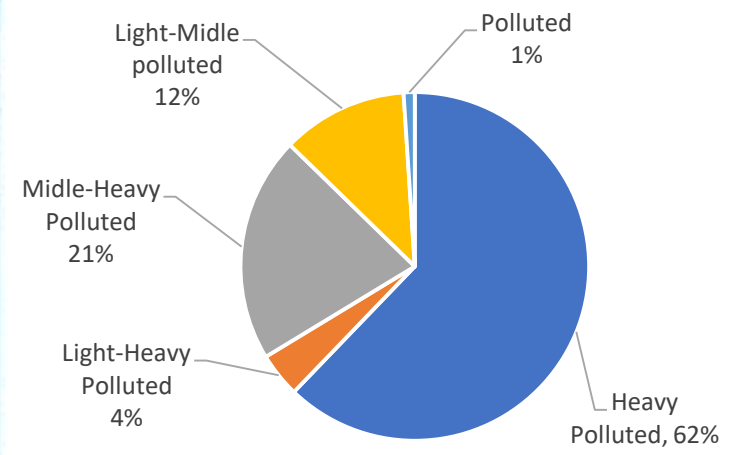
# WATER QUALITY

although BOD and COD have not exceeded the standard, BOD needs to be considered because it almost near the threshold



Water Quality in Indonesian River Year 2015

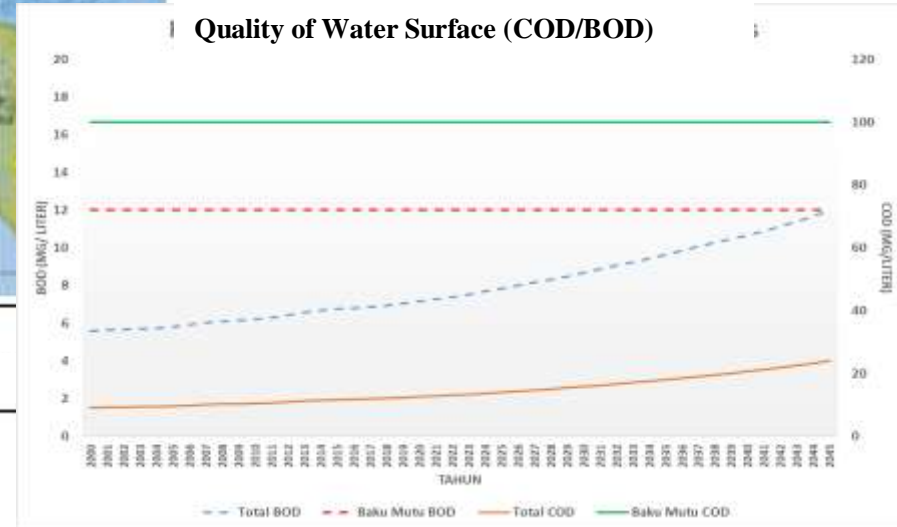
Water Quality for rivers in Indonesia Year 2016



**Note :**

- Heavily Polluted (68%)
- Middle-Heavy Polluted (24%)
- Light-Heavy Polluted (6%)
- Comply (2%)

Source: Analysis from MPWPH, 2016







# PERFORMANCE OF IRRIGATION INFRASTRUCTURE

Only 11% of the irrigation area is guaranteed by reservoir



## TARGET OF AGRICULTURE DEVELOPMENT 2015-2045



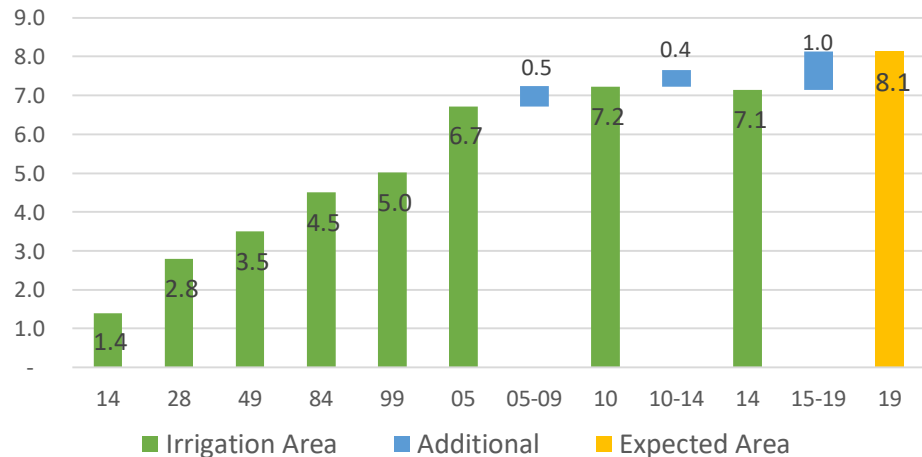
Rice Surplus > 10 million ton for food security

Rice Ekspor > 5 million Ton

Rice Stok : 20 mil ton  
Rice Export : 15 mil ton

Source: Ministry of Agriculture, 2018

## Irrigation Area in Indonesia (Million Ha)



Groundwater Irrigation (1%)	
AREA	113,600 Ha
IP	1,4
Provitas	5,16 (ton/ha)

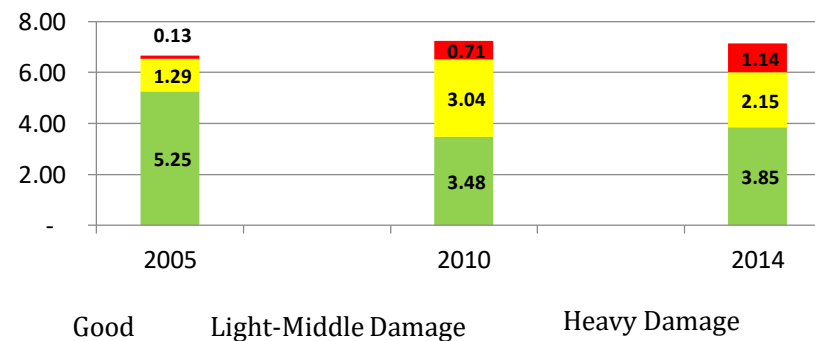
Pond Irrigation (2%)	
AREA	189,747 Ha
IP	--
Provitas	5,16 (ton/ha)

Pump Irrigation (1%)	
AREA	44,23 Ha
IP	--
Provitas	5,16 (ton/ha)

Swamp Irrigation (18%)	
AREA	1,643,283 Ha
IP	1,2 – 1,3
Provitas	3,5 – 5,16 (ton/ha)

Surface Irrigation (78%)	
AREA	7,145,168 Ha
IP	1,4 – 2,3
Provitas	5,16 (ton/ha)

## Condition of Irrigation (million ha)



- In 2030, **urban areas** in Java are predicted to increase to 40%
- As a result: It is estimated that **2.1 million ha** of productive irrigated land in Java will decrease
- 40% of paddy fields and 52% of **national rice production are on P. Java.**

Source: Analysis from MPWPH, 2016

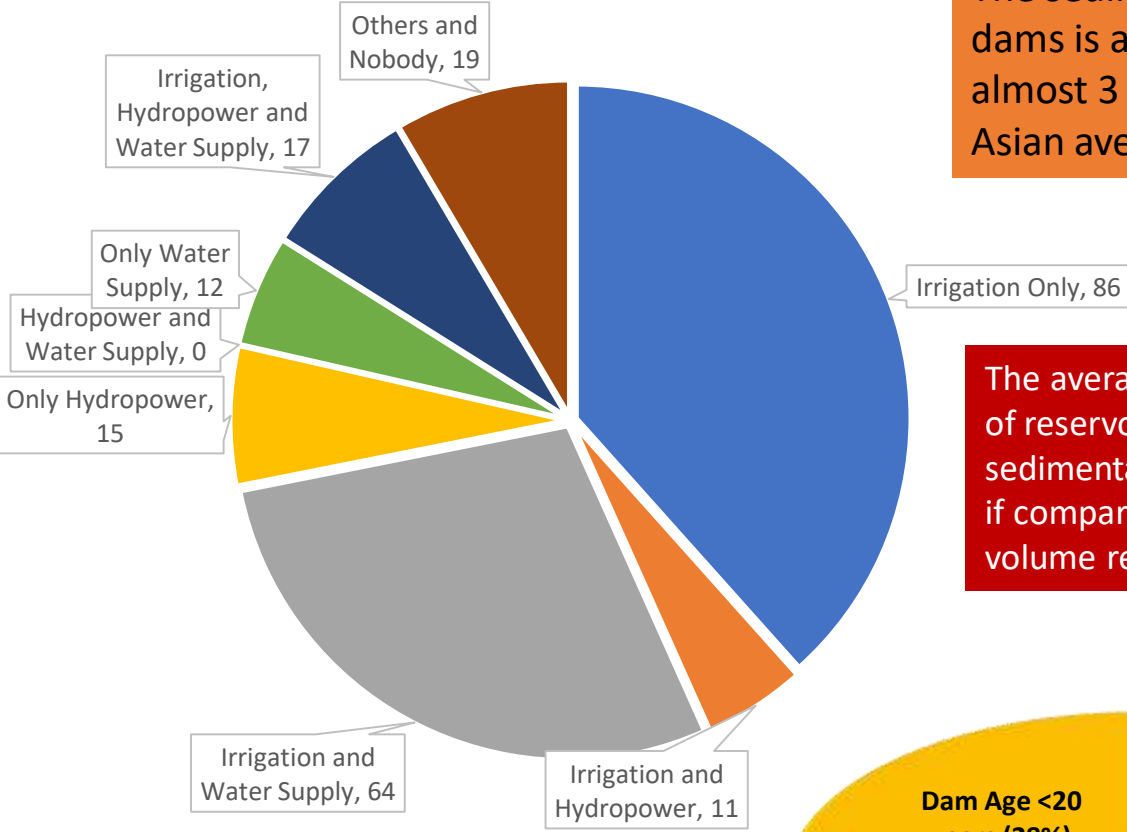


# OPTIMIZING DAM INFRASTRUCTURE

choosing the more effective way to handle aging dam ; developing multipurpose dam

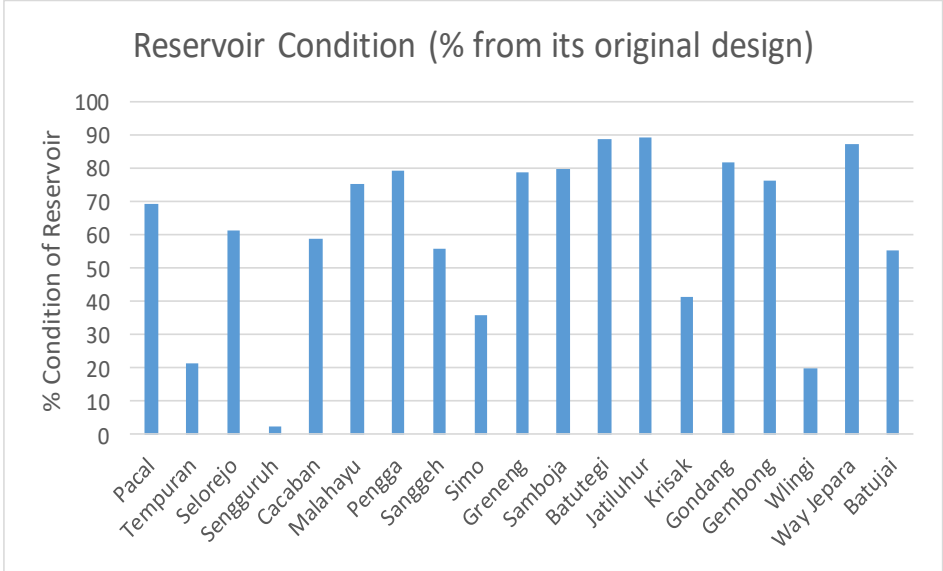


## Existing Dam and Its Benefit

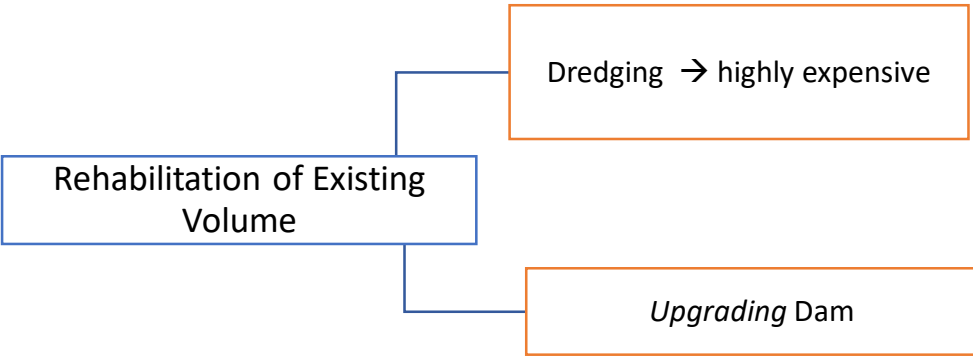
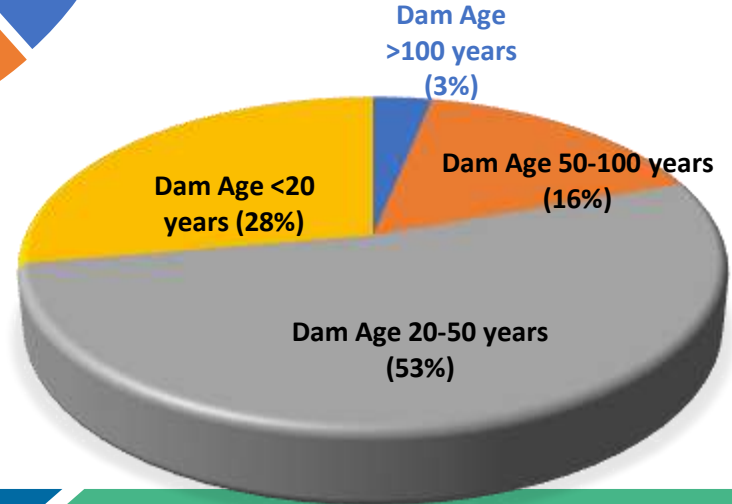


The sedimentation rate of 19 dams is around **0.8% per year**, almost 3 times higher of the Asian average (0.3%)

The average reduction in volume of reservoirs on Java Island due to sedimentation reached 31% while if compare to Indonesia, the volume reduction reached 19%.



Need to develop the idea of multipurpose dam



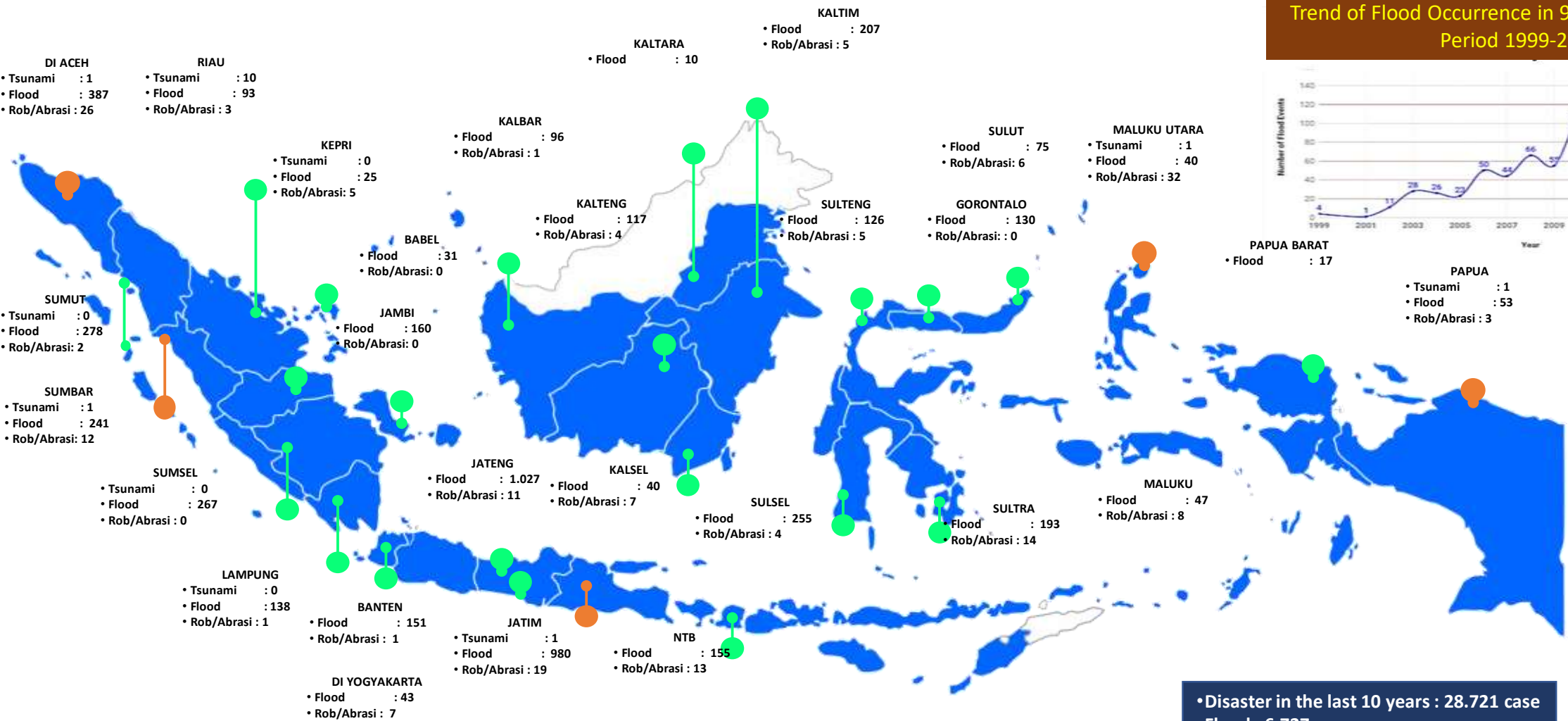
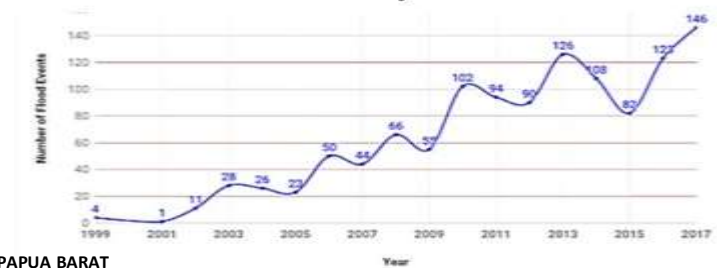
Source: Analysis from MPWPH, 2016



# DISASTER RESILIENCE INFRASTRUCTURE



### Trend of Flood Occurrence in 92 cities in Indonesia Period 1999-2017



• Disaster in the last 10 years : 28.721 case  
 • Flood: 6.727 case  
 • Rob and abrasion : 201 case  
 • Tsunami : 5 case

**NOTE :**  
 Area with the incident of Tsunami, Flood, Rob and Abrasion  
 Area with the incident of Flood and Rob/Abbrasion

Source: Analysis from MPWPH, 2016





# STRENGTHENING WATER GOVERNANCE



# INTEGRATED WATER RESOURCE MANAGEMENT



The Government and Community Working Together for Clean, Healthy and Productive Catchment and Rivers, bringing sustainable benefit to all people in River Basin

## STAKEHOLDER INVOLVED

- GOVERNMENT
- LOCAL GOVERNMENT
- COMMUNITY
- PRIVATE SECTOR
- ACADEMICS
- DONOR AGENCIES

MAIN KEY AREAS



SUPPORT KEY AREAS



## COORDINATION BODIES

- National Water Council**
- Provincial Water Council**
- Water Resources Coordination Team**

- Established since March 2009 by Presidential Decree No. 6/2009
- Established in 33 provinces
- Established in 17 National Strategic RB, 12 Cross Provinces RB, 1 Cross District RB

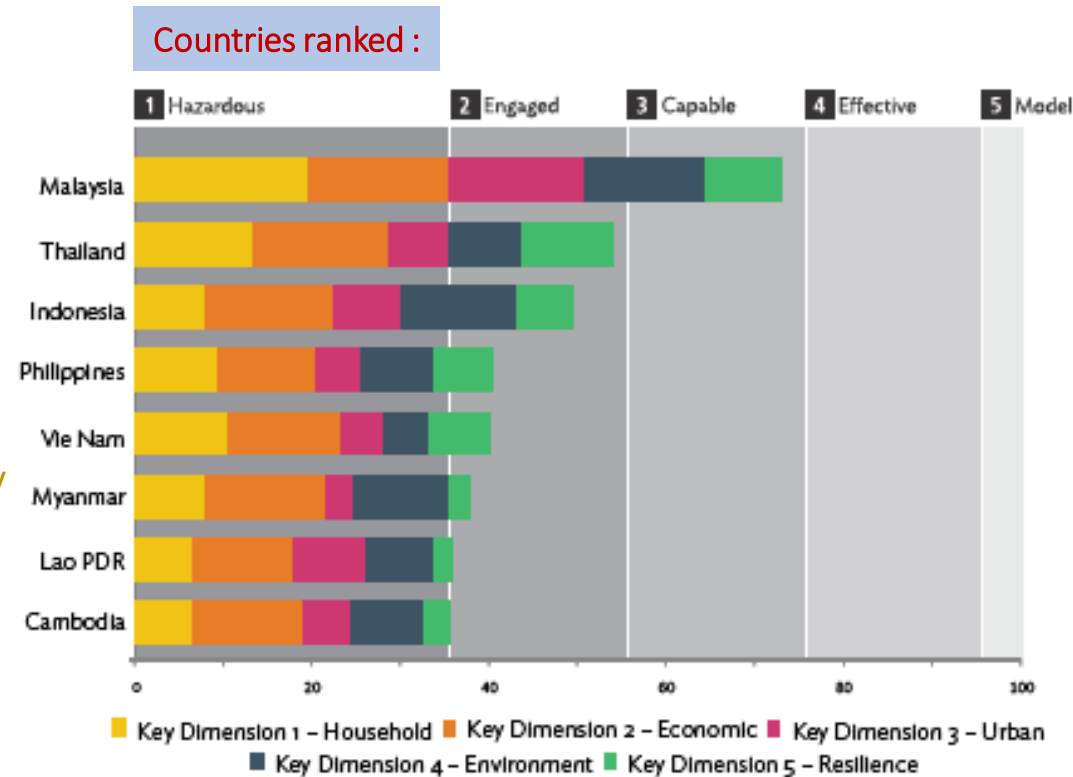
## MEMBER AND COMMISSION:

50% from government organizations and 50% from public users + NGO  
Those institutions were set up to develop better understanding among stakeholders so the IWRM Policies can be achieved.



# INDICATORS FOR WATER RESOURCES DEVELOPMENT

choosing based on Indonesia's conditions and challenges regarding water resources

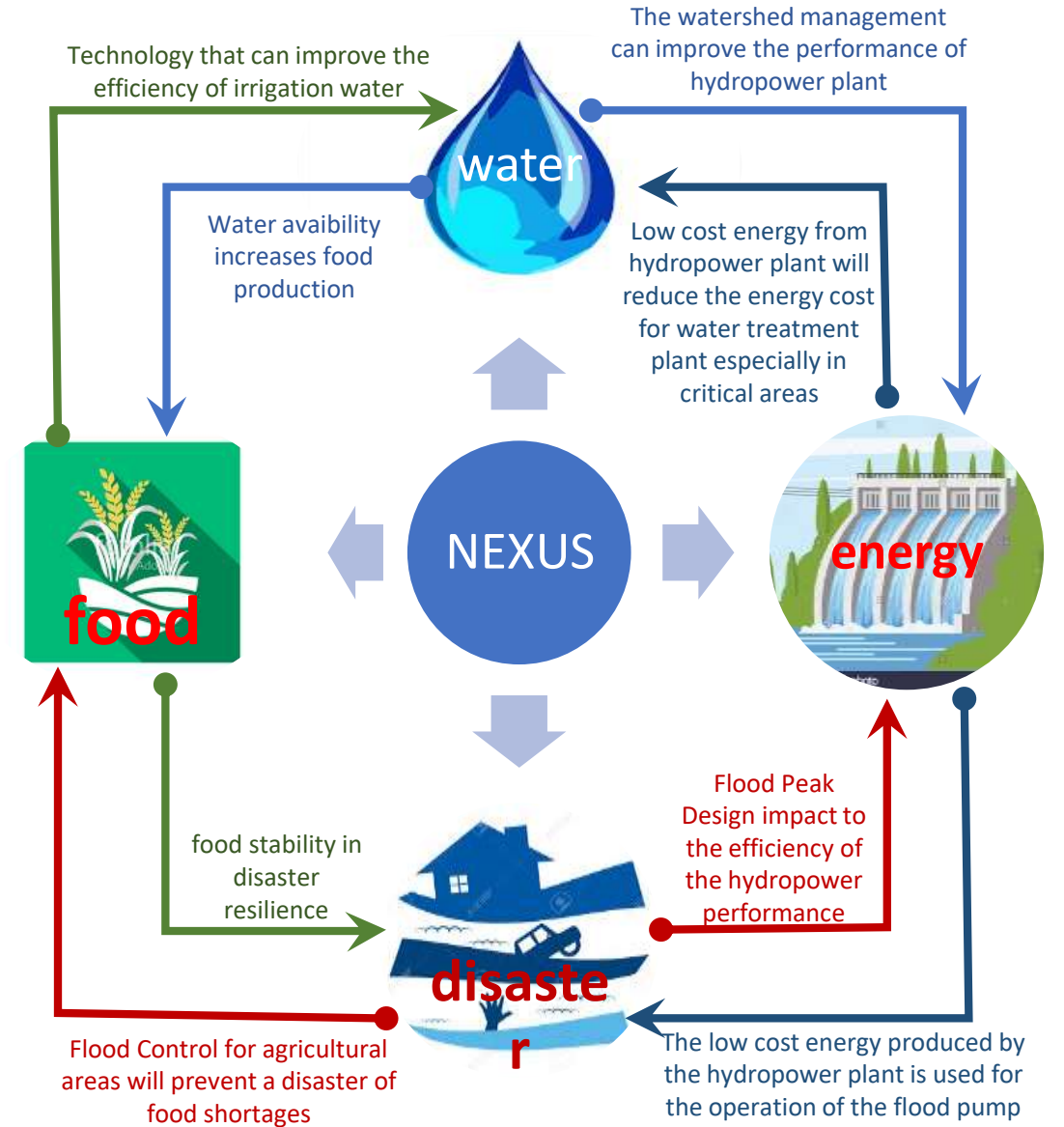


Source: Country Water Assessment ADB, 2016





# QUICK WIN PROGRAMS





# THE VISION OF STRATEGIC PROJECTS



# IRRIGATION, STORAGE/RESERVOIR, AND WATER QUALITY



*"Perlunya efisiensi air irigasi salah satunya dengan penerapan teknologi dan pengelolaan secara modern"*

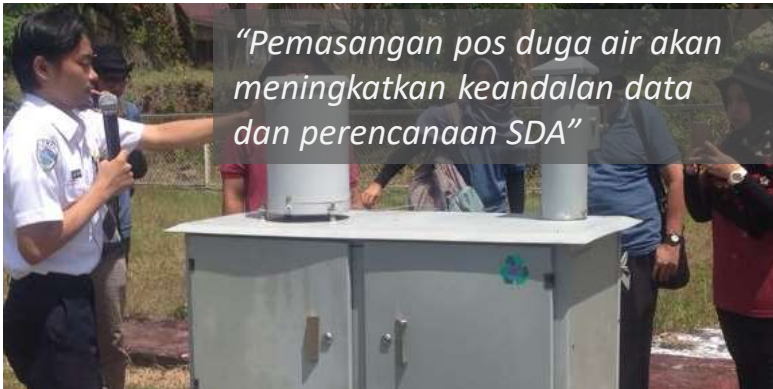


*"Bendungan Multiguna Jatiluhur, Jatigede, dan Karian secara signifikan mendukung ketahanan air di Jawa Barat"*

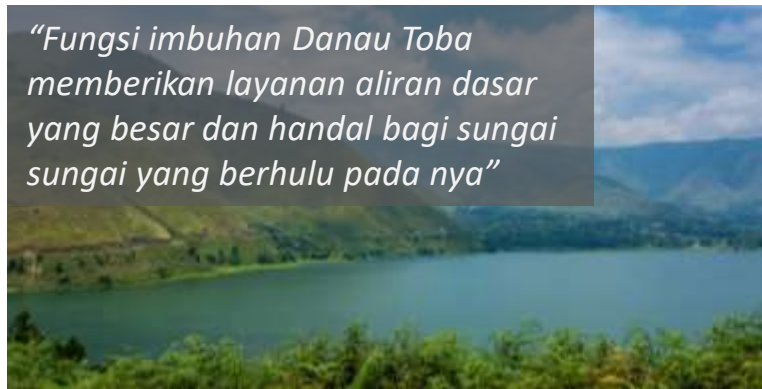


Optimizing the benefits of multipurpose dams to support priority areas ( water,food, energy nexus)

*"Pemasangan pos duga air akan meningkatkan keandalan data dan perencanaan SDA"*



*"Fungsi imbuhan Danau Toba memberikan layanan aliran dasar yang besar dan handal bagi sungai sungai yang berhulu pada nya"*



Developing towards the modernization of irrigation

Increasing the green infrastructure program through a watershed restoration program that supports large cities and agglomerations, ex : citarum

*"Situ Cisanti sebagai titik 0 Citarum menjadi tolak ukur bagaimana kondisi ideal suatu badan air"*



*"Kawasan strategis KI/KEK/KSPN memerlukan energi listrik seperti PLTA"*




Real time monitoring ( smart water management)






# RAW WATER, DISASTERS, AND NORTH COASTAL




*“Pemenuhan air bersih untuk pulau terluar guna mengurangi krisis dimusim kemarau”*




*“Kawasan industri membutuhkan air baku untuk mengurangi ekstraksi air tanah berlebih”*

Ground water and raw water sustainability. ( Domestic and industrial use)




*“Peningkatan suplai air baku ke PDAM sangat diperlukan untuk meningkatkan SPM”*




*“Tanggul sungai untuk mengatasi banjir dan tanah longsor dimusim hujan”*

Increasing access to decent, safe, affordable, and sustainable water



*“Tanggul laut sebagai pengaman kota pesisir dari banjir rob dan land subsidence seperti Jakarta”*



*“3 Aglomerasi di pesisir utara Pulau Jawa (Jabodetabekpunjur, Kedungsepur, Gerbangkertosusila) perlu penanganan khusus terkait SDA”*

Perlindungan terhadap **daya rusak air** (Banjir, longsor, lahar gunung berapi)

Integrated north coastal development



# THANK YOU

*Please do not hesitate to contact  
[ams.idris@bappenas.go.id](mailto:ams.idris@bappenas.go.id)  
for comment/input/suggestion*