



Talk outline



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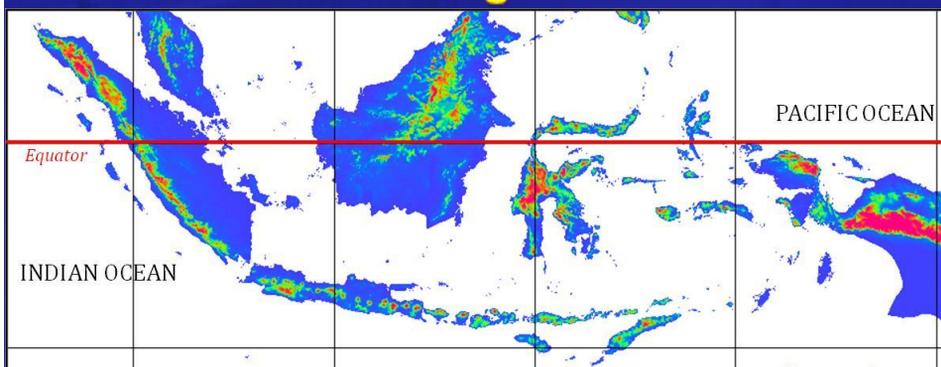
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INTRODUCTION



Indonesia setting: a nation with



- An archipelago: long coastal line, many active volcanoes, many rivers, poorly distributed population, poorly distributed development, diversified social/culture, diversified economic activities/livelihood
- Geographical setting: tropical country with warm climate, monsoonal, affected by ENSO
- Have many rivers and deltas

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Map generated from Digital Elevation Module



Deltas in Indonesia

Delta as a living place of societies

1. Many cities are located in deltas with different demographic and natural resource dependency characteristics

- Jakarta: high population, service city, some societies still directly dependent on natural resources for agriculture, etc.
- Mahakam: oil and gas, shrimp ponds
- Musi: fisheries, rice cultivation, fish ponds

2. Many livelihood are provided by and socioeconomic activities are concentrated in deltas

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Current threats in line with socio-economic growth

Ecosystem degradation:

- land cover change, water pollution,

Fires

- especially on peatland, due to land mismanagement

Disasters

- (damaging) flood
- hurricanes and storm surges

Saline water intrusion

- affecting quality of water, buildings and other infrastructures

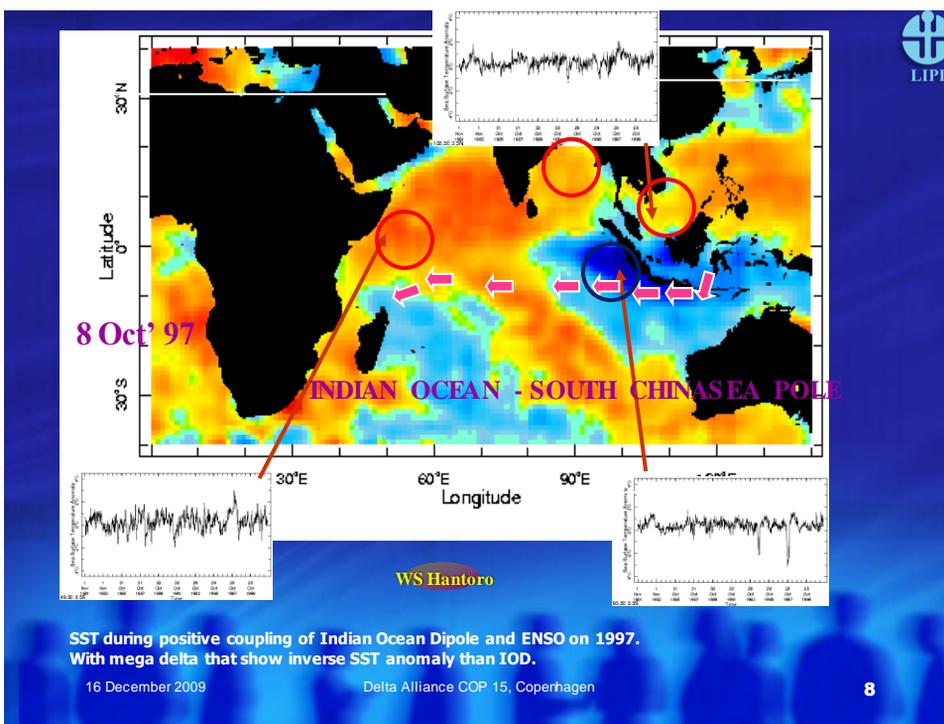
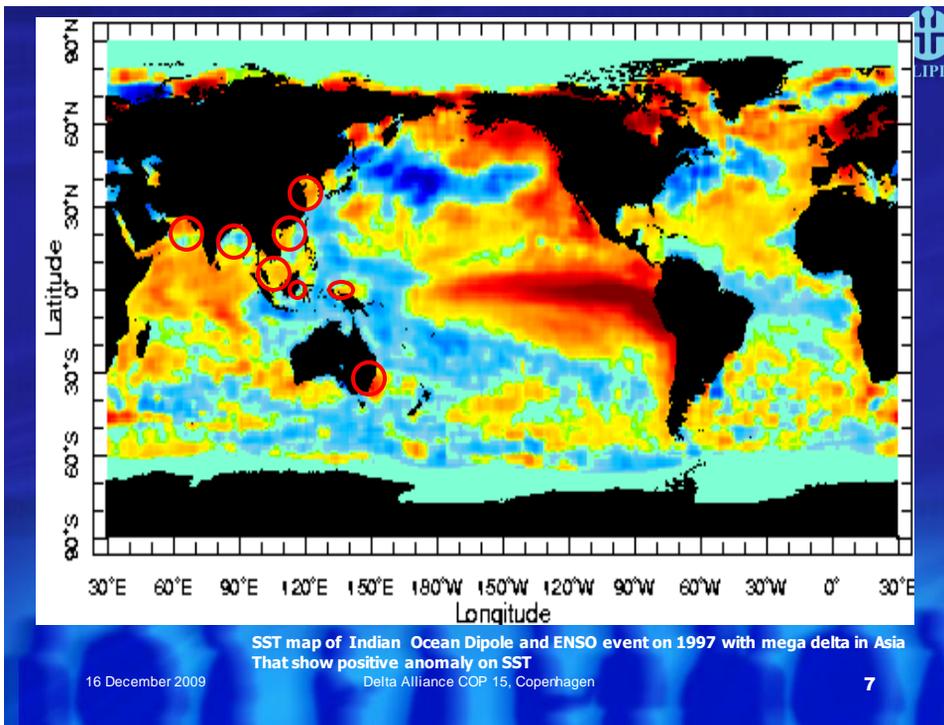
Subsidence

- in particular as a result of over exploitation of groundwater

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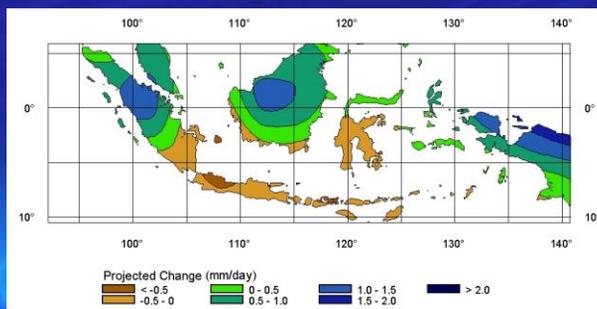
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Climate scenarios

Indonesia

- Higher temperature
- Higher annual precipitation, but not equally distributed
- More frequent extreme rainfall associated with tropical cyclone
- More frequent ENSO related climate variability



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Multi model projections of high emission scenario 2090s

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Impact of global warming on sea level

Possible average sea level rise (low - high emission GHG scenarios, 2080)

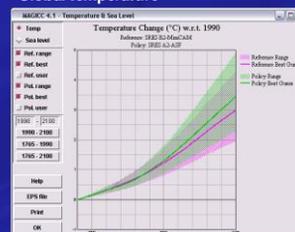


Estimated Lost of land	of total land area of the above map
Maximum	5.71 %
Best guess	0.75 %

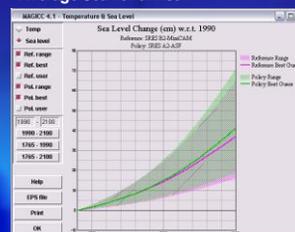
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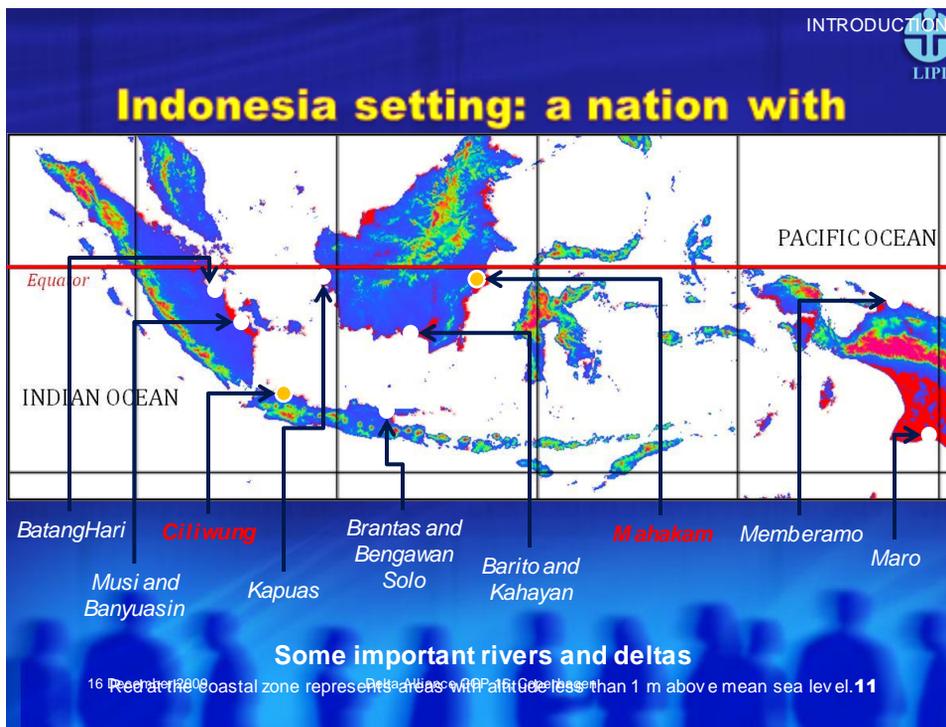
Global temperature



Average Sea level rise



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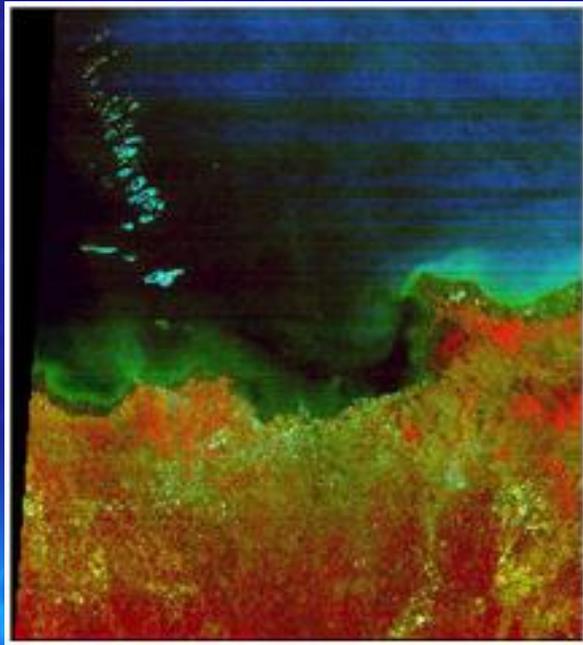


DIVERSED CONDITION OF DELTAS
LIPI

Different setting and different challenges: Ciliwung and Mahakam

	Ciliwung Delta	Mahakam Delta
Nearest main city and population	Jakarta 9 million (2006), excluding population of neighbouring cities	Samarinda 590 thousand (2006)
Delta area (< 1 m msl.)	64 km ²	5,200 km ²
Length and Catchment area	± 102 km and 382.6 km ²	980 km and 77,000 km ²
Average annual precipitation	2,700 mm	2,500 mm
Average annual discharge	'No data'	2,500 m ³ /s
Major infrastructures along the river	Weirs/ small dams for storage and irrigation, flood control canals	None
Main ecosystem and condition	Mangrove, degraded	Peat and mangrove, degraded
Main ecosystem services used by people	Water for domestic use and industries	Water for domestic use and industries, aquaculture (shrimp ponds)
Major issues	Pollution, over land conversion	Human intervention on sediment and mangrove dynamic
Climate change threats	Sea level rise, flood	Sea level rise, peat fire, flood

Data are from various sources



BANJIR KANAL BARAT



Perubahan Penutup/Penggunaan Lahan Pantai Indah Kapuk Berdasarkan Data Penginderaan Jauh Landsat



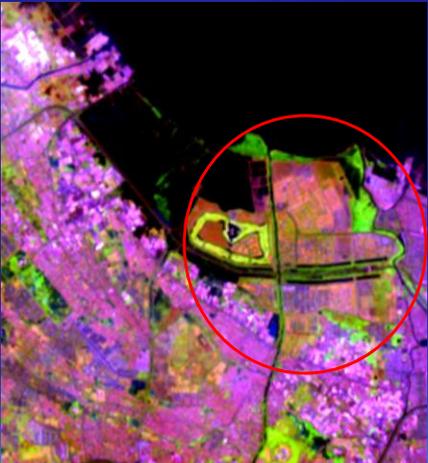


30-07-1992

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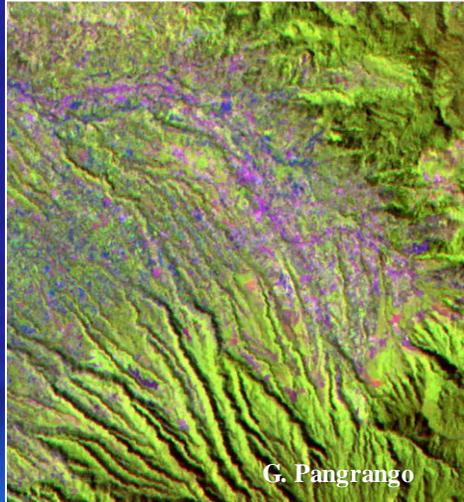


17-09-2001

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Perubahan Penutup/Penggunaan Lahan di Daerah Puncak dan sekitarnya Menggunakan Data Inderaja Landsat-TM





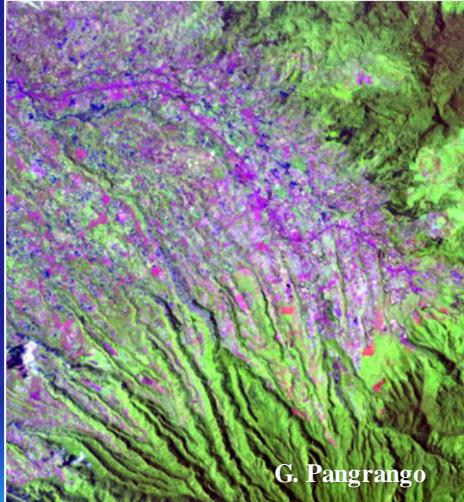
G. Pangrango

30-07-1992

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G. Pangrango

17-09-2001

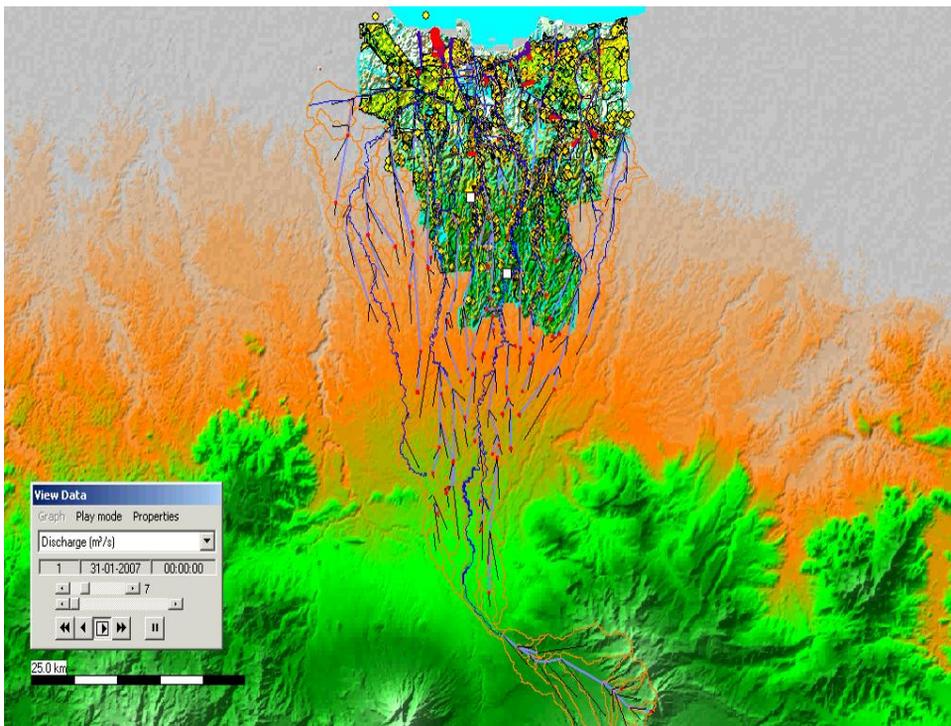
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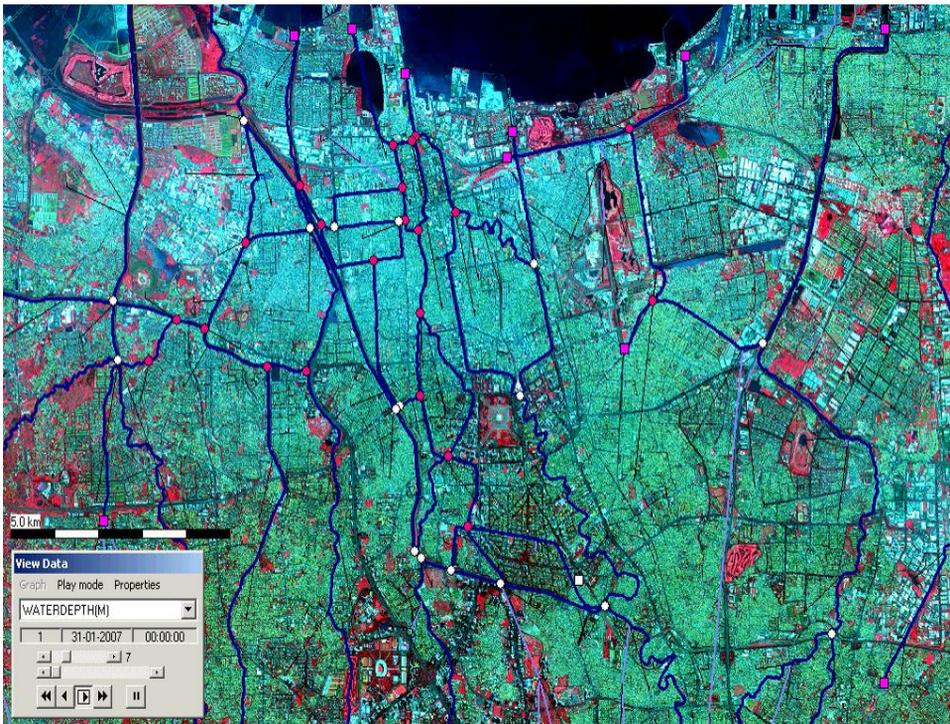
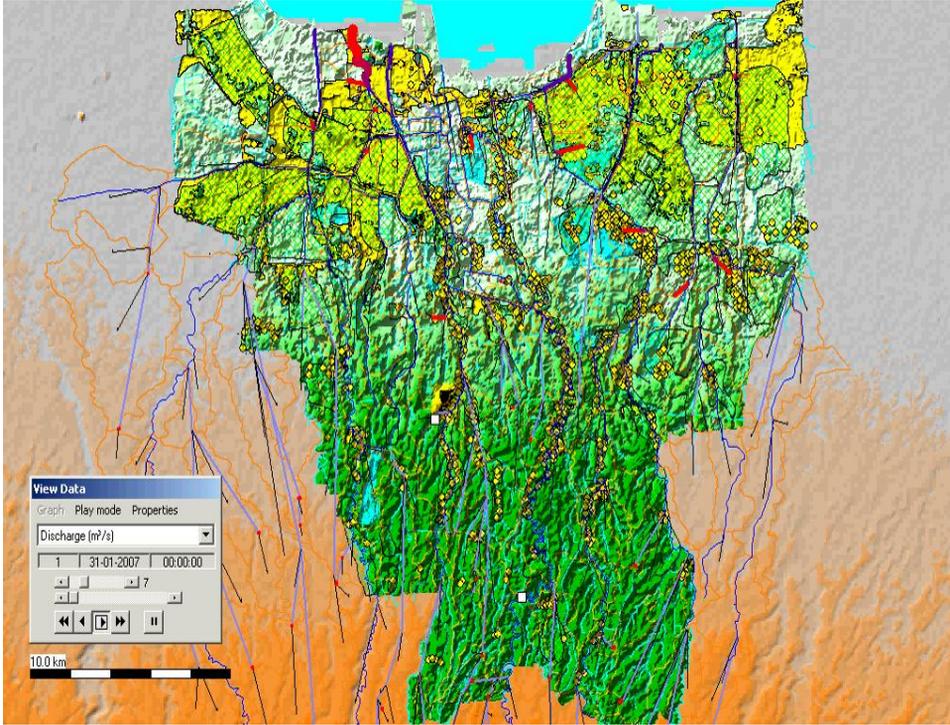
Jakarta MRT Project

LIPI

Engineering Consulting Services for Jakarta Mass Rapid Transit System Project.

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November 26, 2007



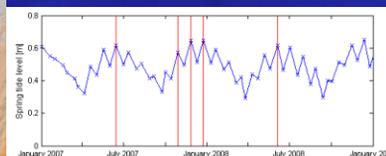
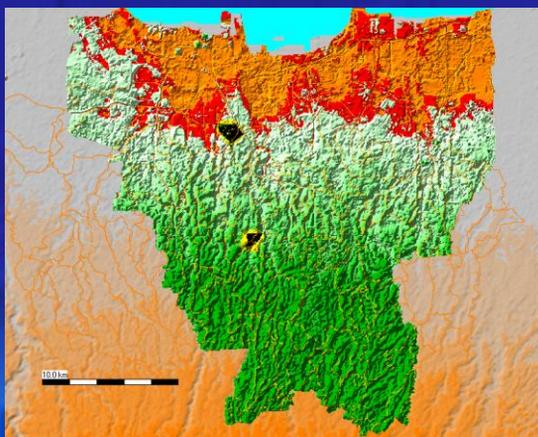
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High tide floods 2007: “Signs of a sinking Jakarta”



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November 26 Flood

Jakarta Flood project:

- Identified the High Tide flood problem

Jakarta flood project says:

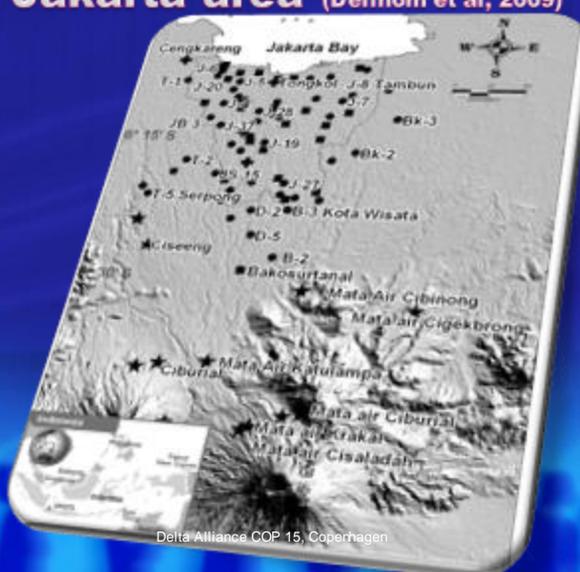
- High tide caused by 18 year cycle
- Warned for floods on October 29, November 26 and December 23-24
- Will happen again January 21 and June 4 2008
- The high sea-level is NOT connected to climate change but controlled by sun and moon
- The flood problem is caused by 'a sinking Jakarta'

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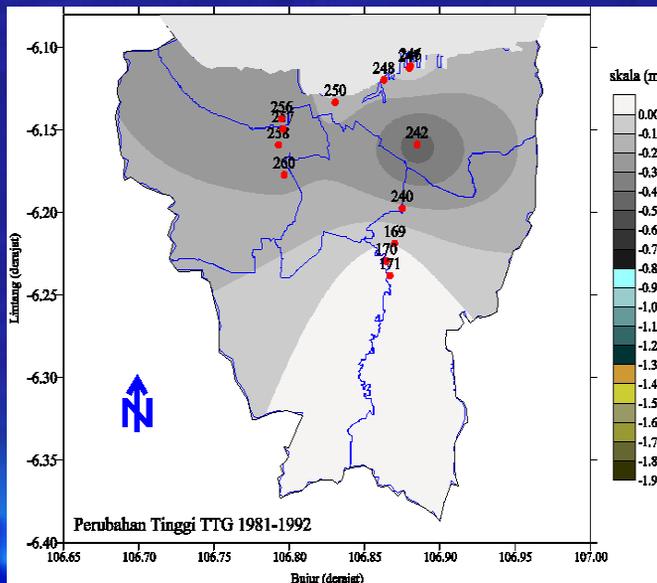
Groundwater monitoring sites in Jakarta area (Delinom et al, 2009)



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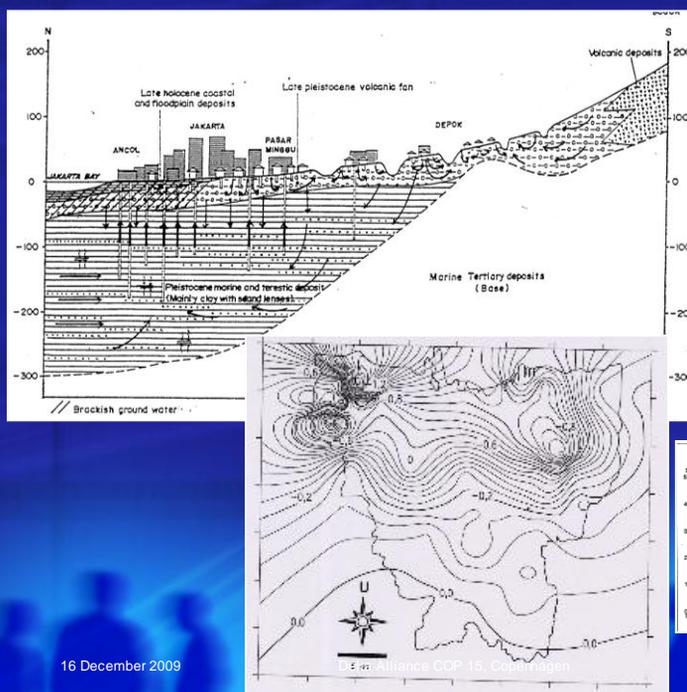
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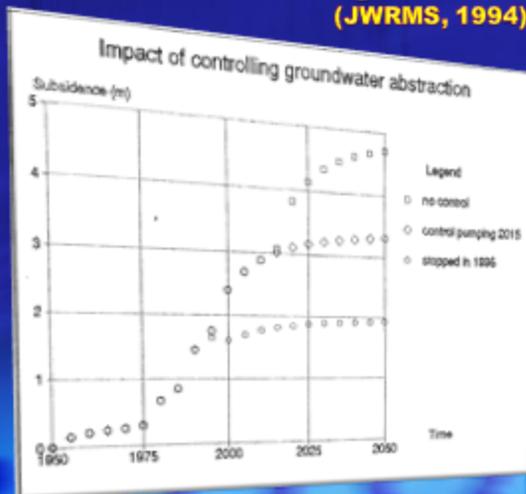
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Jabotabek water resources management study (JWRMS, 1994)



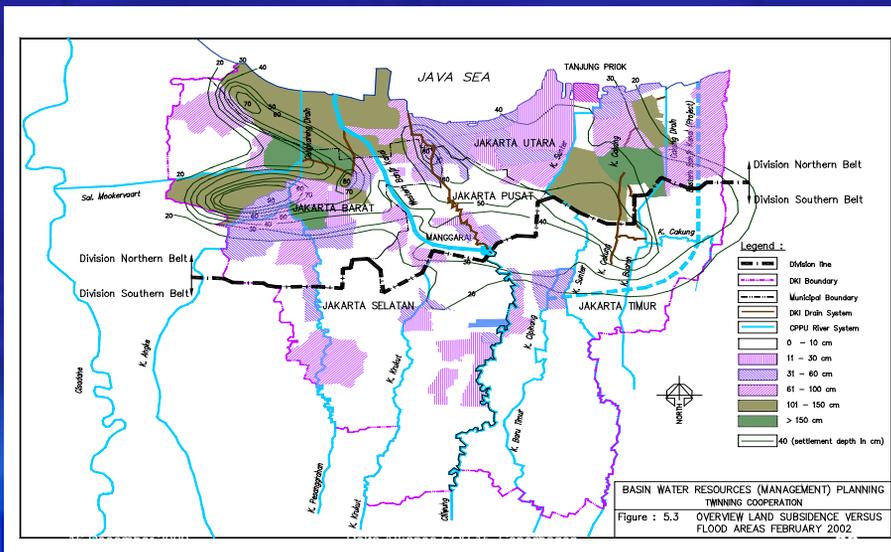
Subsidence closely related to piezometric head drawdown:
10-50 meters from 1985 - 2005

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Subsidence closely related to flood areas



Climate scenarios around Ciliwung Delta



- ✓ Lower annual precipitation, but higher for the upstream (A2 scenario)
- ✓ Sharper inter-seasonal precipitation difference
- ✓ More frequent heavy rainfall
- ✓ Implications: drier ecosystem (but the upstream supply is higher for A2), higher risk of flood, could cause greater effort in water management

Ciliwung

	Annual Precipitations		Seasonal precipitations		Average number of heavy rain days (≥ 25 mm/day)
	P _{Annual}	Δ P _{Annual} relative to baseline	DJF	JJA	
1960-1990 Baseline	1249 mm <i>Increasing</i>		539 mm	131 mm	0.23 days/yr <i>Decreasing</i>
2070-2100 A2	959 mm <i>Decreasing</i>	-23.0 %	507 mm <i>Sharper difference</i>	66 mm	0.70 days/yr <i>Decreasing</i>
B2	961 mm <i>Stable-decreasing</i>	-23.0 %	517 mm <i>Sharper difference</i>	53 mm	0.47 days/yr <i>Decreasing</i>

Sentul, Bogor (delta)

	Annual Precipitations		Seasonal precipitations		Average number of heavy rain days (≥ 25 mm/day)
	P _{Annual}	Δ P _{Annual} relative to baseline	DJF	JJA	
1960-1990 Baseline	1755 mm <i>Increasing</i>		599 mm	240 mm	0.77 days/yr <i>Stable-decreasing</i>
2070-2100 A2	2271 mm <i>Increasing</i>	+29.4 %	786 mm <i>Sharper difference</i>	262 mm	3.97 days/yr <i>Increasing</i>
B2	1680 mm <i>Stable-increasing</i>	-4.3 %	700 mm <i>Sharper difference</i>	133 mm	1.76 days/yr <i>Decreasing</i>

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The Gov. of DKI Jakarta Through MRT Projects Introducing Transit Oriented Development (TOD)



First model to combat urban sprawl and mobility issue.
“a pedestrian-driven development”

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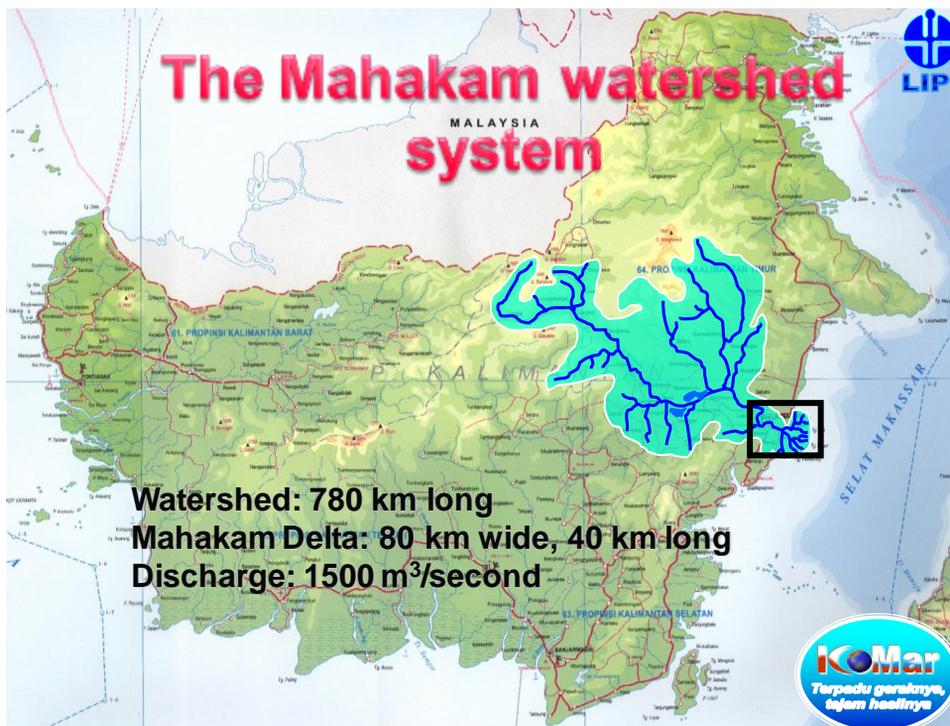
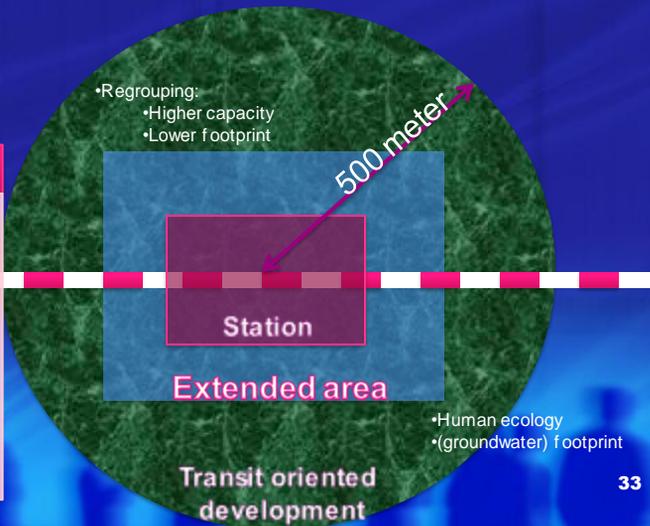
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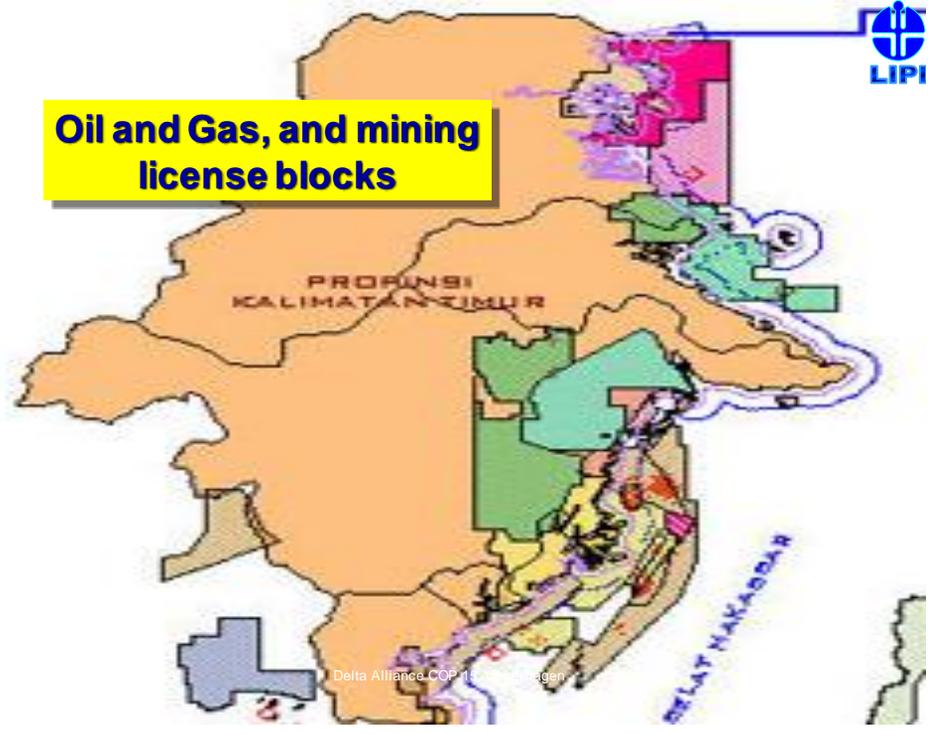
Design and built

- Envisioning:**
- Environmental services
 - Flood & disaster mgt
 - Integrated utility system
 - Sustainability index
 - 6 w ill be the locus of urban renewal to let Jakarta grow more sustainably



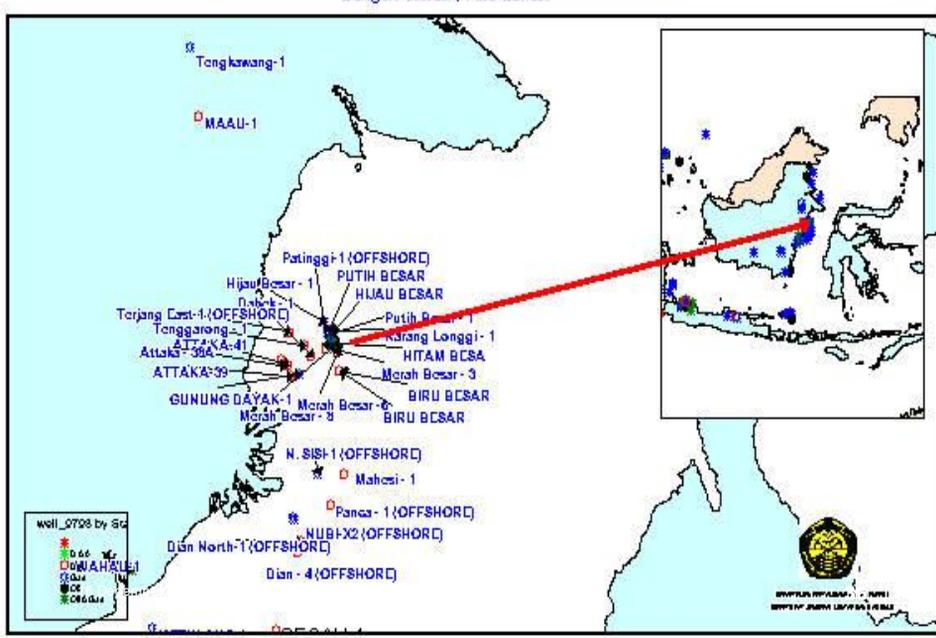


Oil and Gas, and mining license blocks

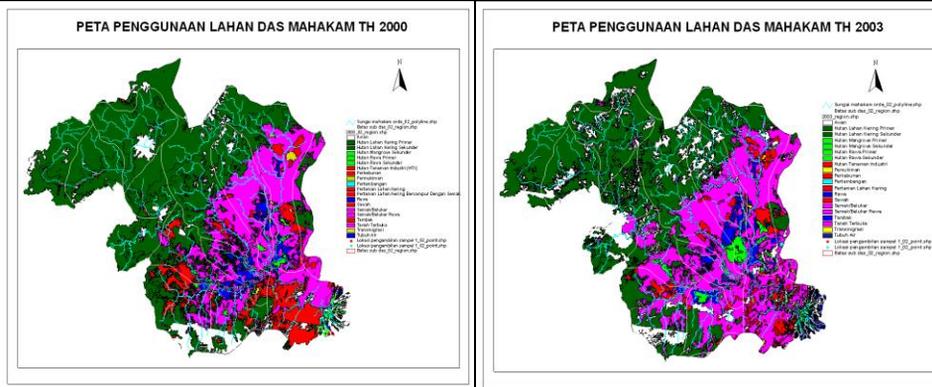


WELLS (1997 - 1998) EAST KALIMANTAN & MAKASSAR STRAIT

Peta Lokasi Sumur di sekitar Kalimantan Timur & Selat Makassar
 Dengan Status : Peta Lokasi



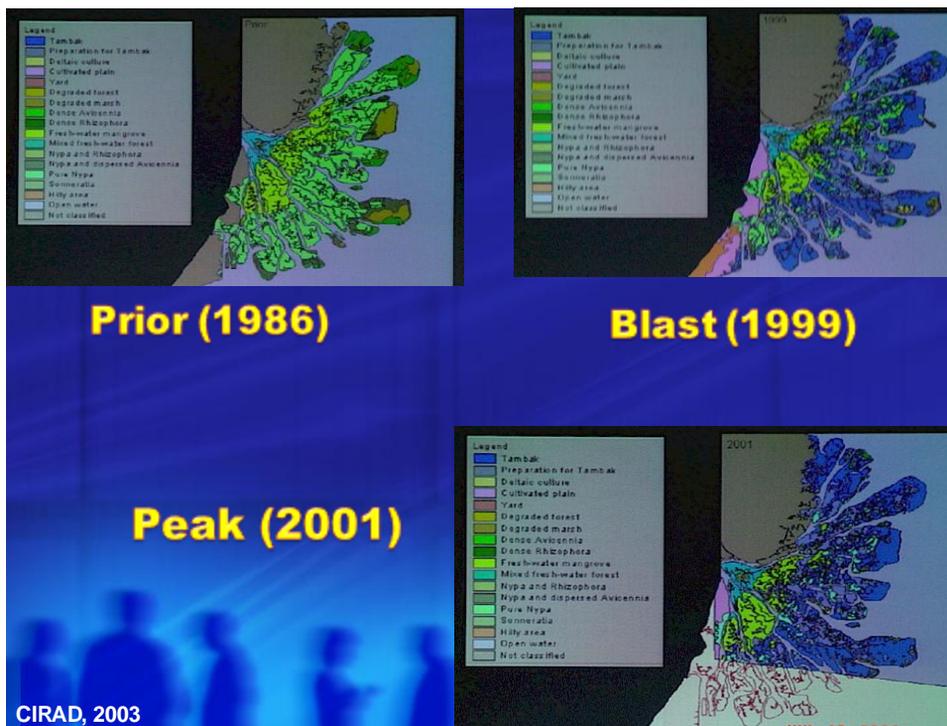
Konversi lahan DAS Mahakam



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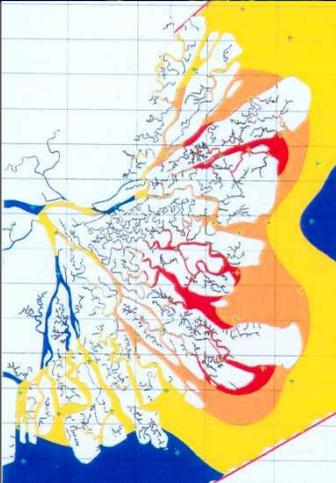
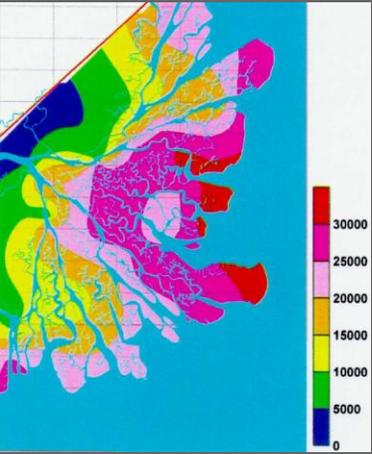
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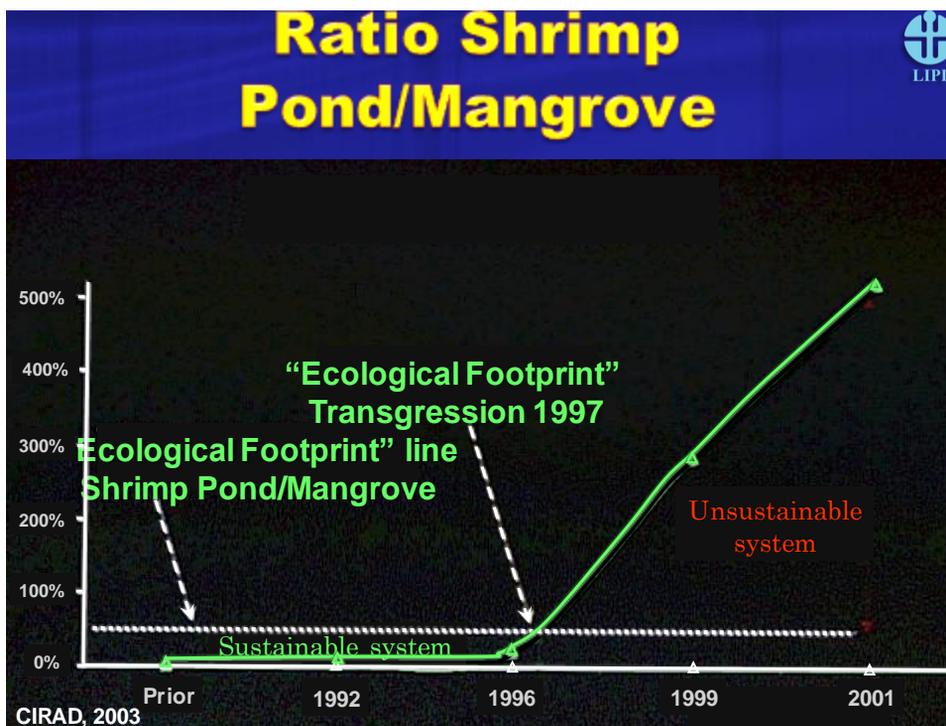
- Excavating activities contribute to oxidizing of the sediment
- Oxidation of pyrite results in the formation of sulfuric acid

- Acidification of ground and surface waters causes the release of toxic aluminum
- low pH and aluminium cause stress on shrimps decreasing their immune response and promoting the development of pathologies

pH in water channels as low as 3.5 Aluminum Content

Source: Erik Dutrieux, CREOCEAN 16 December 2009 39 Delt a



Climate scenarios of Mahakam Delta

- ☑ Lower annual precipitation
- ☑ Sharper inter-seasonal precipitation difference
- ☑ More frequent 'extreme' dry condition, indicated by drought index
- ☑ Implications: drier ecosystem, higher risk of fire, could cause greater effort in water management

	Annual Precipitations		Seasonal Precipitations		Annual average Maximum Temperature		Average no. of 'Extreme' days per year
	P _{Annual}	Δ P _{Annual} relative to baseline	DJF	JJA	T _{MAX}	Δ T _{MAX}	
1960-1990 Baseline	2005 mm <i>Increasing</i>		678 mm	352 mm	26.73 °C <i>Increasing</i>		13.9 days/yr <i>Stable-decreasing</i>
2070-2100 A2	1970 mm <i>Decreasing</i>	-1.7 %	787 mm <i>Sharper difference</i>	250 mm	30.67 °C <i>Increasing</i>	+3.94 °C	55.2 days/yr <i>Increasing</i>
B2	1765 mm <i>Stable</i>	-11.9 %	742 mm <i>Sharper difference</i>	209 mm	29.80 °C <i>Increasing</i>	+3.06 °C	42.9 days/yr <i>Increasing</i>

A2 = high emission scenario, B2 = low emission scenario.
 Simulated by PRECIS regional climate model.
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Delta Issues





Delta Issues

Sustainable Delta and Coastal Lowland

- Optimisation of national resources vs regional requirements (coordination)
- Mission oriented research and implement technological developments
- Multi-purpose/multi-hazard
- Sharing knowledge, capabilities, practices
- Community awareness
- More strategic planning

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Action Plan

DA Scoping Workshop

- National
 - March 2010
 - Outcome:
 - DAIndonesia Wing Programme
 - Initiative on Jakarta Climate Proof Plan
 - Blueprint for saving Indonesian Deltas
- Regional
 - May 2010
 - Outcome:
 - DACommon Regional Programme
 - Towards Rotterdam Launching 2010

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Action Plan

Joint Netherlands – Indonesia Symposium on Mahakam and Berau Deltas, East Kalimantan	• October 2010
Jakarta Climate Proof Study	• April 2010 – September 2011 • Roadmap to Jakarta 2050
Delta and Lowland Summit	• October 2011

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Support needed

Strengthen the DA Indonesia Wing Secretariat	<ul style="list-style-type: none"> • Website • Profile of Indonesian Deltas • Stewarding the DA Indonesia Wing Programme
Network and collaboration on	<ul style="list-style-type: none"> • Research on Adaptation Strategy for Jakarta and other Indonesian deltas and lowlands • Capacity building for the Jakarta and East Kalimantan provincial government

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