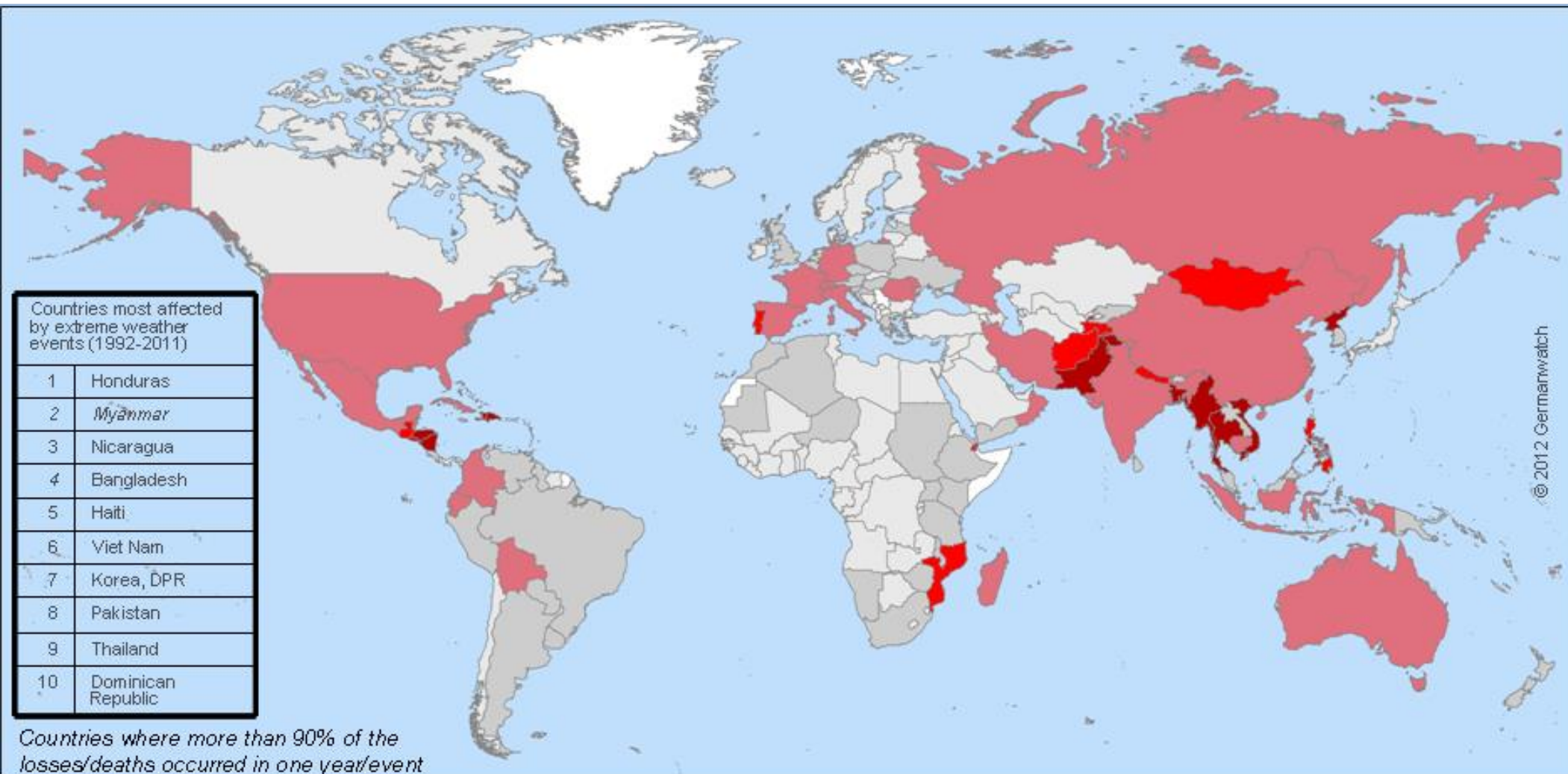


# Climate Change

Seree Supratid (D.Eng.), Assoc. Prof.

Director, Climate Change and Disaster Center, Rangsit U., THAILAND

# ระดับความเสี่ยงจาก CC



Climate Risk Index: Ranking 1992 – 2011

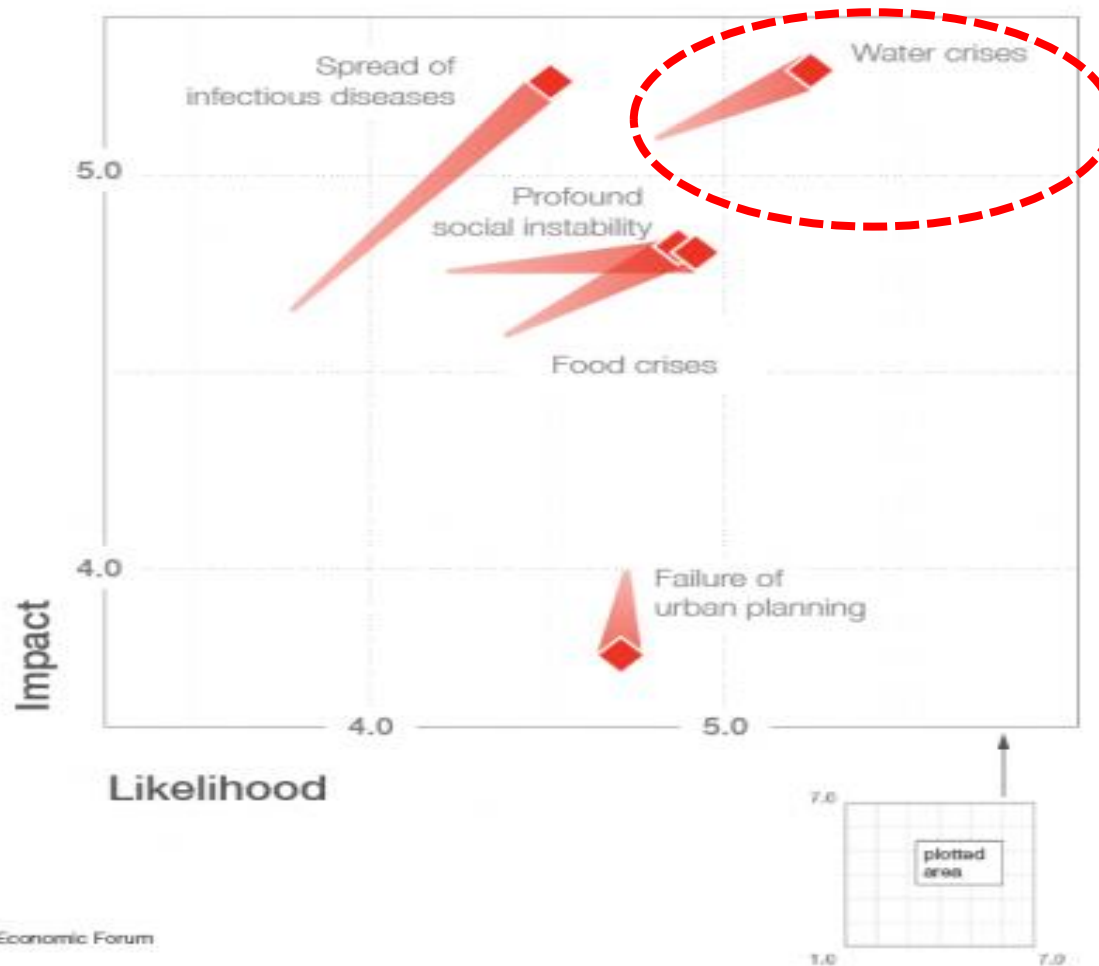


# The Global Risks 2015 Report

## The Changing Global Risks Landscape

### Societal Risks

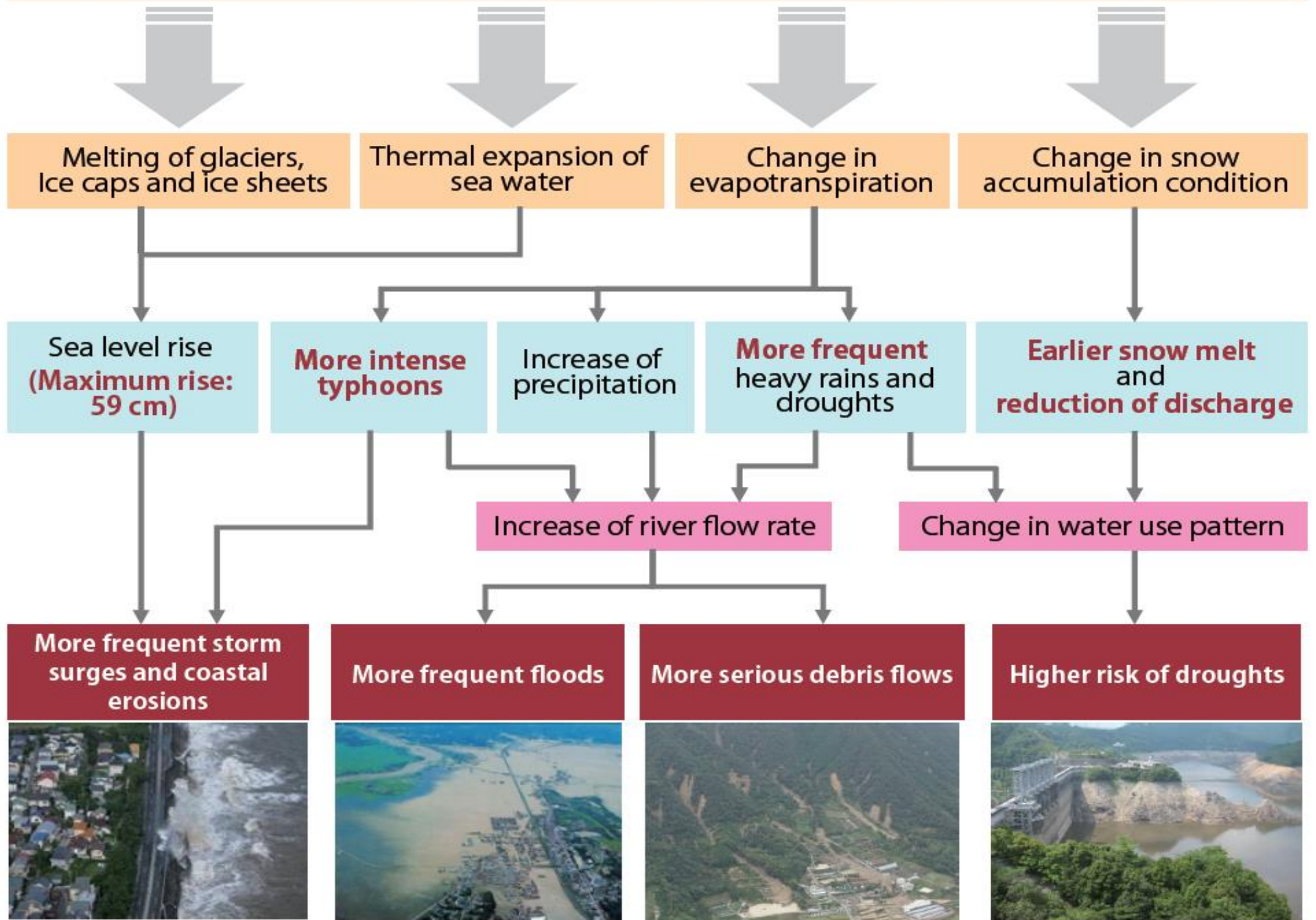
2014  2015



Source: Global Risks 2015 report, World Economic Forum

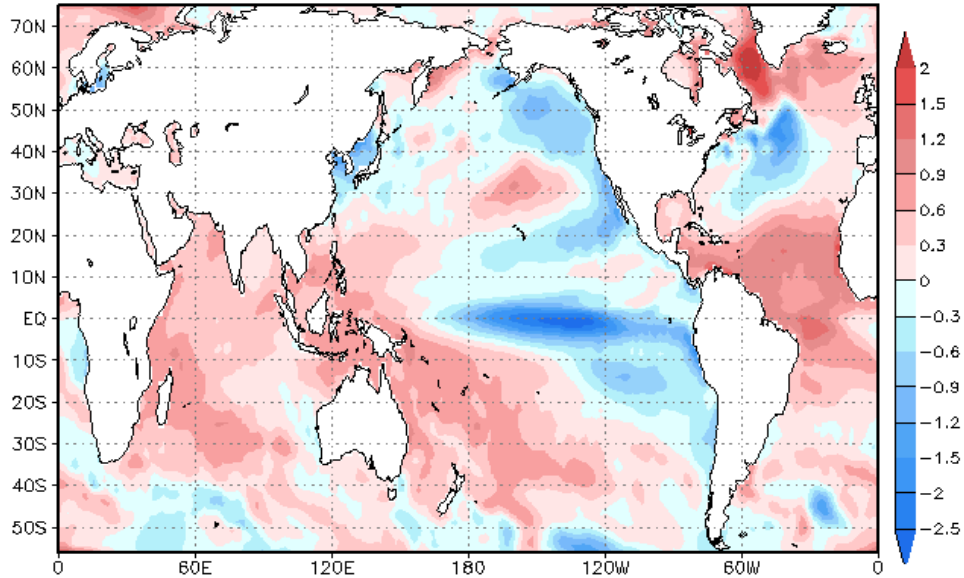
Learn more at <http://wef.ch/grr2015> Get in touch: [GlobalRisksReport@weforum.org](mailto:GlobalRisksReport@weforum.org) or call +41 (0)22 869 1212

Increased heat absorption due to increased greenhouse gas concentration raises temperature and then sea levels.

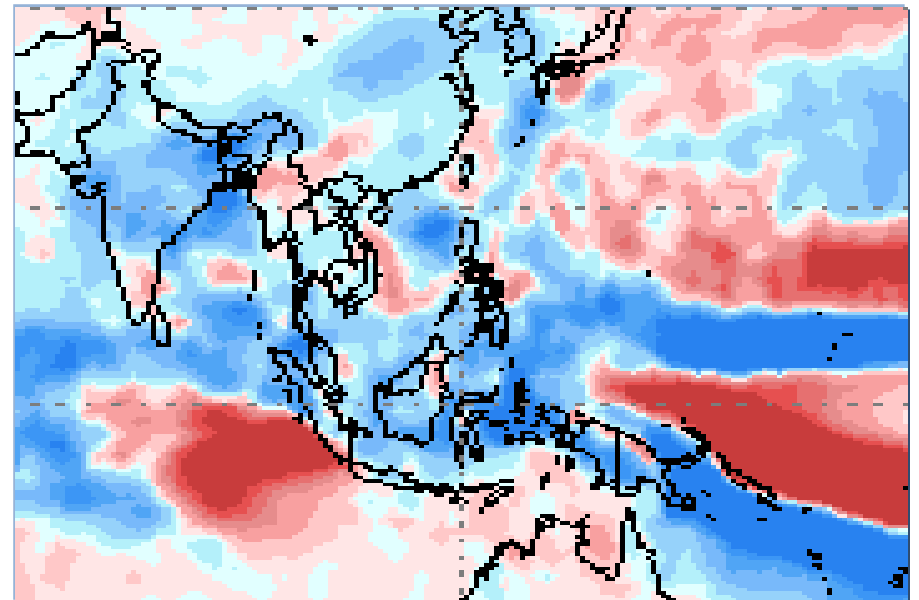
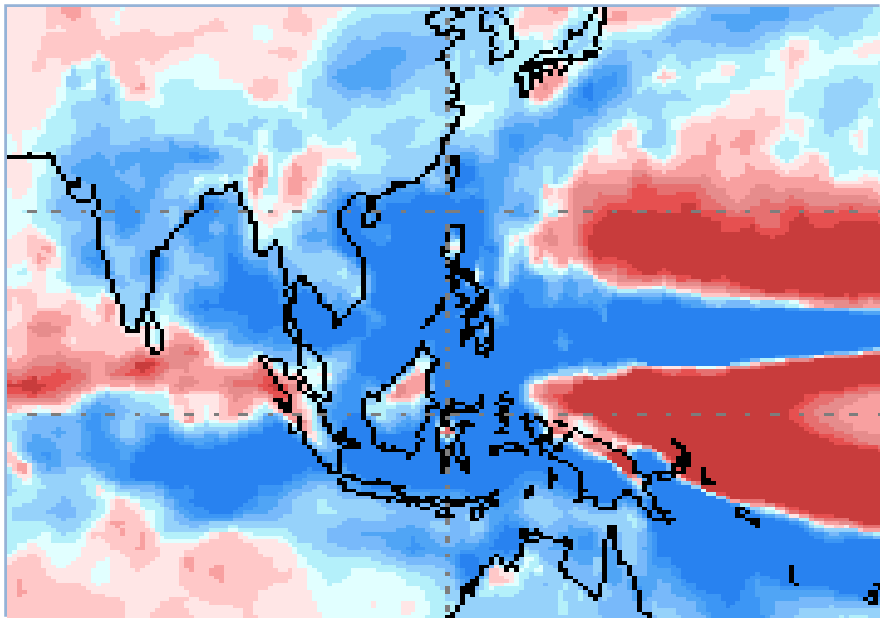
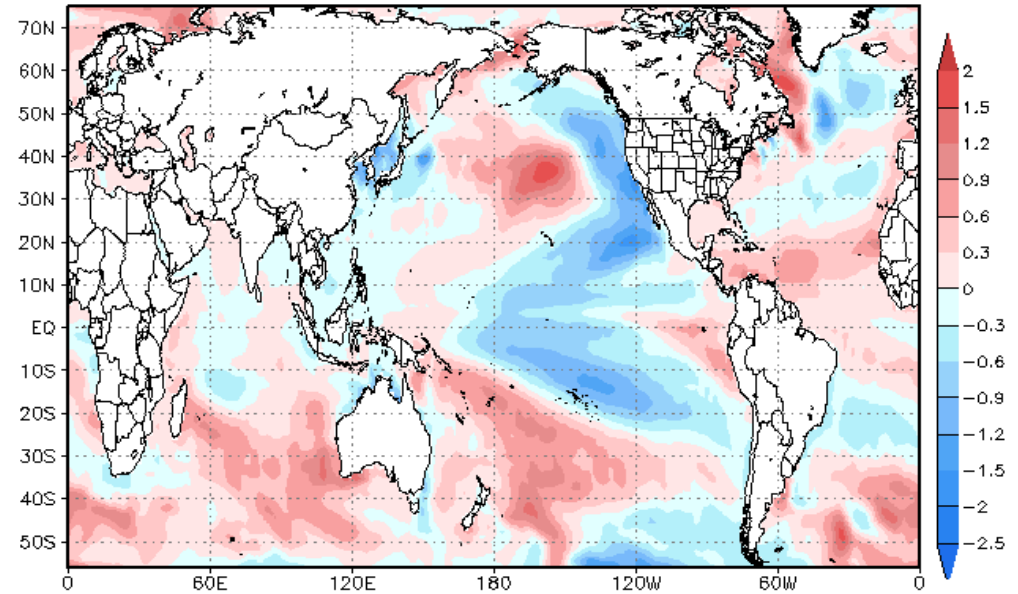


# Seasonal forecasting for wet season 2010, 2011

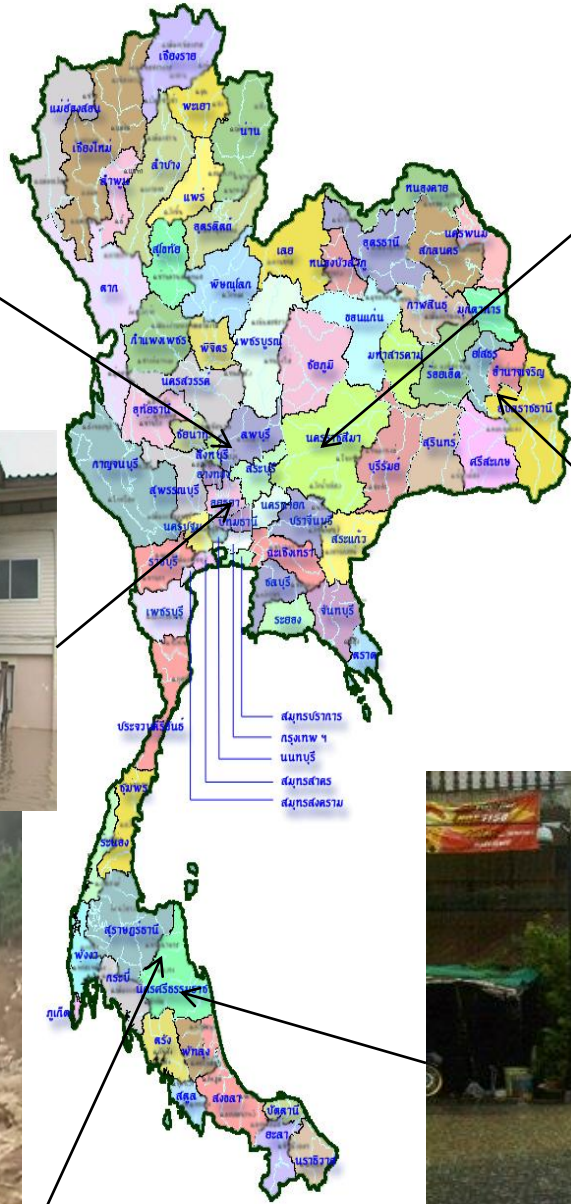
Predicted JJA2010 SST anom. from 1jun2010 (27-member)



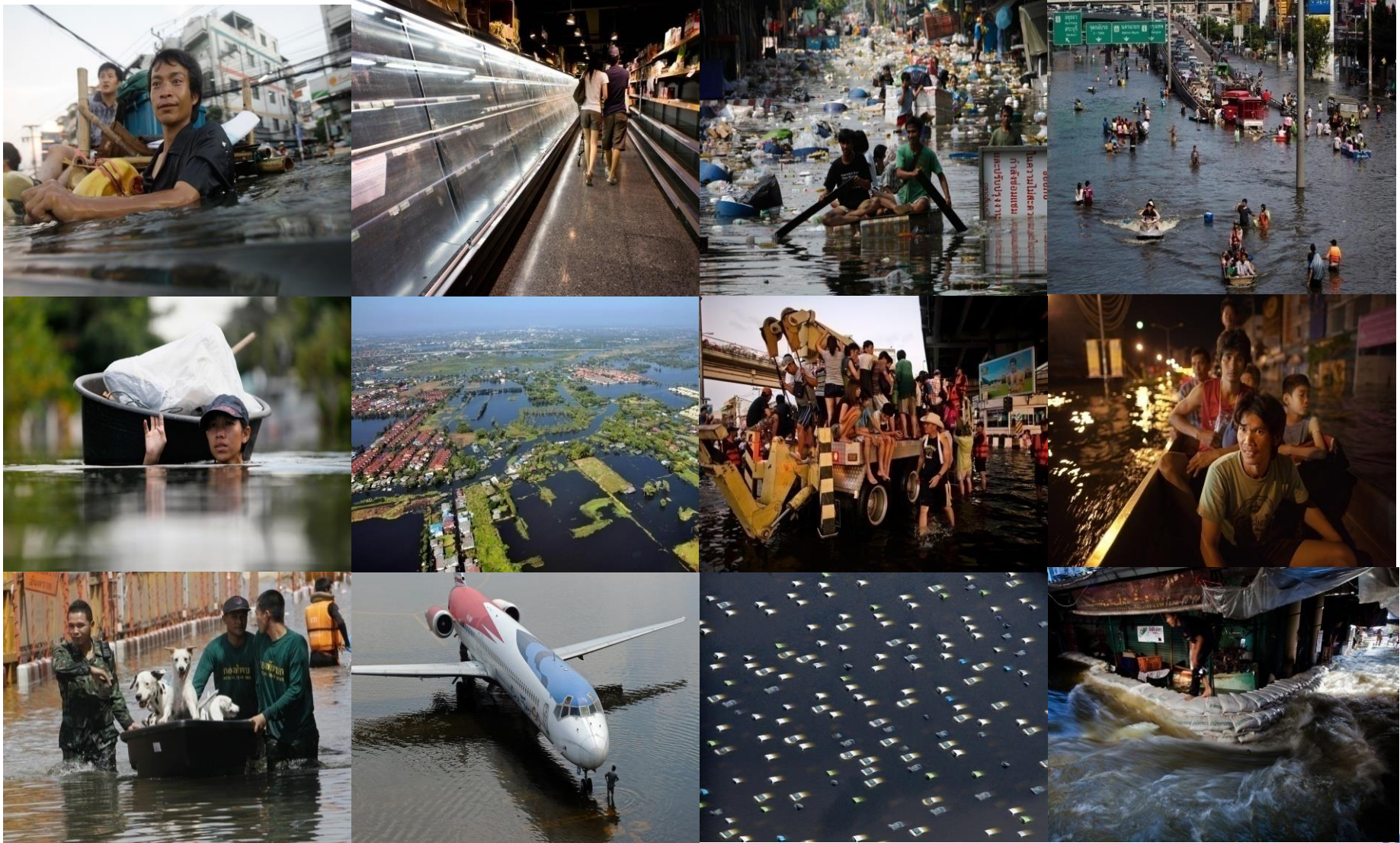
Predicted JJA2011 SST anom. from 1jun2011 (27-member)



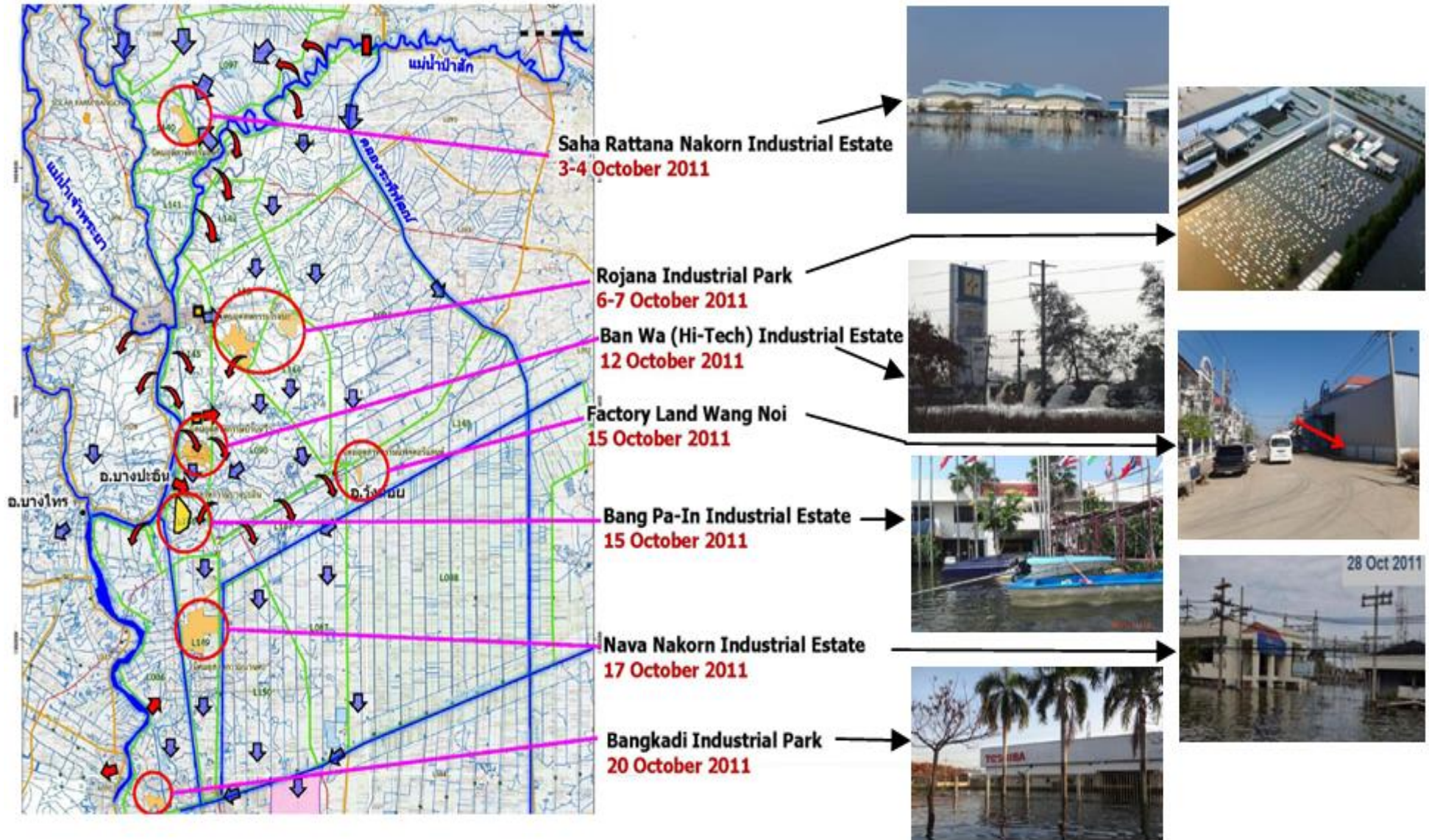
# Severe floods occurred around the country in 2010



# Great flood 2011



# 7 Industrial estates were inundated





# Money is nothing



# Damages and losses for 2011 Flood (World Bank)

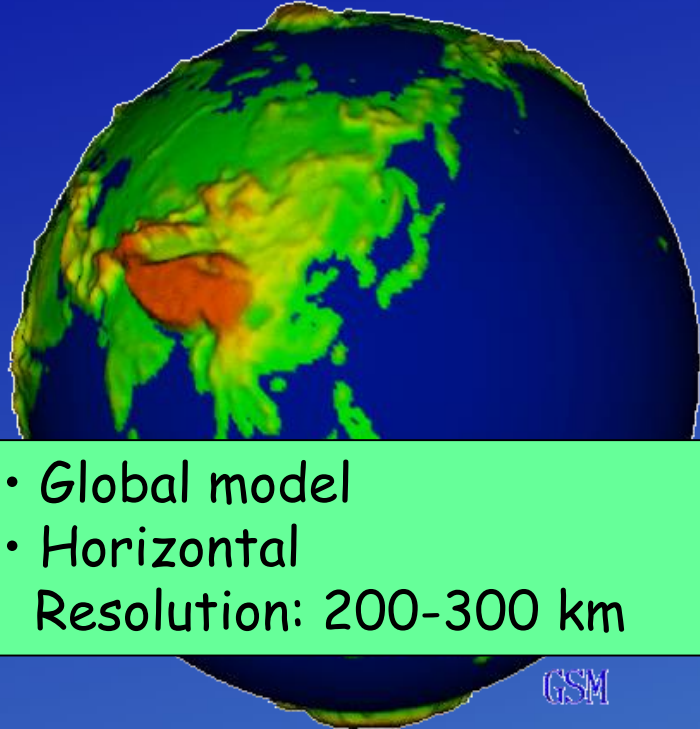
Sub Sector	Disaster Effects			Ownership	
	Damage	Losses	Total	Public	Private
<b>Infrastructure</b>					
Water Resources Management	8,715	-	8,715	8,715	-
Transport	23,538	6,938	30,476	30,326	150
Telecommunication	1,290	2,558	3,848	1,597	2,251
Electricity	3,186	5,716	8,901	5,385	3,517
Water Supply and Sanitation	3,497	1,984	5,481	5,481	-
<b>Productive</b>					
Agriculture, Livestock and Fishery	5,666	34,715	40,381	-	40,381
Manufacturing	513,881	493,258	1,007,139	-	1,007,139
Tourism	5,134	89,673	94,808	403	94,405
Finance & Banking	-	115,276	115,276	74,076	41,200
<b>Social</b>					
Health	1,684	2,133	3,817	1,627	2,190
Education	13,051	1,798	14,849	10,614	4,235
Housing	45,908	37,889	83,797	-	83,797
Cultural Heritage	4,429	3,076	7,505	3,041	4,463
<b>Cross Cutting</b>					
Enironment	375	176	551	212	339
<b>TOTAL</b>	<b>630,354</b>	<b>795,191</b>	<b>1,425,544</b>	<b>141,477</b>	<b>1,284,066</b>

# บทเรียน 5 ย. มหาอุทกภัย 2554

- อย่าบอกกว่า “ไม่ต้องห่วง เอาอยู่”
- อย่าให้ชาวอีสาน ปนข่าวลือ
- อย่าบอกเราตอนเขามาแล้ว
- อย่าเตะตัดขาตนเอง
- อย่าชี้ข้างจับตักแตน

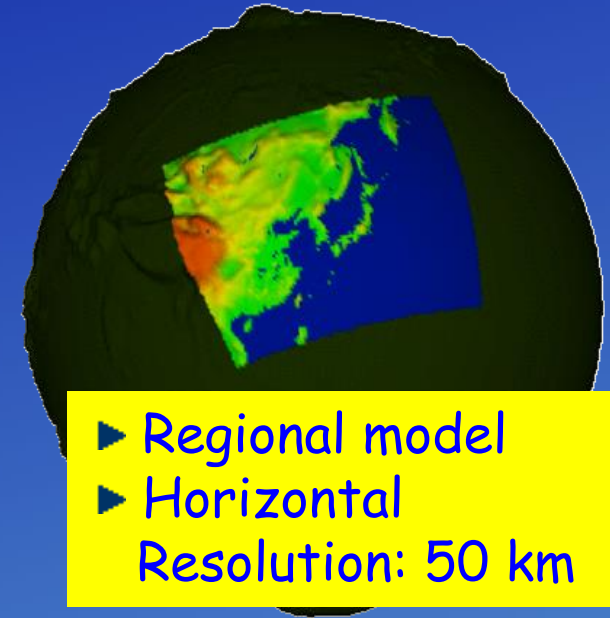
[www.bbbery.net](http://www.bbbery.net)

# Downscaling

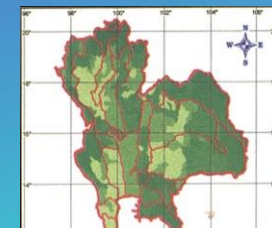


- Global model
- Horizontal Resolution: 200-300 km

GSM



- ▶ Regional model
- ▶ Horizontal Resolution: 50 km

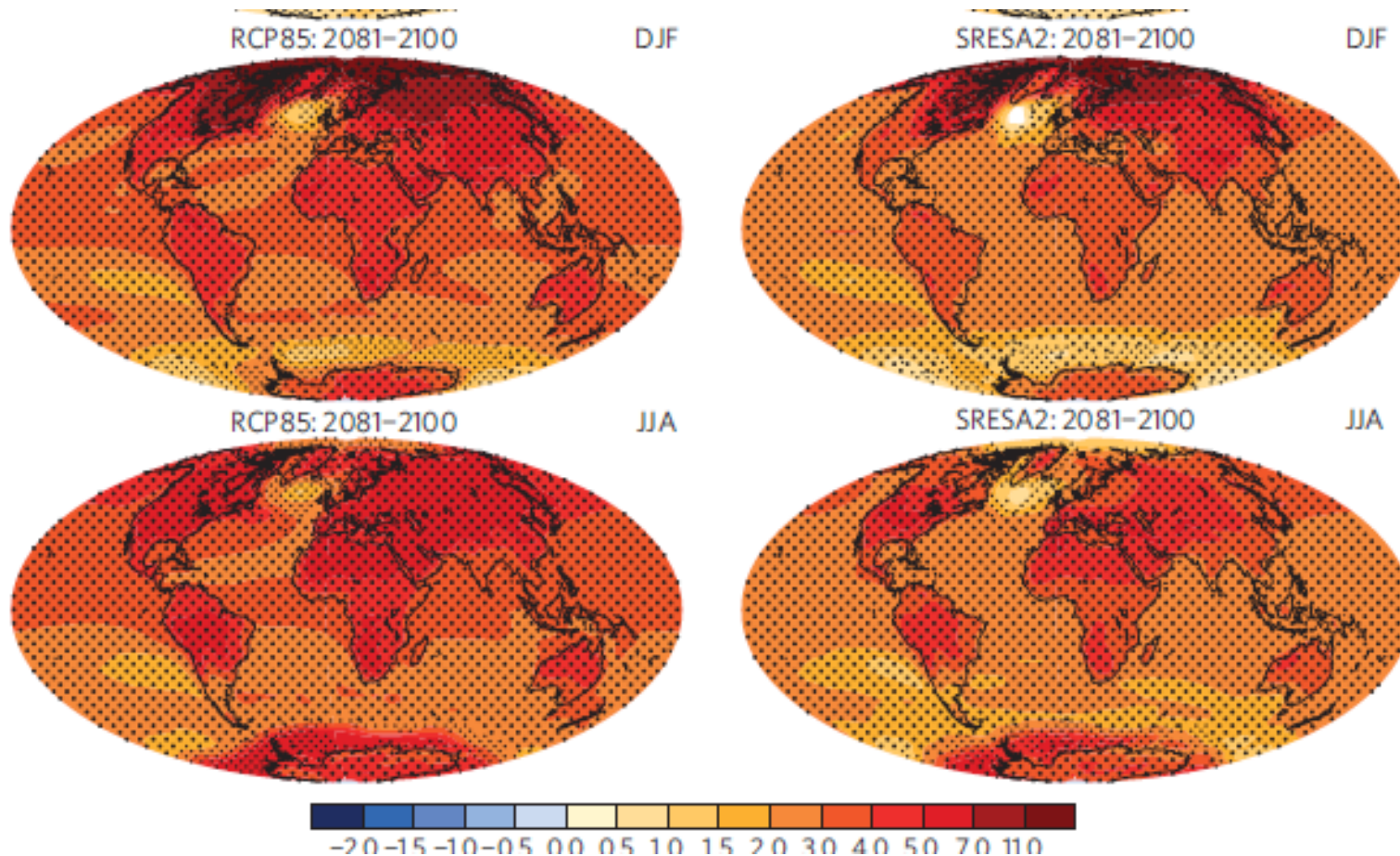


- ▶ Mesoscale model
- ▶ Horizontal Resolution: 2.5-10 km



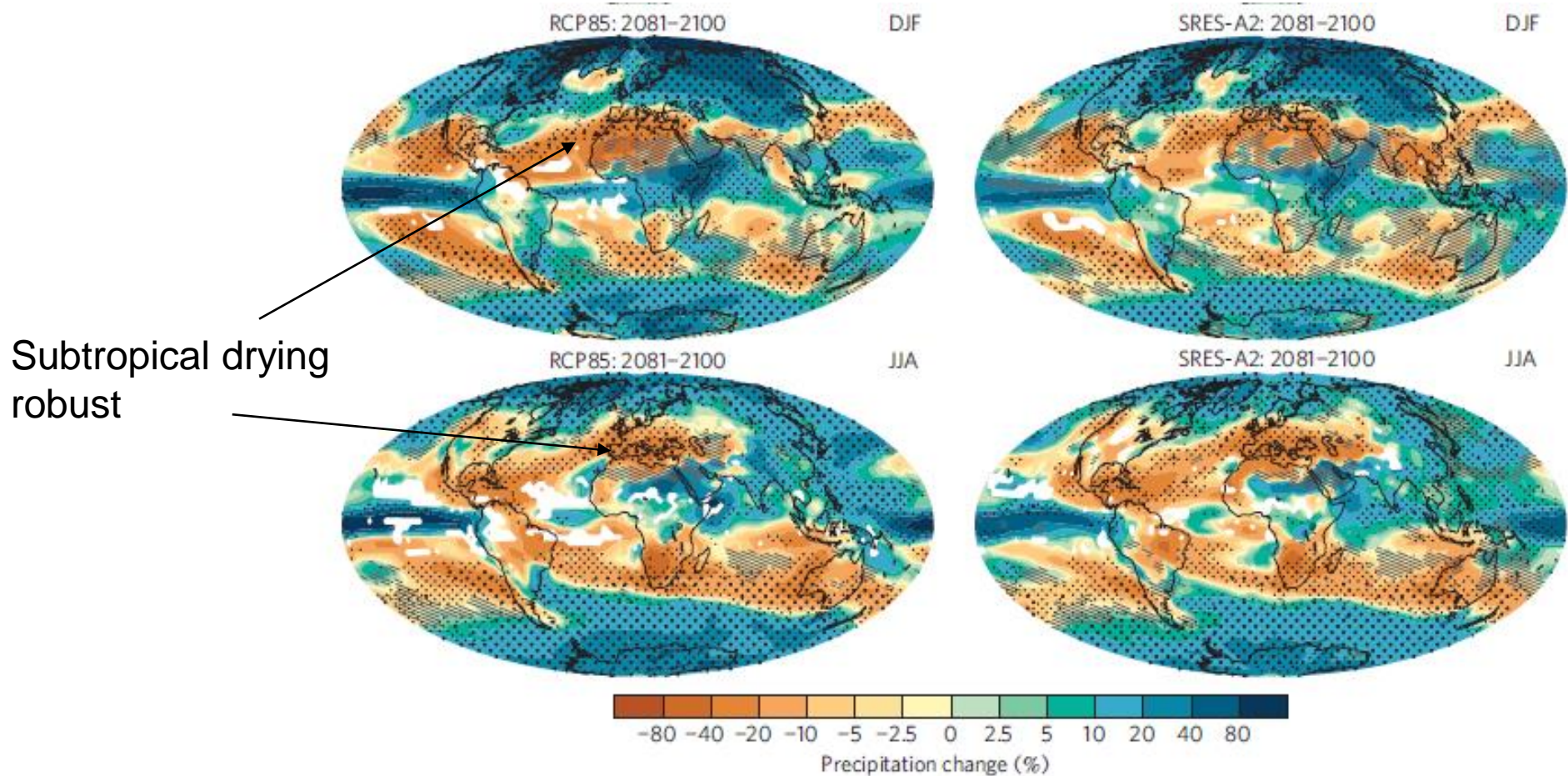
- ▶ Local model
- ▶ Horizontal Resolution: 20-200 m

**How does CMIP5 projections compare with CMIP3?  
Global Surface Temperature change distribution by 2081-2100  
minus 1981-2000 (Knutti et al. 2008)**



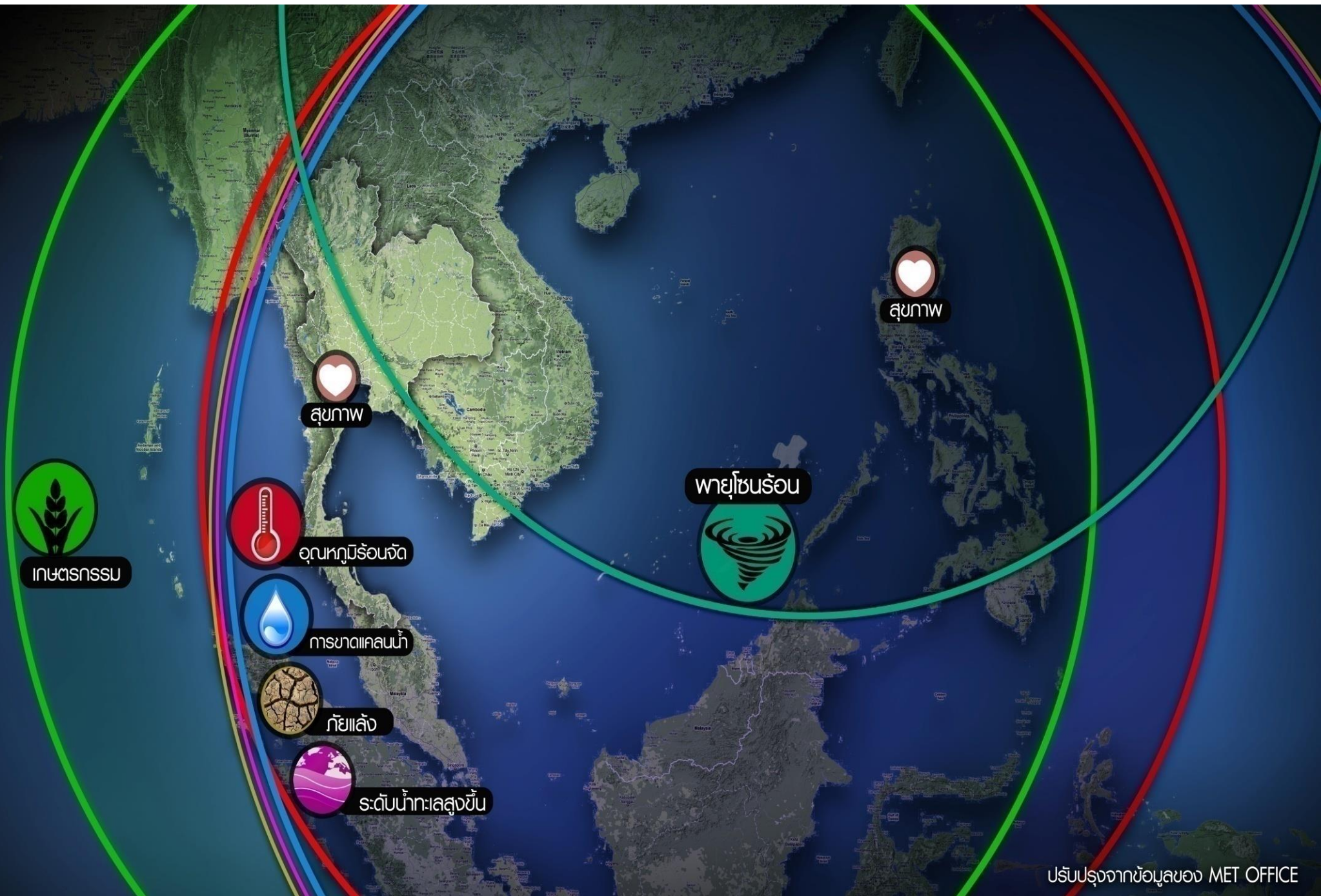
**Global warming is a robust projection also regionally**

# How does CMIP5 projections compare with CMIP3? Global precipitation change distribution by 2081-2100 minus 1981-2000 (Knutti et al. 2008)



**Precipitation changes are less robust regionally**

# ประเทศไทยกำลังเปื่อย

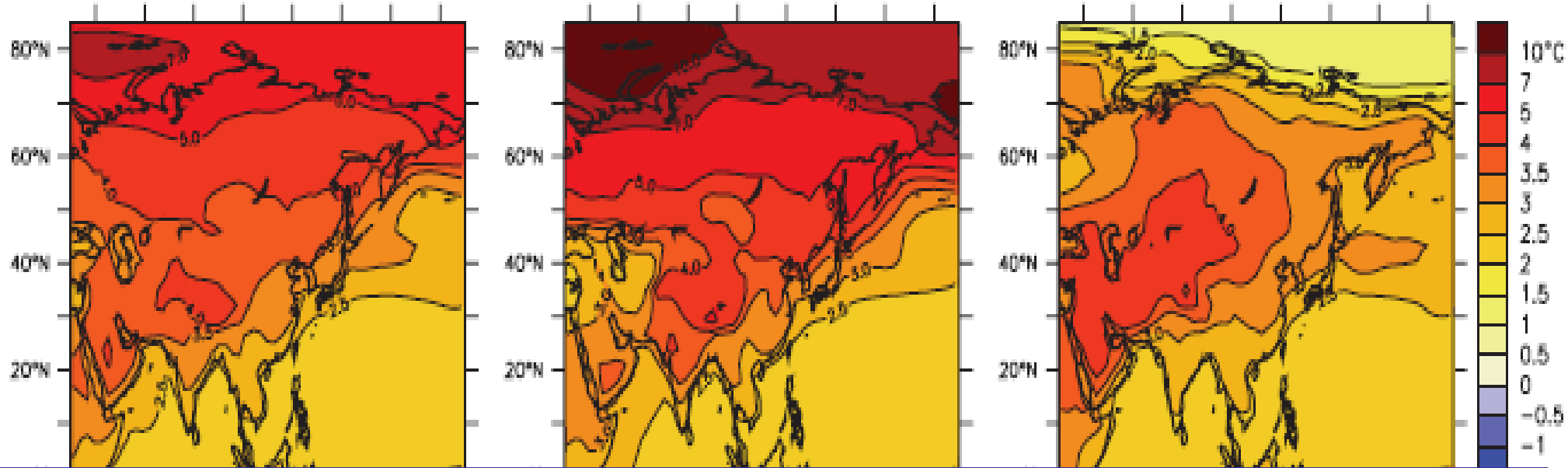


Annual

DJF

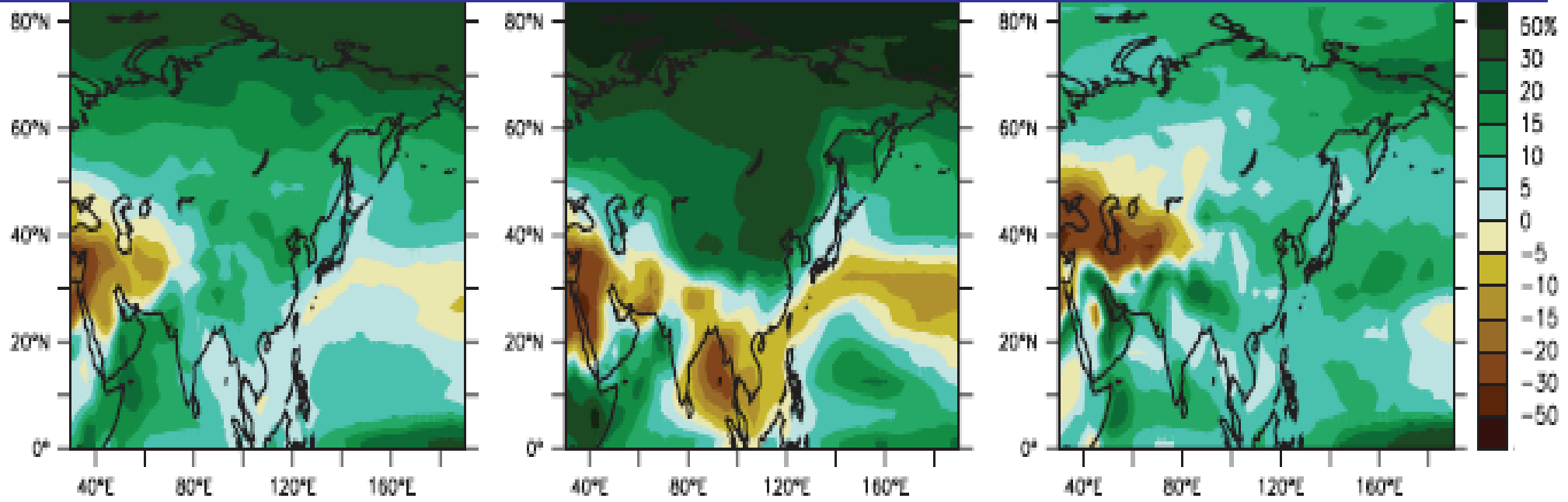
JJA

Temp Response (°C)



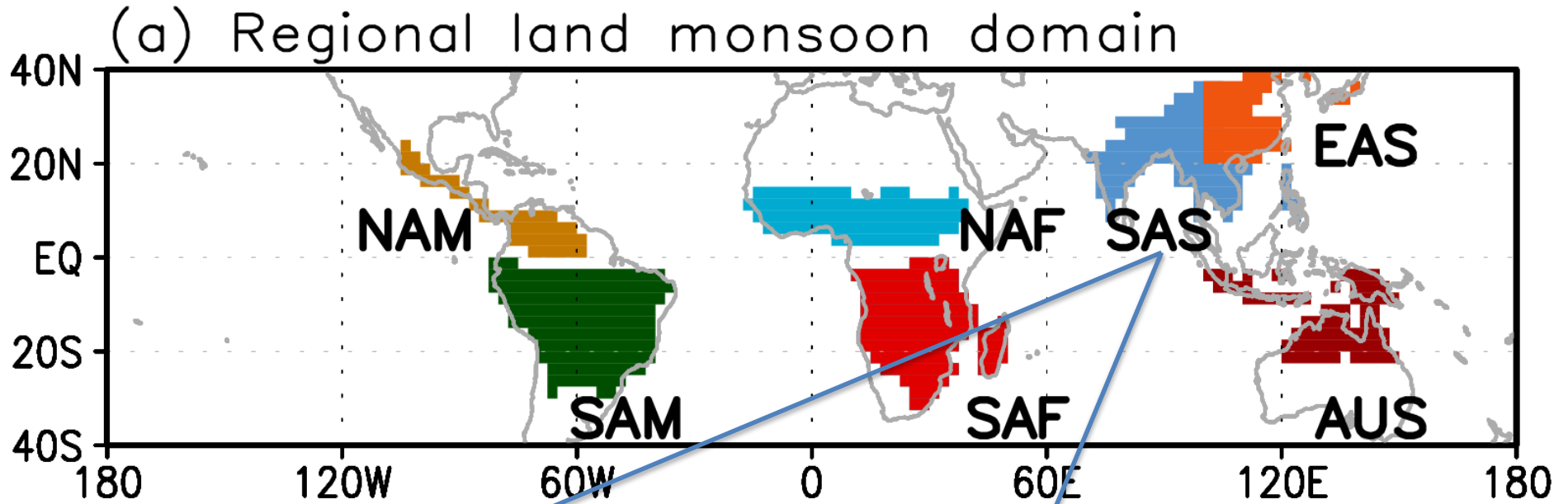
# Impact from climate change ?

Prec Response (%)





# Precipitation change (Kitoh, 2013)

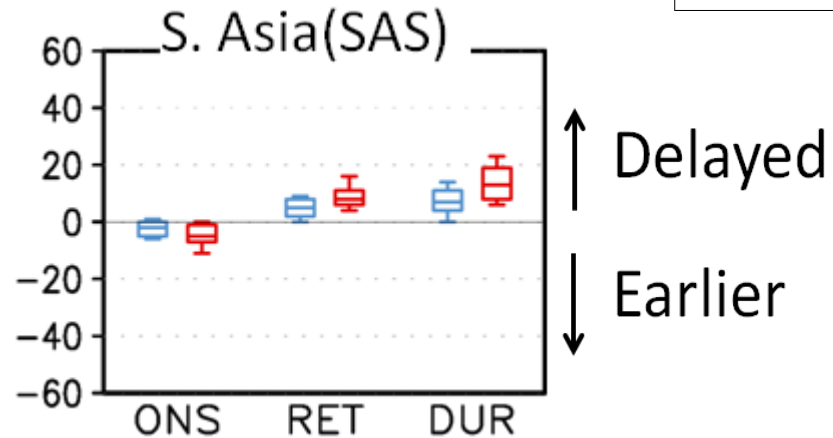
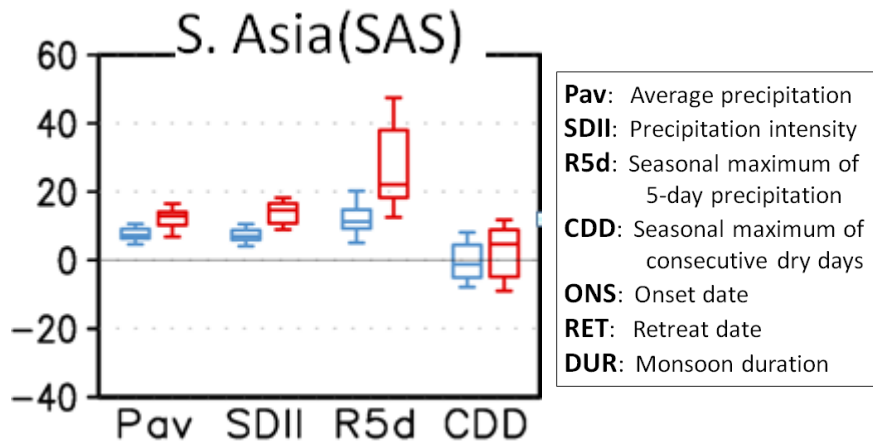


RCP4.5 RCP8.5

ONS: Onset date  
RET: Retreat date  
DUR: Monsoon duration

SAS : Extreme indice

SAS : Seasonal Monsoon



# CMIP3 & CMIP5 models selection

CMIP3	Resolution	CMIP5	Resolution	Center
CNRM-CM3	128 x 64	CNRM-CM5	256 x 128	Centre National de Recherches Meteorologiques, France
CSIRO-Mk3.0	192 x 96	CSIRO-Mk3.6	192 x 96	CSIRO, Australia
GFDL-CM2.0	144 x 90	GFDL-CM3	144 x 90	Geophysical Fluid Dynamics Laboratory, NOAA
GFDL-CM2.1	144 x 90	GFDL-ESM2M	144 x 90	Geophysical Fluid Dynamics Laboratory, NOAA
GISS-ER	144 x 90	GISS-E2-H	144 x 90	Goddard Institute for Space Studies, USA
INM-CM3.0	180 x 120	INM-CM4	180 x 120	Institute of Numerical Mathematics, Russia
IPSL-CM4	96 x 96	IPSL-CM5A-LR	96 x 96	Institut Pierre Simon Laplace, France
MIROC3.2 (medres)	320 x 160	MIROC5	256 x 128	CCSR/NIES/FRCGC, Japan
ECHAM5/MPI-OM	192 x 96	MPI-ESM-MR	192 x 96	Max plank institute for meteorology, Germany
MRI-CGCM2.3.2	128 x 64	MRI-CGCM3	320 x 160	Meteorological Research Institute, Japan

## Climate models

CMIP5 (Historical, RCP4.5, RCP8.5)

CMIP3 (Historical, B1, A2)

Season : All year

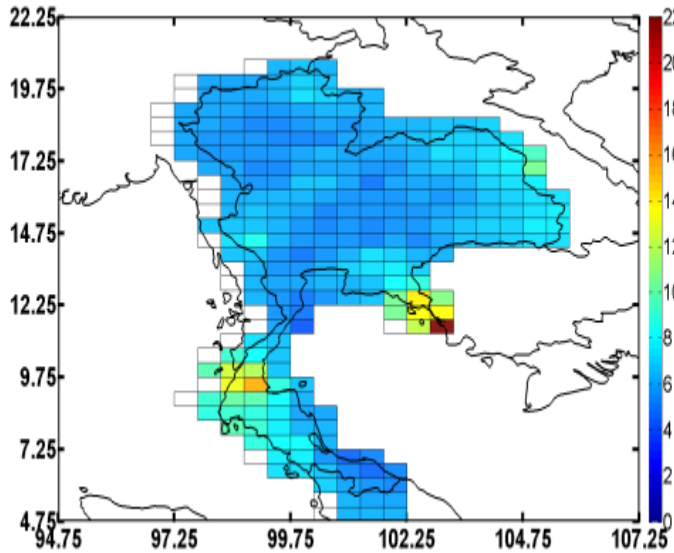
## Obs.

Current Climatology : TMD at Bangkok (1980-1999)

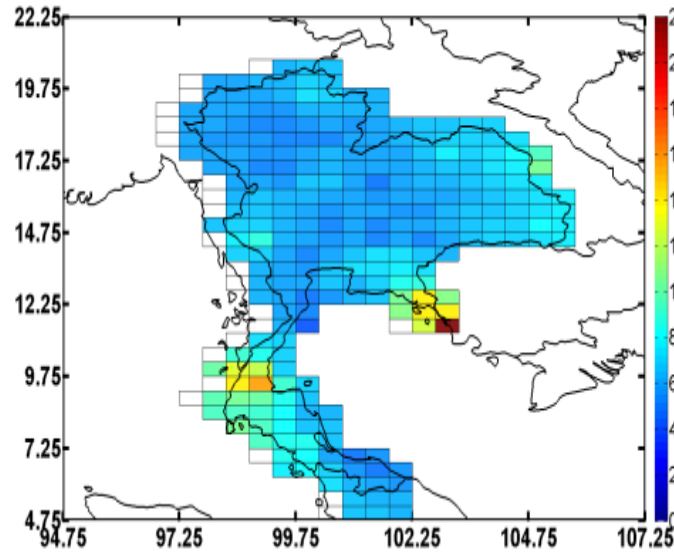
Future projection : 2010-2039, 2040-2069; 2070-2099

# CMIP3-CMIP5 downscaling for Thailand

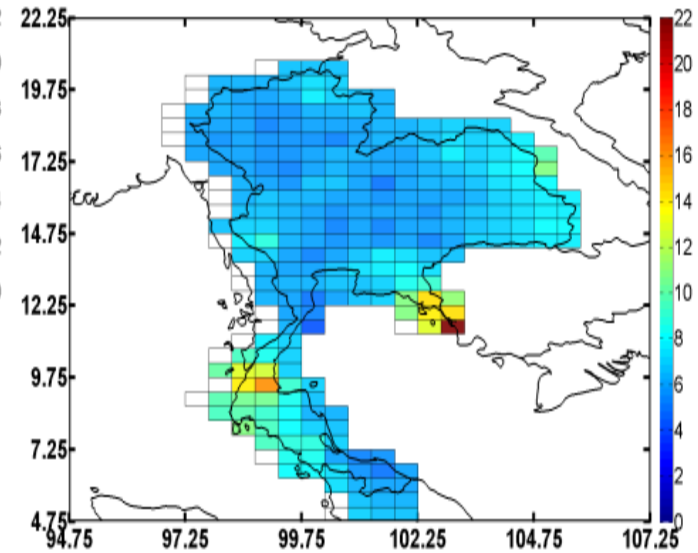
MME CMIP3 MJJASO 2010-2039 DM



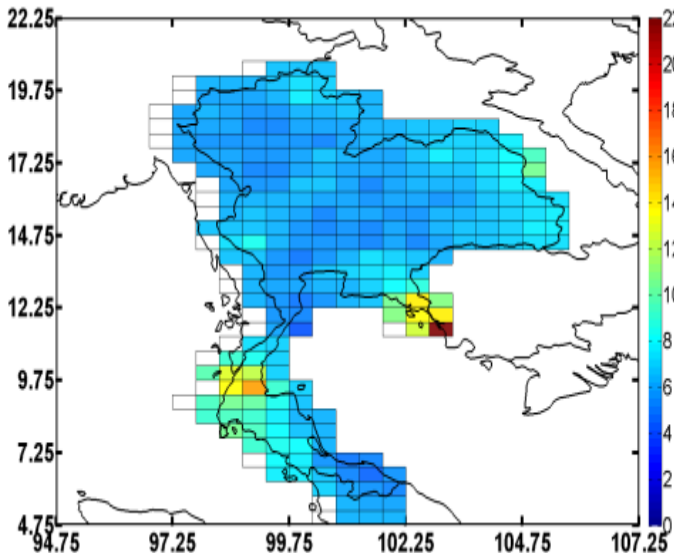
MME CMIP3 MJJASO 2040-2069 DM



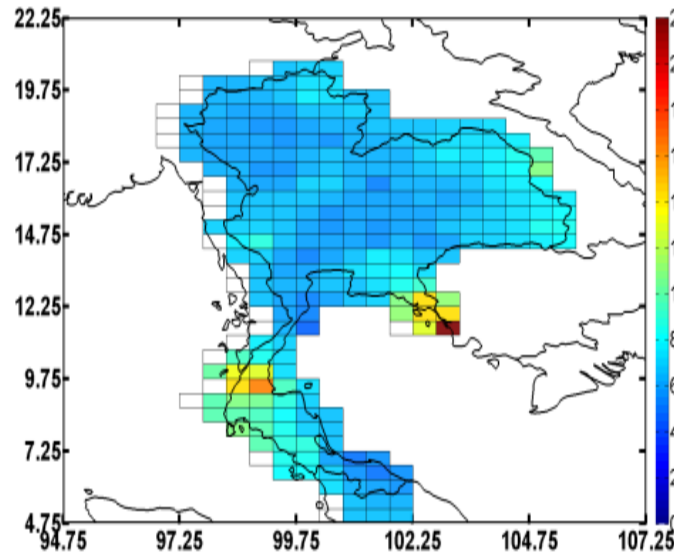
MME CMIP3 MJJASO 2070-2099 DM



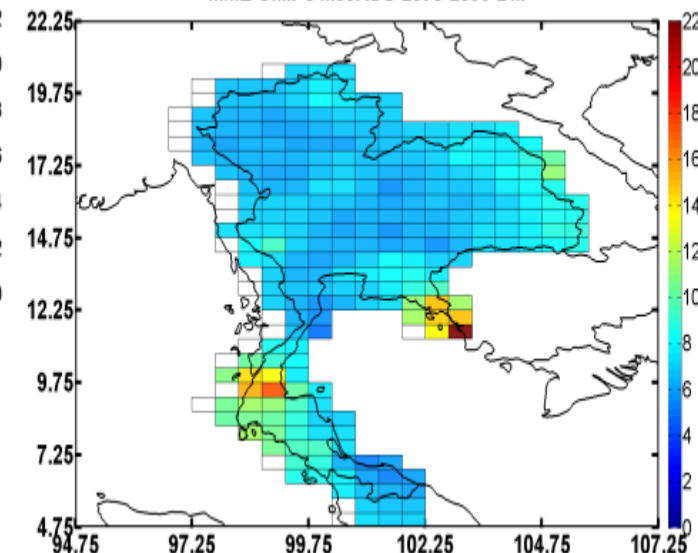
MME CMIP5 MJJASO 2010-2039 DM



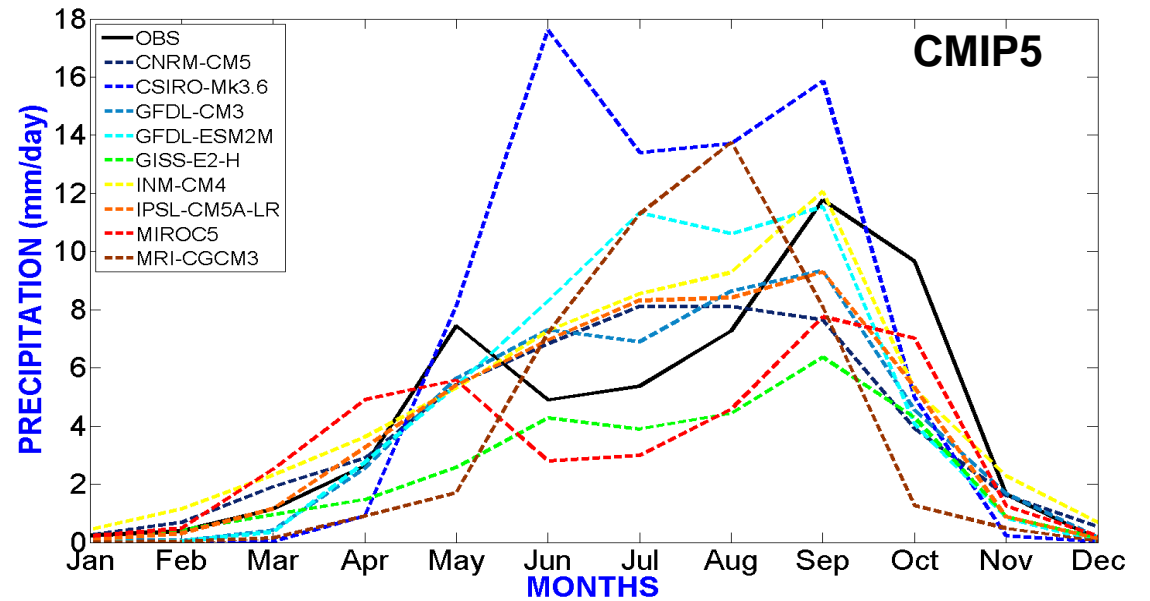
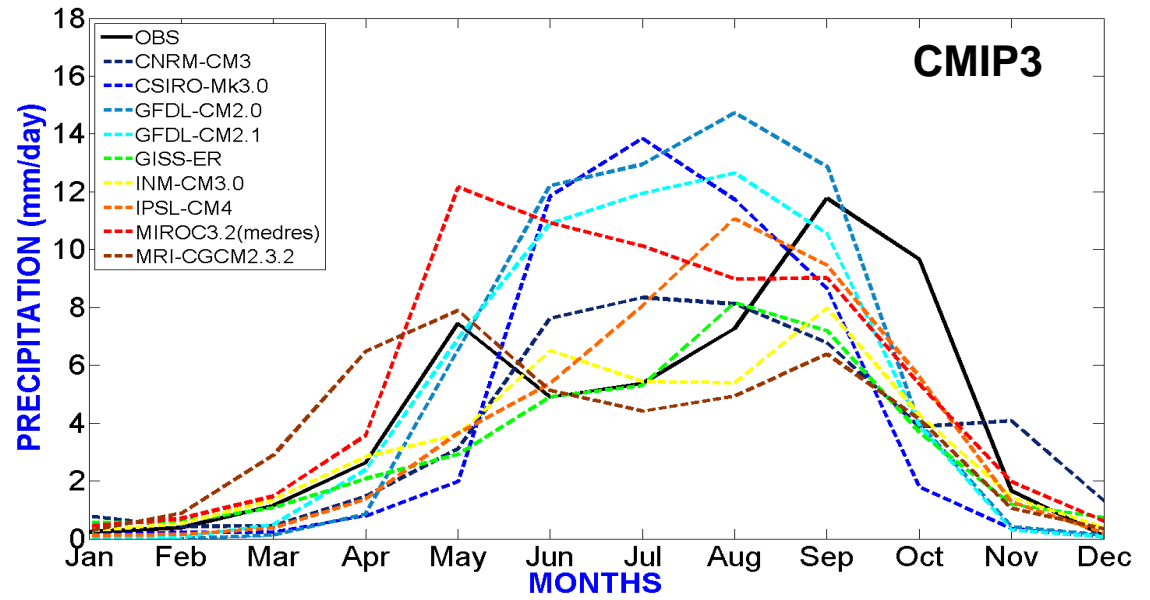
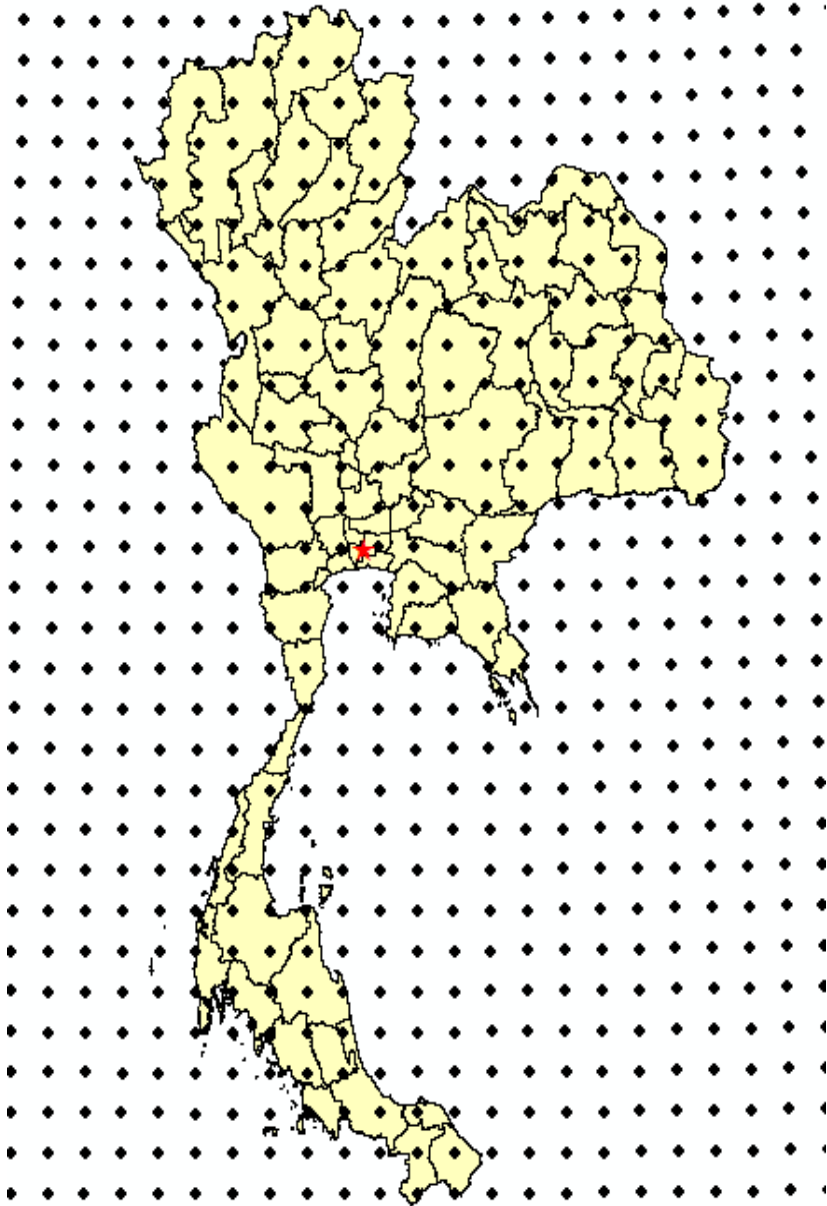
MME CMIP5 MJJASO 2040-2069 DM



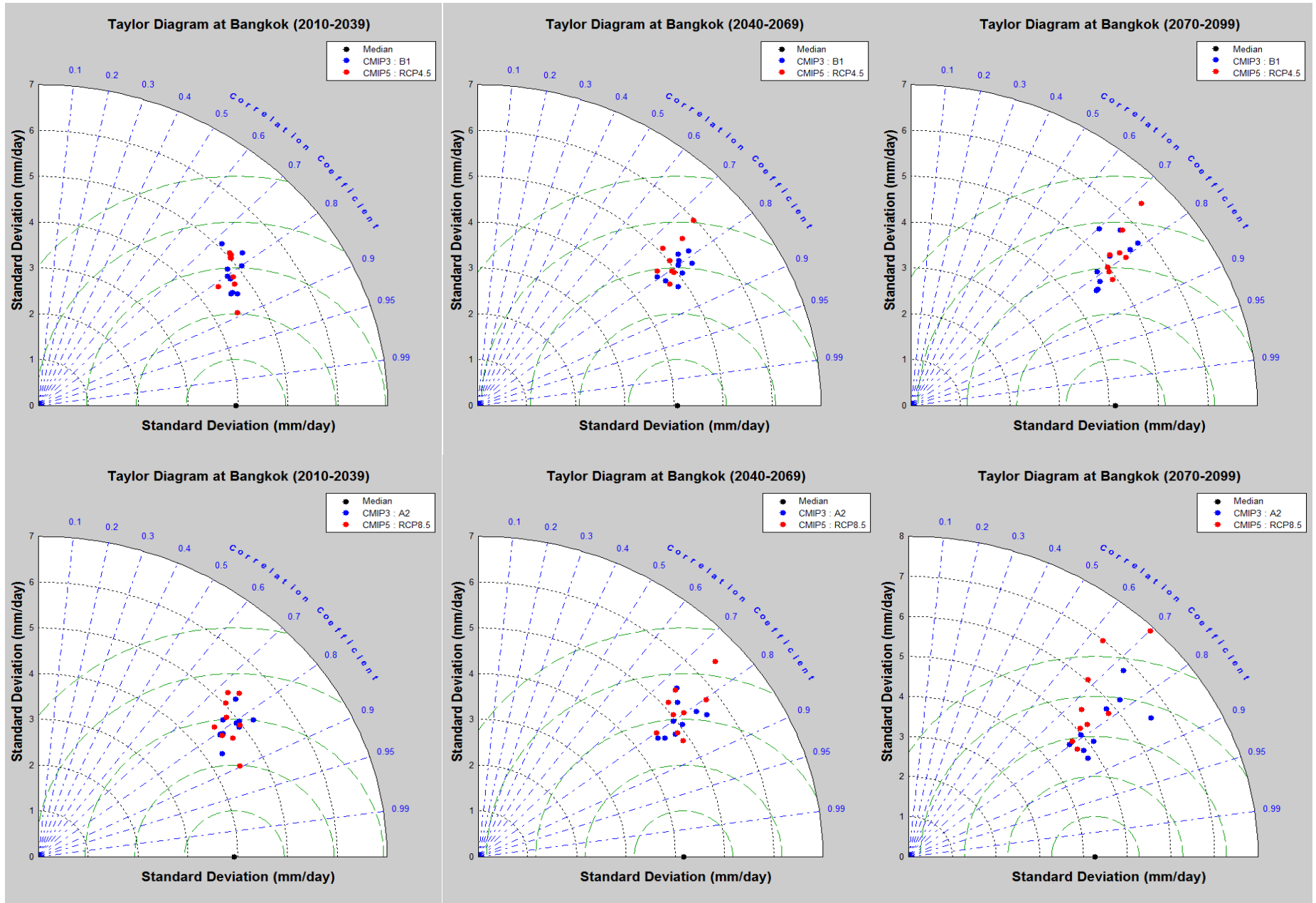
MME CMIP5 MJJASO 2070-2099 DM



# CMIP3-CMIP5 downscaling to 0.5° x 0.5°



# Taylor diagram CMIP3 vs. CMIP5 (2010-2099)



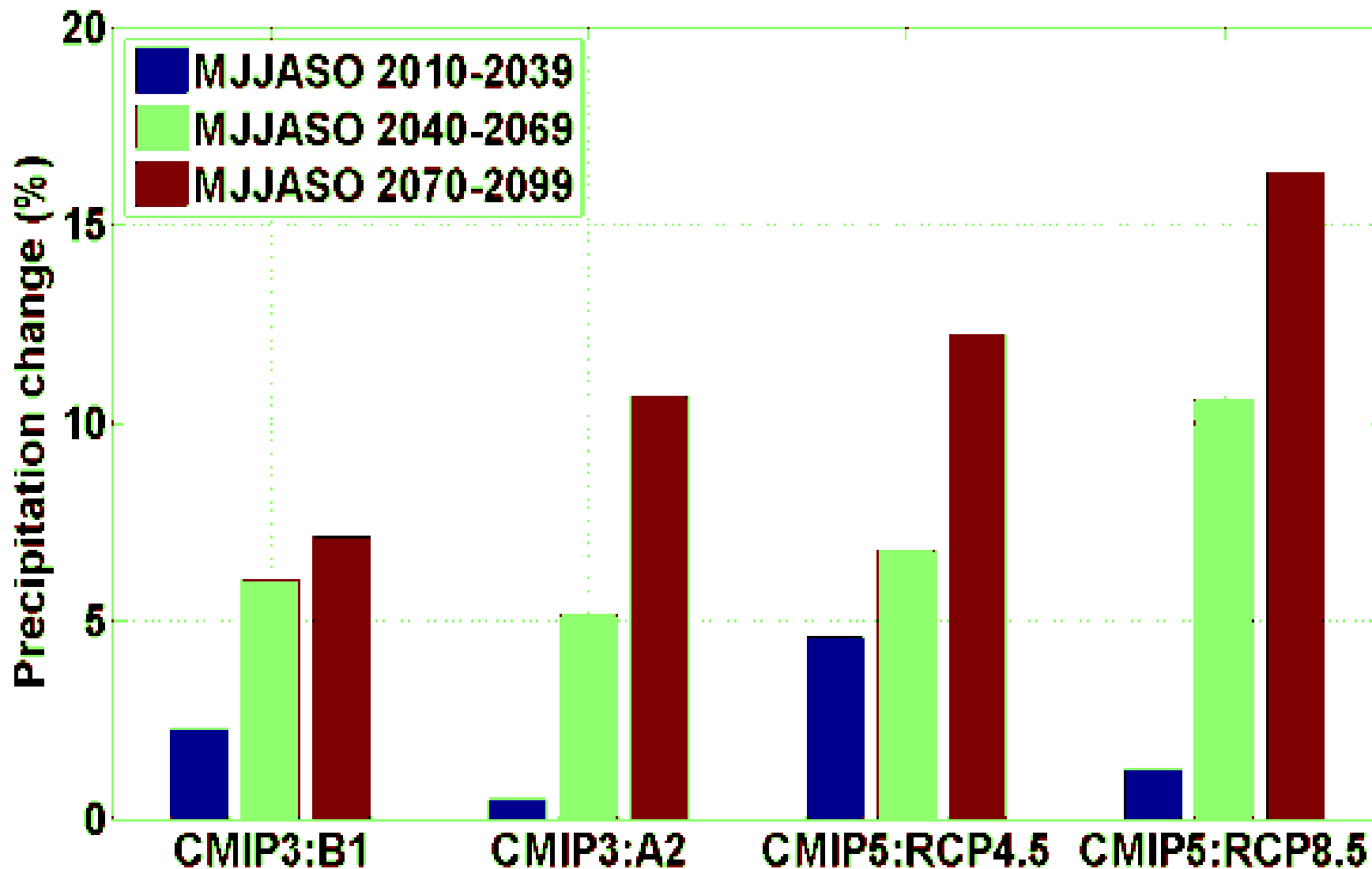
(2010-2039)

(2040-2069)

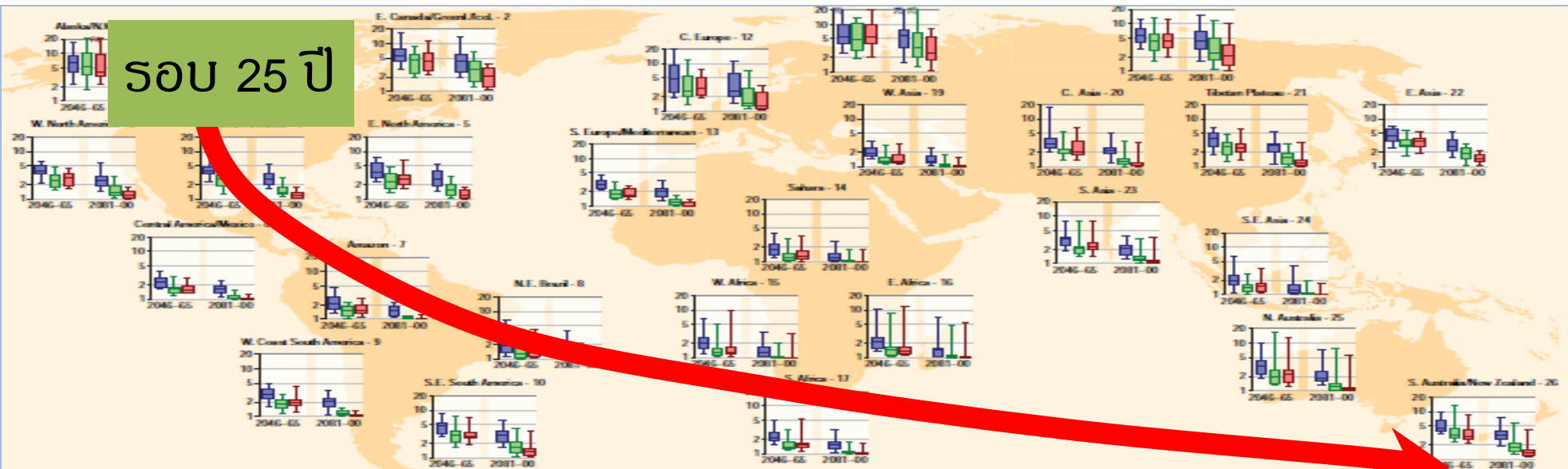
(2070-2099)

# CMIP3-CMIP5 MME (2010-2099)

## DELTA CHANGE FACTOR FOR FUTURE PRECIPITATION AT BANGKOK

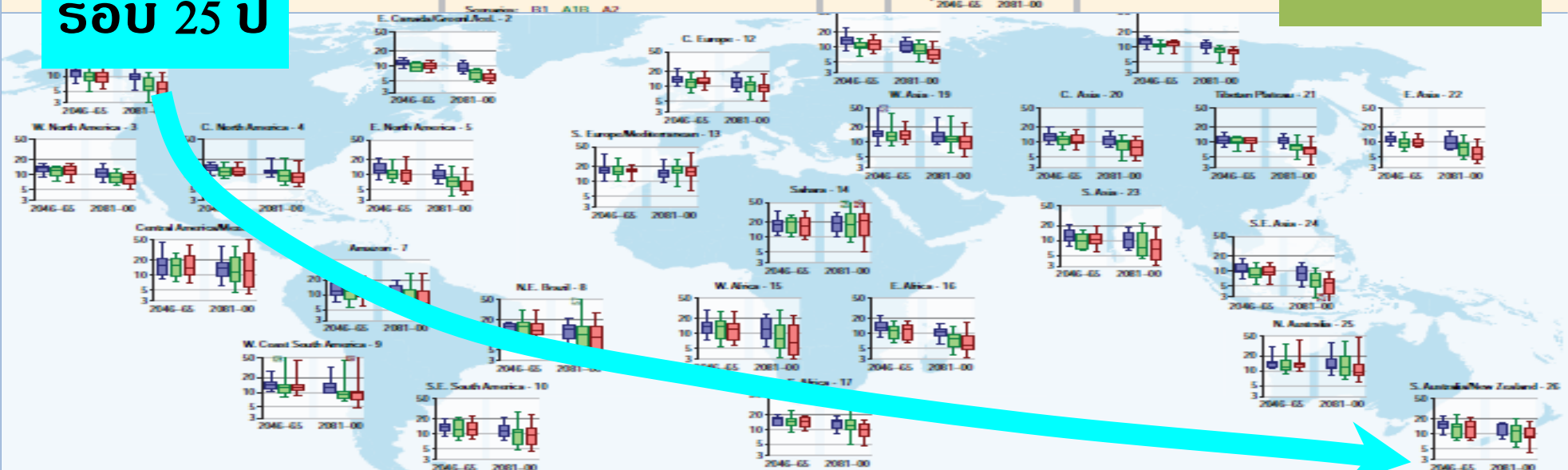


รอบ 25 ปี



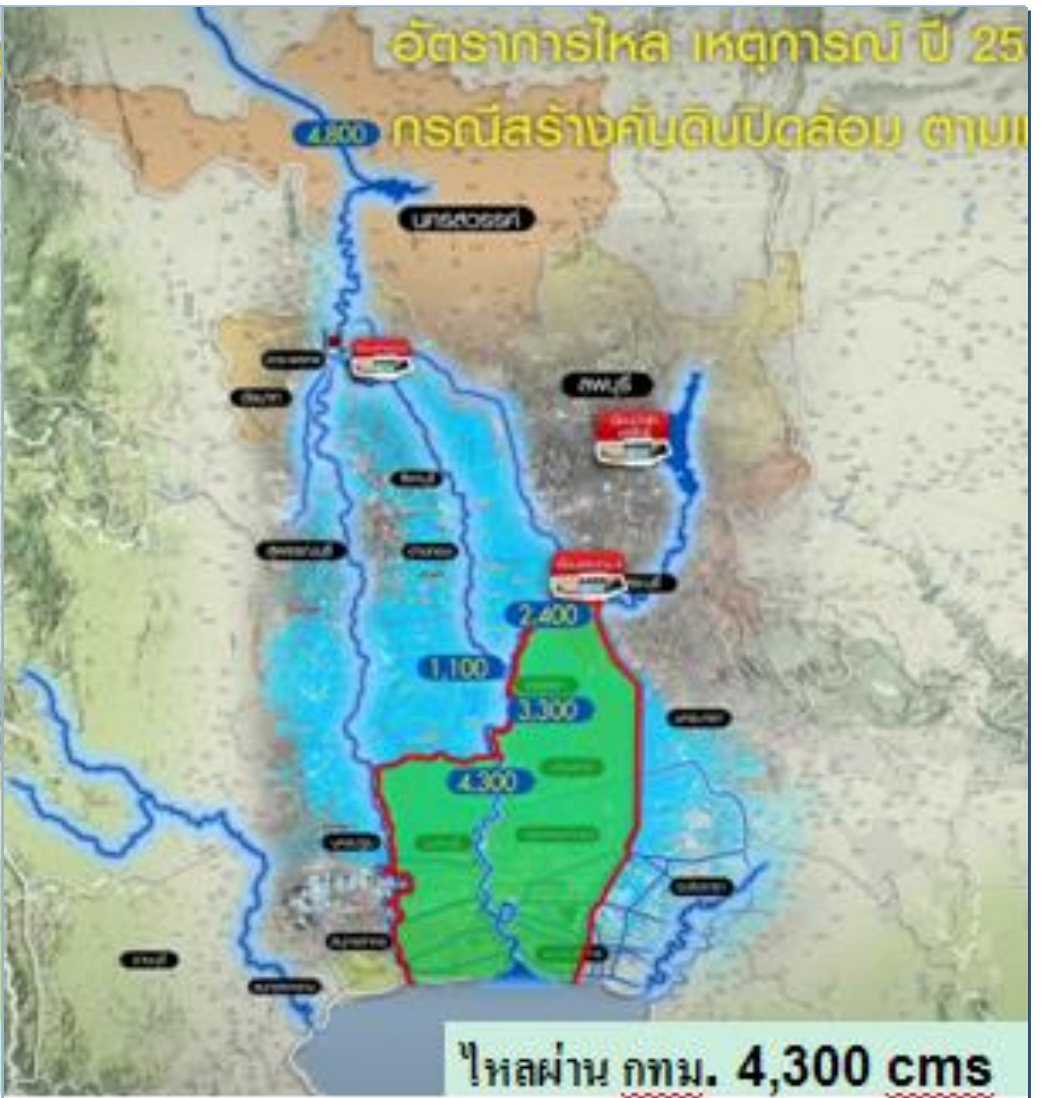
รอบ 2-5 ปี

รอบ 25 ปี



รอบ 2-5 ปี

# สภาพน้ำท่วม 2554



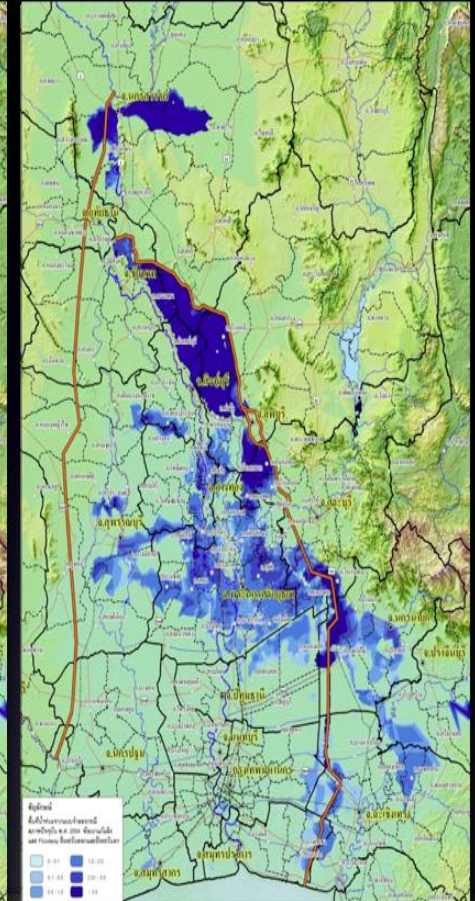
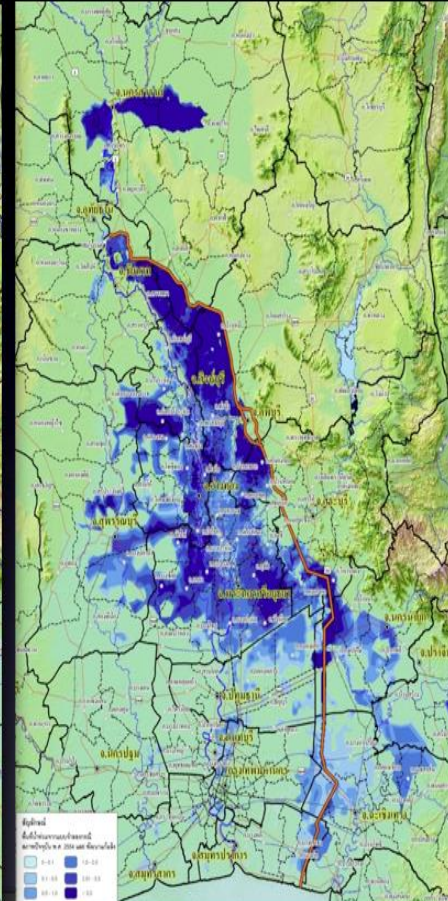
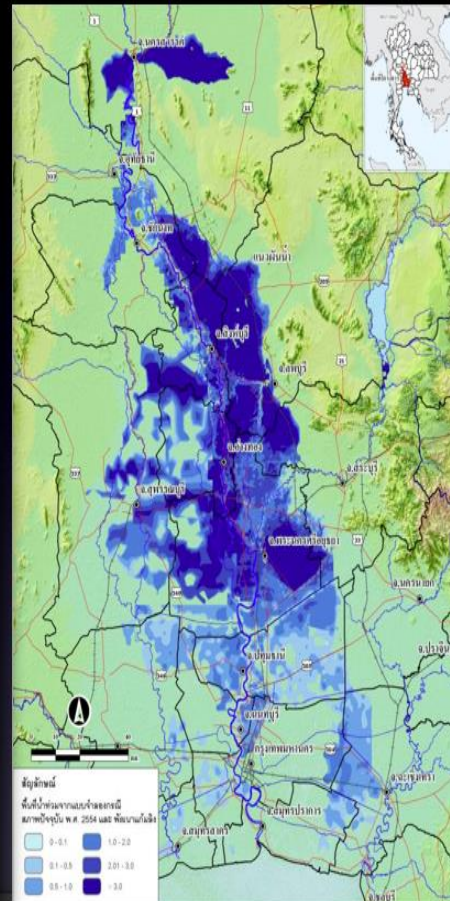
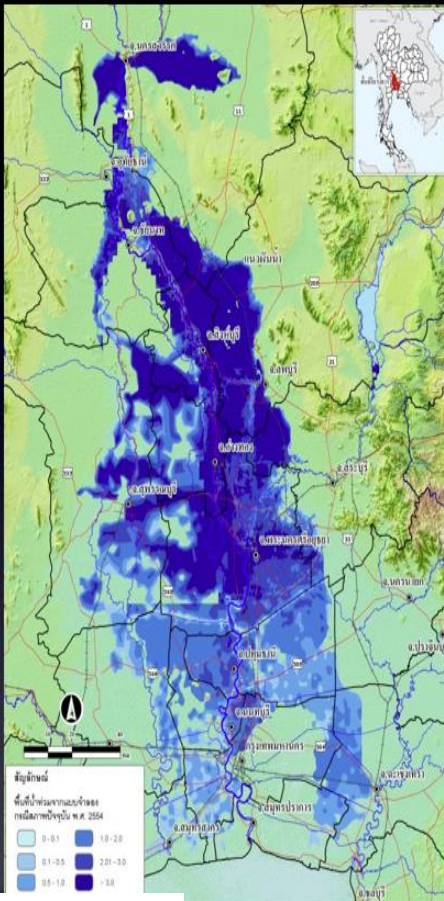


# Case 1)

# Case 2)

# Case 3)

# Case 4)



**Inundation Area (mil.Rai)**  
1 Rai = 1,600 km<sup>2</sup>

**8.8**

**7.2**

**5.7**

**4.2**

**-18%**

**-35%**

**-52%**

**Immediate plan**

**Long-term plan**

# Thailand great flood 2011 : Key findings

High vulnerable and exposure are the outcome of “Skewed development”  
Environmental mismanagement, Rapid unplanned urbanisation, Demographic change, Failed governance, Scarcity of livelihood



2006



2010

Sustainable ?

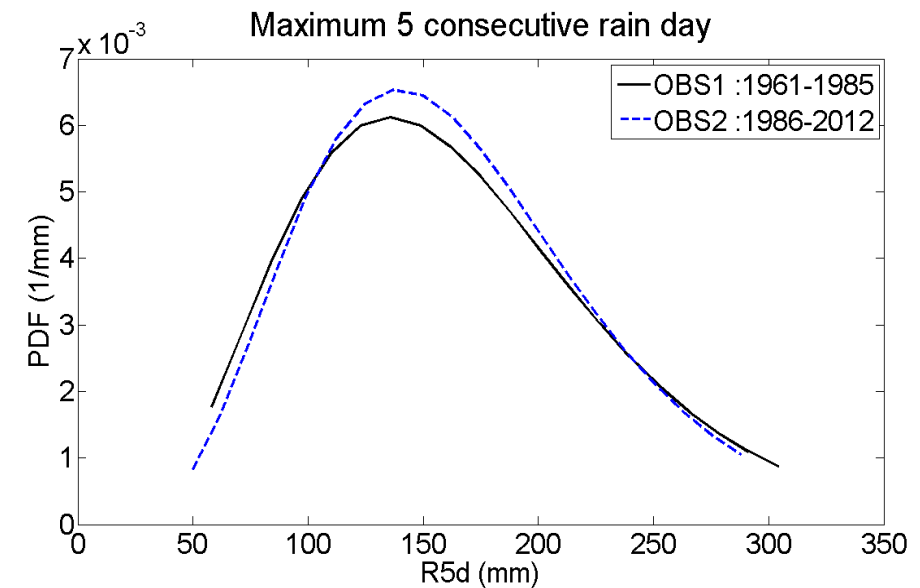
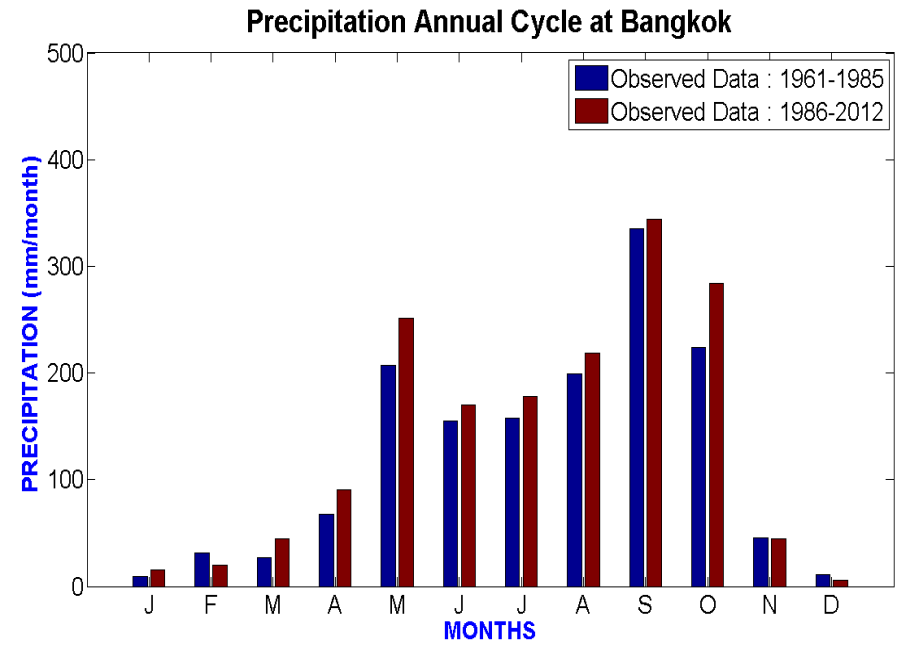


2011



2012

# Chao Phrya river basin



# พื้นที่เสี่ยง กทม



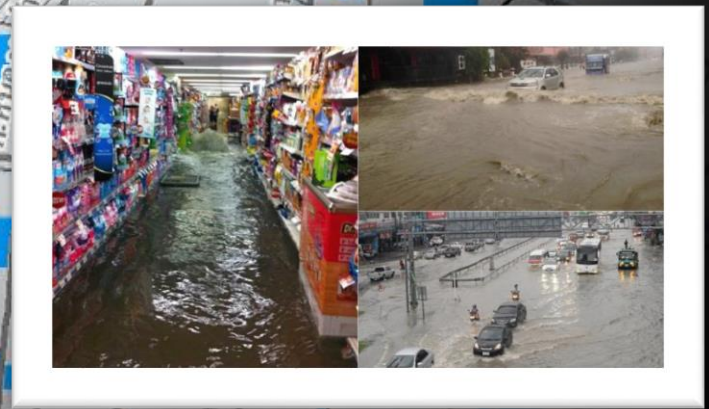
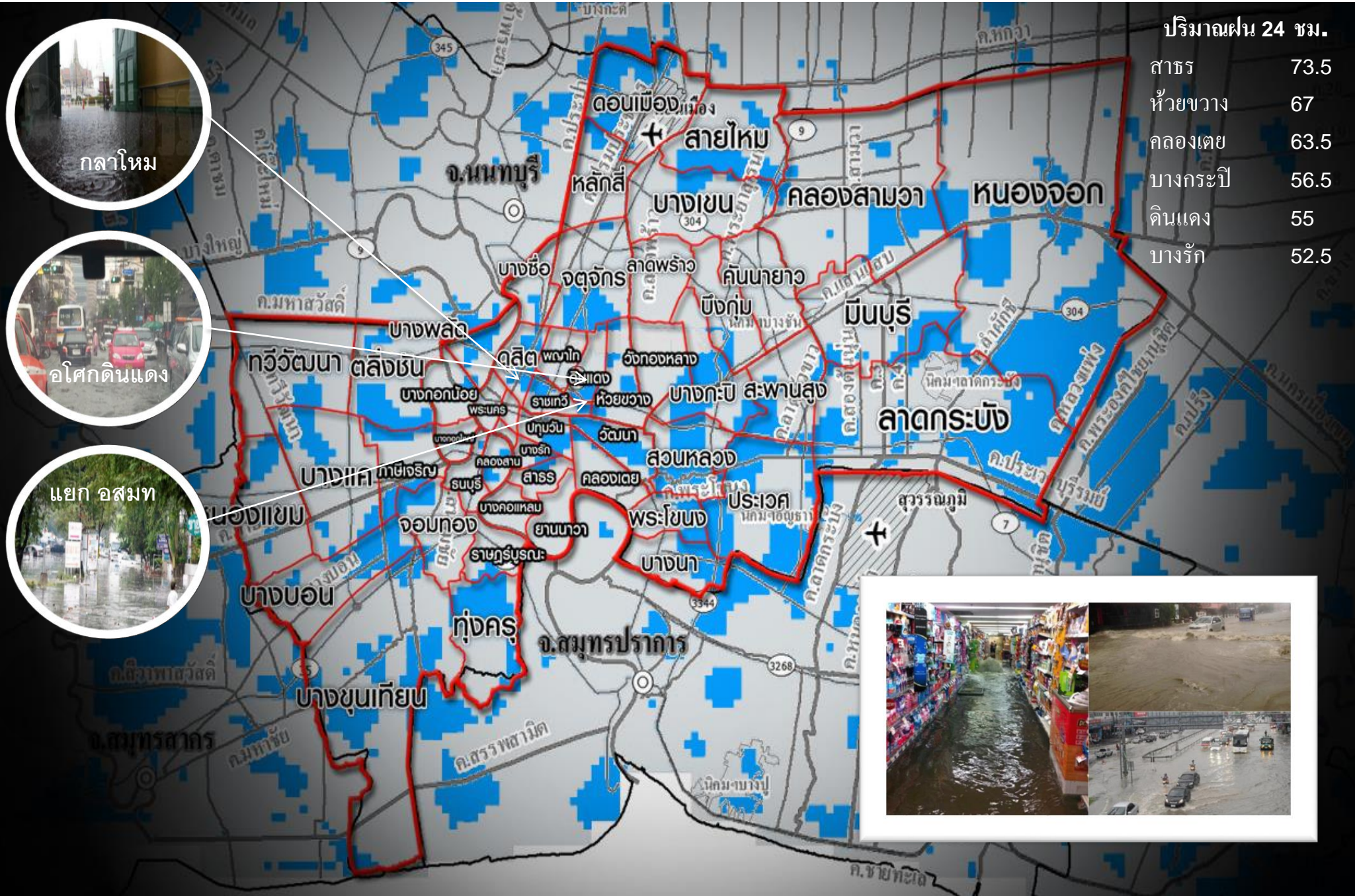
กลาโหม



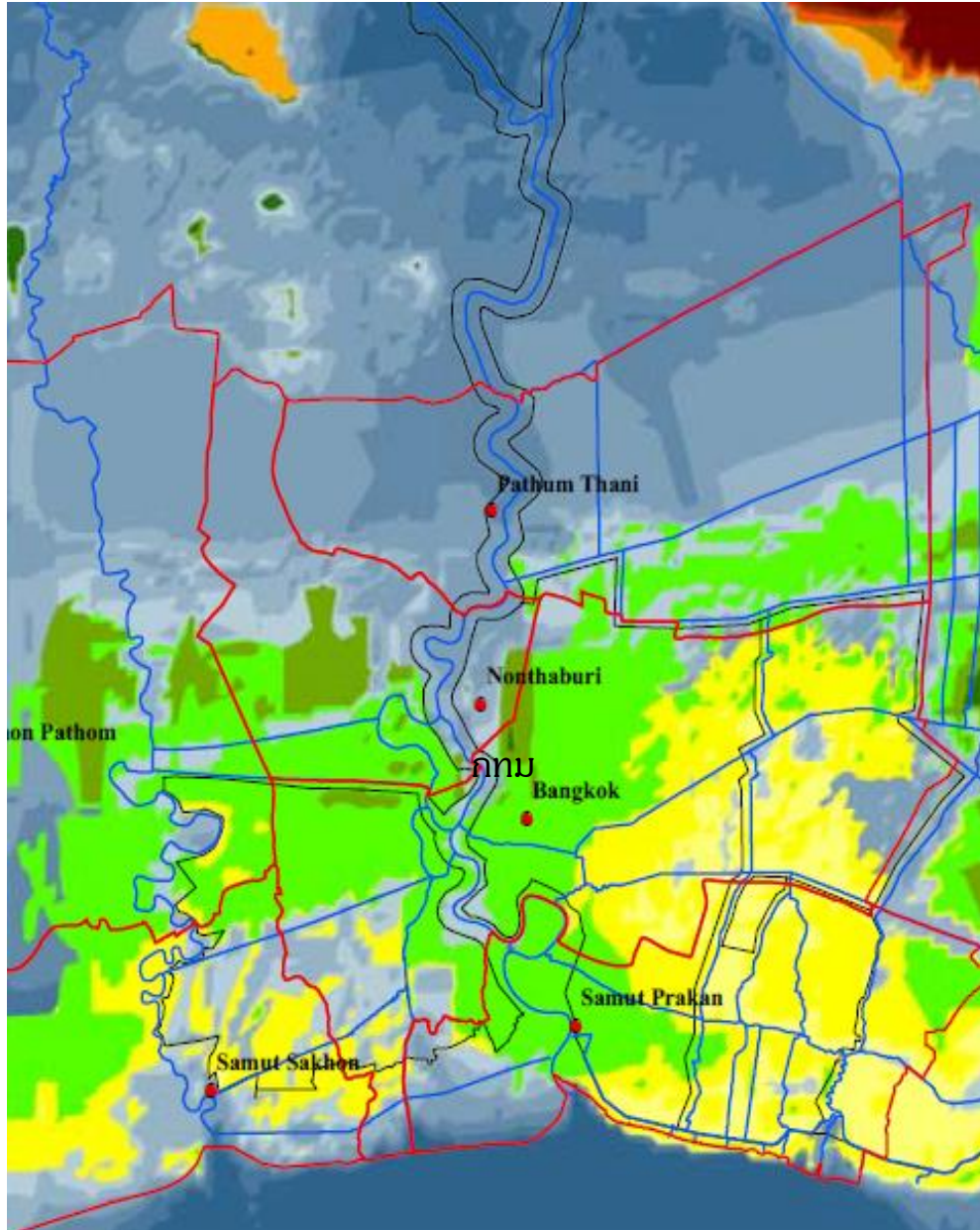
อโศกดินแดง



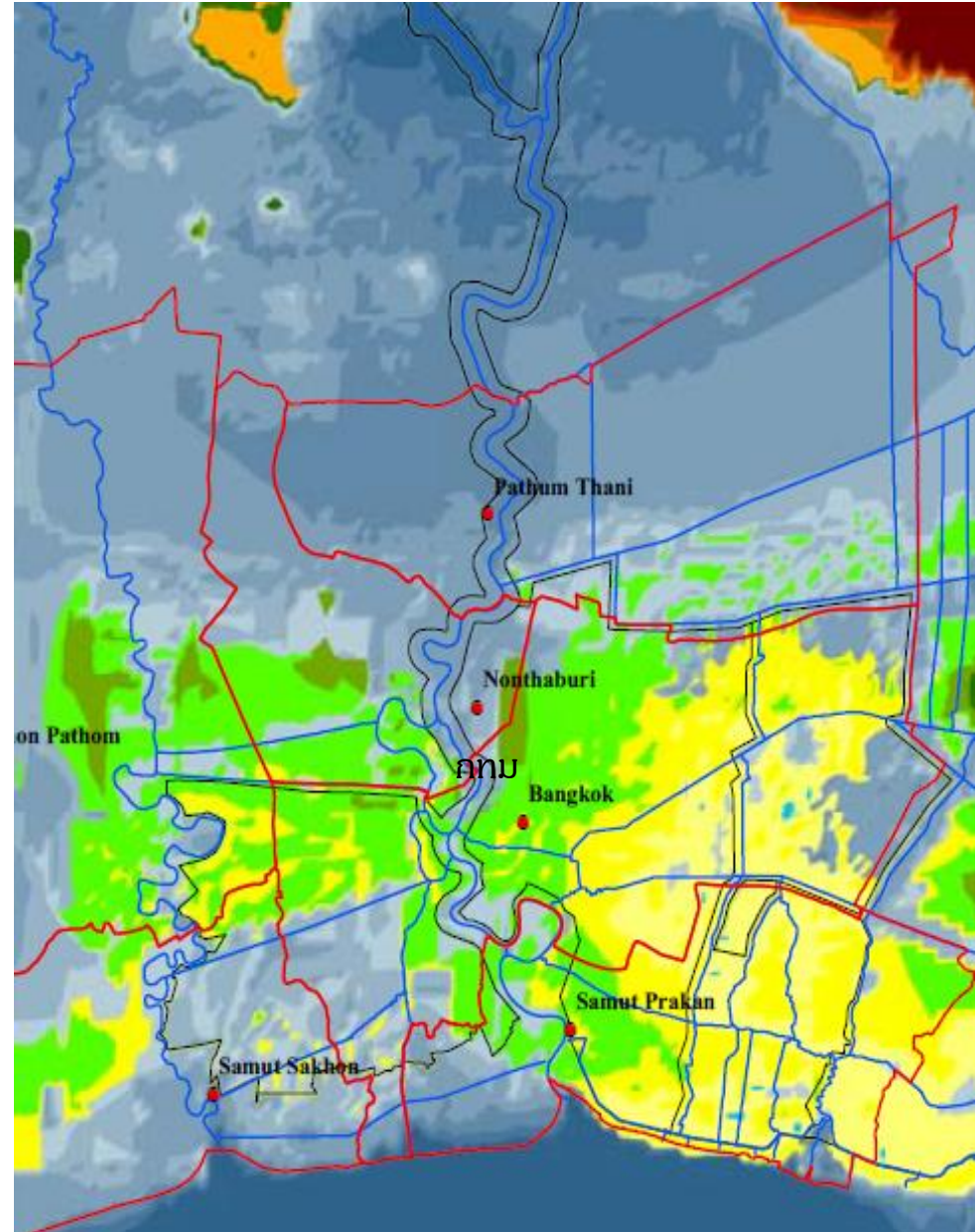
แยก อสมท



# Flood map with CC impact



Present-day flood



2050 flood (A1FI)

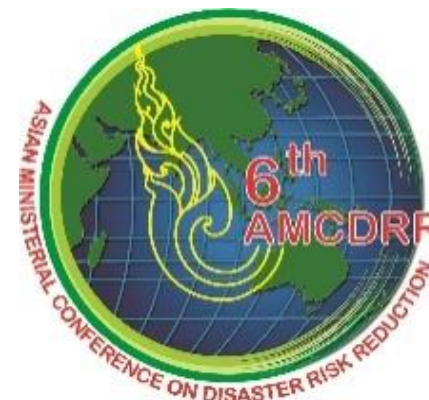
A dramatic, dark, and stormy sky over a cityscape, with a prominent tall, thin tower in the center. The text "Bangkok in the future?" is overlaid in white.

**Bangkok in the future?**

# #WCDRR

## HFA 2005-2015

- Priority 1 : Governance and policy
- Priority 2 : Risk identification and Early Warning
- Priority 3 : Use knowledge, innovation and education
- Priority 4 : Reducing the underlying risk factors
- Priority 5 : Strengthen disaster preparedness for effective response



## Bangkok Declaration



## Sendai Framework for Disaster Risk Reduction 2015-2030

- Priority 1 : Understanding disaster risk
- Priority 2 : Strengthening disaster risk governance to manage disaster risk
- Priority 3 : Investing in disaster risk reduction for **“resilience”**
- Priority 4 : Enhancing disaster preparedness for effective response, and to **“build back better”** in recovery, rehabilitation, and reconstruction

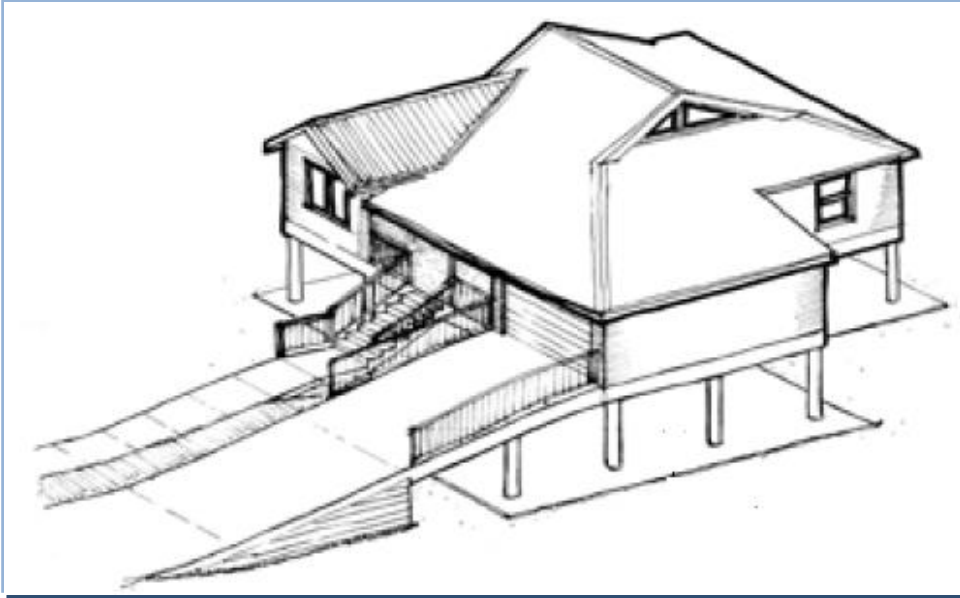
## DDPM

SNAP(Strategic National Action Plan on Disaster Risk Reduction (2010-2019)

Disaster Prevention and Mitigation Act (2007)

National Disaster Prevention and Mitigation Plan (2010-2014)

# Flood adaptation in Thailand (Housing)





# เอาอยู่แบบไทย ๆ Smart wall ?

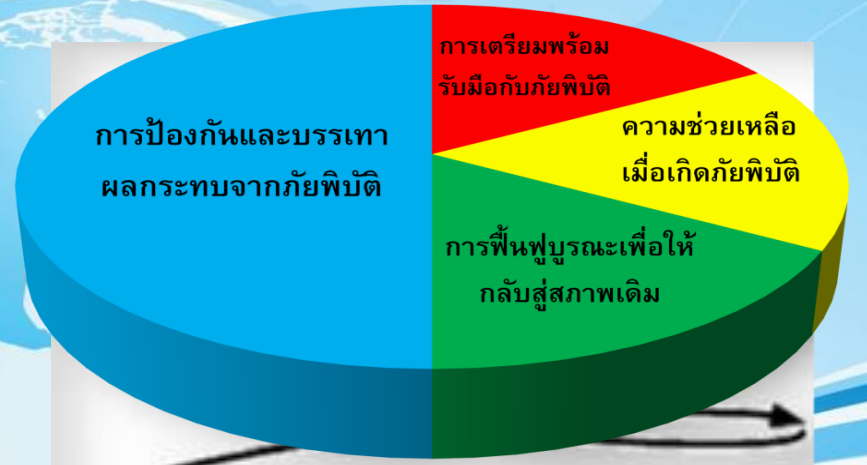


ยุทธศาสตร์

การสร้างภูมิคุ้มกัน การปรับตัว ความยืดหยุ่น  
เพื่อการพัฒนาอย่างยั่งยืน



ปัจจัยความเสี่ยง  
สภาวะอันตราย  
ภาวะคุกคาม  
ความเปราะบาง



การบูรณาการ  
DRR & CCA  
ในการวางแผน  
และการดำเนินงาน

