

ADAPTATION TO CLIMATE CHANGE TOWARDS CITY RESILIENCY: DKI JAKARTA

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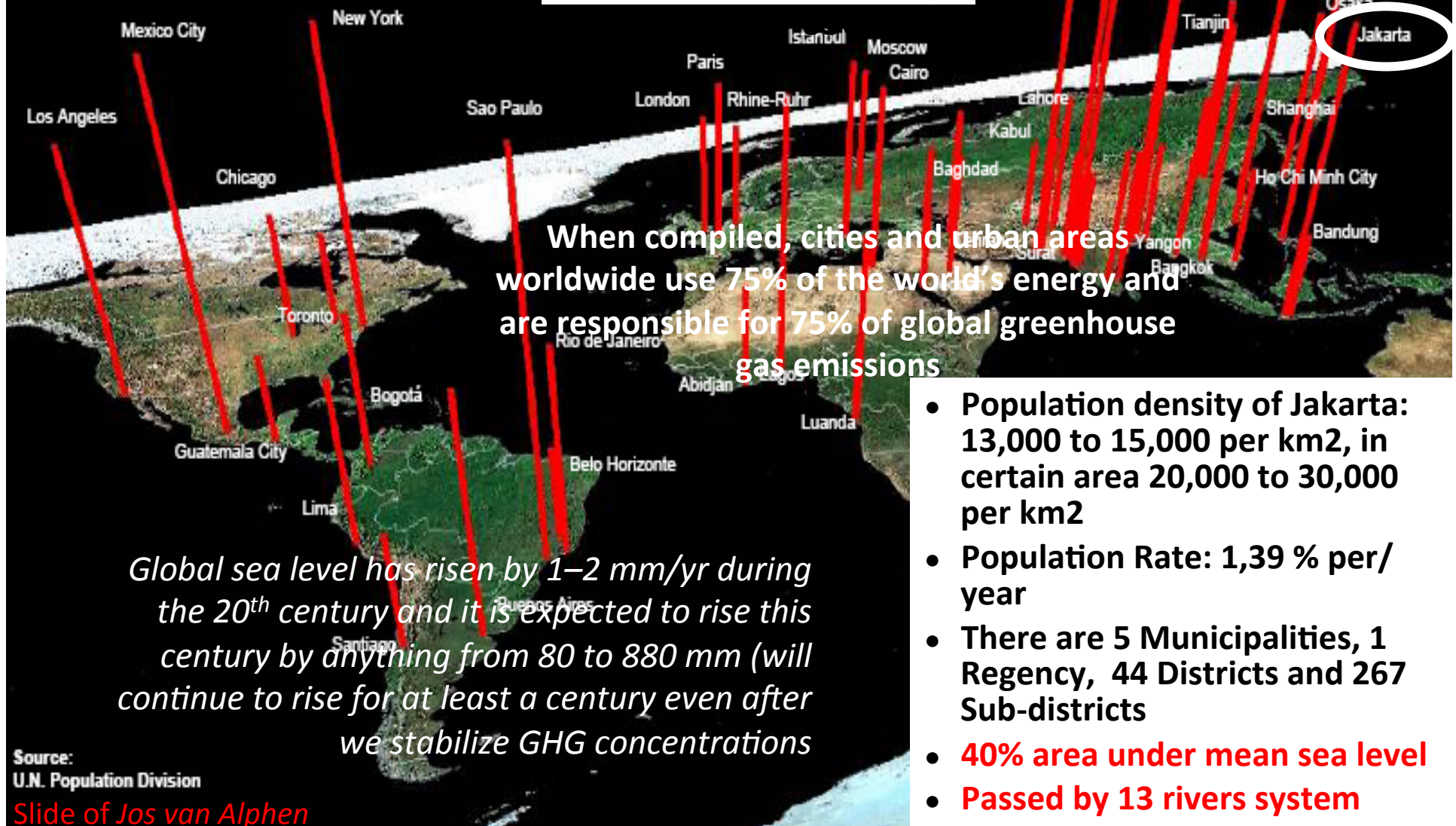
Outline

- General Condition of DKI Jakarta
- Vision and Mission of DKI Jakarta Capital City
- Climate Change and its Potential Impact
- Vulnerability Assessment for assisting the development of CCA Plan
- Goal of CCA Plan of DKI
- Proposed Institutional Arrangement



JAKARTA ONE OF MEGACITIES

POPULATION OF
JAKARTA: 9,6 MILLION,
DAY TIME
POPULATION: 11.5
MILLION



GENERAL CONDITION

- In 2010, per capita GRDP of DKI Jakarta inhabitants at current price was 8,500 USD/capita (the Highest)
- Human Development Index (HDI) 77 in 2008 (the Highest)
- Public transportation is mainly served by 10 corridors (out of 15 corridors) transJakarta bus way (average 250.000 passengers per day).
- Clean water service coverage : 60%
- Vulnerable inhabitants around 3,48%
- Slums area : 416 RW out of 2.196 RW



Vision and Missions

- VISION
 - Jakarta as modern and tidy city, comfortable for living, has a cultured society, and the government-oriented public service
- MISSION
 - Developing Jakarta as a modern and tidy city and consistent with the Spatial Plan.
 - Making Jakarta to be free from chronic problems such as traffic jams, floods, slums, waste and others.
 - Ensuring availability of residential and public spaces which are feasible and affordable for the citizens
 - Building a culture that is tolerant, but also at the same time have the awareness to maintain the city.
 - Building a clean and transparent governance with public service oriented.



City Challenges

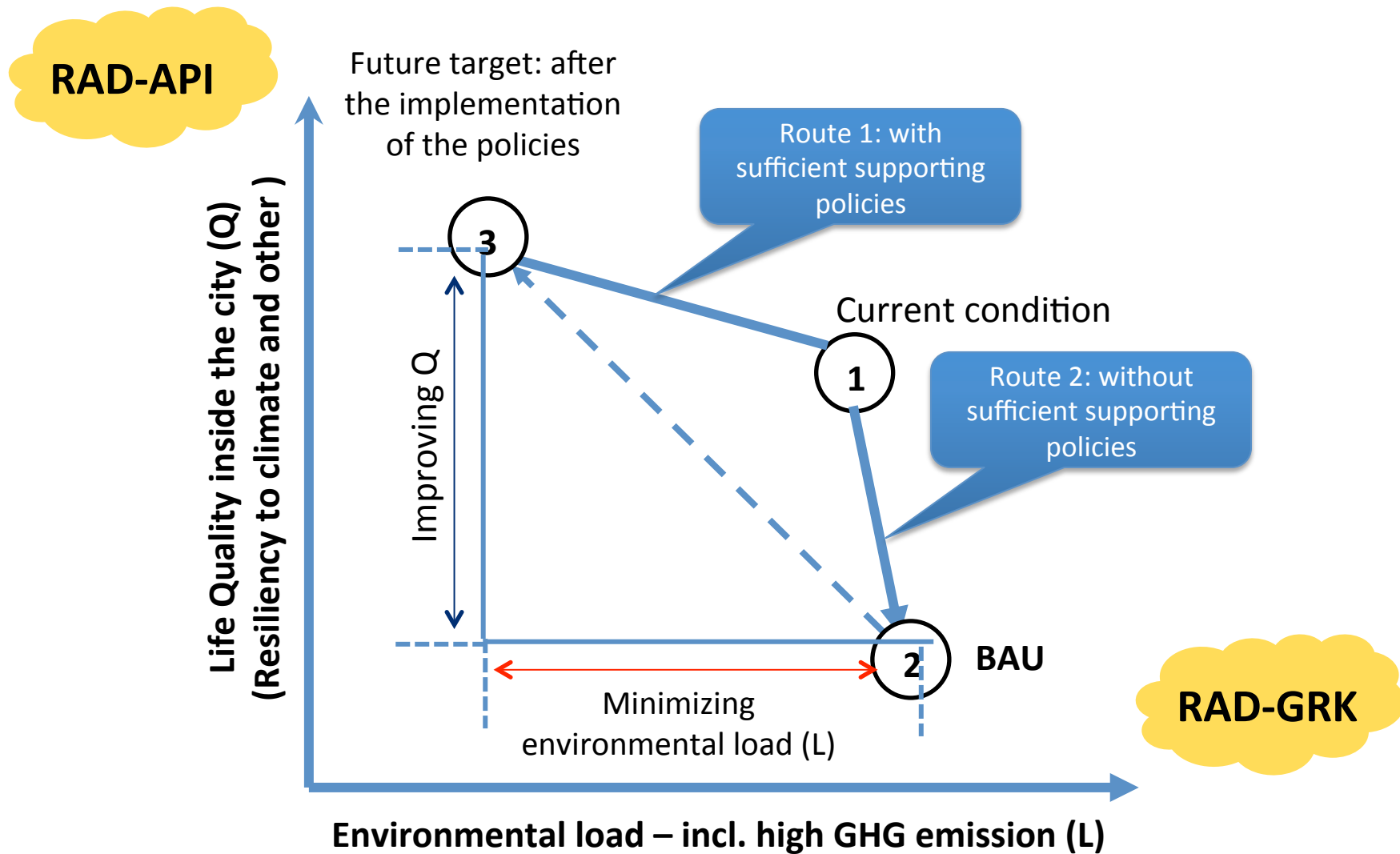
Challenges faced by the city
(Source: Baker, 2012)

- Population growth
- Expansion of urbanization area
- Land use change
- Large-scale infrastructure problems
- Climate related disaster: flooding impacted social and economy



Flood in February 2007: one of the worst flood (return period 50 years), covering 70% of metropolitan area, with total financial Loss of US \$ 879,12 million (Source: Kusumawati, 2011)

INDICATORS TO ACHIEVE JAKARTA RESILIENT CITY

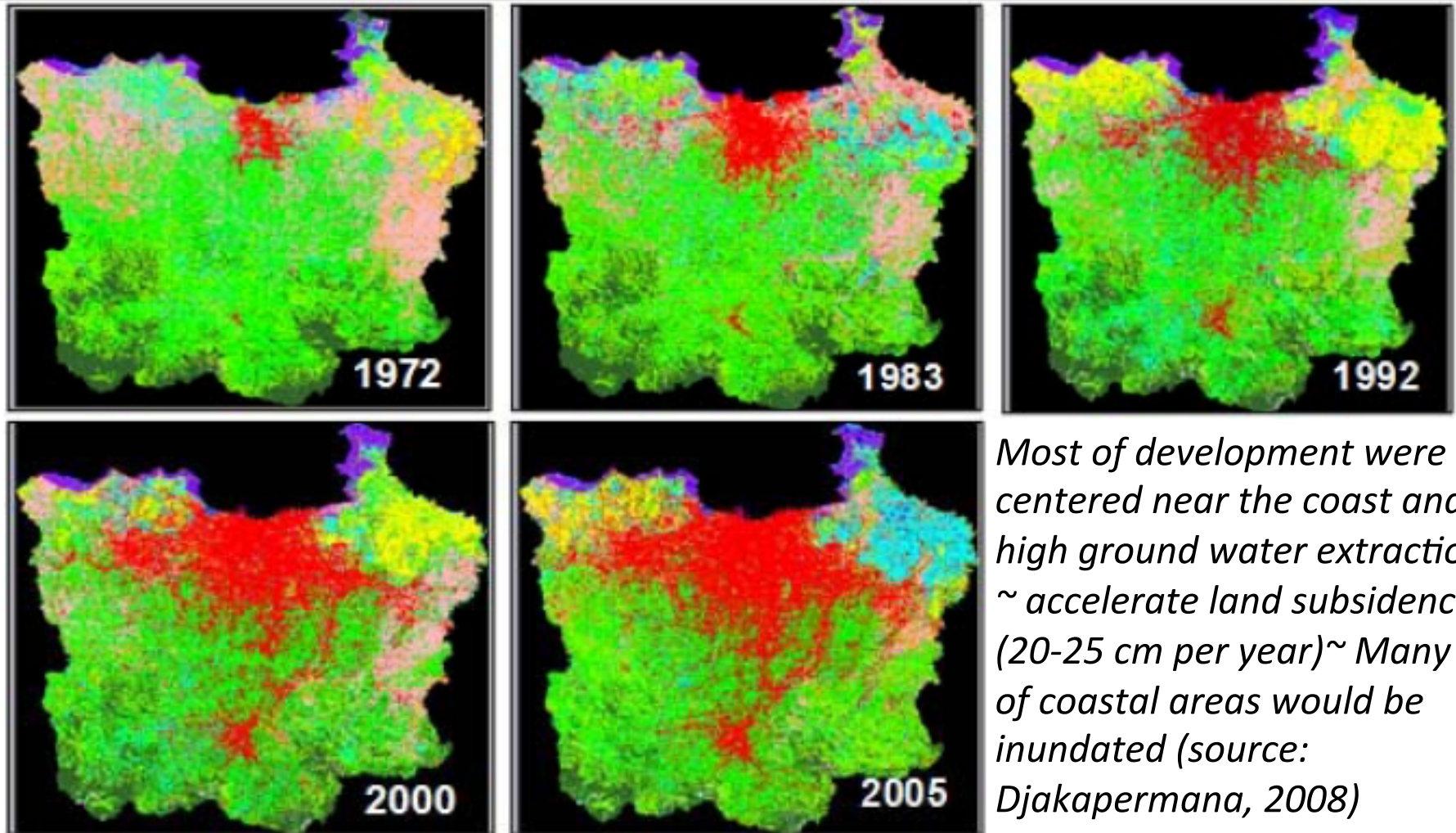


Source: Modified from JSBC (2012)

Climate Change and Potential Impact

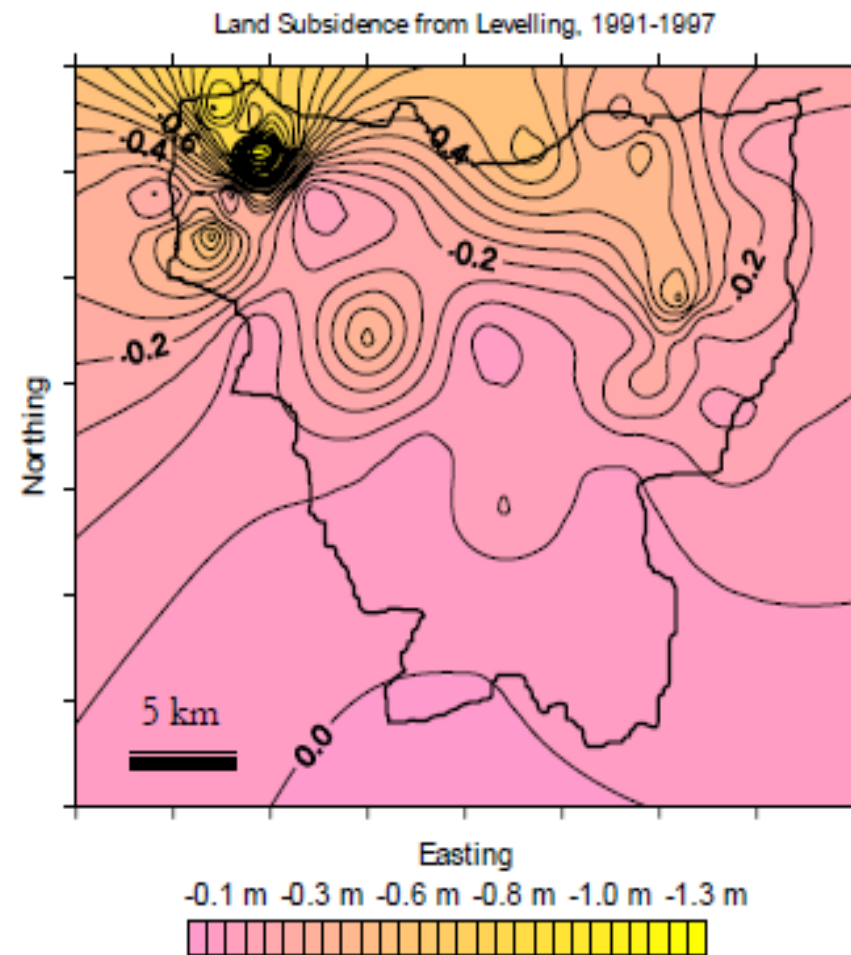
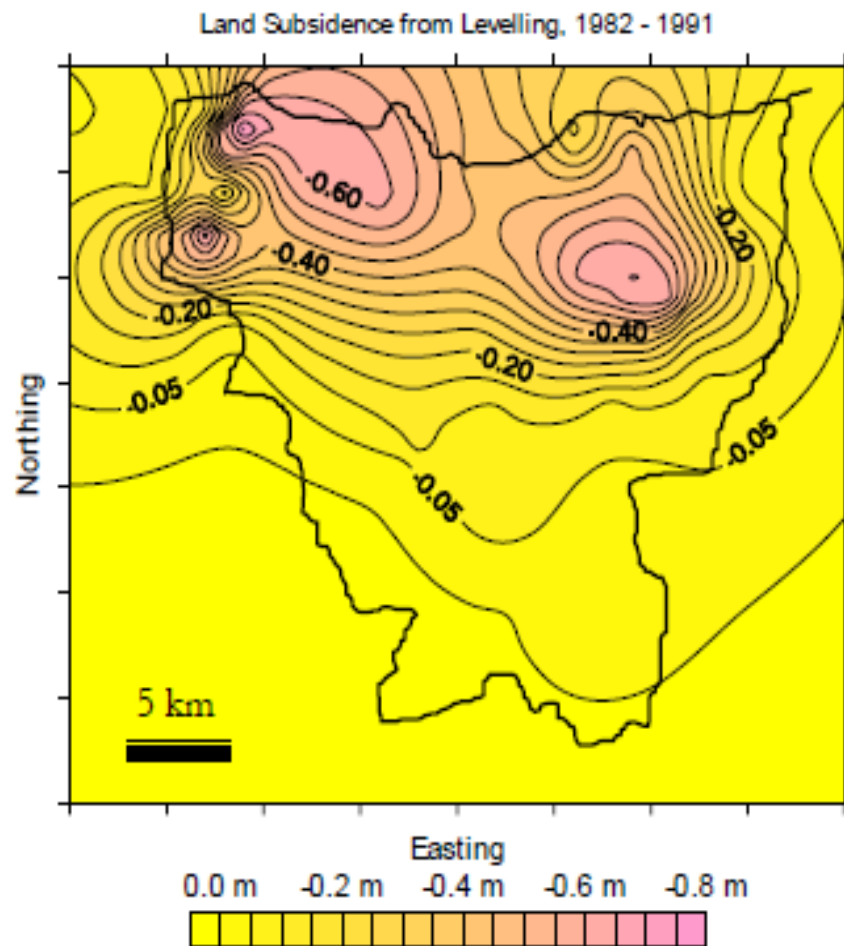
- Environmental and biophysical condition of DKI Jakarta have deteriorated which increase the vulnerability
 - Level of exposure and sensitivity increased particularly due to land subsidence, increase population density, improvement of waste management is not in balance with its generation, drainage capacity is low and open space area is decreasing, transportation system
 - Without adaptation, impact of climate change may be severe and economic loss due to climate hazards is getting higher → late actions will lead to much higher investment required for the adaptation

RAPID CITY DEVELOPMENT (RED = *BUILT UP AREA*)



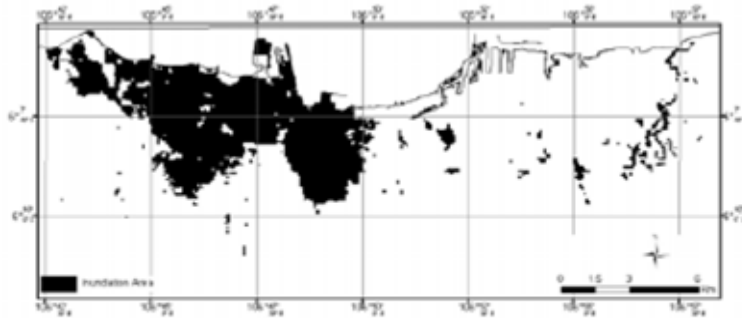
Most of development were centered near the coast and high ground water extraction ~ accelerate land subsidence (20-25 cm per year) ~ Many of coastal areas would be inundated (source: Djakapermana, 2008)

Land Subsidence (1982-1991 vs 1991-1997)

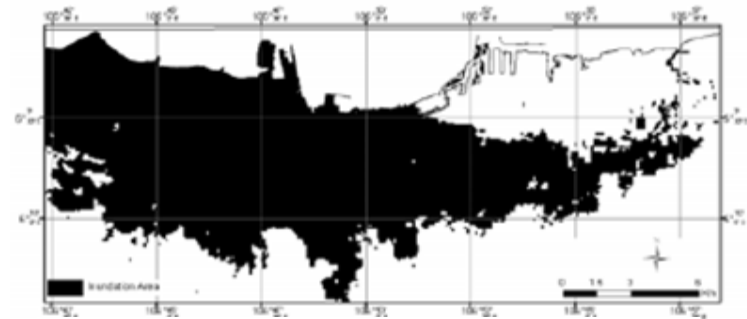


Source: Abidin et al, 2001

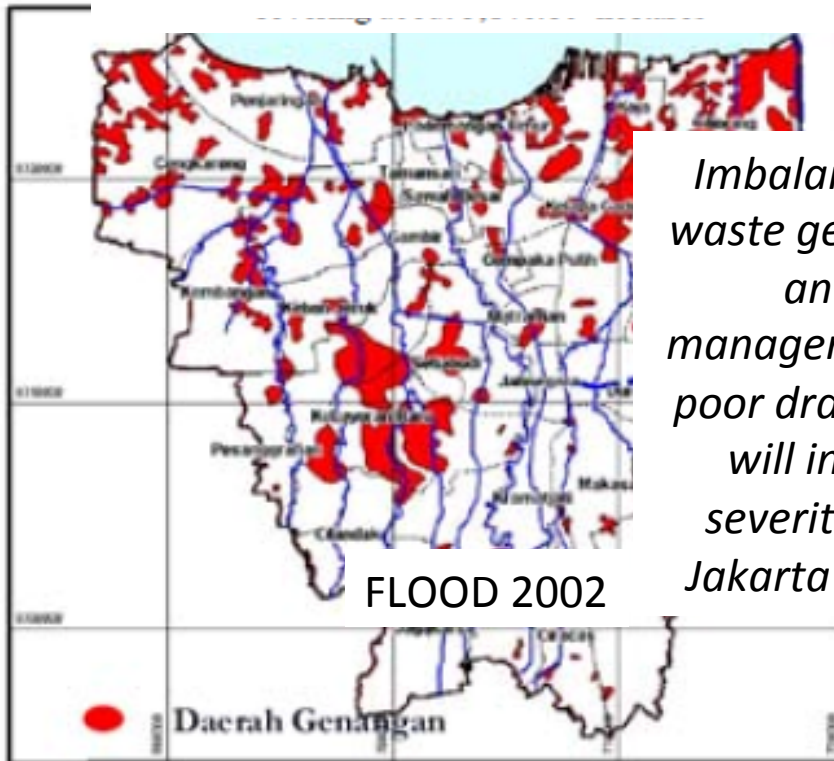
PREDICTED INUNDATED AREA DUE TO LAND SUBSIDENCE



Black-Inundated 2020: 5146 ha

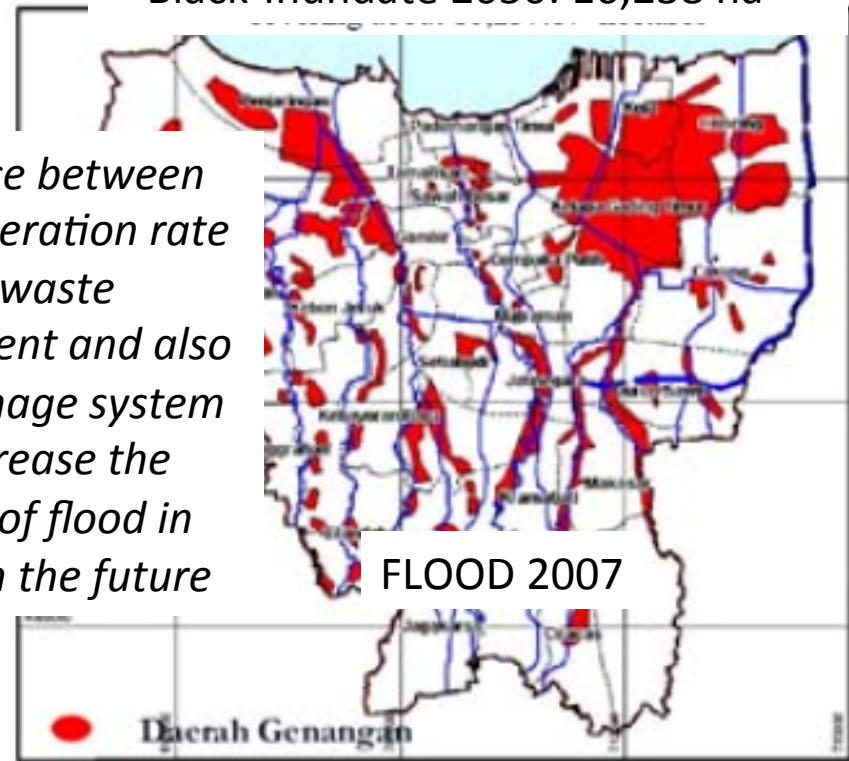


Black-Inundate 2050: 16,238 ha



FLOOD 2002

Flooding of 2002, courtesy of LAPAN



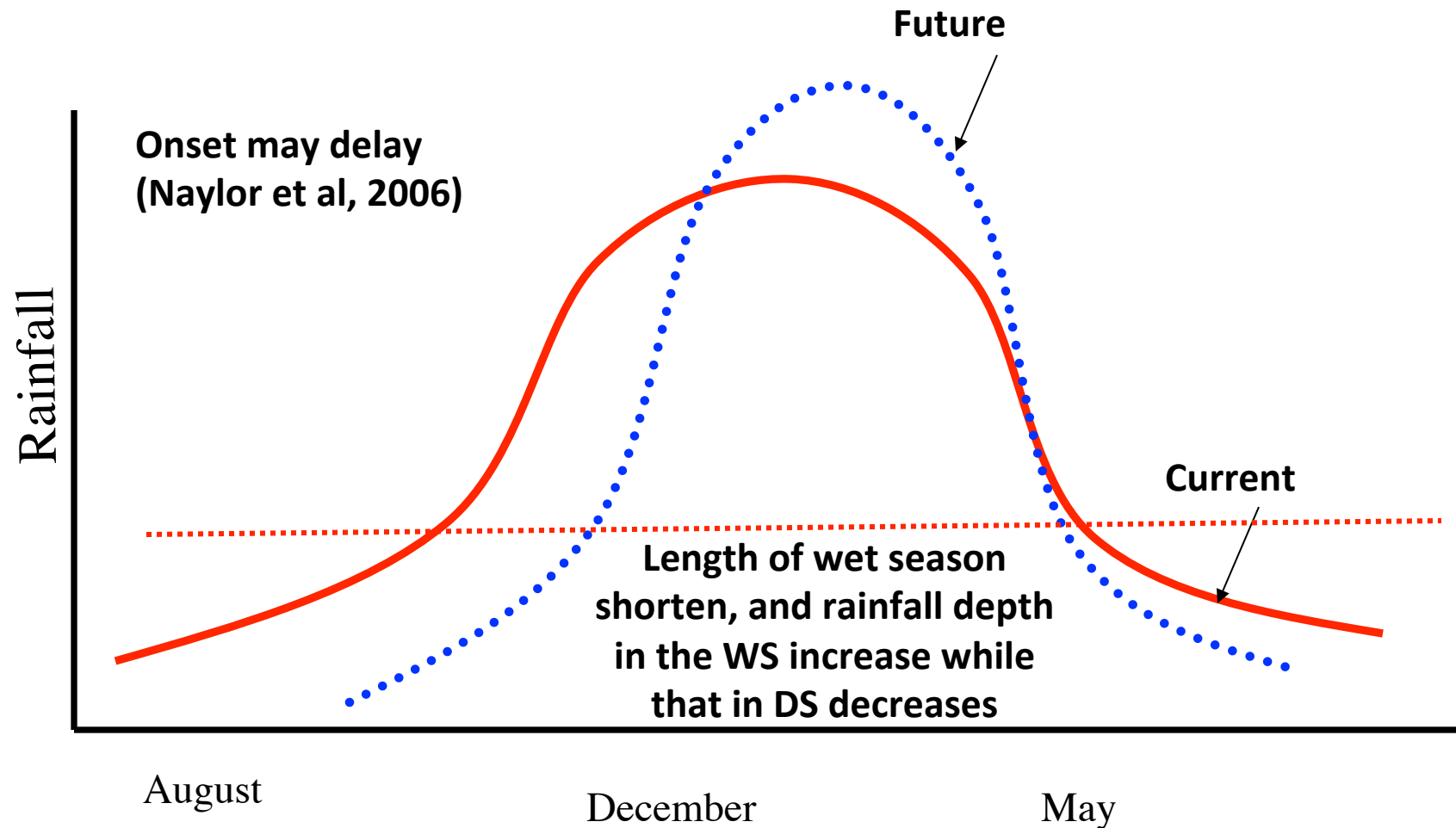
FLOOD 2007

Flooding of 2007, courtesy of Kompas (10 February)

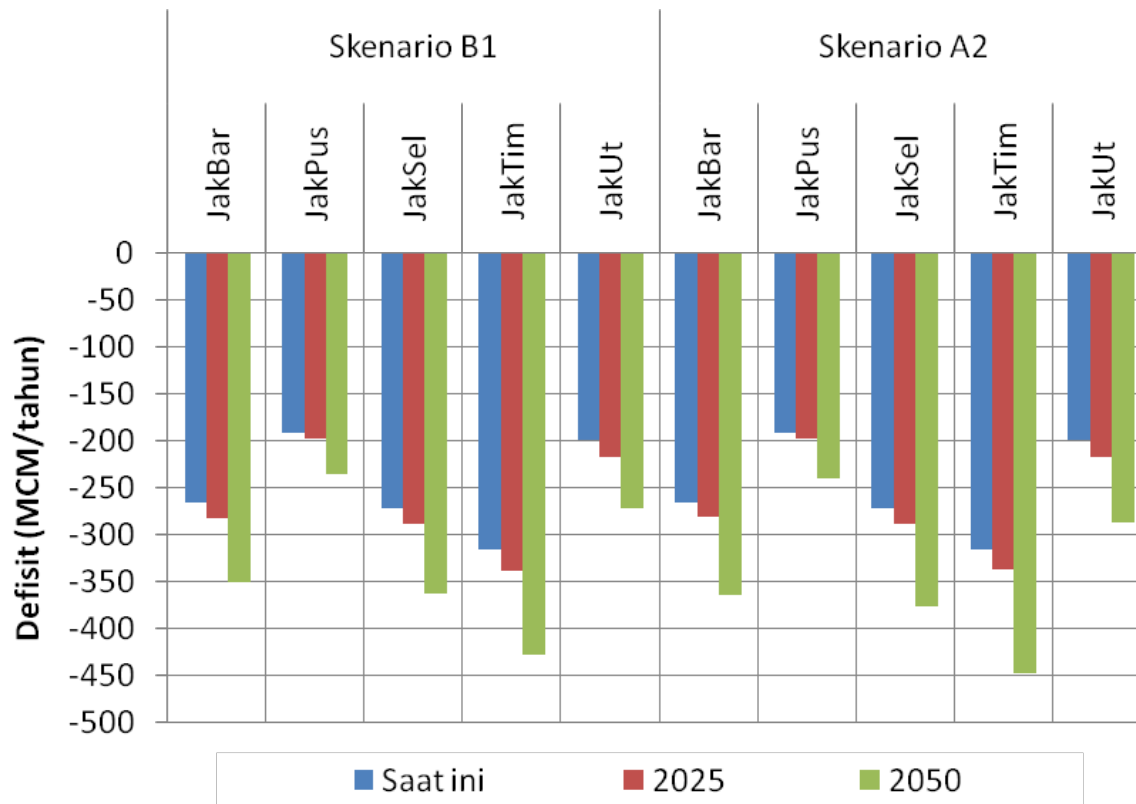
Imbalance between waste generation rate and waste management and also poor drainage system will increase the severity of flood in Jakarta in the future

Sumber: Abidin et al., 2009)

Predicted Change of Climate in the Future (2050)



Source: Based on Naylor et al (2007)

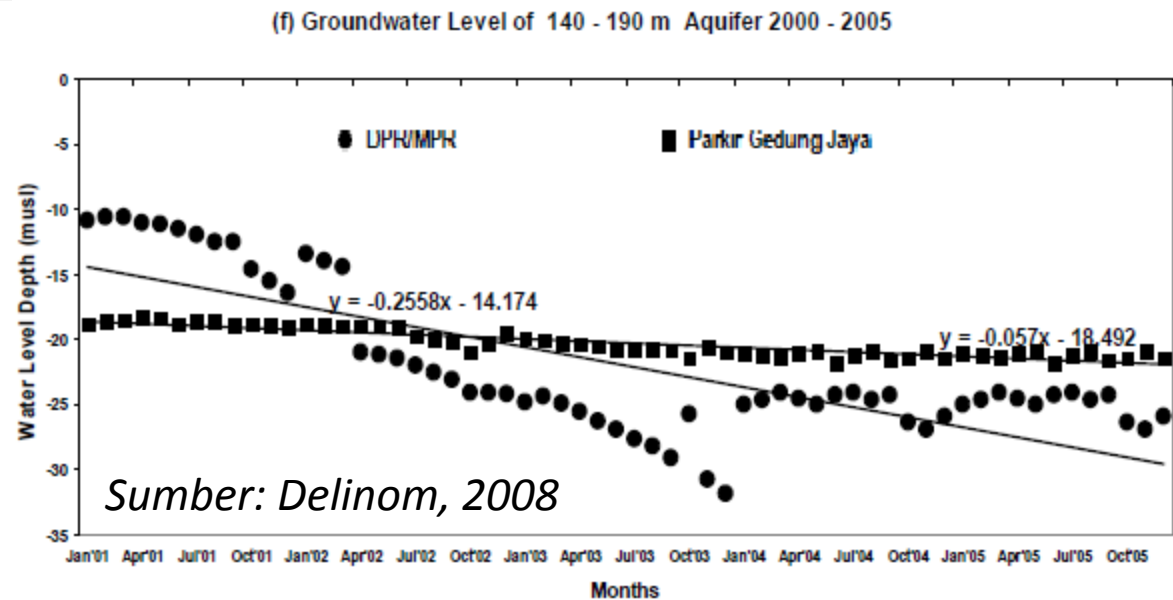


Assumption: Population growth 1.46% per year up to 2015 and then 1% per year

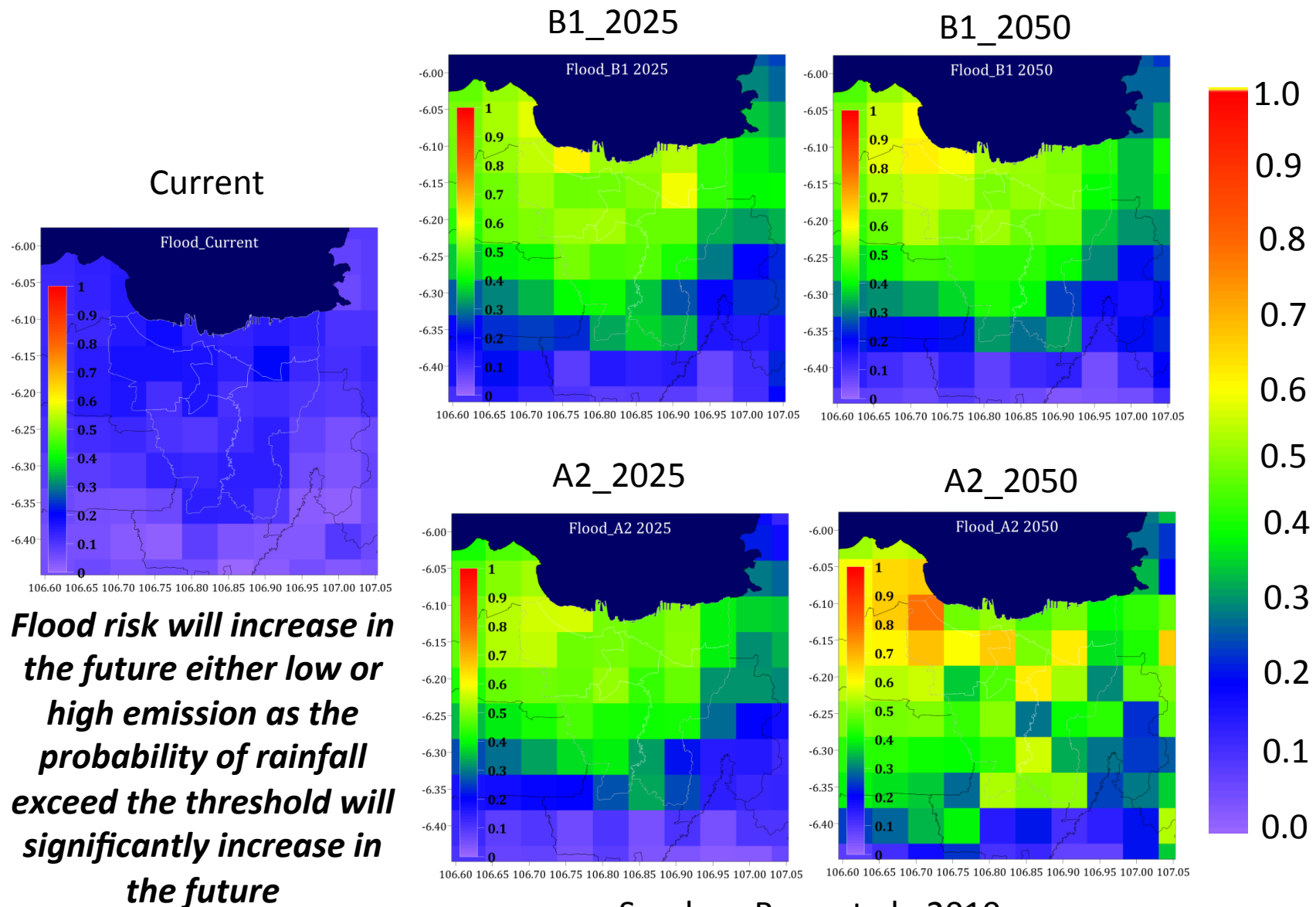
Water deficit will be taken from ground water – increase the use of ground water

Problem of land subsidence will increase

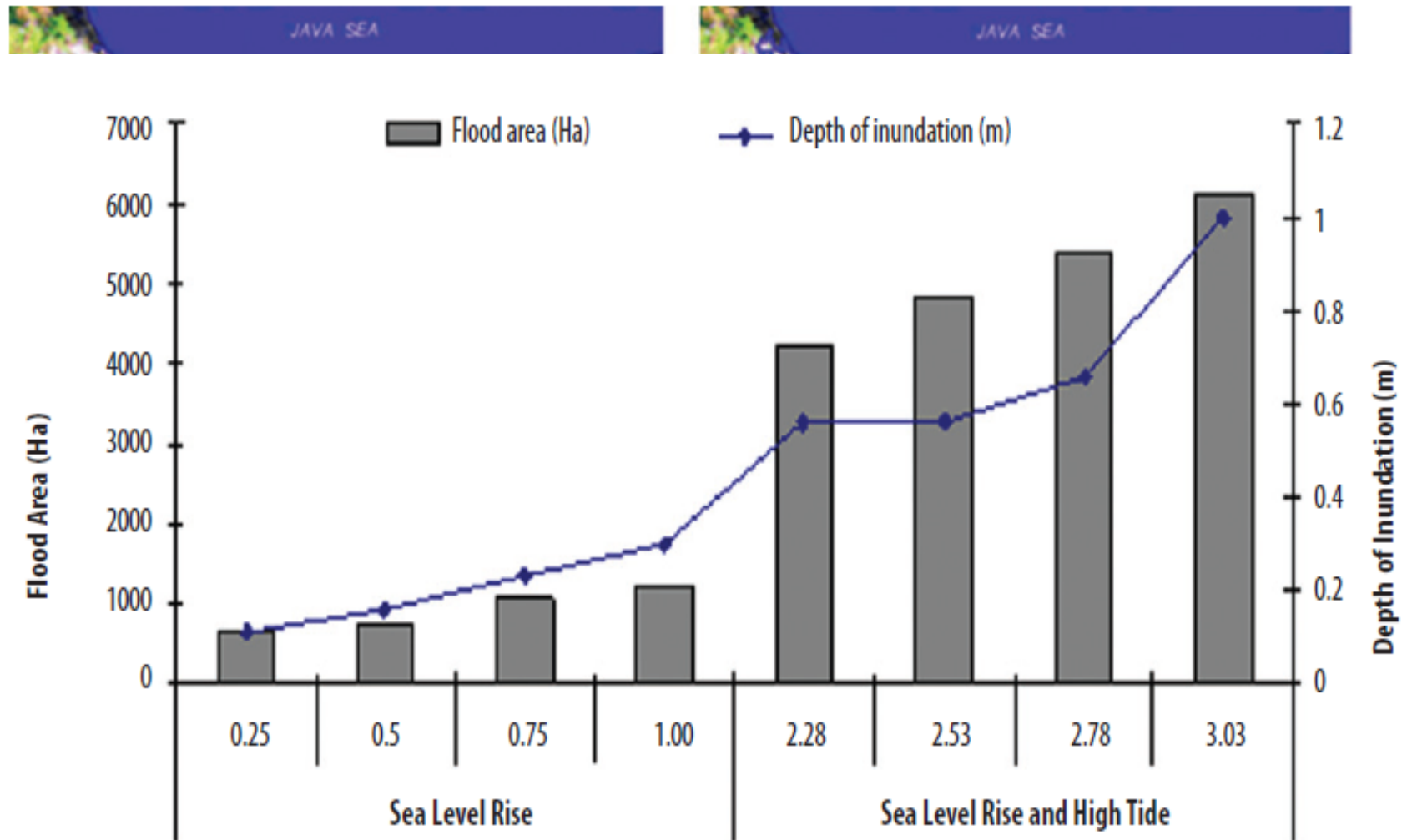
Water deficit will increase in the future (water supply only from surface runoff)



Change of Flood Probability under changing Climate



Impact of Sea Level Rise 0.25 m (A), 1.0 m (B), sea level rise + high tide of 2.28 m (C) and sea level rise + high tide of 3.03 m (D)

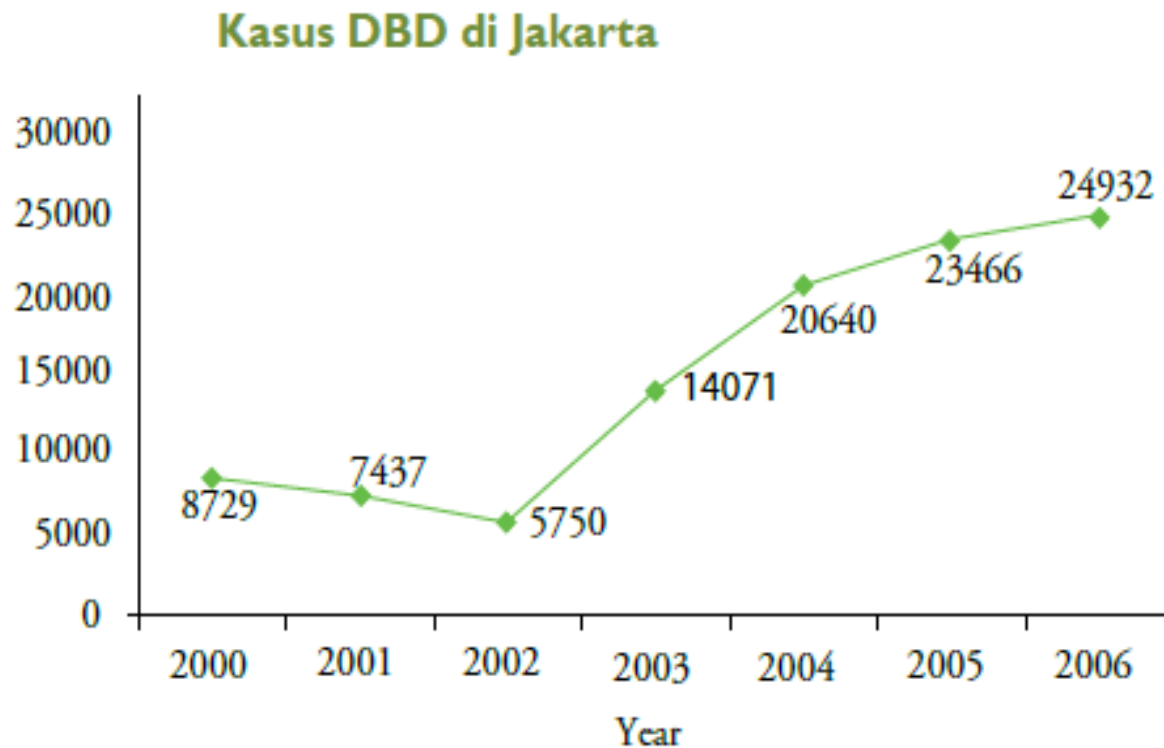


ESTIMATED ECONOMIC LOSS DUE TO SLR IN JAKARTA

Scenario		Number of people affected (in thousands)	Economic Loss (billion IDR)				
			Settlements	Rice	Ponds	Harbor/Airport	Total
SLR (m)	0.25	74	1.00	0.06	0.12	6,489.56	6490.74
	0.50	93	1.27	0.07	0.23	7,202.44	7204.01
	0.75	109	1.63	0.08	0.62	7,881.83	7884.16
	1.00	130	2.15	0.28	0.71	8,622.76	8625.90
SLR + tides and wave action (m)	2.28	236	1.00	8.49	1.48	6,489.56	6500.53
	2.53	280	1.27	9.50	1.55	7,202.44	7214.76
	2.78	325	1.63	10.15	1.63	7,881.83	7895.24
	3.03	381	2.15	11.05	1.71	8,622.76	8637.67

Source: SNC (MoE, 2010)

Dengue case in Jakarta



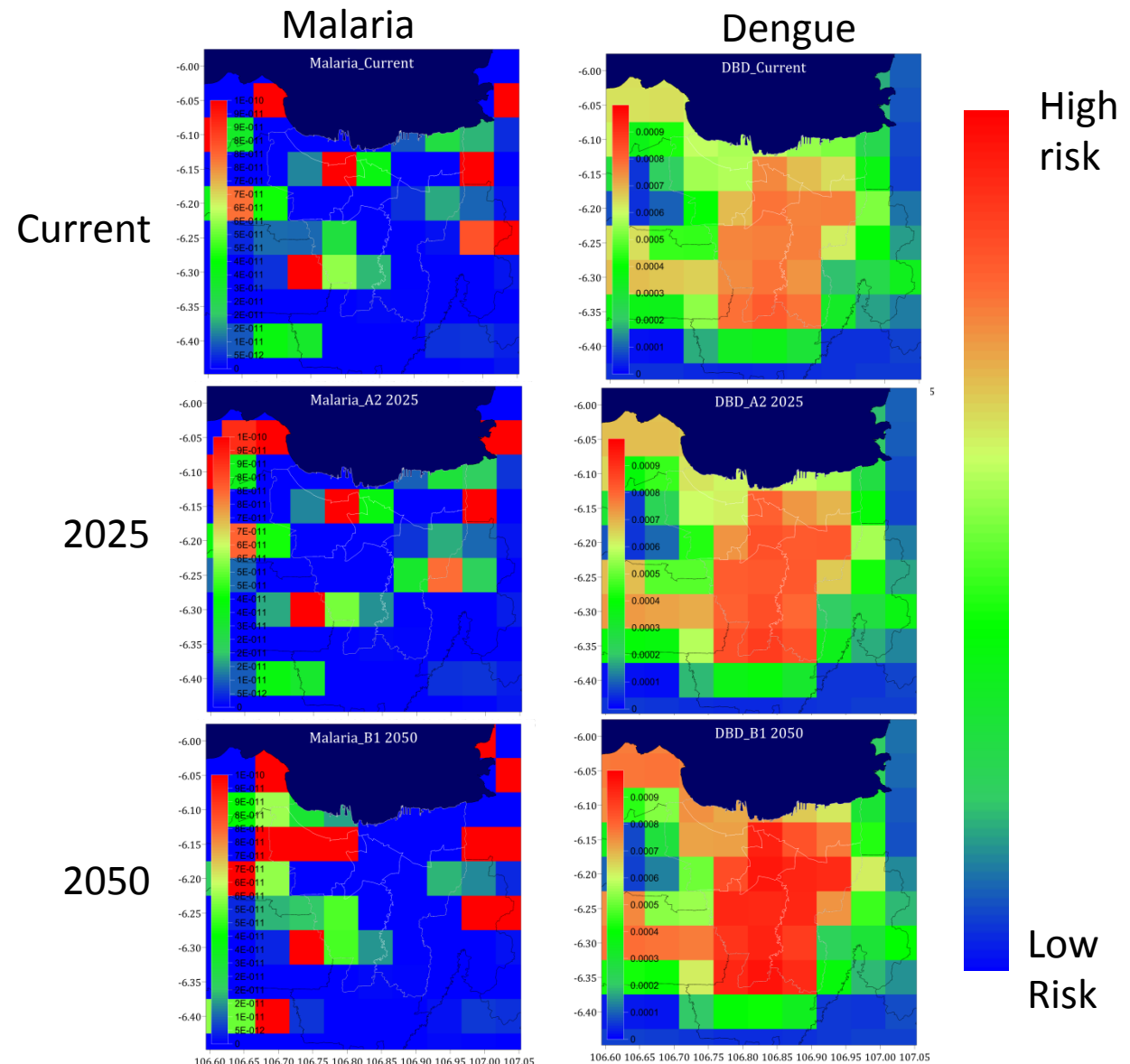
Sumber: Sumantri, Arif, Model Pencegahan Berbasis Lingkungan terhadap Penyebaran Penyakit DBD di DKI Jakarta¹⁸. 2008

Change in rainfall and the increase in temperature are suspected as the cause of the increase of Dengue cases in Jakarta in the last 10 years

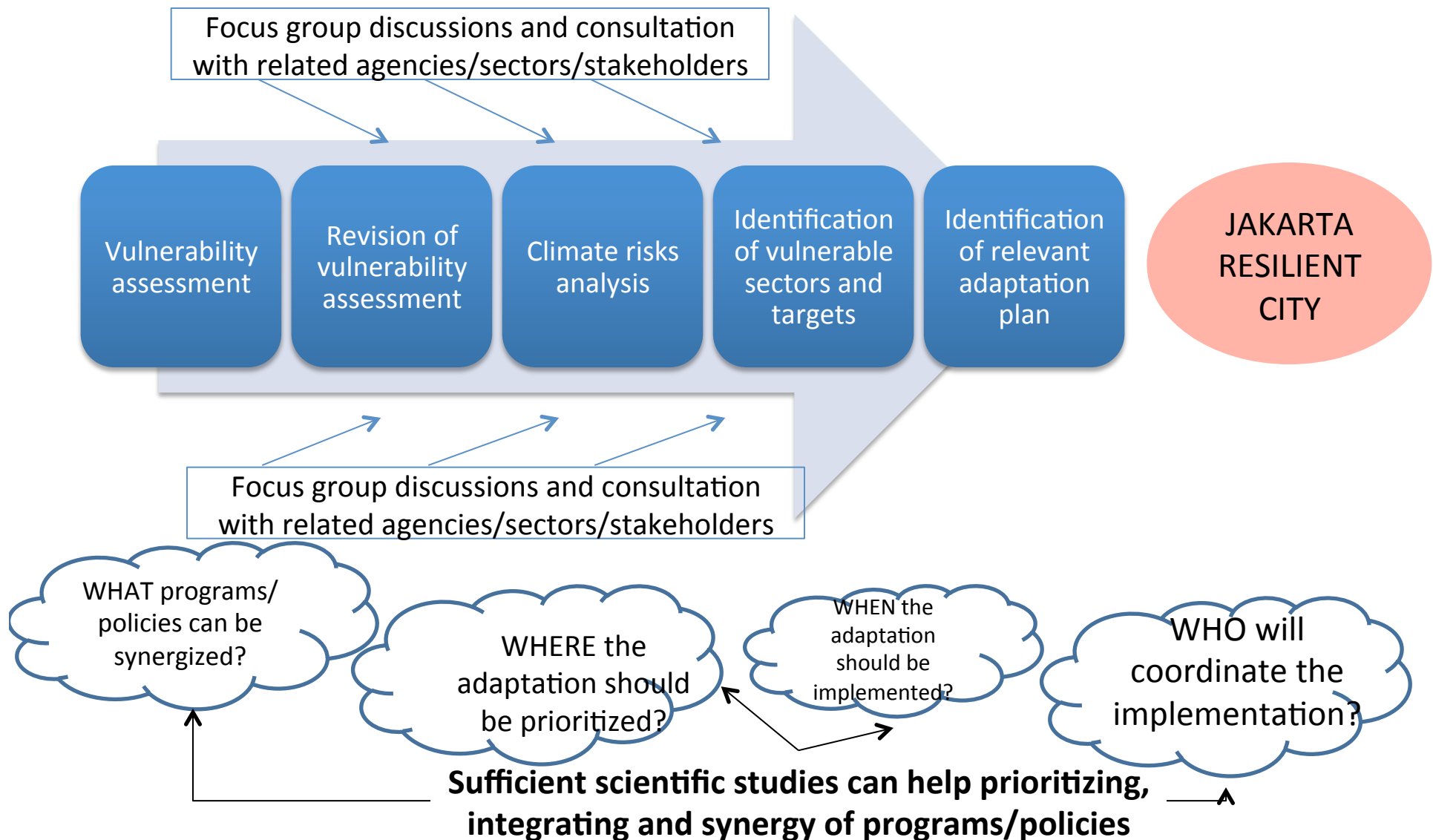
Dengue and Malaria Risk

Mean of
transmission risk
of the vector
tends to increase
in the future,
particularly for
Dengue

Source: Analyzed from
Hidayati et al, 2010



PROCESS OF DEVELOPMENT OF DKI JAKARTA CLIMATE CHANGE ADAPTATION PLAN (RAD API)

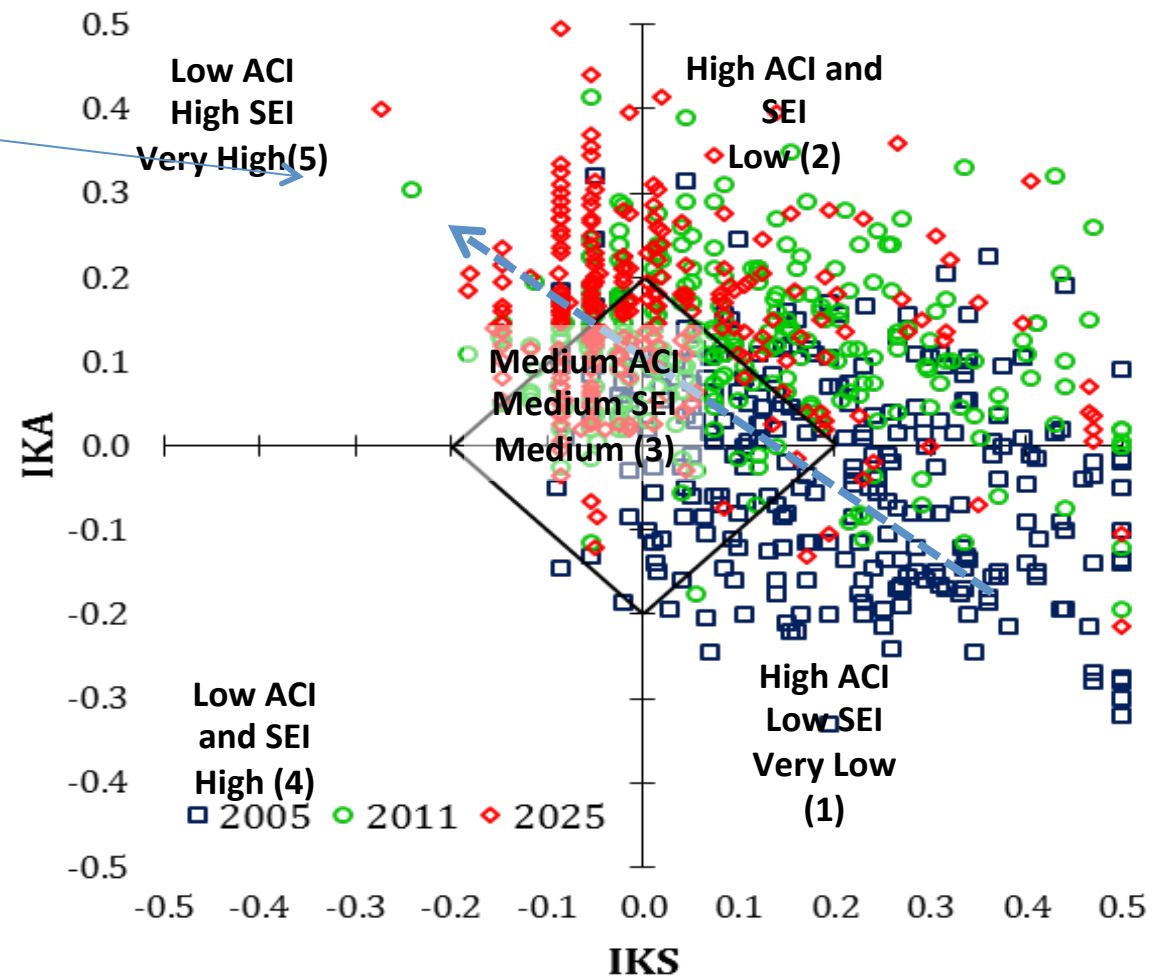


Vulnerability Assessment of Kelurahan (Villages)

A	Indicator for adaptive capacity (ACI)	Weight	B	Indicator for sensitivity and level exposure (SEI)	Weight
A1	Electricity facility (KKLt)	0.10	B1	No. HH live near river side (KKBs)	0.05
A2	Education facility (FDidik)	0.45	B2	No Building near the river side (BgBs)	0.05
A21	TK (Kinder Garden)	0.07	B3	Source of drinking water (SAM)	0.10
A22	SD (Elementary School)	0.13	B31	- Pipe (PDAM)	0.25
A23	SMP (Yunior High School)	0.20	B32	- Wells	0.50
A24	SMU (Senior High School)	0.27	B33	- Spring	0.50
A25	Universities	0.30	B34	- Lake/river	0.75
A3	Main source of income (SMP)	0.10	B35	- Rainfall	1.00
A4	Health facility (FSehat)	0.35	B4	Population density (PD)	0.15
A41	Puskesmas	0.20	B5	Poverty Level (KKPs)	0.10
A42	Polyclinic	0.30	B6	Waste fraction (R.Sampah)	0.25
A43	Posyandu	0.20	B7	No HH in slump areas (KKPk)	0.15
A44	Midwife	0.10	B8	No building in slump area (BgPk)	0.05
A45	Medical doctor	0.20	B9	Land Subsidence (LS)	0.10

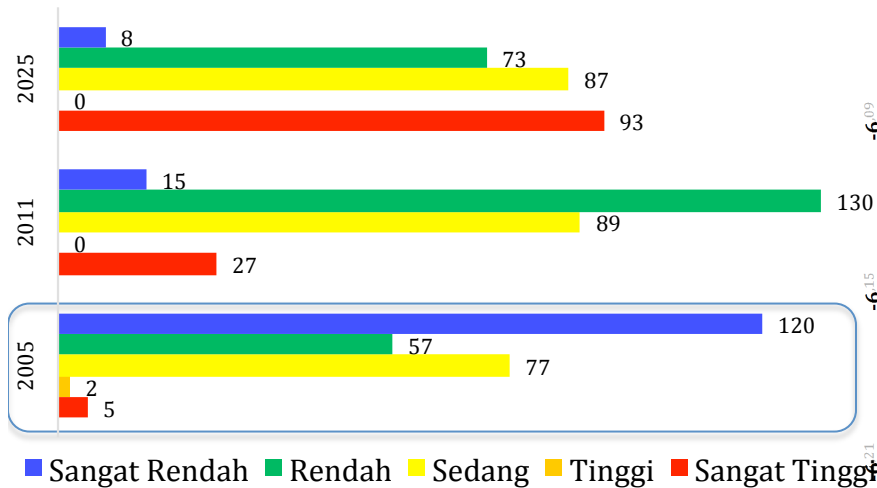
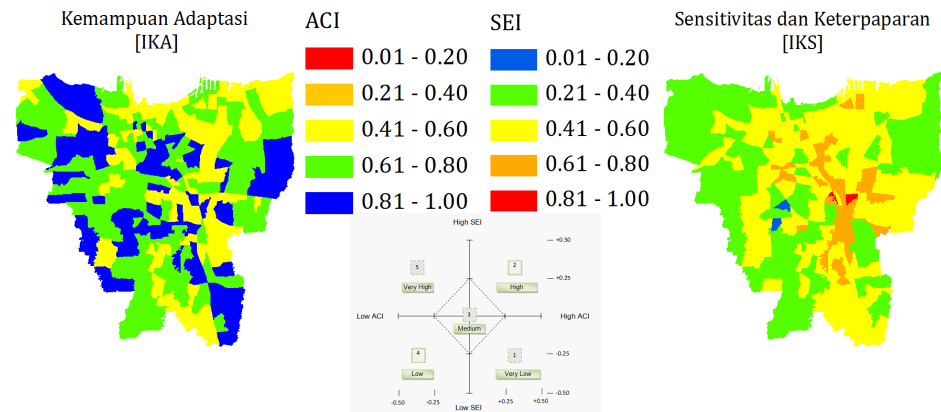
Vulnerability Analysis: Categorization of the Villages

Very vulnerable villages are indicated by high exposure and sensitivity index (SEI), and low adaptive capacity (ACI)

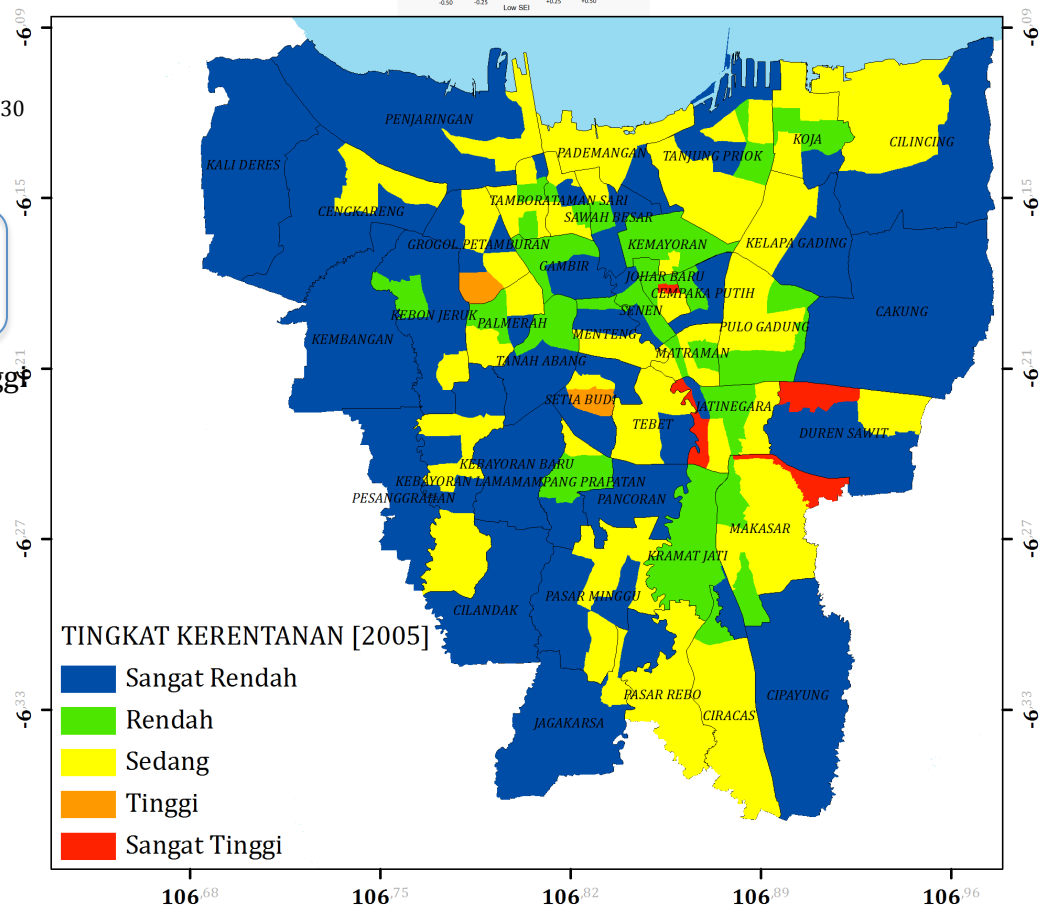


From 2005 to 2011, the number of vulnerable villages increases, and in 2025 without effective adaptation efforts, most villages will fall into the category of very high vulnerable.

Vulnerability Level of Villages in 2005 [Baseline 2005]

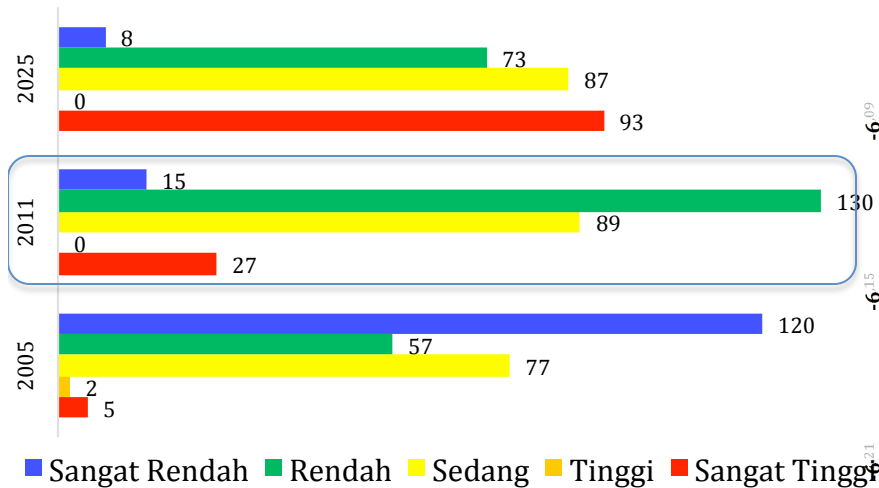


In 2005, the number of villages fall into the vulnerability level of very high are about 5 villages (1.92%)

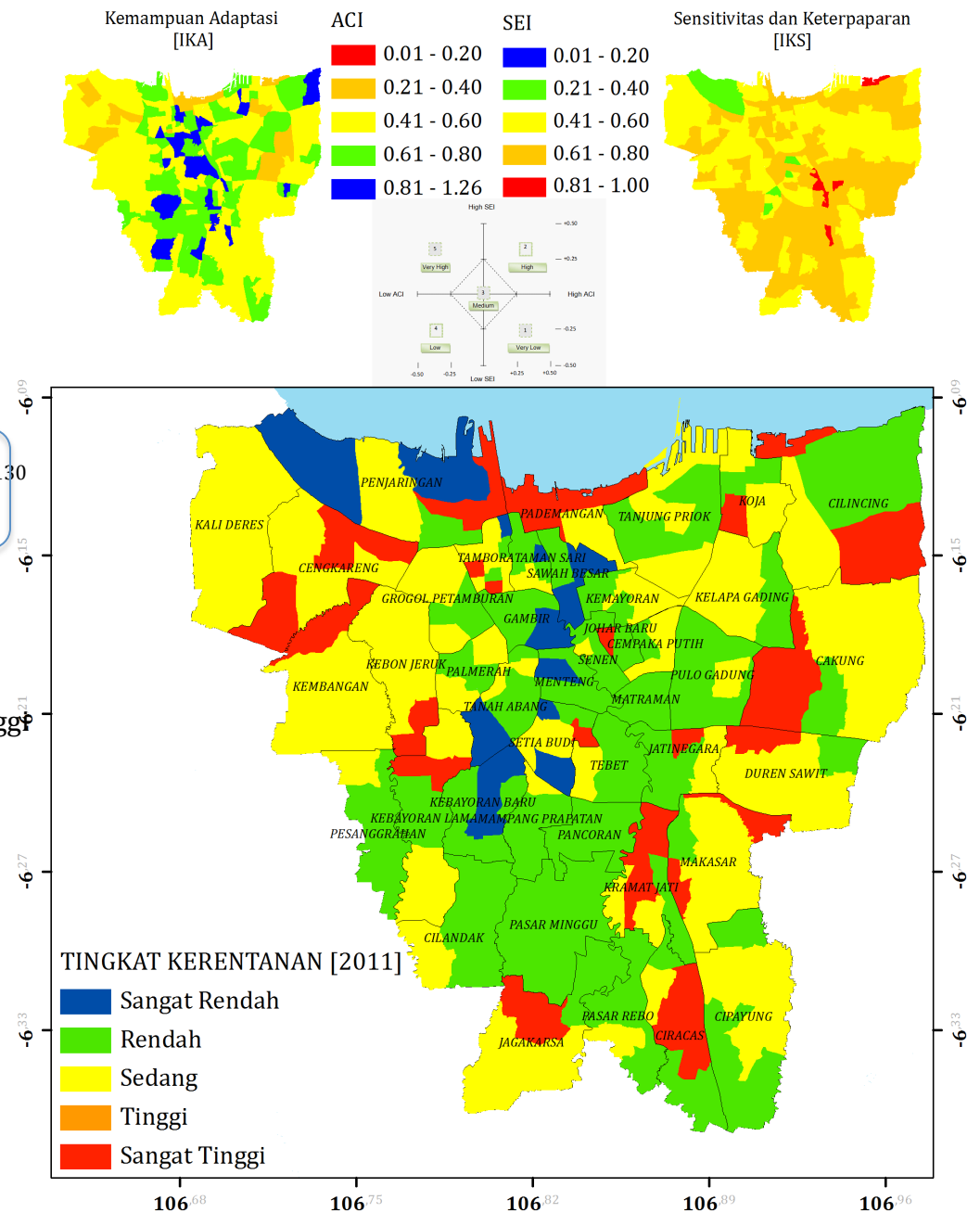


Note: Blue means very low, and red means very high

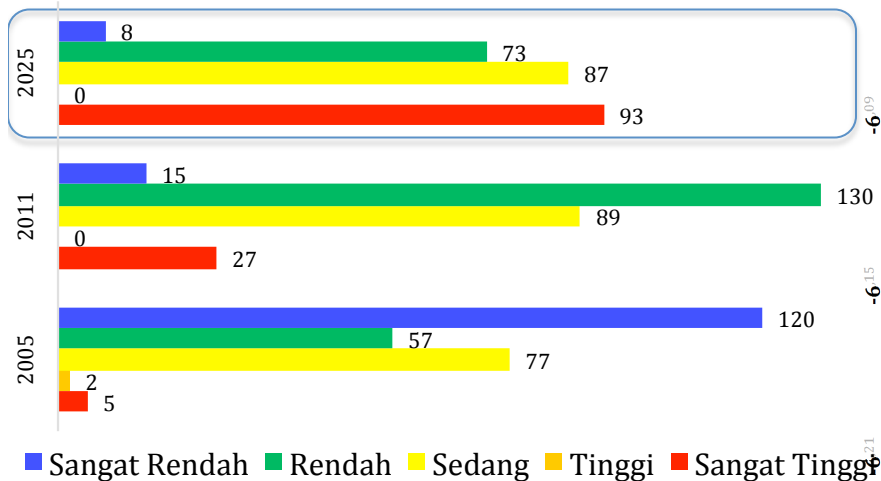
Vulnerability Level of Villages in 2011 [Baseline 2005]



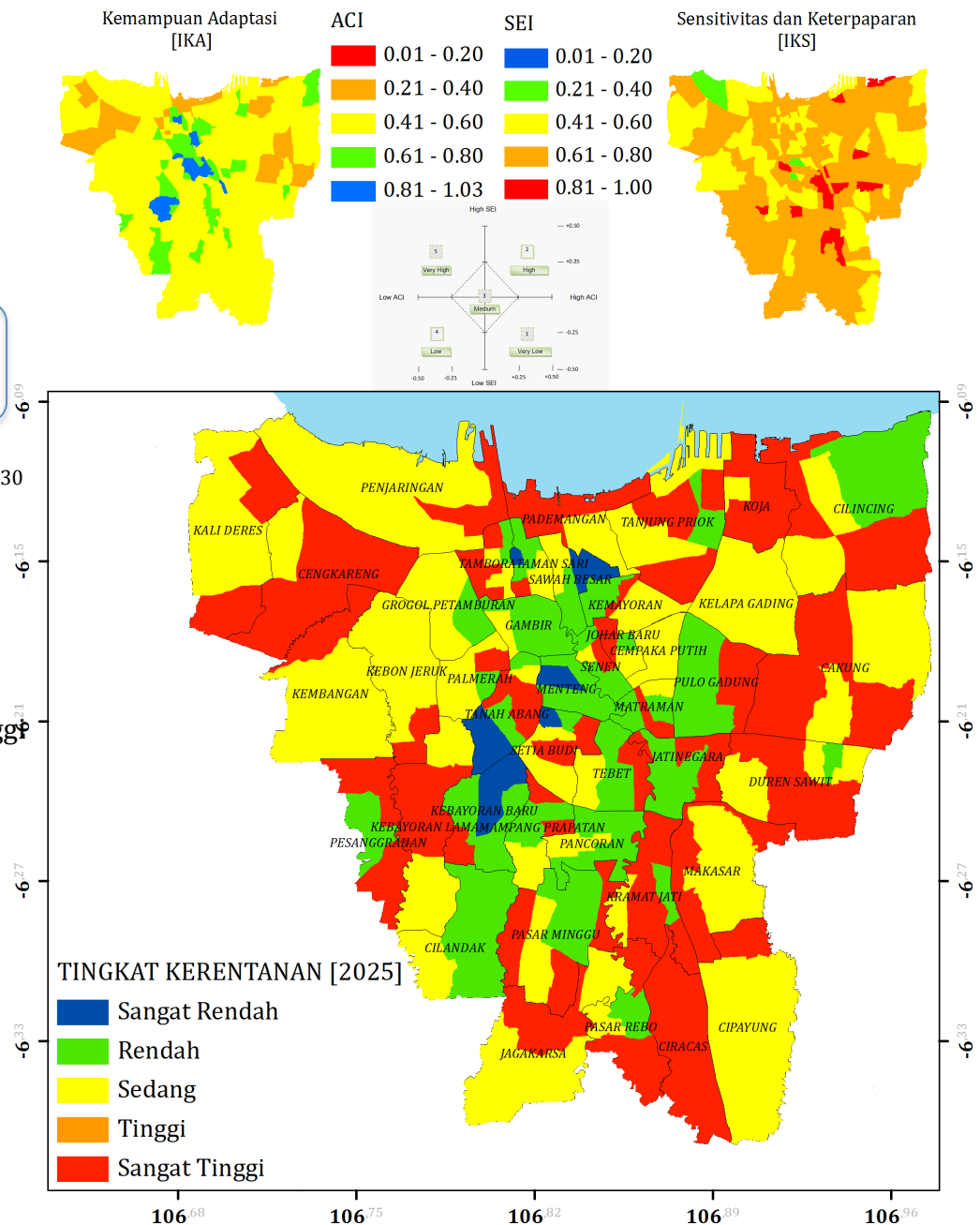
In 2011, the number of villages fall into the vulnerability level of very high are about 27 villages (10.35%)



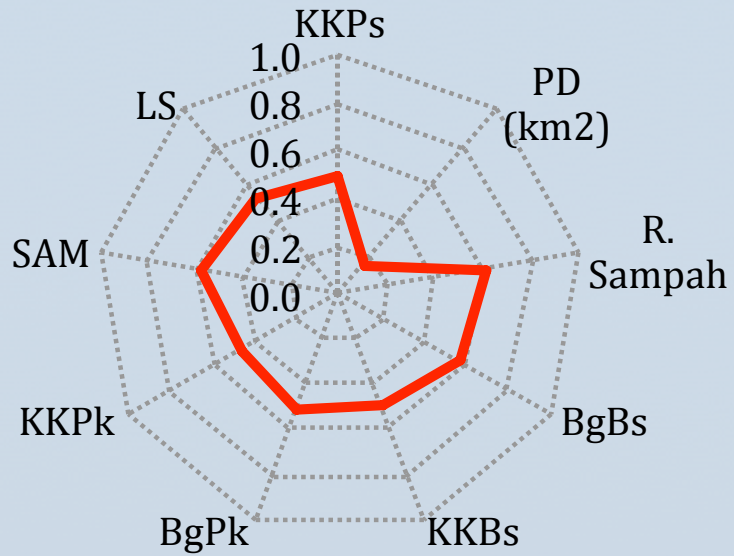
Vulnerability Level of Villages in 2025 [Baseline 2005]



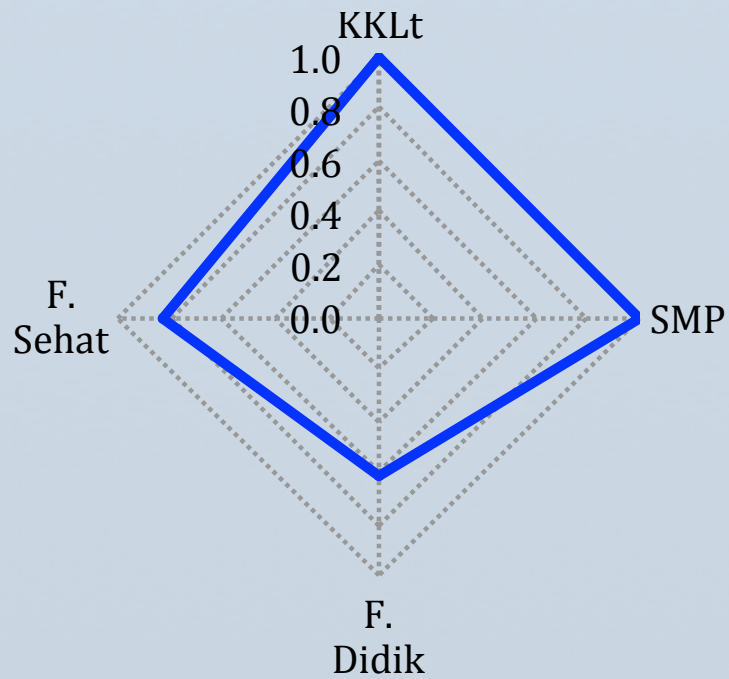
In 2025, without effective adaptation efforts, the number of villages fall into the vulnerability level of very high are about 93 villages (35.63%)



SEI

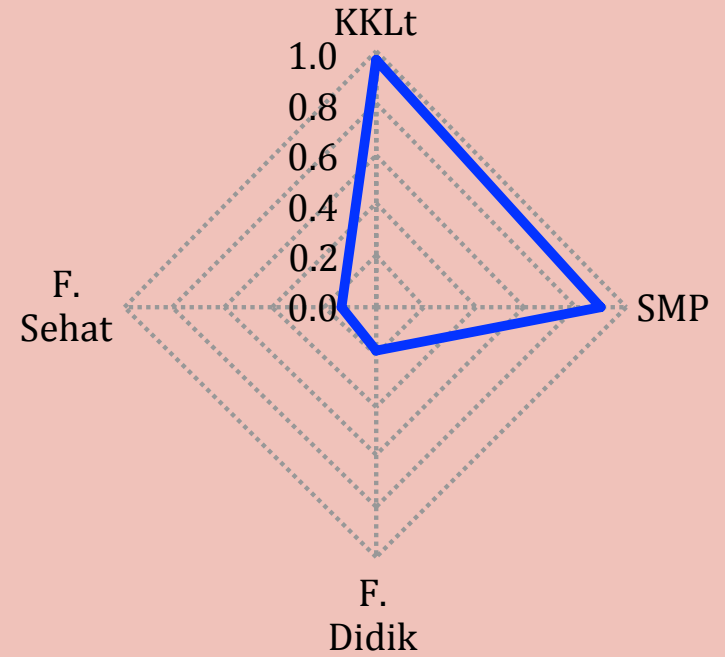
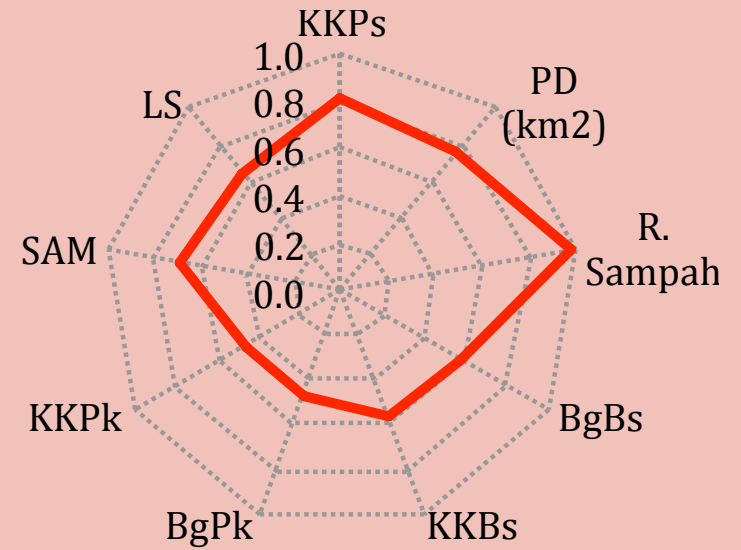


ACI



Very Low Vulnerability

2011



Very High Vulnerability

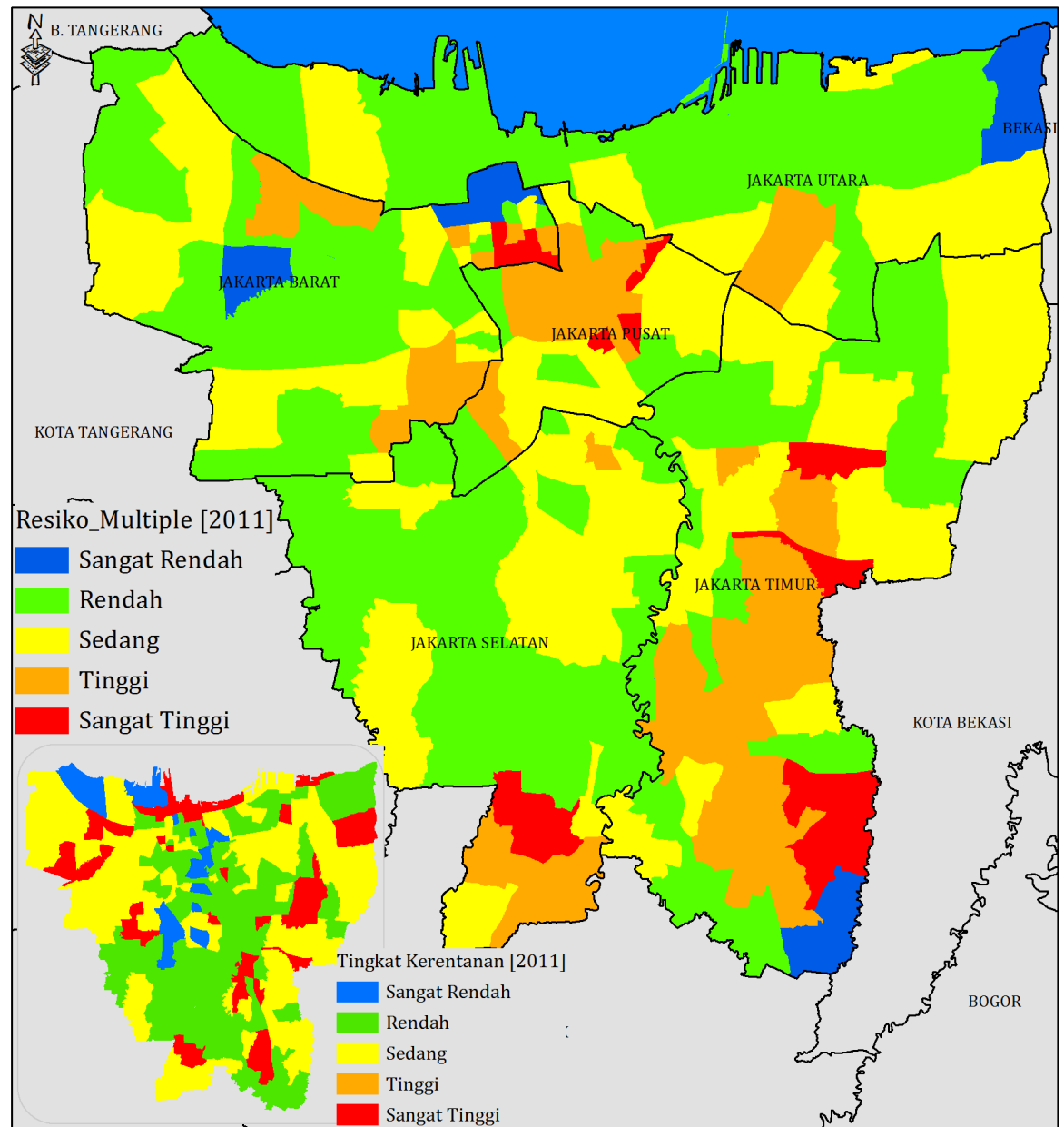
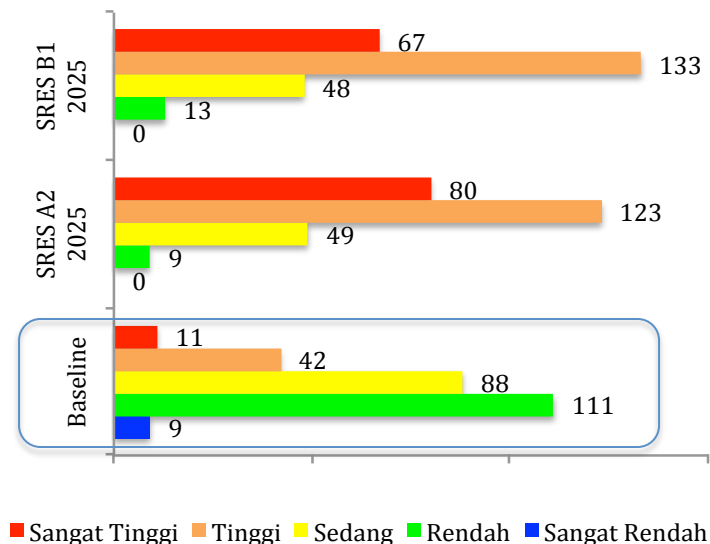
Villages fall into the very high vulnerability level [2011]

KABUPATEN	KECAMATAN	KELURAHAN
JAKARTA SELATAN	Jagakarsa	Jagakarsa
	Kebayoran Lama	Grogol Selatan
	Setia Budi	Menteng Atas
JAKARTA TIMUR	Ciracas	Kelapa Dua Wetan
		Ciracas
	Makasar	Makasar
		Cipinang Melayu
	Kramat Jati	Batu Ampar
		Cililitan
		Cawang
		Cipinang Besar Utara
	Duren Sawit	Klender
	Cakung	Jatinegara
		Rawa Terate

Villages fall into the very high vulnerability level [2011]

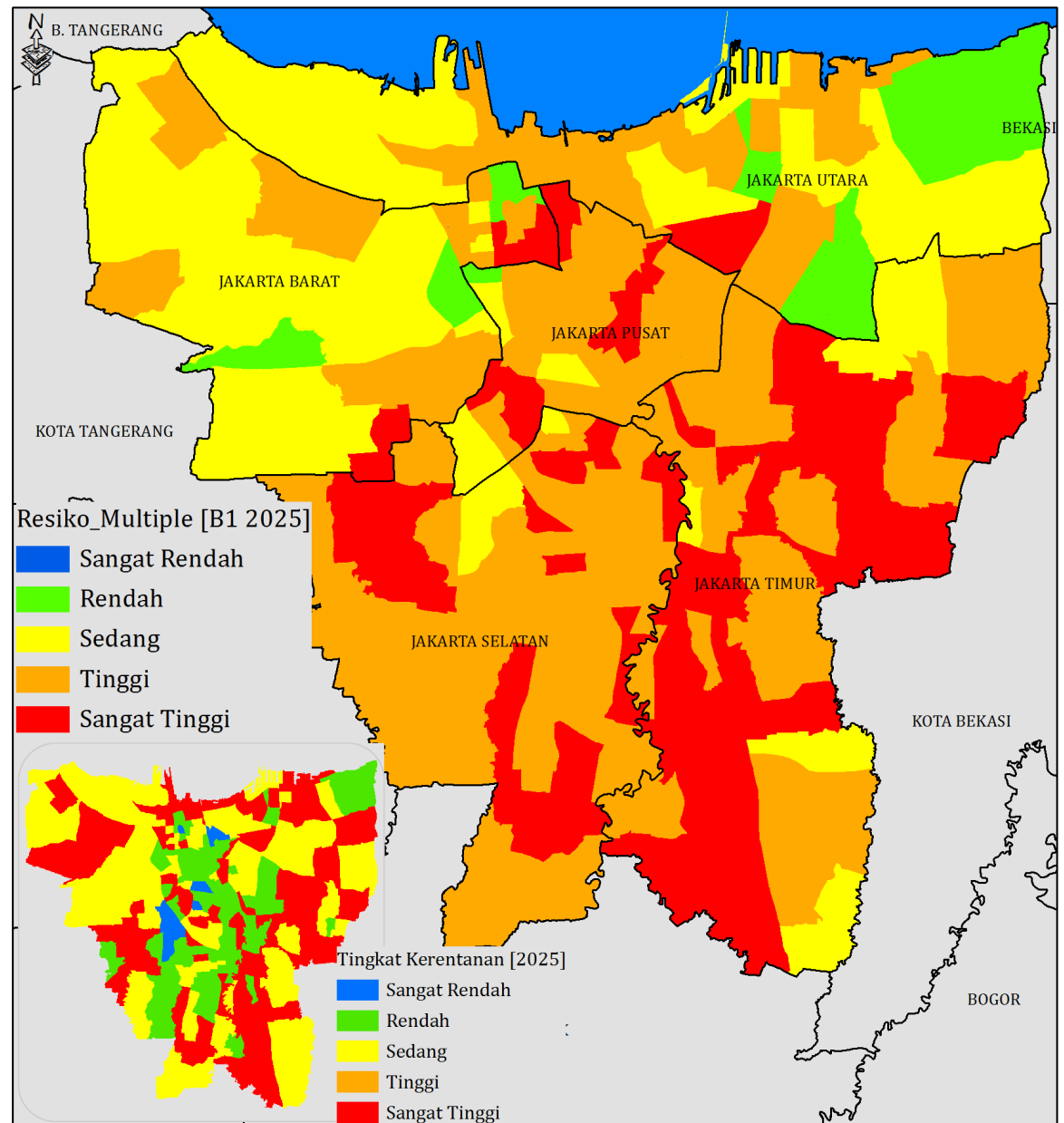
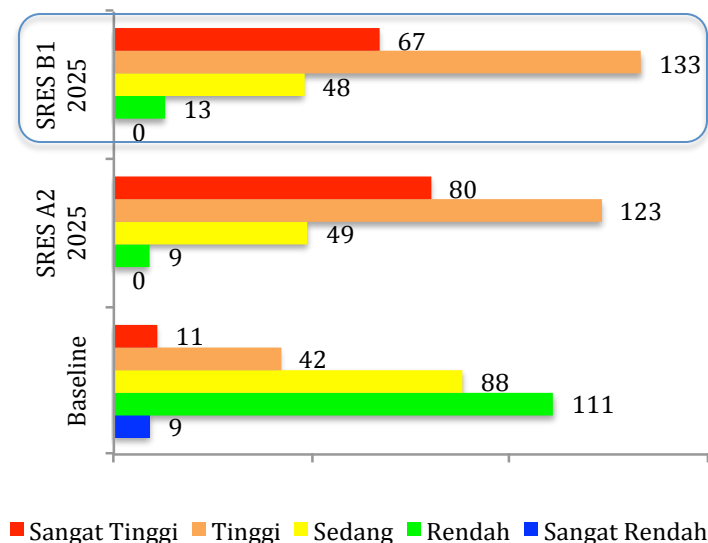
KABUPATEN	KECAMATAN	KELURAHAN
JAKARTA PUSAT	Johar Baru	Tanah Tinggi
JAKARTA BARAT	Kembangan	Kembangan Utara
	Kebon Jeruk	Sukabumi Selatan
		Sukabumi Utara
	Tambora	Duri Selatan
		Jembatan Besi
	Cengkareng	Duri Kosambi
		Kapuk
JAKARTA UTARA	Penjaringan	Penjaringan
	Pademangan	Ancol
	Koja	Rawabadak Selatan
	Cilincing	Suka Pura
		Kali Baru

The Level of Climate Risks of Villages for Multiple Hazard [Flood and DBD] Baseline condition [2011]



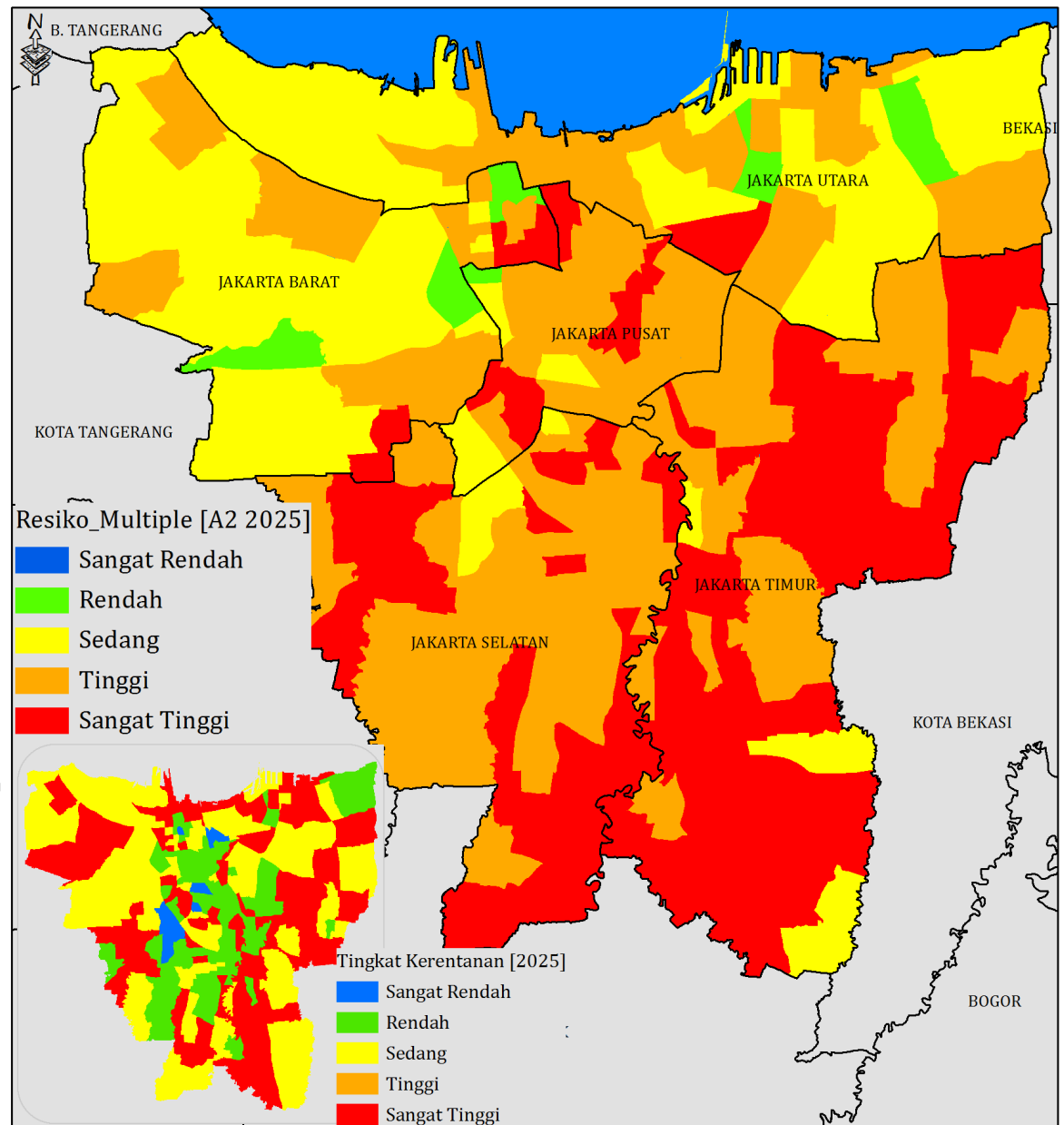
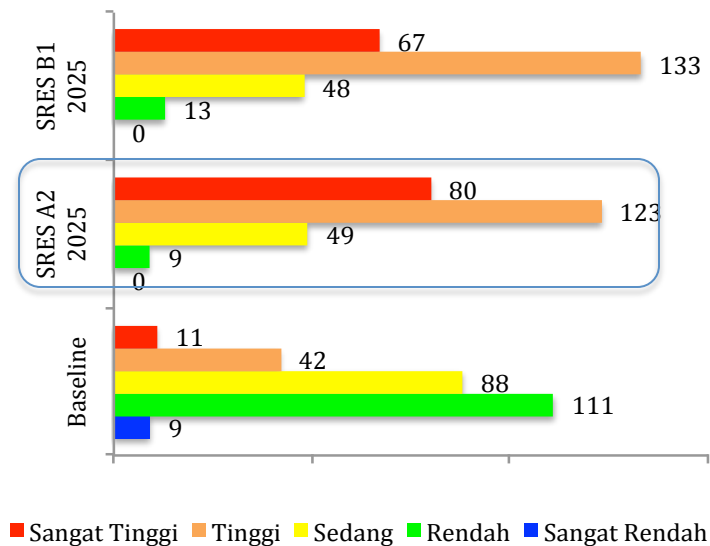
Note: Blue means very low, and red means very high

The Level of Climate Risks of Villages for Multiple Hazard [Flood and DBD] Future scenario [SRES B1 2025]



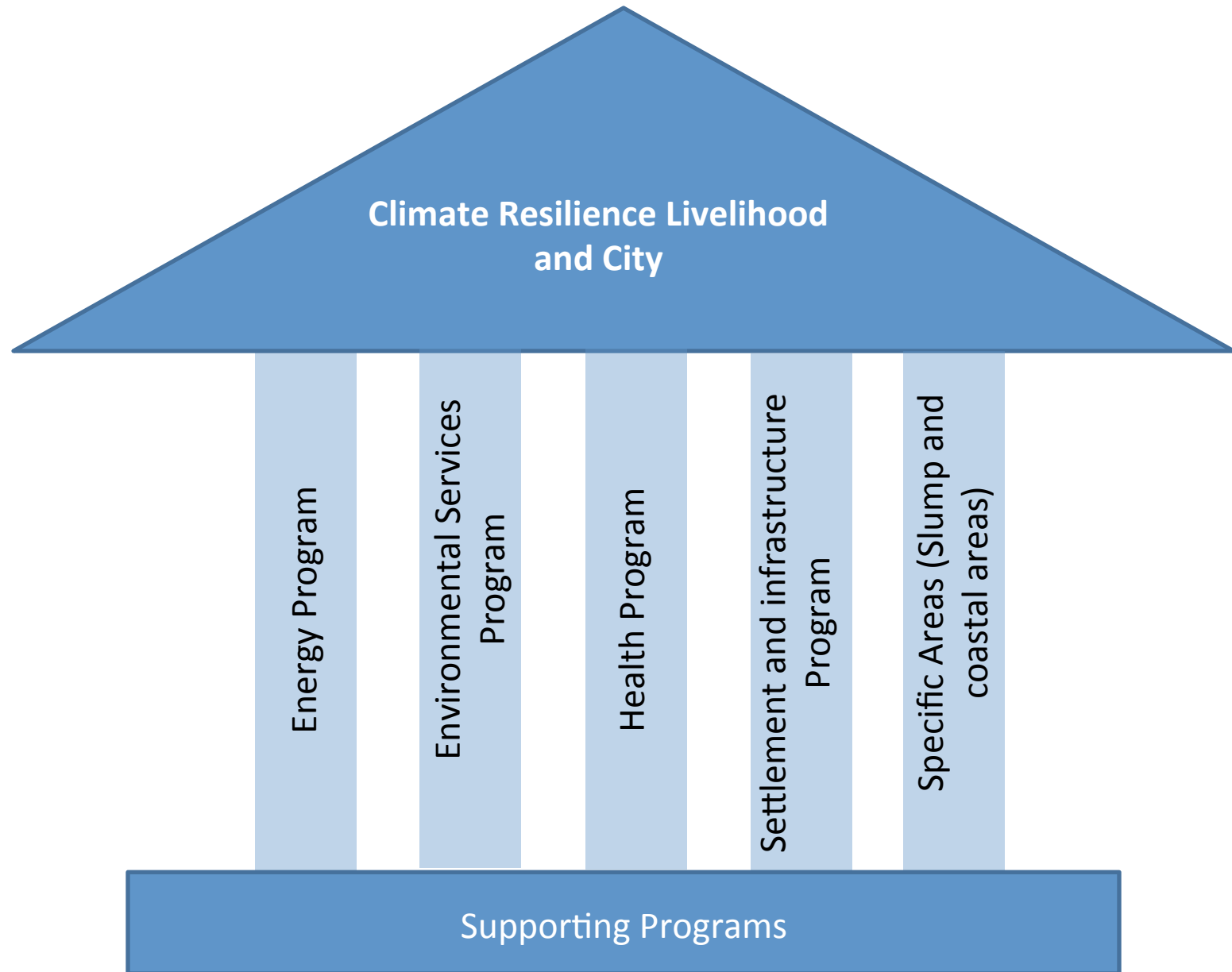
Note: Blue means very low, and red means very high

The Level of Climate Risks of Villages for Multiple Hazard [Flood and DBD] Future scenario [SRES A2 2025]



Note: Blue means very low, and red means very high

Goal of CCA Plan of DKI



Goal of the CCA Plan of DKI

Sector	Goal
Self Energy Sufficiency	<ul style="list-style-type: none"> Increasing energy self sufficiency through the utilization of household waste and domestic waste to meet energy needs for reducing burden on environmental Enhancing cooperation between the city and the local government in the upstream region to maintain and improve the condition of the rain catchment area as source of hydroelectric power plant
Specific Areas (Slump and coastal areas)	<ul style="list-style-type: none"> Increasing community knowledge and adaptability, particularly in slums areas, coastal, and small islands in addressing climate risk Reducing slum settlements areas, especially in river side and coastal areas
Health	<ul style="list-style-type: none"> increasing early warning system for disease control and health disorders and accidents due to climate change Reducing health disorders (dengue, malaria etc) as well as accidents due to climate change
Etc	<ul style="list-style-type: none"> Etc
Supporting	<ul style="list-style-type: none"> Establishing a city committee facilitate coordination and synergy among sectors and stakeholders for increasing community and city resilience

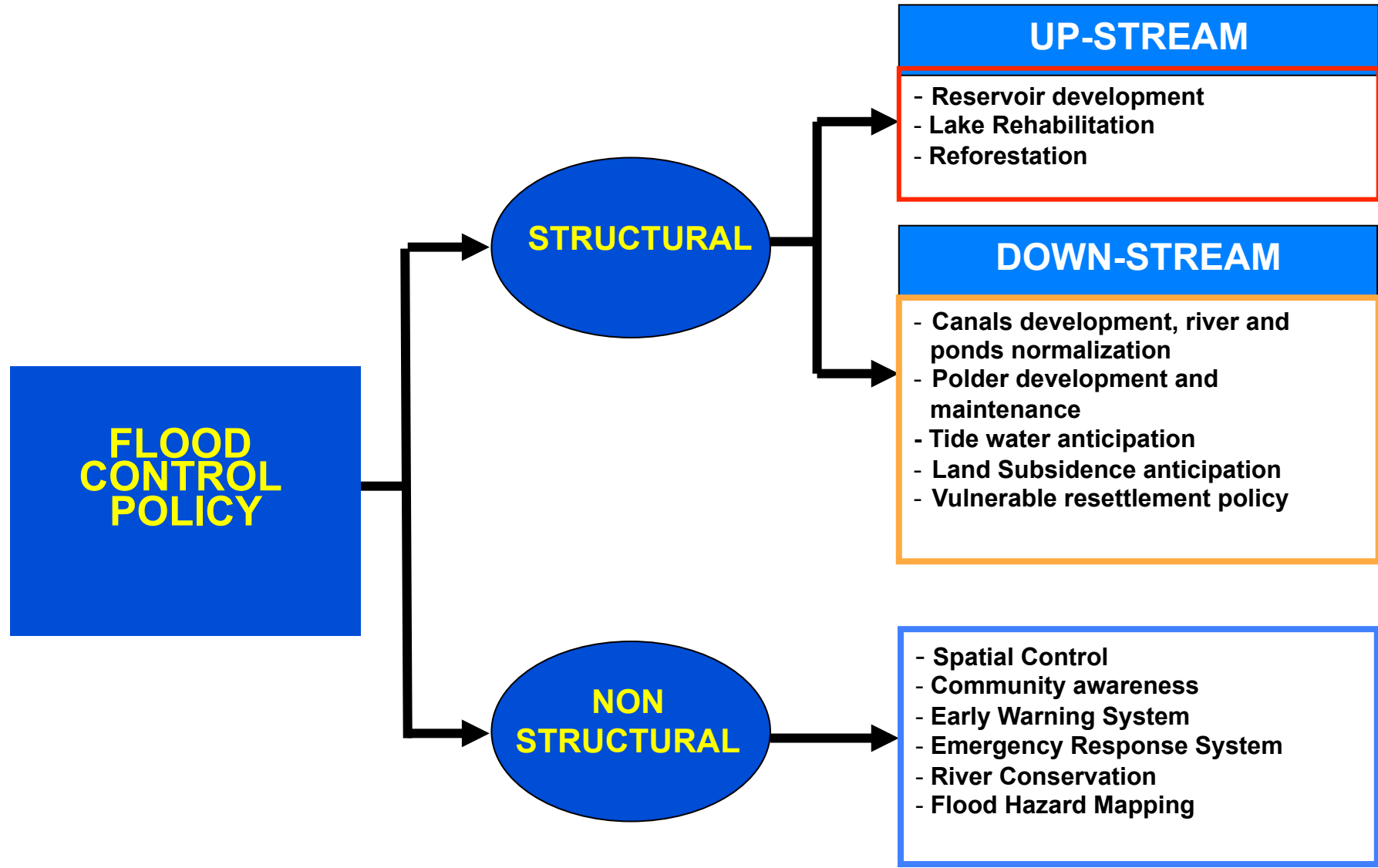
ADAPTATION PROGRAMME

Adaptation Program :

- Flood Control Infrastructure Development
- Maintenance of Shore Line Flood Barrier and Construction of Flood Channel
- Rehabilitation of the mangrove forest
- Plan of Giant Sea Defense Development



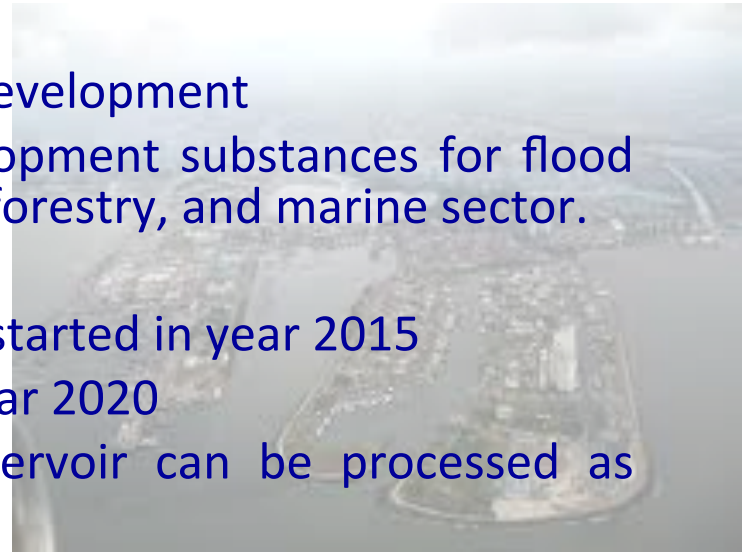
FLOOD CONTROL POLICY



Source: Kusumawati (2011)

ADAPTATION EFFORTS

- Plan of Giant Sea Defense Development
 - Activities that have been / are running:
 - Building concept of Giant Sea Wall Development
 - Deepening of Giant Sea Wall Development substances for flood controlling, wastewater, raw water, forestry, and marine sector.
 - The plan further activities:
 - Giant Sea Wall Development will be started in year 2015
 - Giant Sea Wall will be operated in year 2020
 - The raw water from retention reservoir can be processed as drinking water in year 2022.



Community Practice: Response

**Health and First Aid
Training**



**Water Rescue
Equipment - Rafts**



Public Kitchen



Water Rescue

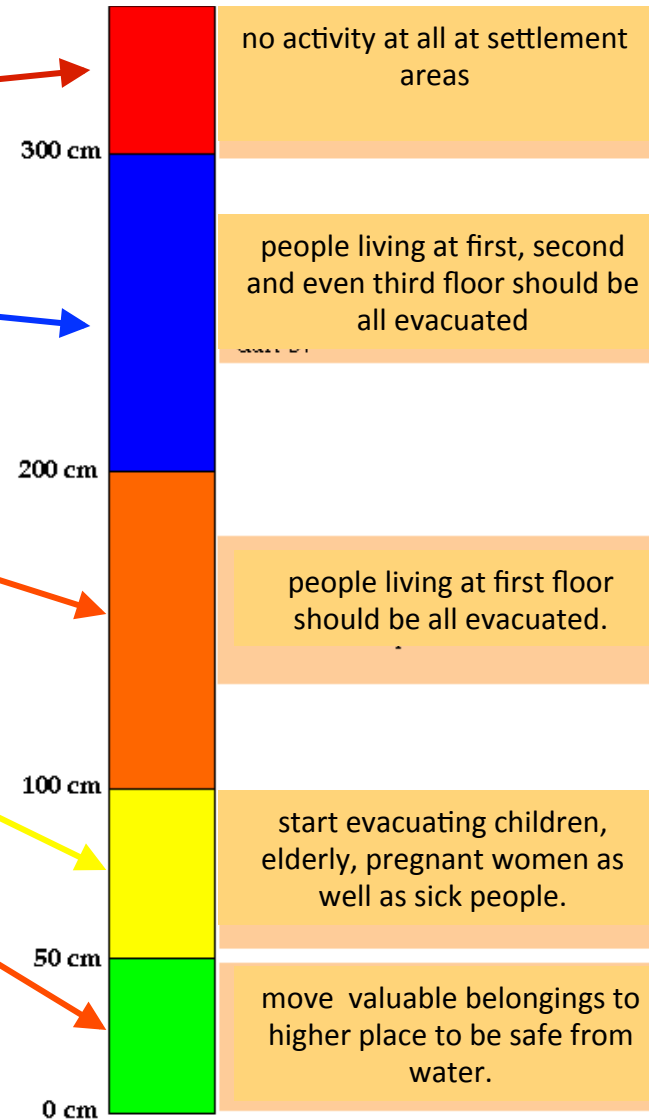
Location : Bukit Duri and Kebon Baru

Source: Kusumawati (2011)

Community Practice: Response

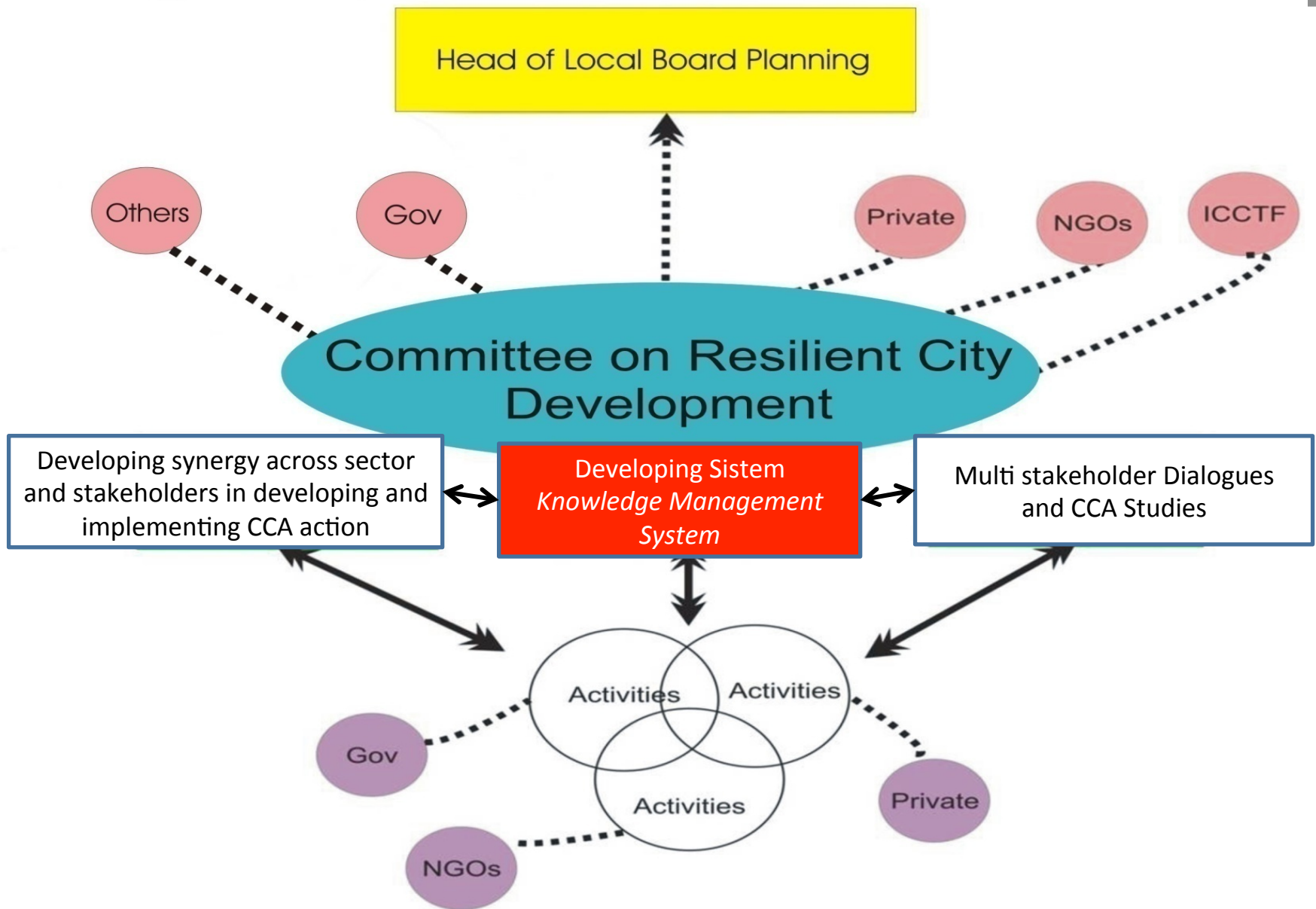


**Flood Warning
(Location: Bukit Duri
and Kebon Baru)**



Source: Kusumawati (2011)

City Resilience Committee



Committee of Resilience City Development

- Proposed for effective management of city development programs
 - ✓ Provide strategic advices for the Government of DKI Jakarta toward resilience city
 - ✓ Create database and information focusing on climate change and city resiliency
 - ✓ Strengthen coordination among institutions to increase mutual understanding and to conduct programs on climate change and city resiliency
 - ✓ Optimization of the use available resources towards the development of resilient city

Source: Integrated Team of Bappeda DKI (2011)

Summary

- Population and economic growth pose socio-economic and environmental challenges to the Jakarta City
 - Flood is the major climate related disaster faced by the city
- The numbers of high vulnerable villages increase from year to year, and the numbers of villages exposed to the risks of multiple climate hazard [Flood and DBD] also increase under the scenario of future climate change
- The implementation of adaptation strategies should be prioritized for the very high vulnerable and climate risk villages
- The government have planned adaptation strategies and executed activities to decrease flood occurrences, and the community has also responded to flood
- A framework towards the development of City Resilience Committee has been proposed

THANK YOU

