Climate Change and Water Issues In the Coastal Area : Jakarta Case Study

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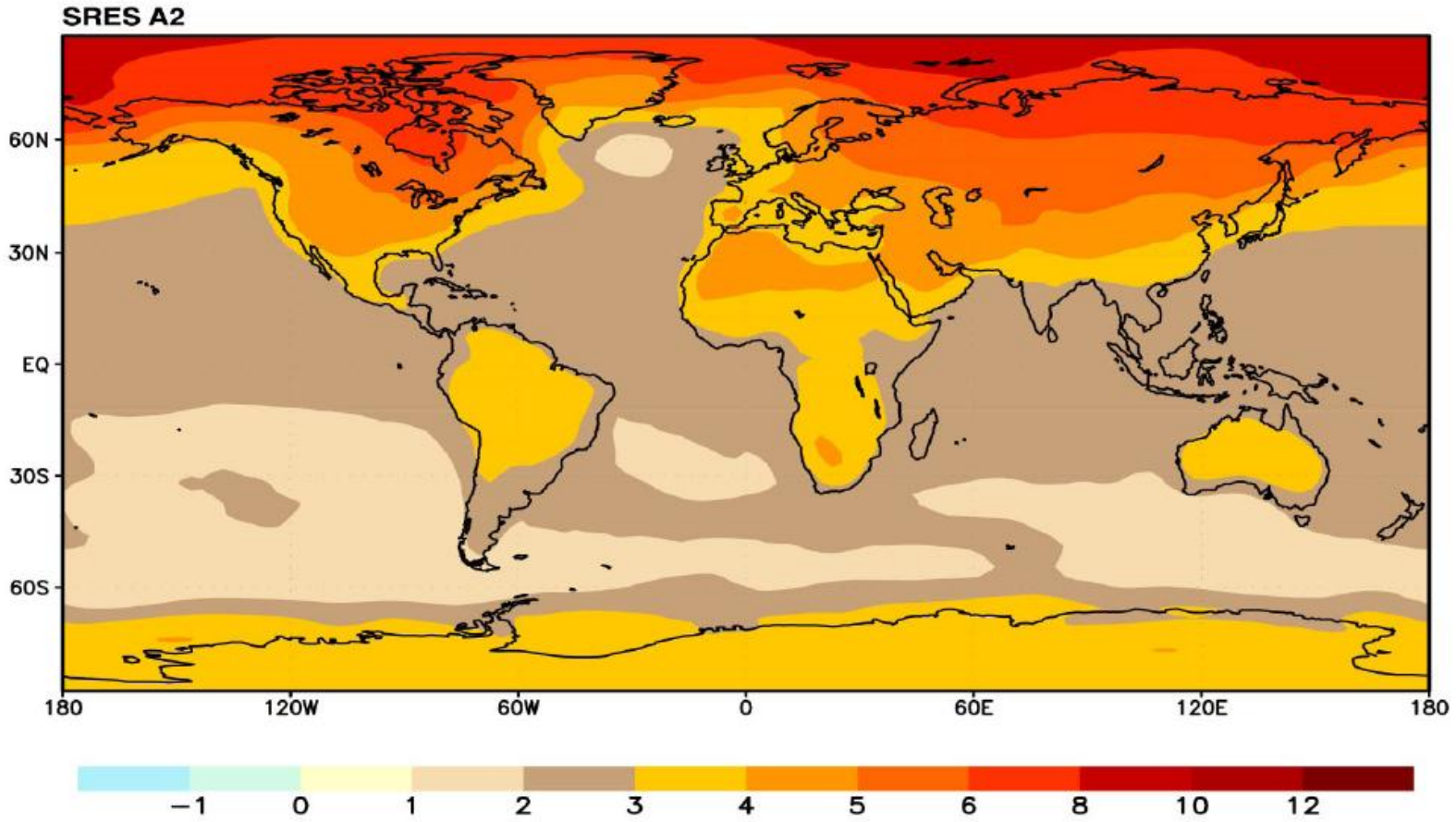
Climate Change In Indonesia

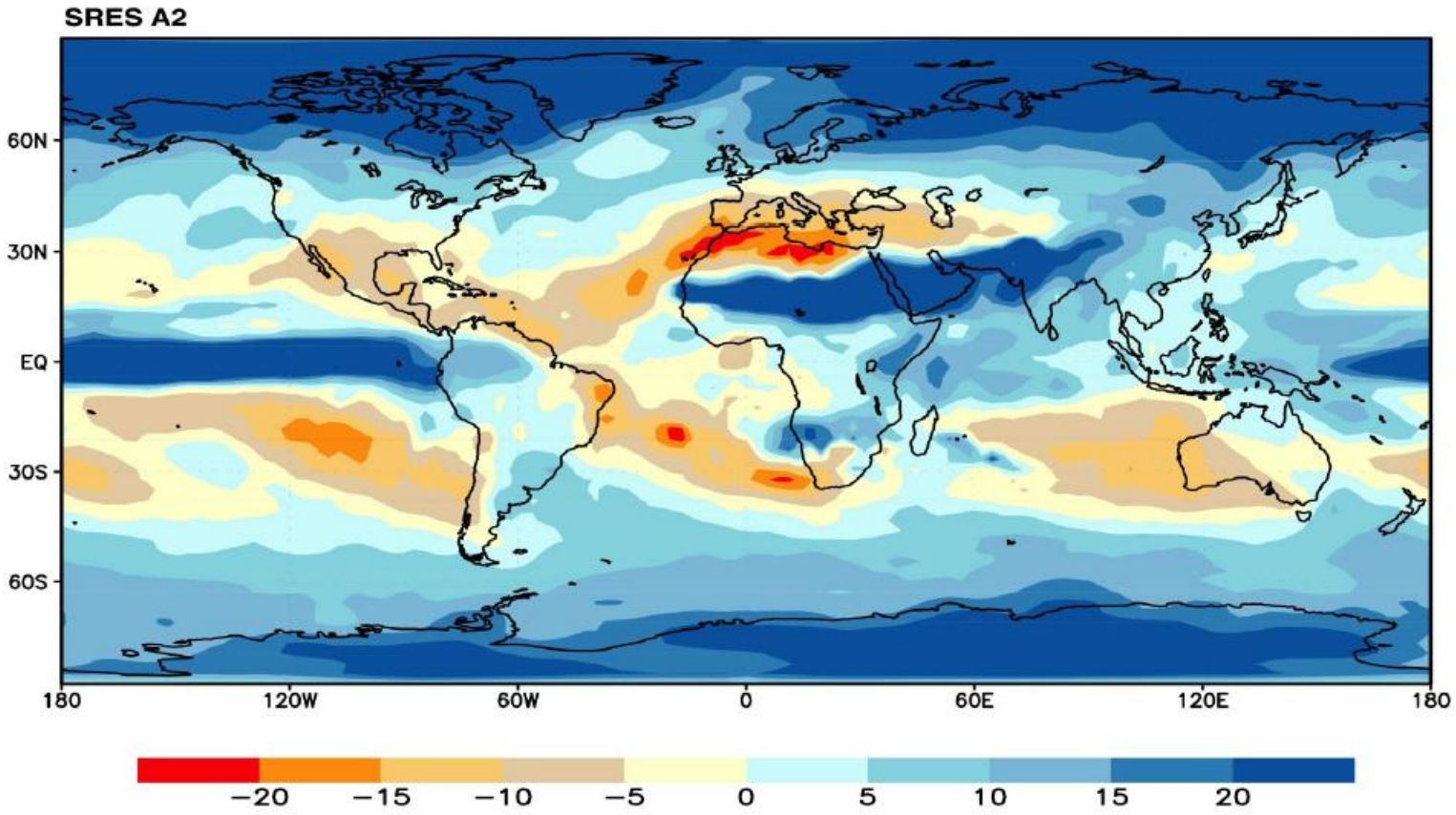
Global Issue

CLIMATE CHANGE



Annual mean temperature change, 2071 to 2100 relative to 1990: Global Average in 2085 = +3.1°C

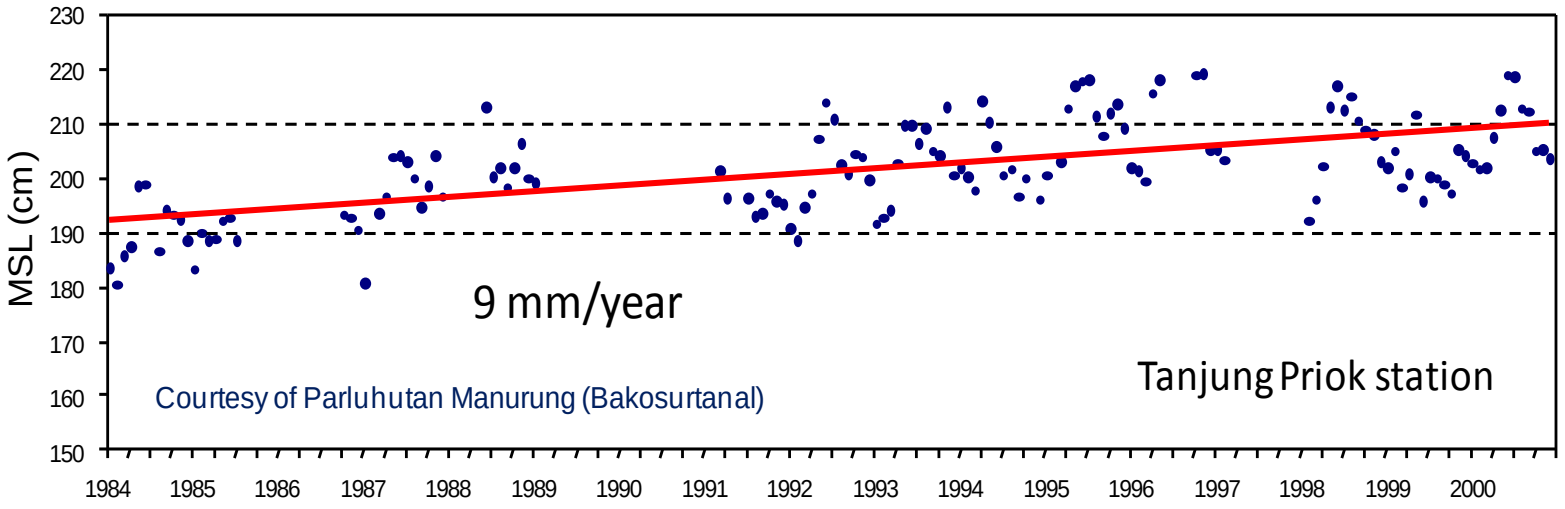
Change of precipitation due to global warming



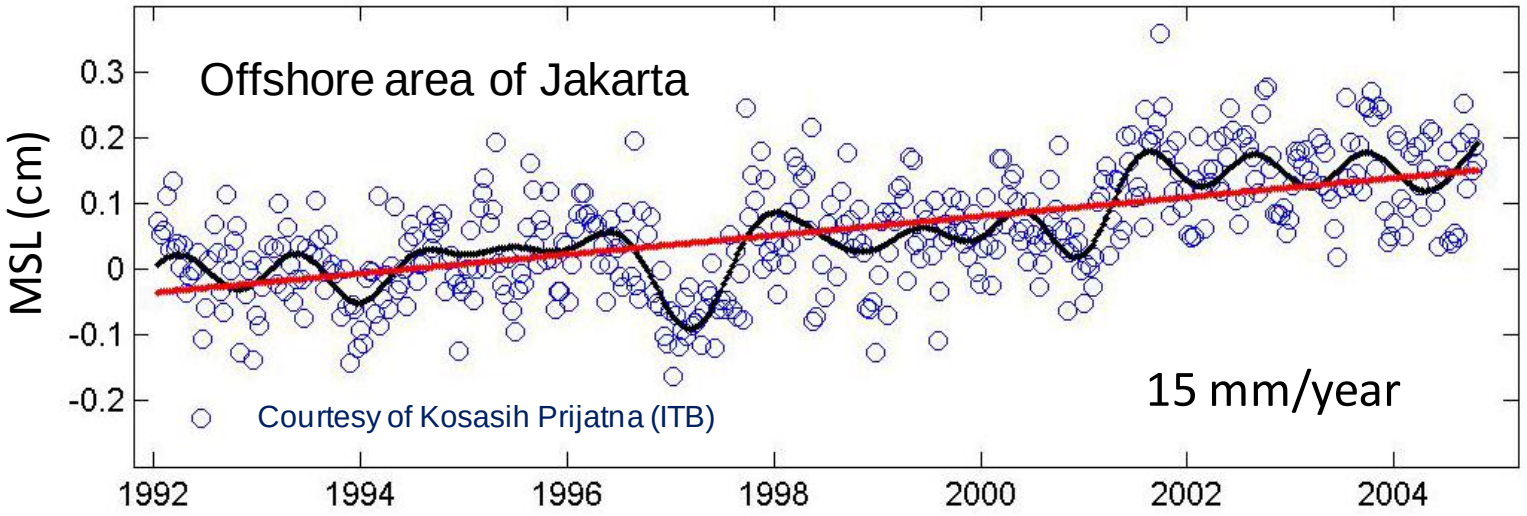
Annual mean precipitation change: 2071 to 2100 Relative to 1990

Sea Level Rise in Coastal Areas of Jakarta

Tide Gauge



Satellite Altimetry



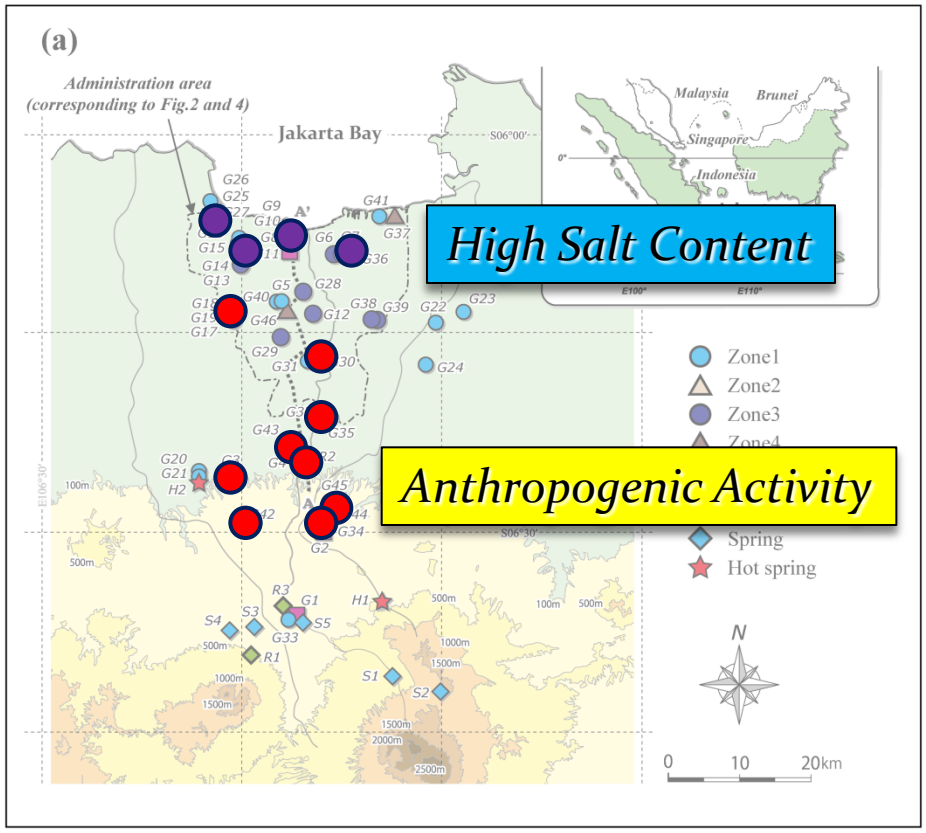
Hasanuddin Z. Abidin, 2009

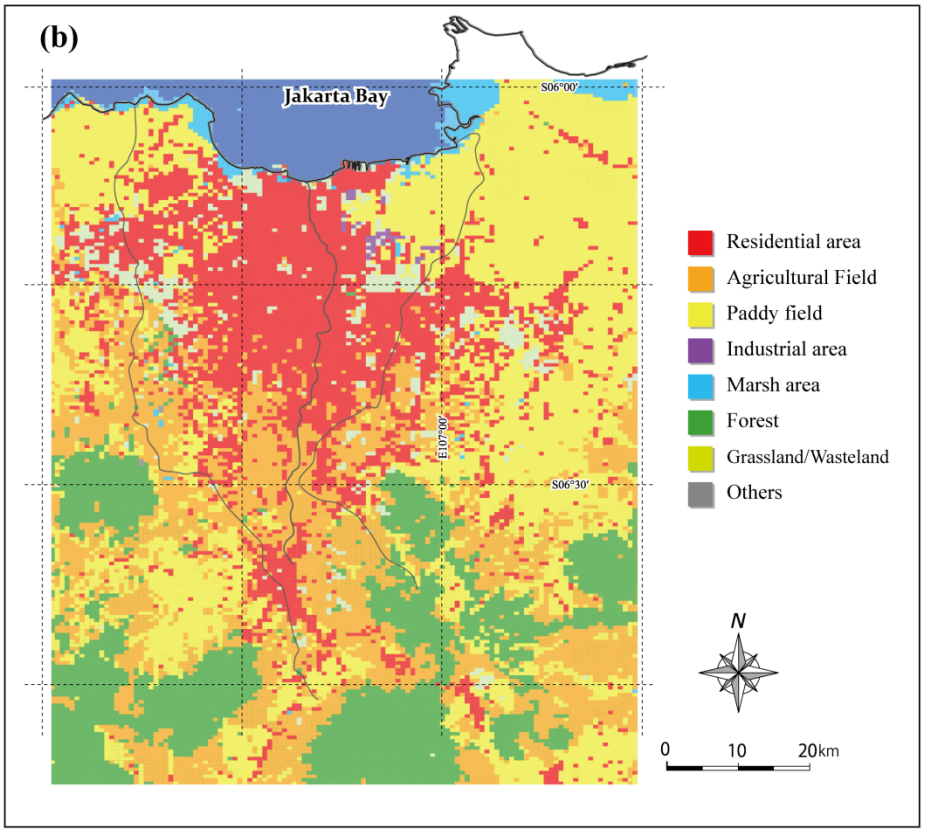
Possible Inundation Areas in Coastal Areas of Jakarta

	CONSERVATIVE SCENARIO	PESIMISTIC SCENARIO
Land subsidence rate	2.5 cm/year	10 cm/year
Sea level rise rate	0.2 cm/year	1 cm/year

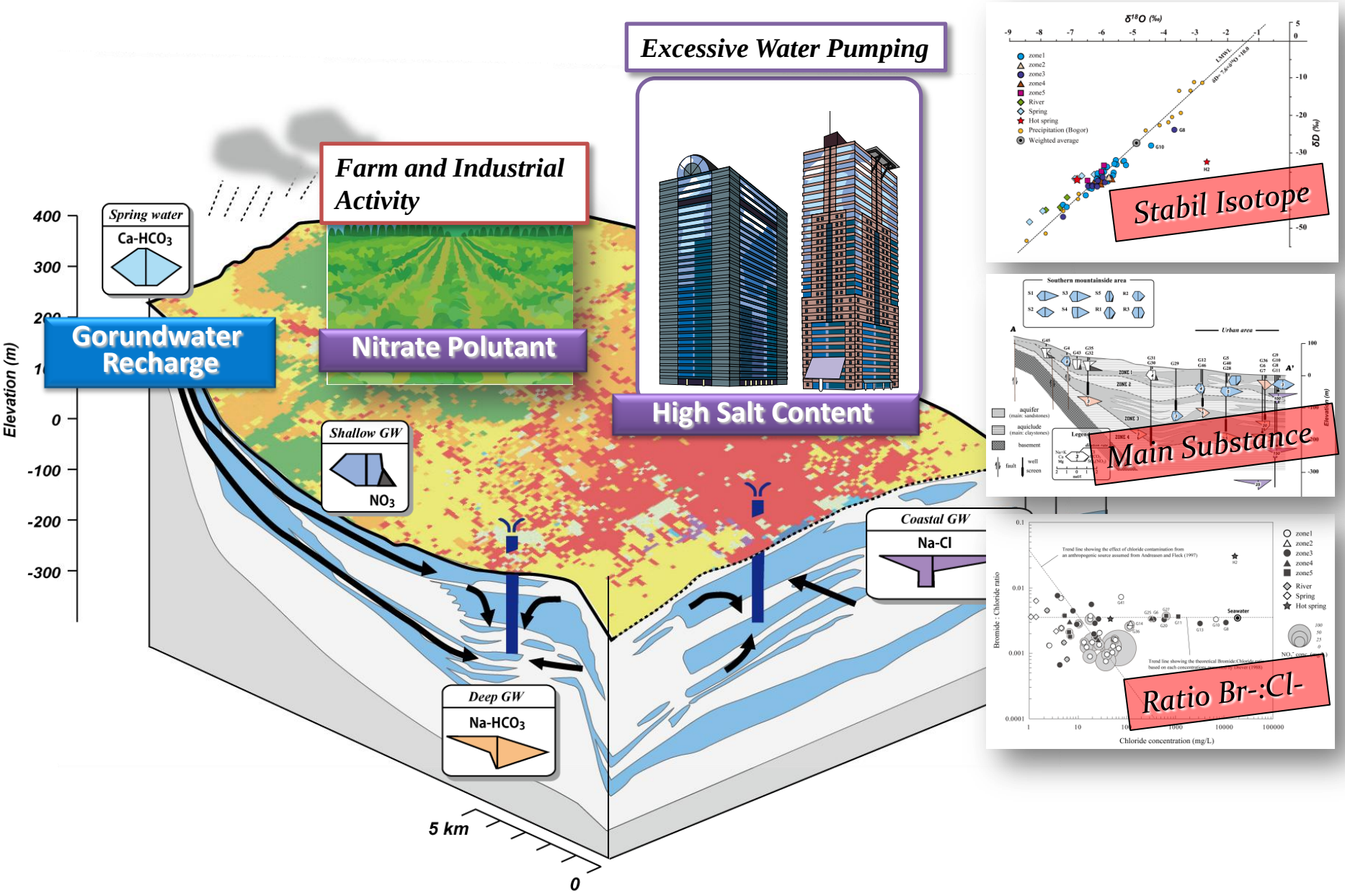
Hasanuddin Z. Abidin, 2009

Ratio of Br^-/Cl^- Content





Schematic of subsurface pollution in Jakarta groundwater flow system



Action?

Adaptation to the previous situation

1. To apply appropriate technology at limited water resource
2. To design implementation planning on sustainable development Dringking Water system for community

Why Water Technology?

- MDGs target: water access and health status
- Indonesian capacity on Water Technology (Public R&D, Universities and Industry)

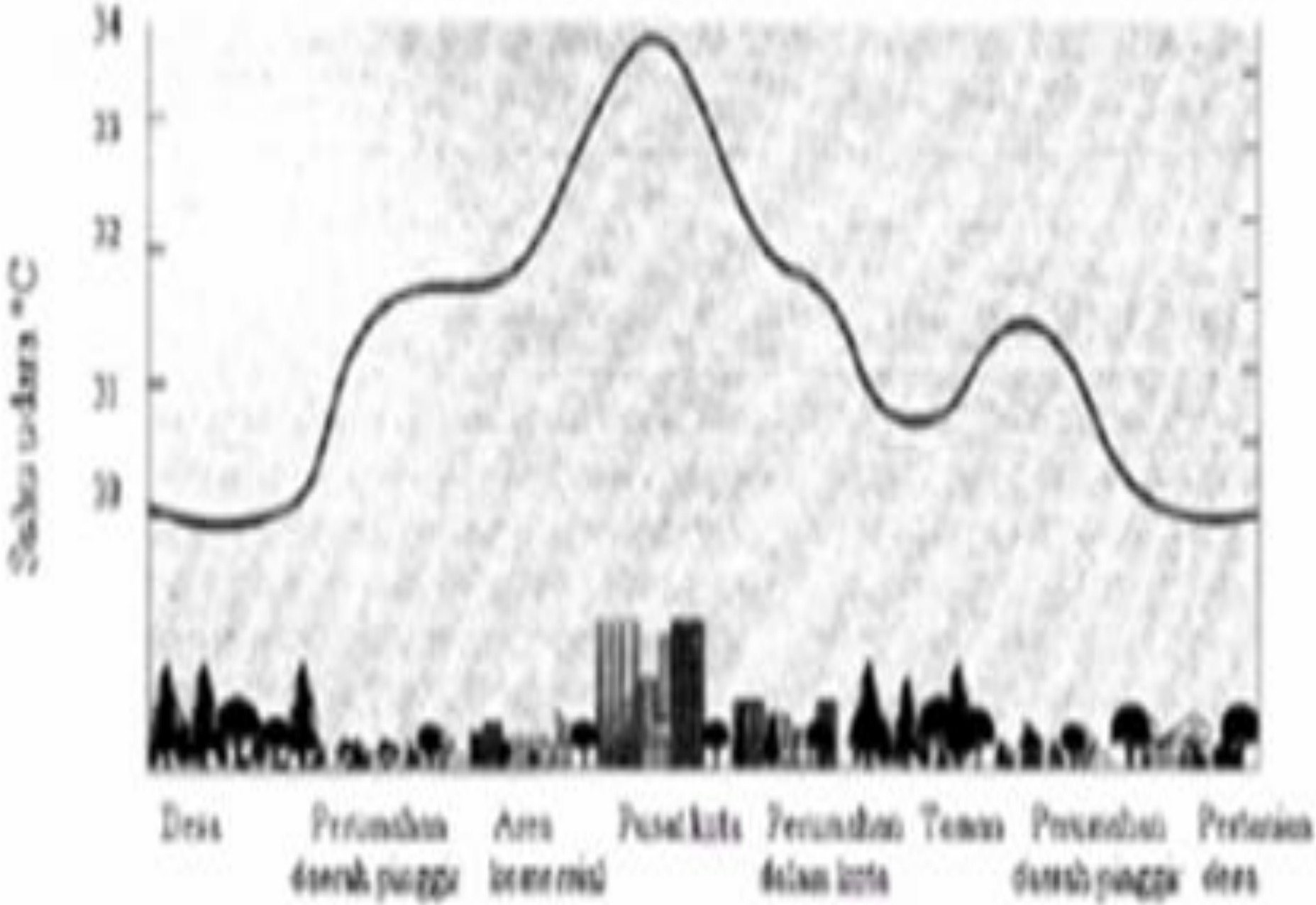
Technology Aquisition

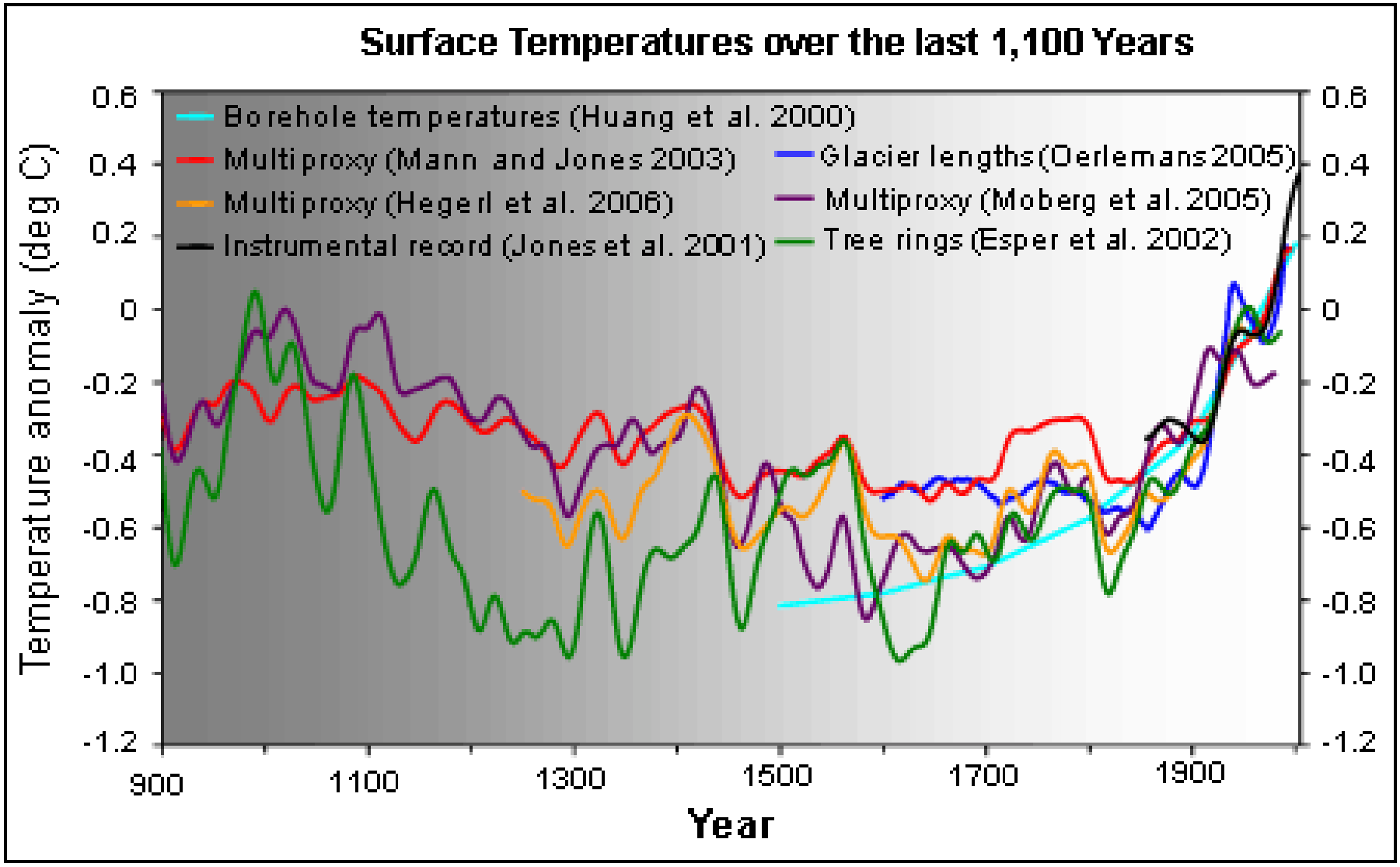
		Technology Acquisition		
		Source	Partnership	Fundir
Ql-Ru	Biofilter	LIPI and some R&D in other countries	USAID	Co-funding
	Reverse Osmosis	USA	Commercial buying	Gov. of Indonesia
	Slowsand Filter	Japan	Min. of Public Works and Japan	JICA
	Traditional Filtering System	Public Domain	Self/Community acquisition	Self/Community acquisition
	Oxidation/aeration (to reduce Fe)	Public Domain	Self/Community acquisition	Self/Community acquisition
	Man Made Pond	Public Domain	Self/Community acquisition	Self/Community acquisition
Ql-Ur	Biofilter	LIPI and some R&D in other countries	Self/Community acquisition	Self/Community acquisition
	Reverse Osmosis	USA	Commercial buying	Gov. of Indonesia
	Slow sand Filter	Japan	Min. of Public Works and Japan	JICA
	Ozonisation	Public Domain	Self/Community acquisition	Self/Community acquisition
	Electrical discharges	LIPI	Japan	
Qn-Ru	Rain Water Harvesting	Public Domain	Self/Community acquisition	Self/Community acquisition
	Pumping and piping	Public Domain	Self/Community acquisition	Self/Community acquisition
Qn-Ur	Reclaimed Water	Public Domain	Self/Community acquisition	Self/Community acquisition
	Pumping and piping	Public Domain	Self/Community acquisition	Self/Community acquisition

LOCAL ISSUE

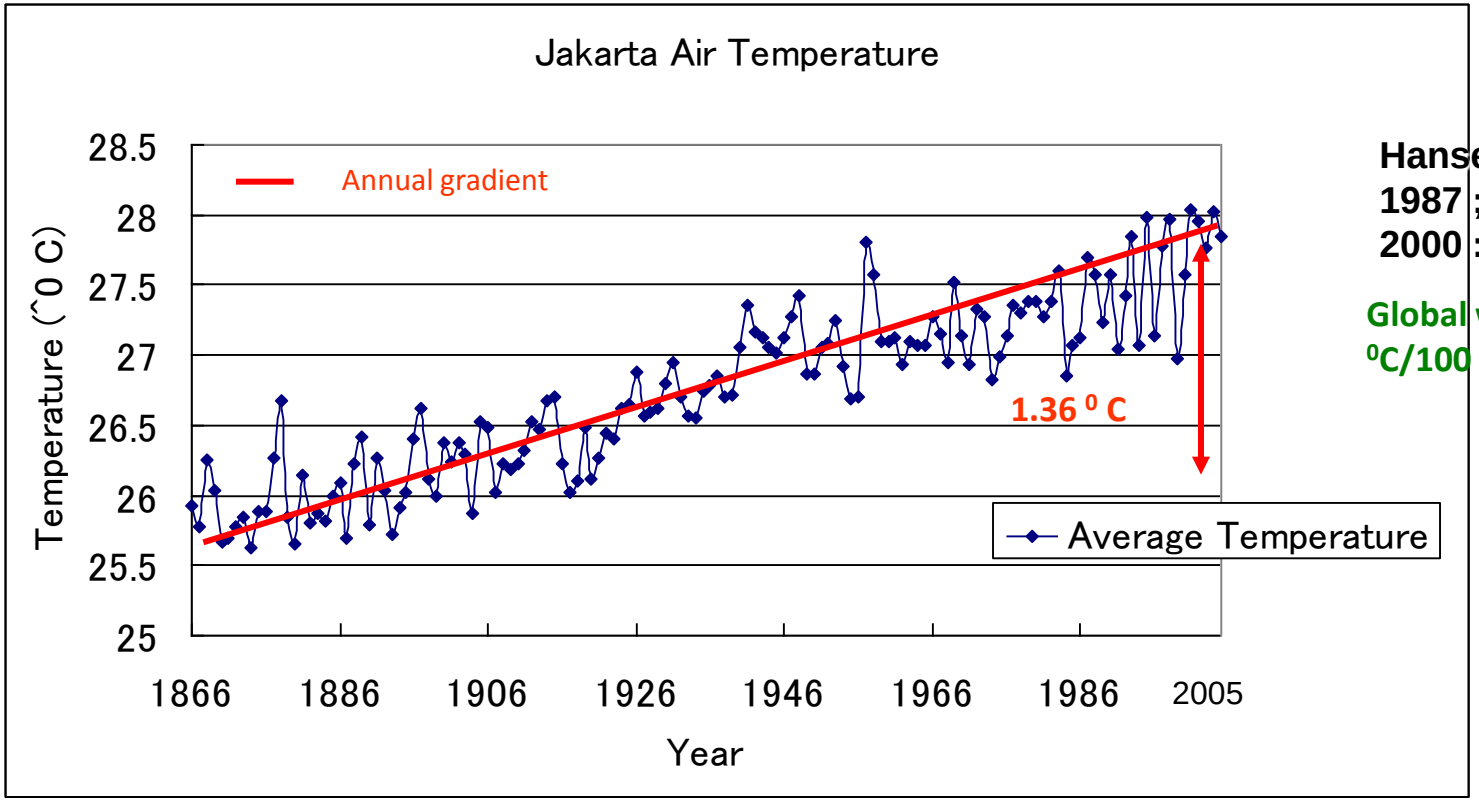
HEAT ISLAND

Temperature in the city which is higher than the surrounding area due to effects anthropogenic activities as large amount of waste heat release


34
33
32
31
30
°C


Surface Temperatures over the last 1,100 Years
Borehole temperatures (Huang et al. 2000)
Multiproxy (Mann and Jones 2003)
Multiproxy (Hegerl et al. 2006)
Instrumental record (Jones et al. 2001)
Glacier lengths (Oerlemans 2005)
Multiproxy (Moberg et al. 2005)
Tree rings (Esper et al. 2002)
Temperature anomaly (deg C)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
900
1100
1300
1500
1700
1900
Year

AIR TEMPERATURE AT JAKARTA



Hansen and Lebendeff, 1987 ; Huang et.all, 2000 :

Global warming : 0.5 – 0.7 ^{0}C/100 year

Automatic Water Level Recorder

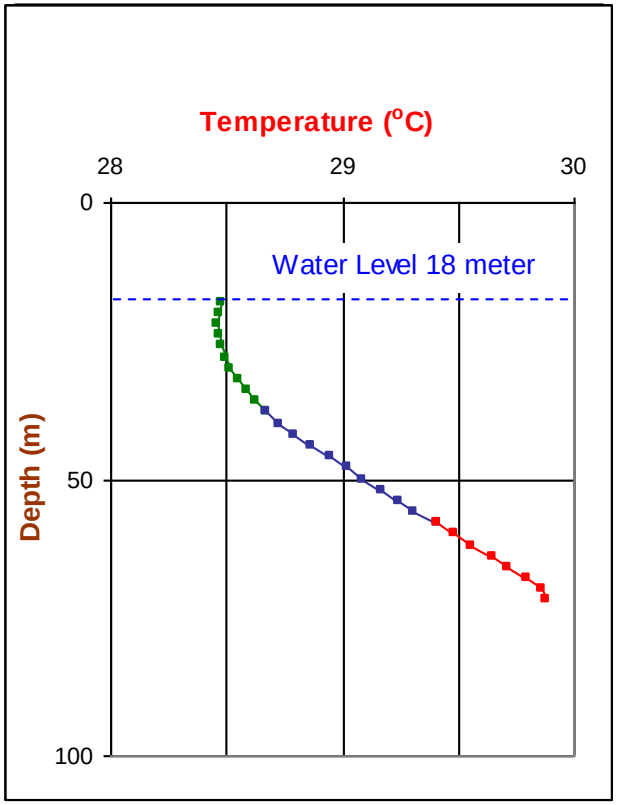
AWLR

Water Level (18 Meter)

20 meter with interval 2 meter

20 meter with interval 2 meter

20 meter with interval 2 meter

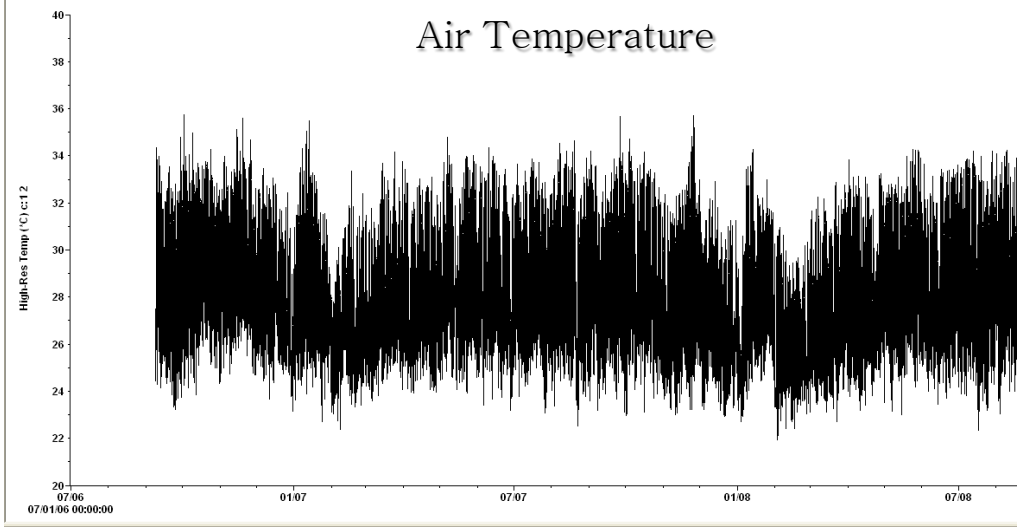


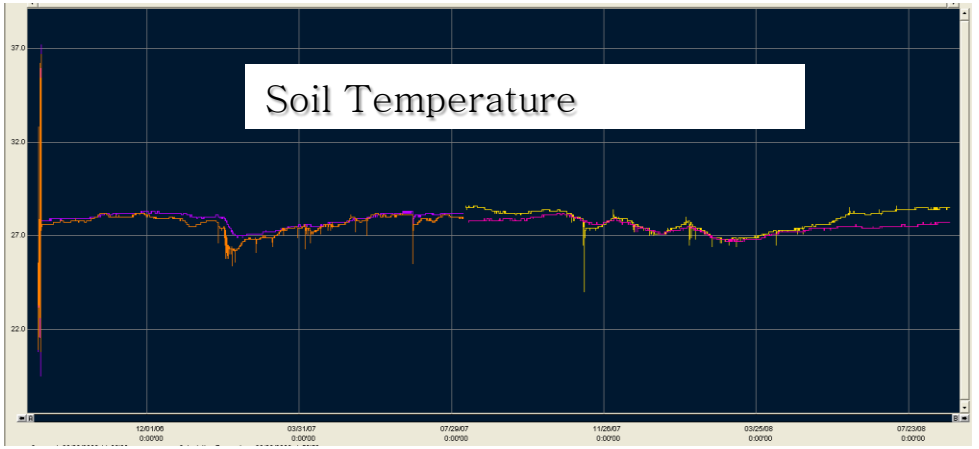
Measurement Schematic

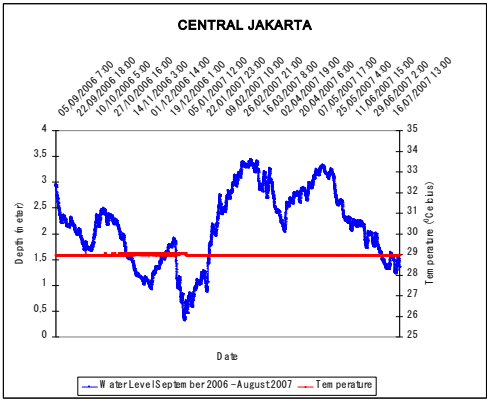
The thermal-profile measurements were made at 2-m intervals from the water level to the bottom of the hole with a digital thermister thermometer of 0.01 ^{0}C precision)

CENTRAL JAKARTA

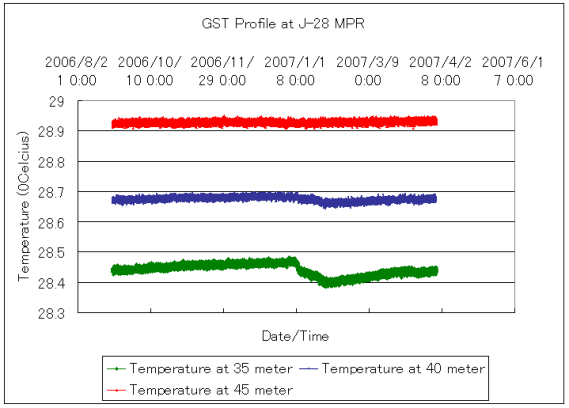
(September 2006 – August 2007)



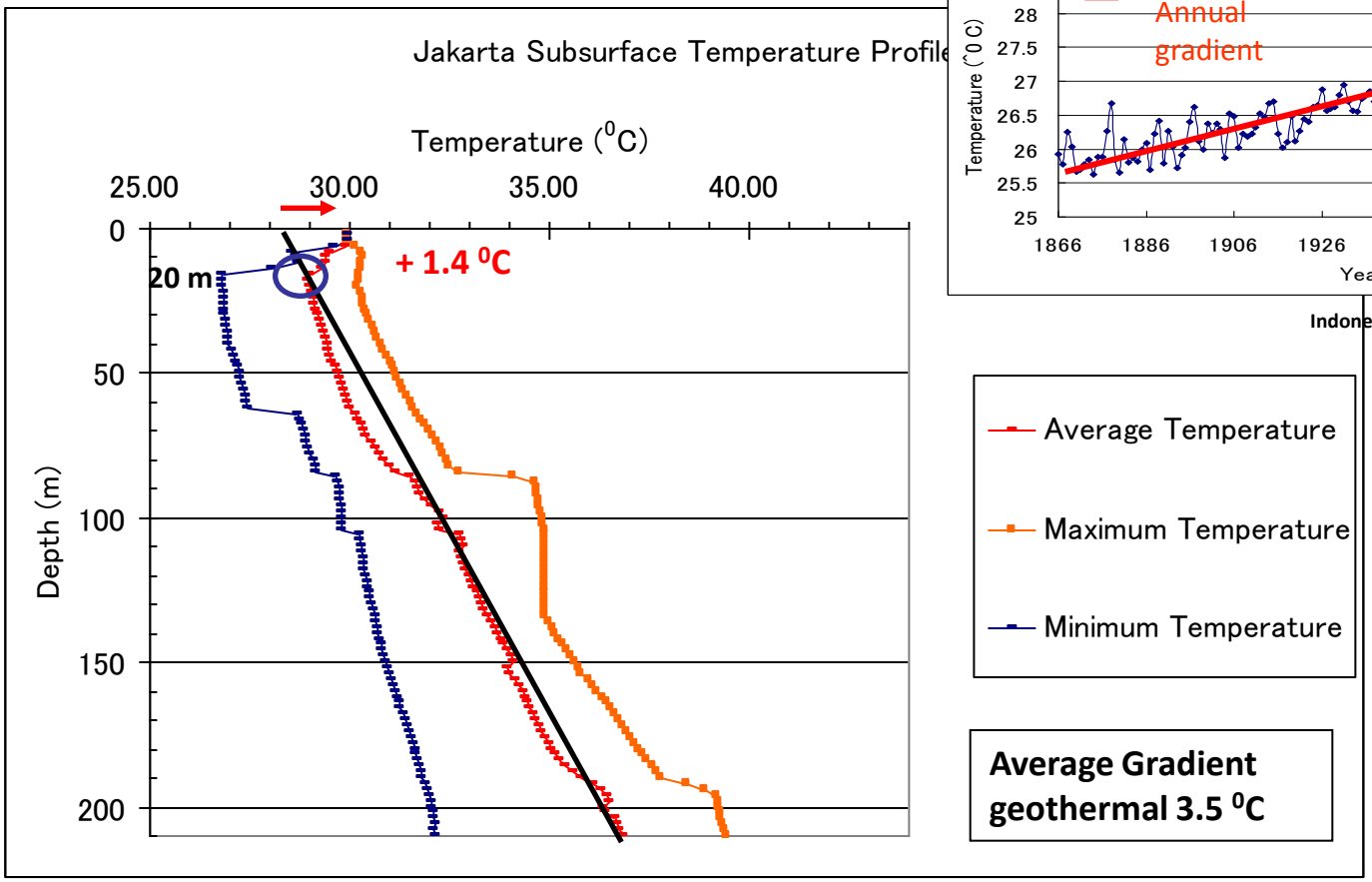


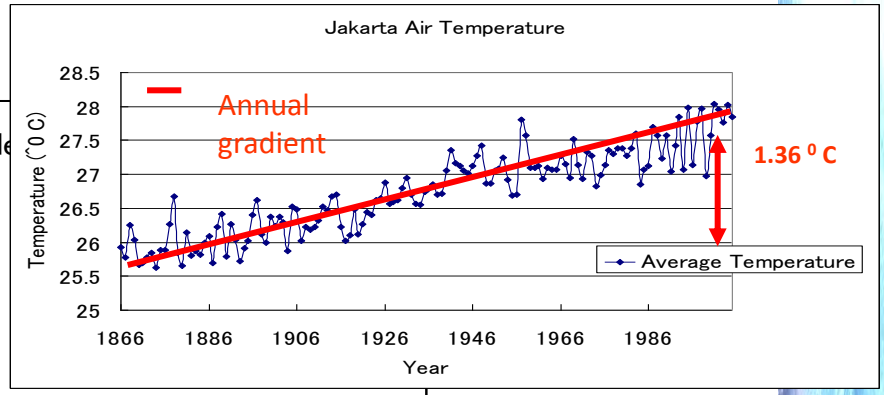


Water Level



Groundwater Temperature





Indonesia Ministry of Environment & NOAA, BMG, 2007

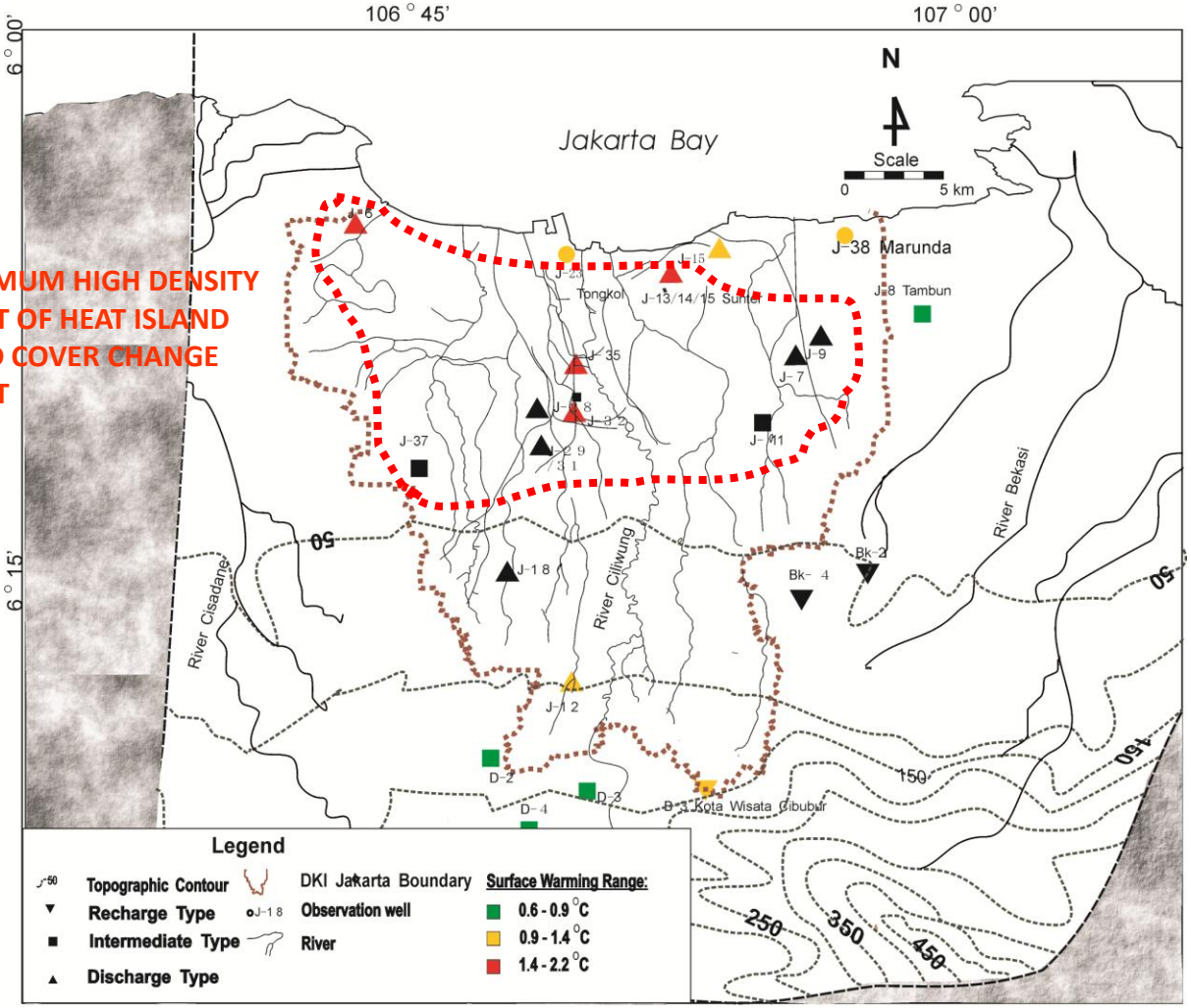
From 25 selected observation well :

Magnitude of Surface Warming : 1.4 ^{0}C

Depth for steady thermal gradient : 20 m

Distribution Surface Temperature Warming in Jakarta Groundwater Basin

MAXIMUM HIGH DENSITY EFFECT OF HEAT ISLAND /LAND COVER CHANGE EFFECT



RESPONCES

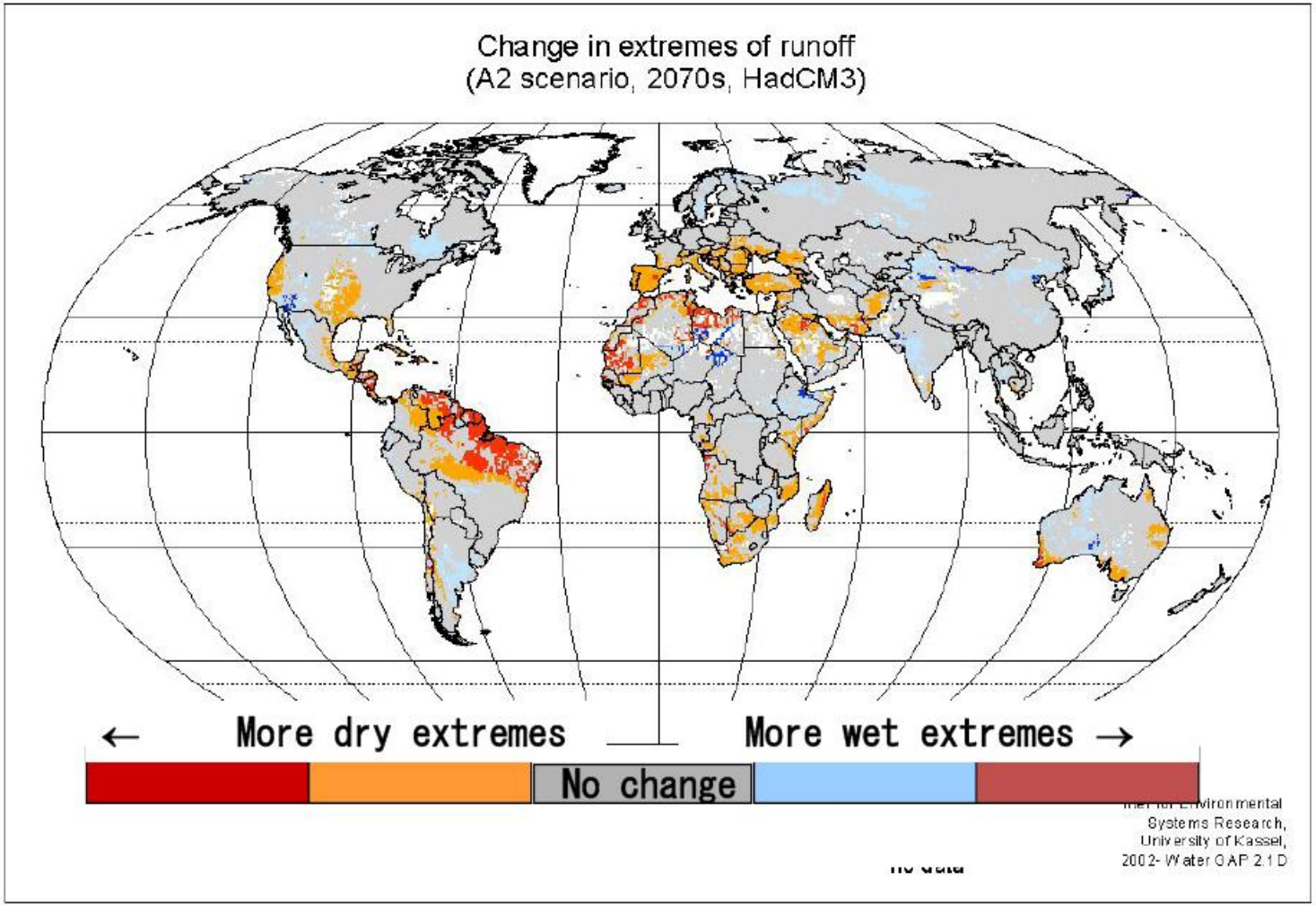
To Study the change of local climate due to Heat Island Phenomena.

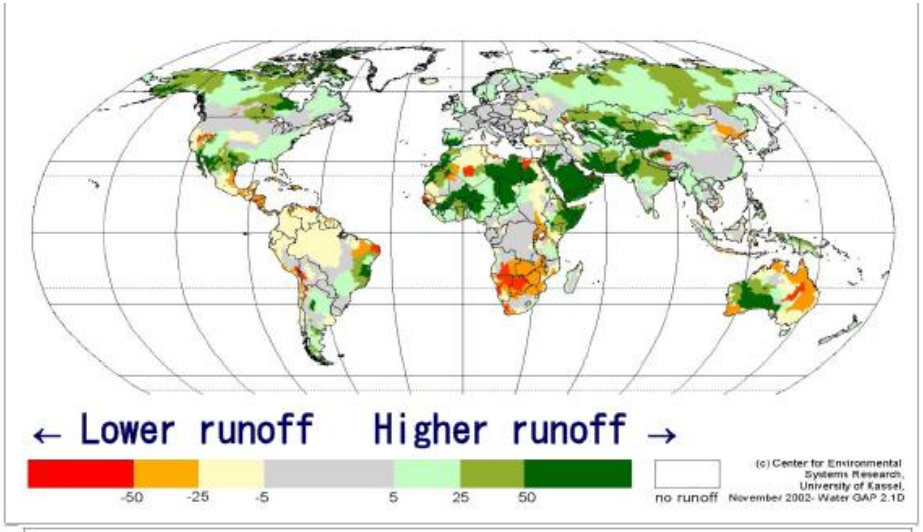
LIPI, ITB, BMKG


Thank You

Changes in Runoff Extremes

(2070s, A2 Scenario, WaterGAP Model, Hadley Climate Predictions)

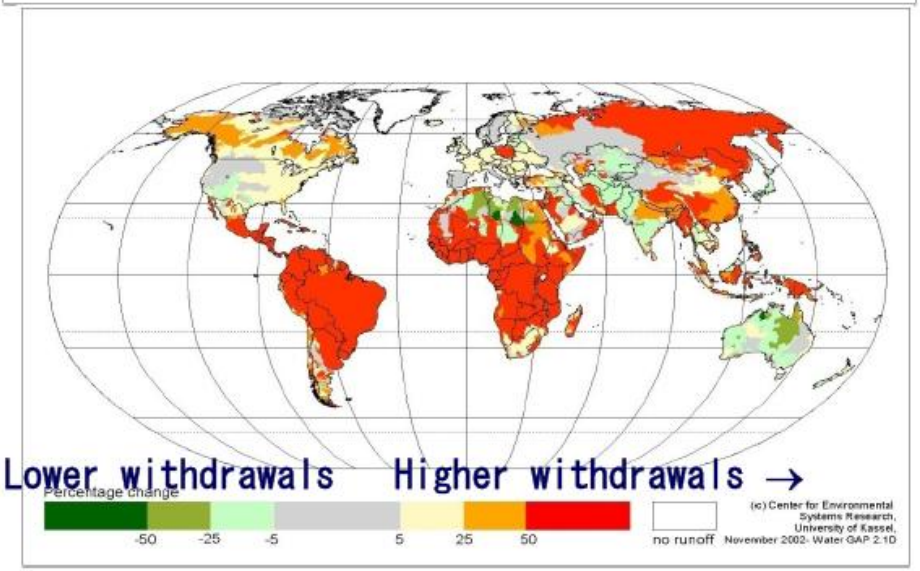




Change in Annual Water Availability

(2020s, A2 Scenario, WaterGAP Model, Hadley Climate Predictions)

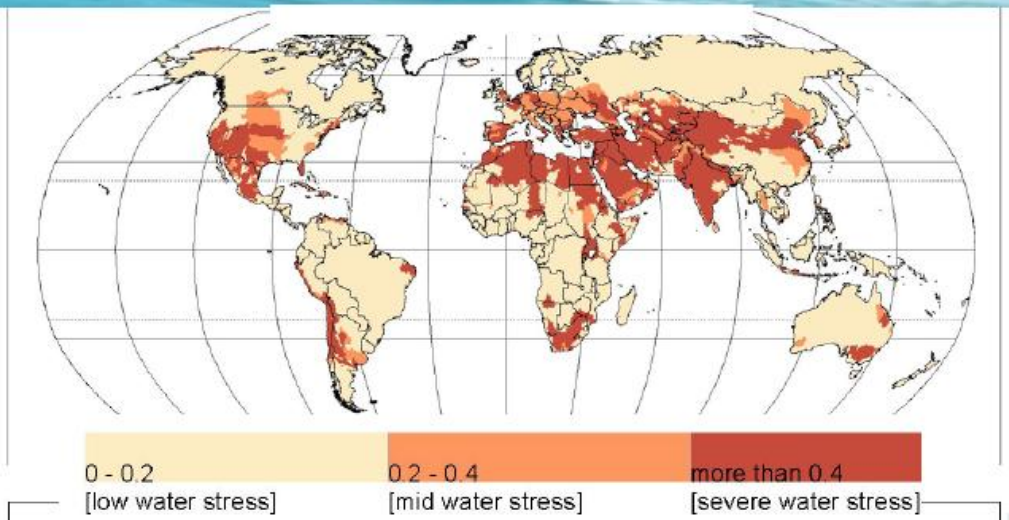
Climate change



Change in Annual Water Withdrawals

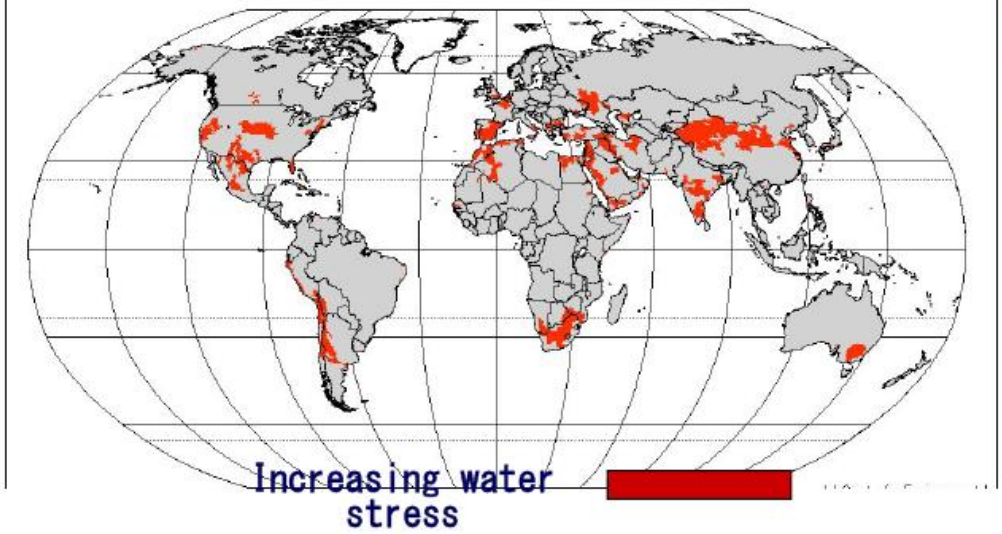
(2020s, A2 Scenario, WaterGAP Model)

Socio-economic change



Withdrawal to Availability Ratio: Water Stress

(2020s, A2 Scenario, WaterGAP Model, Hadley Climate Predictions)



Water Scarce Areas with Increasing Water Stress (up to 2020s)

because of:

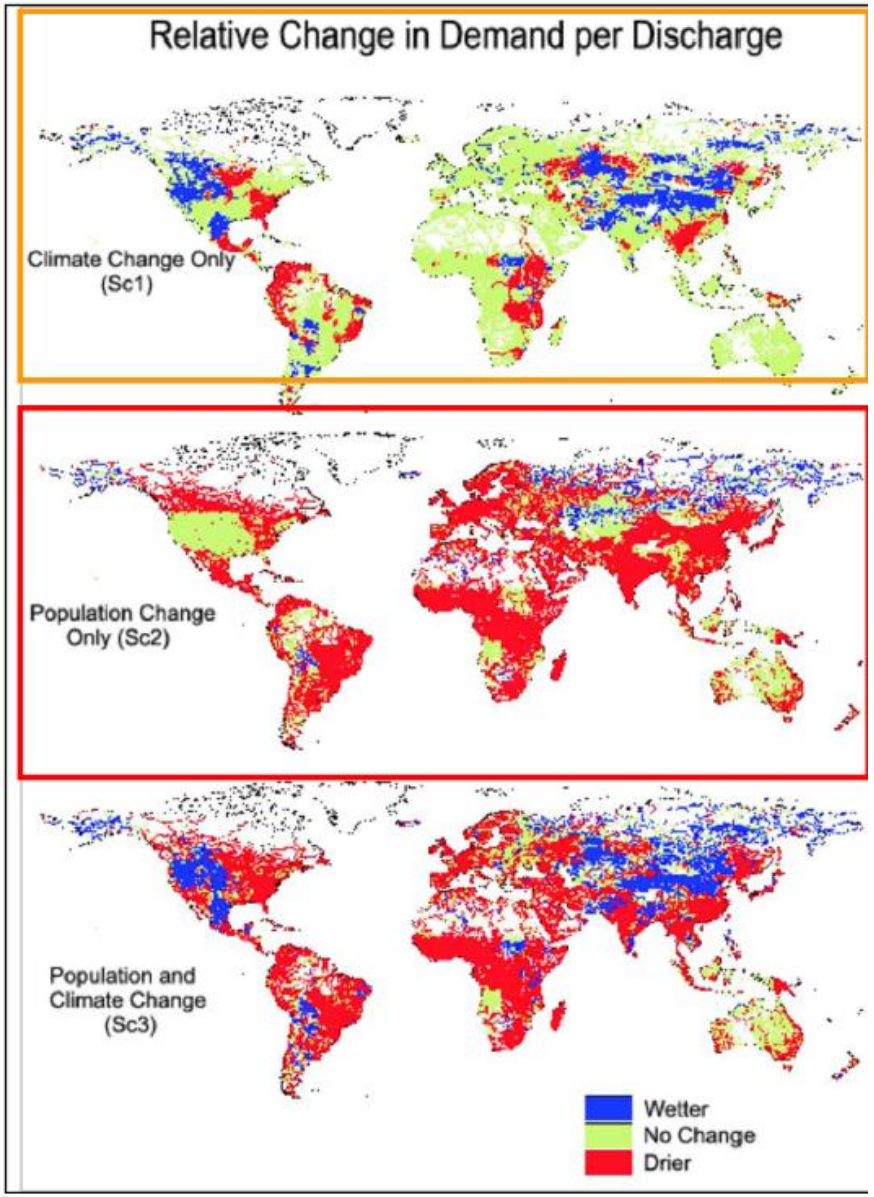
- *increasing water use (socio-economic changes) and/or*
- *decreasing water availability (climate change)*

Water Stress Changes to 2025

Effect of Climate change
20 %

Effects of population change
80 %

Both effects of Climate and population changes
100 %



UNH

Modified from Vörösmarty et al. 2000