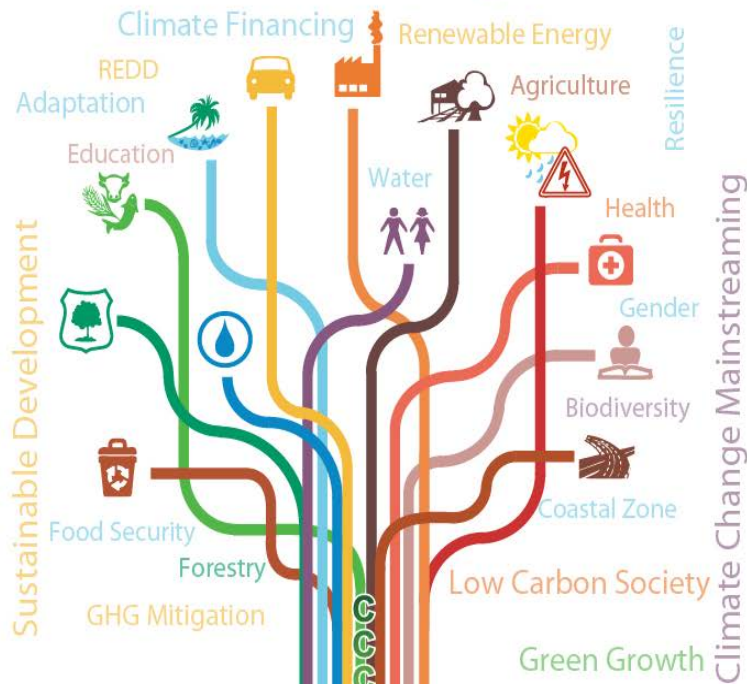


# 3<sup>rd</sup> National Forum on Climate Change

5 – 7 November 2013, Cambodia

*“Taking Action for Sustainable Development in the Changing Climate”*

## Climate Change



## Update on Climate Change Science: Causes and Impacts

Mozaharul Alam

UNEP

5 November 2013

CAMBODIA CLIMATE CHANGE ALLIANCE



# About Presentation

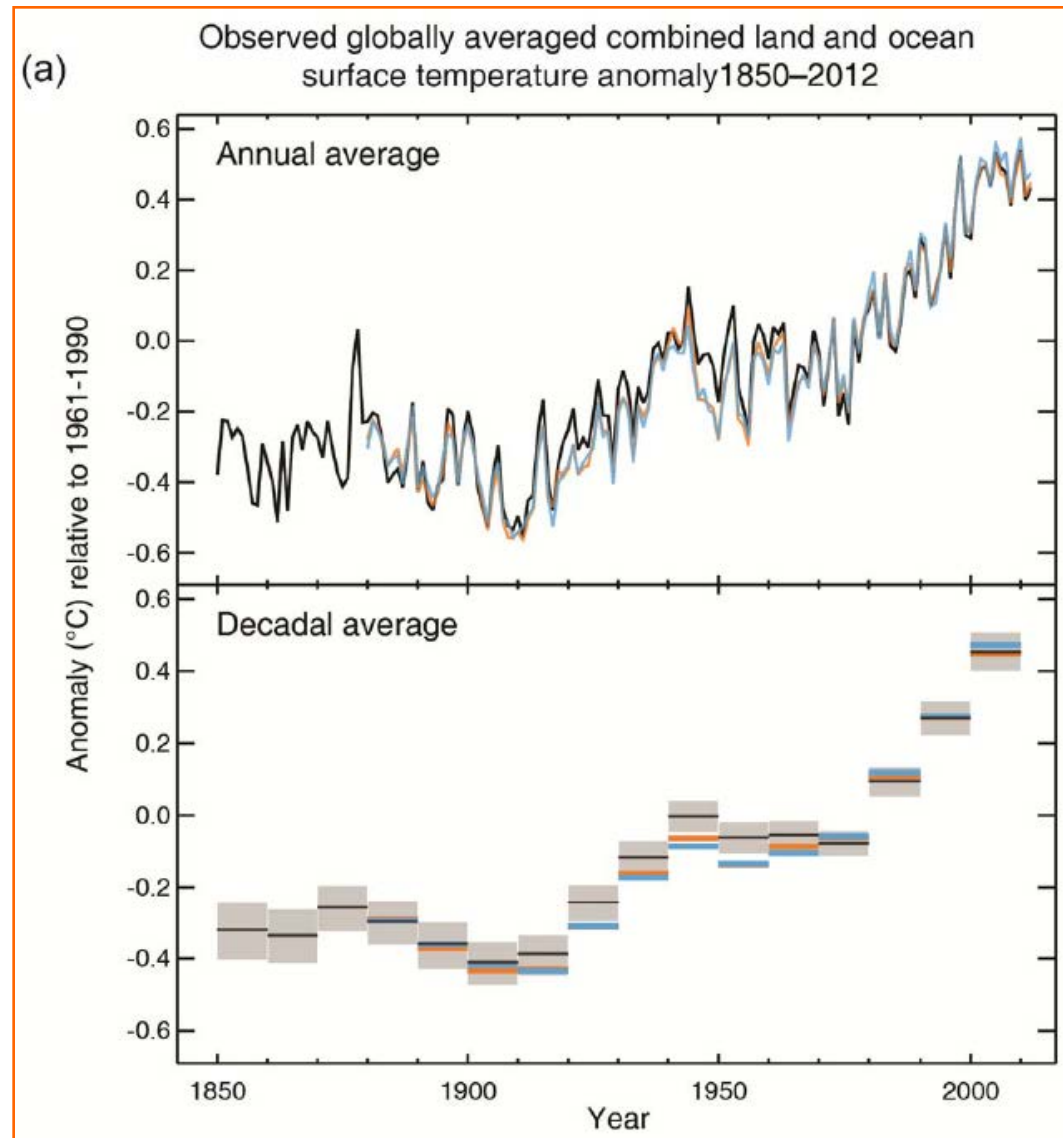
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- Key signs of climate change
  - Temperature change
  - Rainfall variation
  - Sea level change
- Key finds of IPCC AR5 Working Group I report 2013



# Temperature – observed changes

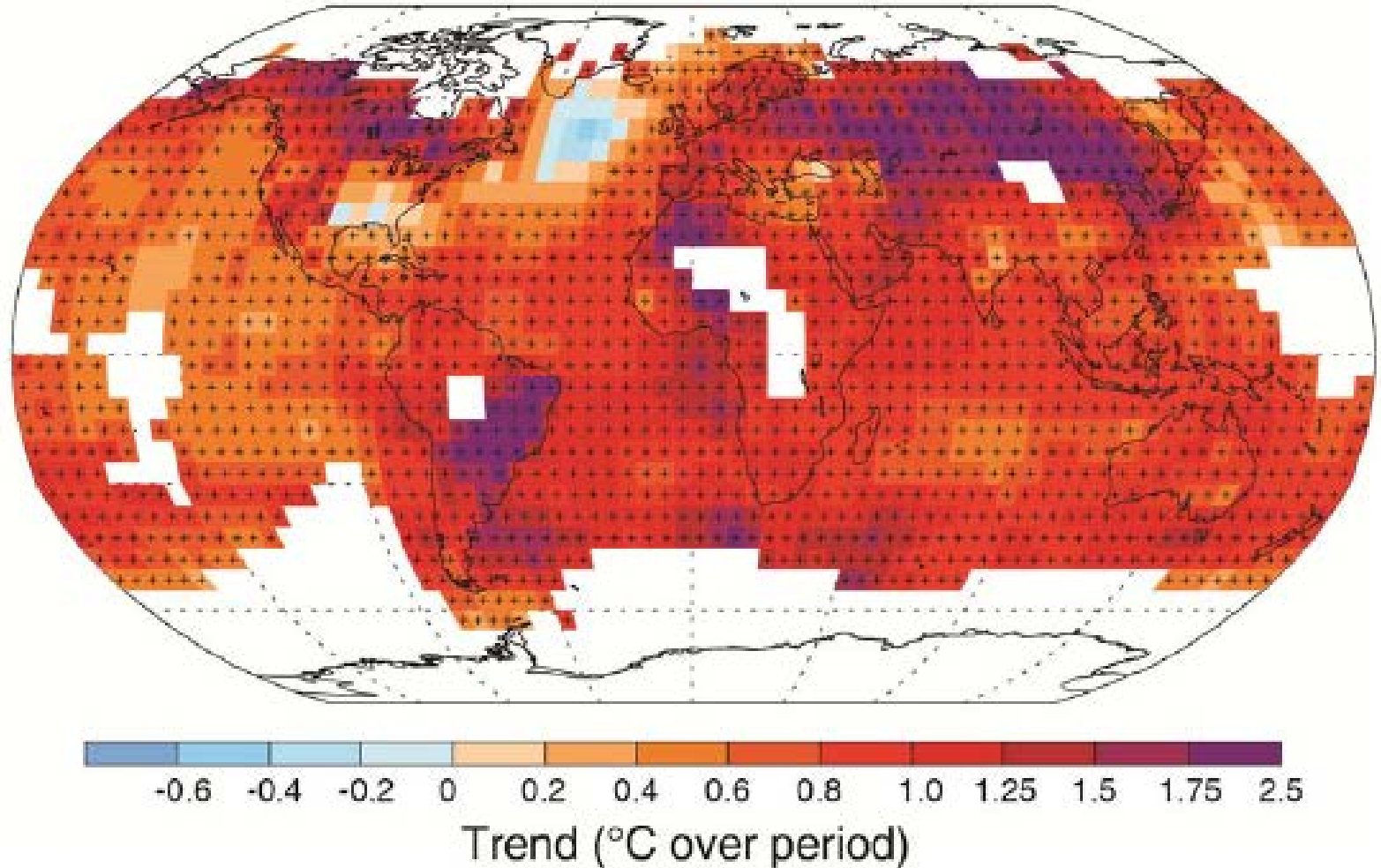
- The globally averaged combined land and ocean surface temperature data show a warming of 0.85 [0.65 to 1.06] °C<sup>3</sup>, over the period 1880–2012
- The total increase between the average of the 1850–1900 period and the 2003–2012 period is 0.78 [0.72 to 0.85] °C



Source: IPCC, 2013

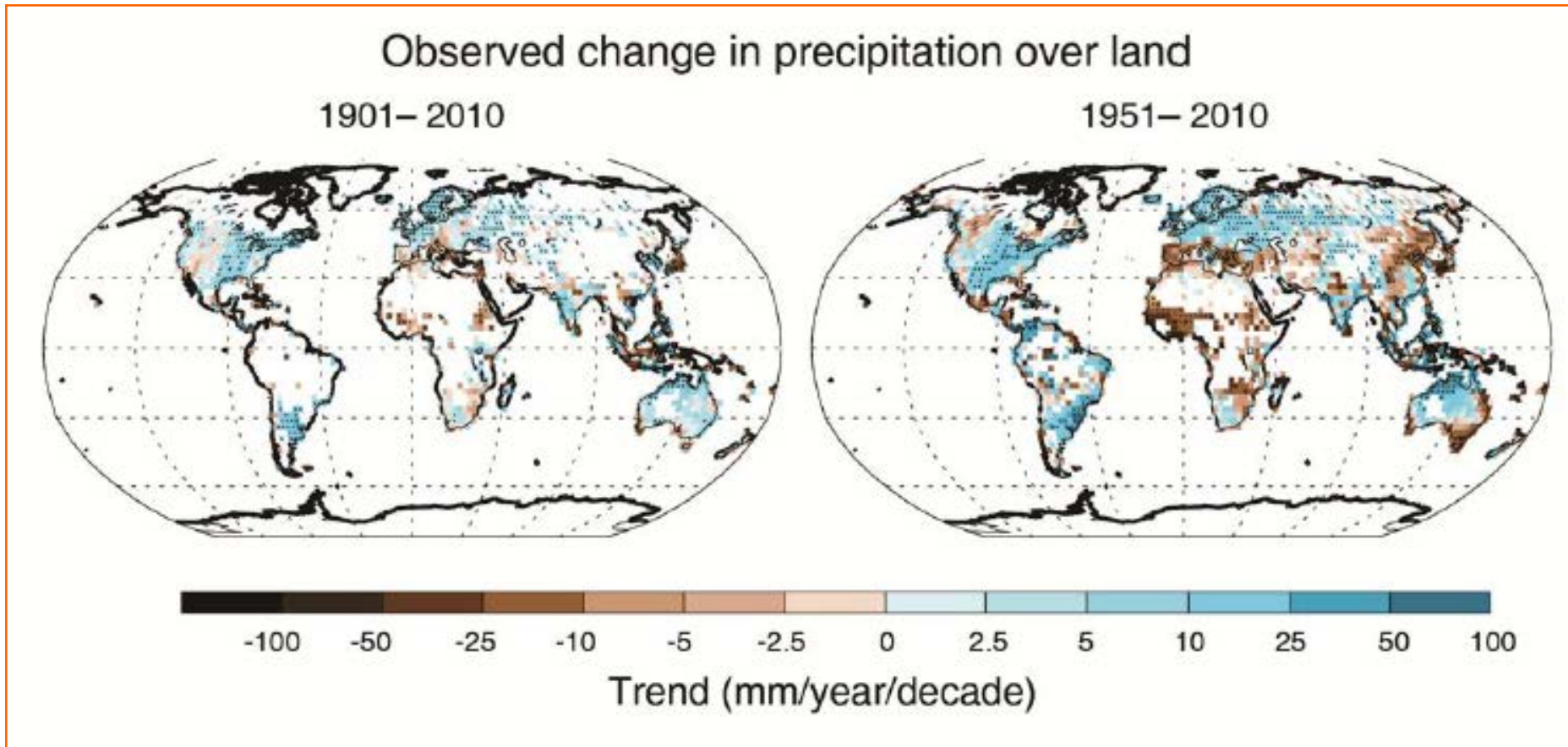
# Temperature – observed changes

(b) Observed change in average surface temperature 1901–2012



Source: IPCC, 2013

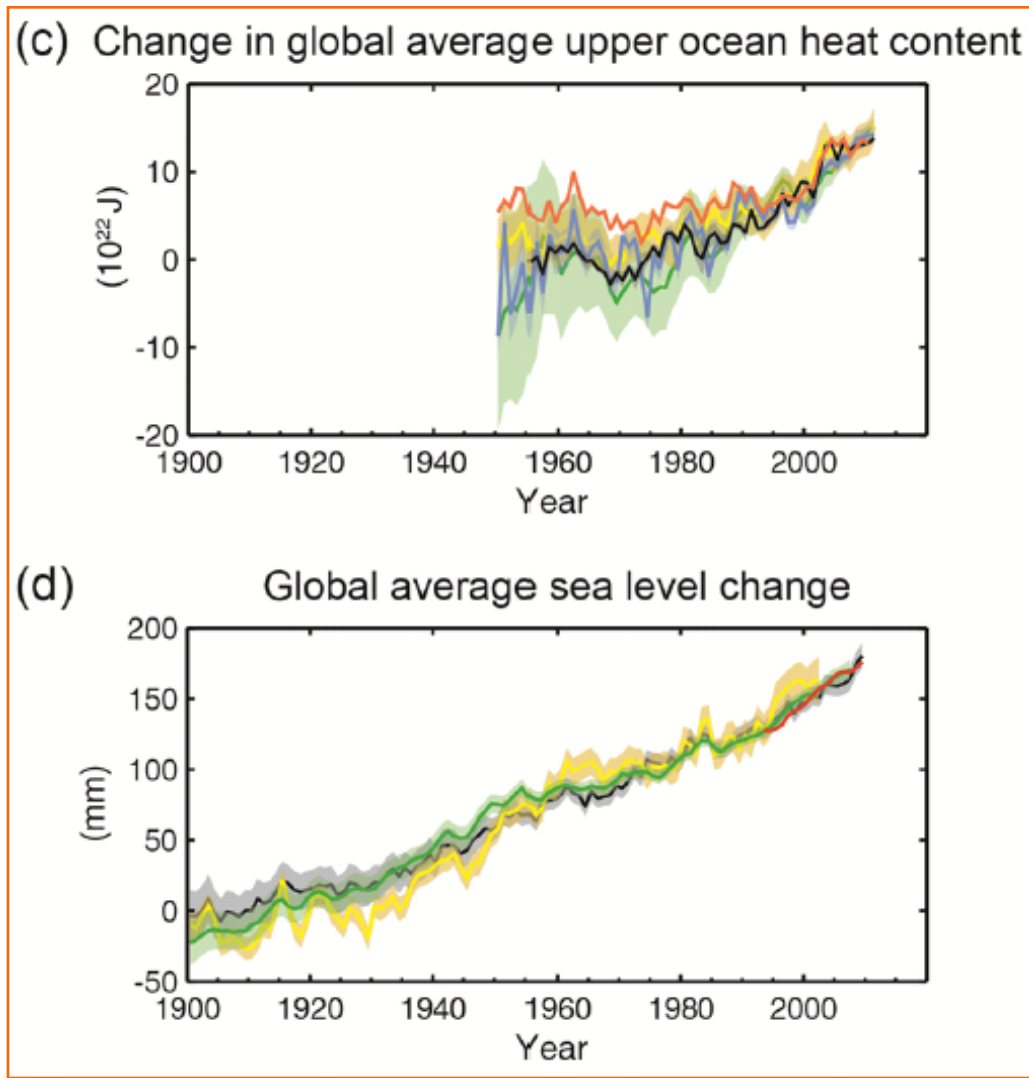
# Precipitation – observed changes



Source: IPCC, 2013

# Sea level rise – observed changes

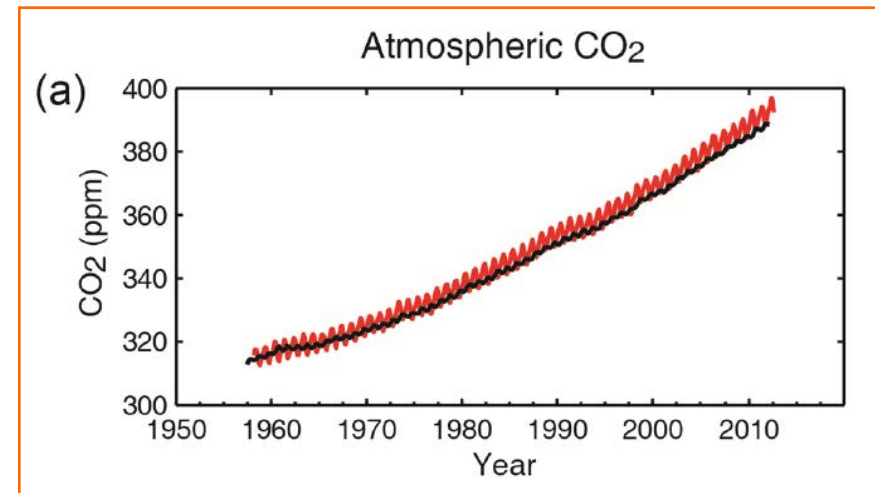
- Over the period 1901–2010, global mean sea level rose by 0.19 [0.17 to 0.21] m
- It is very likely that the mean rate of global averaged sea level rise was
  - 1.7 [1.5 to 1.9] mm/yr between 1901 and 2010,
  - 2.0 [1.7 to 2.3] mm/yr between 1971 and 2010
  - 3.2 [2.8 to 3.6] mm/yr between 1993 and 2010



Source: IPCC, 2013

# CO<sub>2</sub> concentration – observed changes

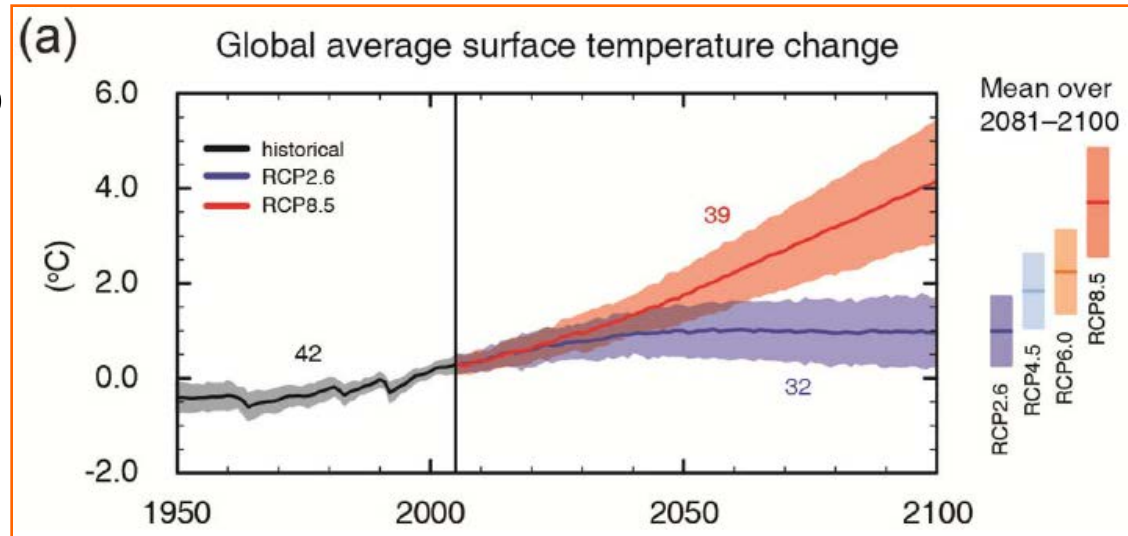
- The atmospheric concentrations of the greenhouse gases carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O) have all increased since 1750 due to human activity.
- In 2011, the concentrations of these greenhouse gases were
  - CO<sub>2</sub> - 391 ppm, exceeded the pre-industrial levels by about 40%
  - CH<sub>4</sub> - 1803 ppb, exceeded the pre-industrial levels by about 150%
  - N<sub>2</sub>O - 324 ppb, exceeded the pre-industrial levels by about 20%



Source: IPCC, 2013

# Temperature – future

- Increase of global mean surface temperatures for 2081–2100 relative to 1986–2005 is projected to likely be in the ranges of 0.3°C to 1.7°C (RCP2.6), 1.1°C to 2.6°C (RCP4.5), 1.4°C to 3.1°C (RCP6.0), 2.6°C to 4.8°C (RCP8.5)

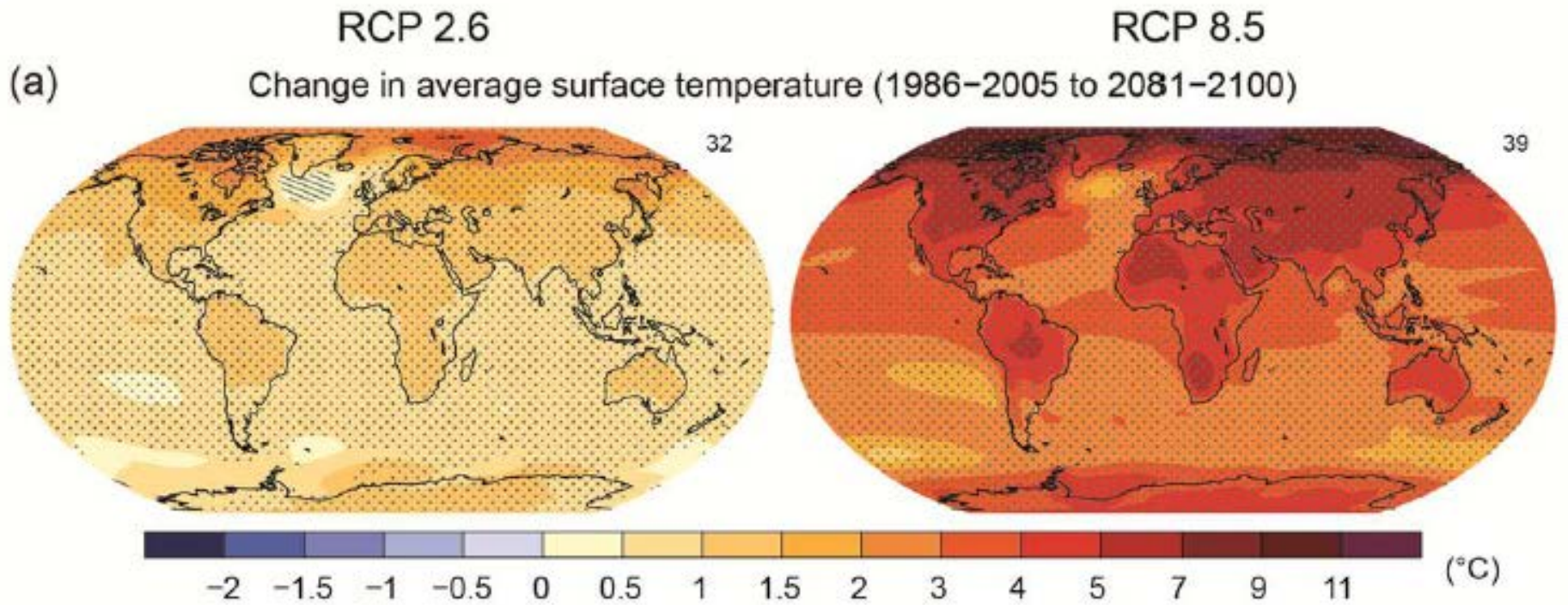


- The Arctic region will warm more rapidly than the global mean
- Mean warming over land will be larger than over the ocean

Source: IPCC, 2013



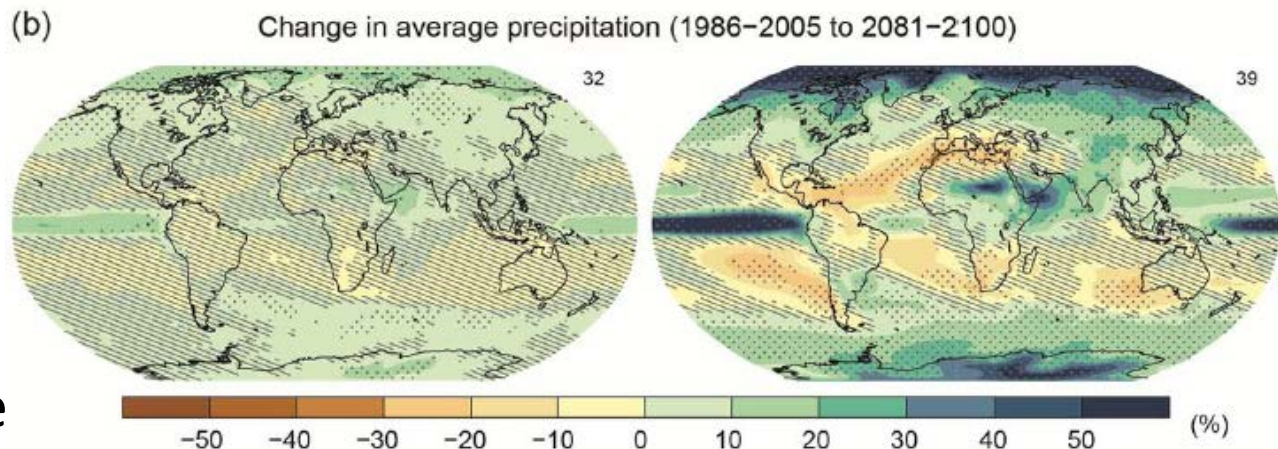
# Temperature – future



Source: IPCC, 2013

# Precipitation - future

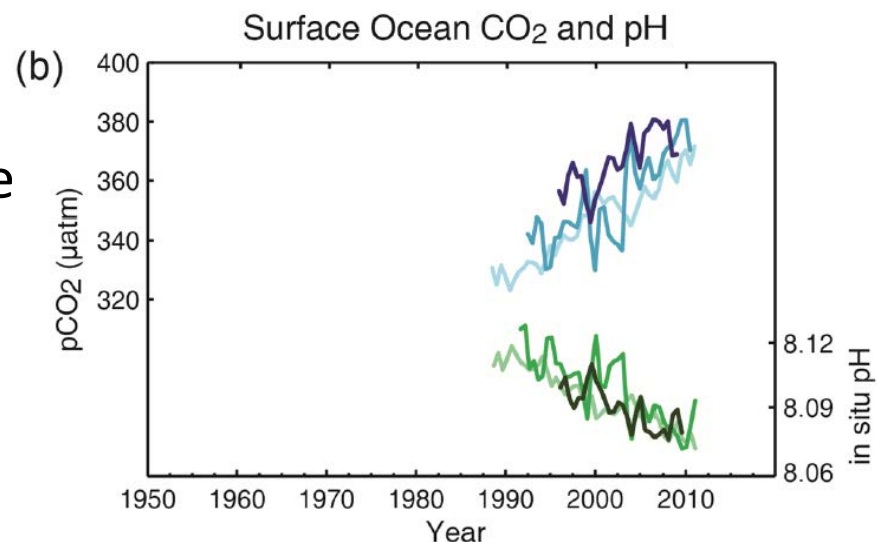
- Changes in the global water cycle in response to the warming over the 21st century will not be uniform
- The contrast in precipitation between wet and dry regions and between wet and dry seasons will increase, although there may be regional exceptions



Source: IPCC, 2013

# Ocean warming – future

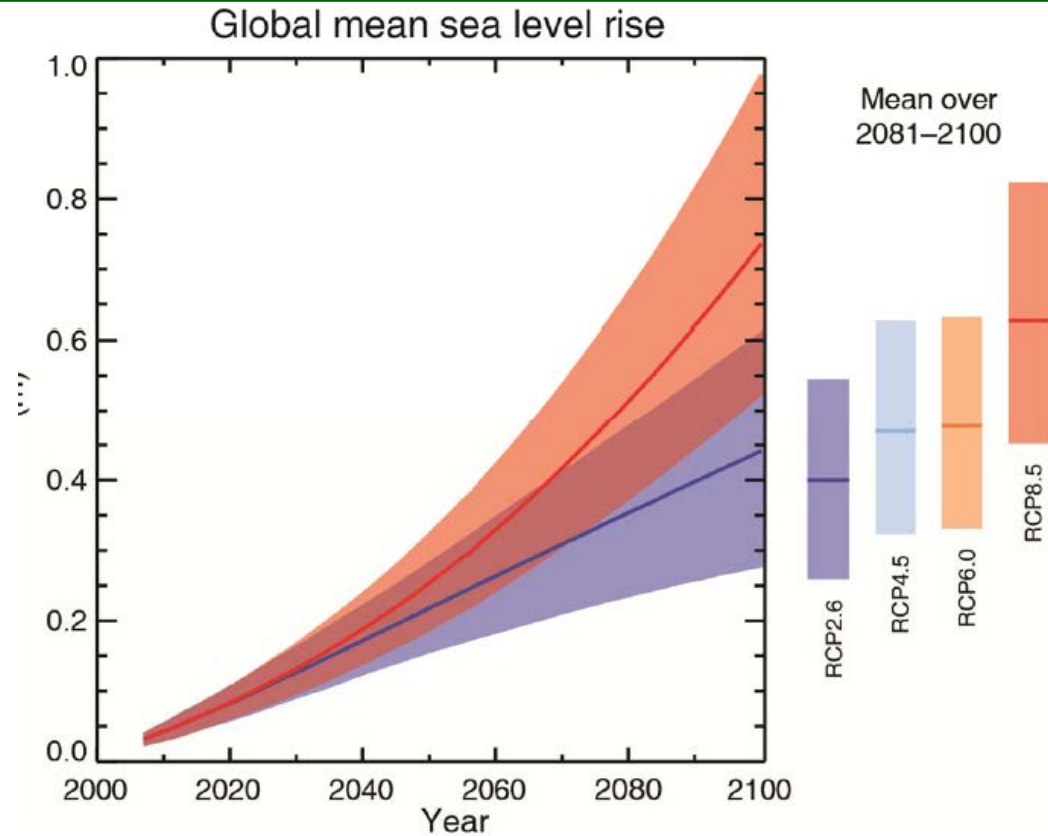
- The global ocean will continue to warm during the 21st century. Heat will penetrate from the surface to the deep ocean and affect ocean circulation.
- The strongest ocean warming is projected for the surface in tropical and Northern Hemisphere subtropical regions.
- Best estimates of ocean warming in the top one hundred meters are about 0.6°C (RCP2.6) to 2.0°C (RCP8.5)
- about 0.3°C (RCP2.6) to 0.6°C (RCP8.5) at a depth of about 1000 m by the end of the 21st century.



Source: IPCC, 2013

# Sea level rise – future

- Global mean sea level rise for 2081–2100 relative to 1986–2005 will likely be in the ranges of
- 0.26 to 0.55 m for RCP2.6, 0.32 to 0.63 m for RCP4.5, 0.33 to 0.63 m for RCP6.0, 0.45 to 0.82 m for RCP8.5
- For RCP8.5, the rise by the year 2100 is 0.52 to 0.98m, with a rate during 2081–2100 of 8 to 16 mm/yr



Source: IPCC, 2013

# Summary

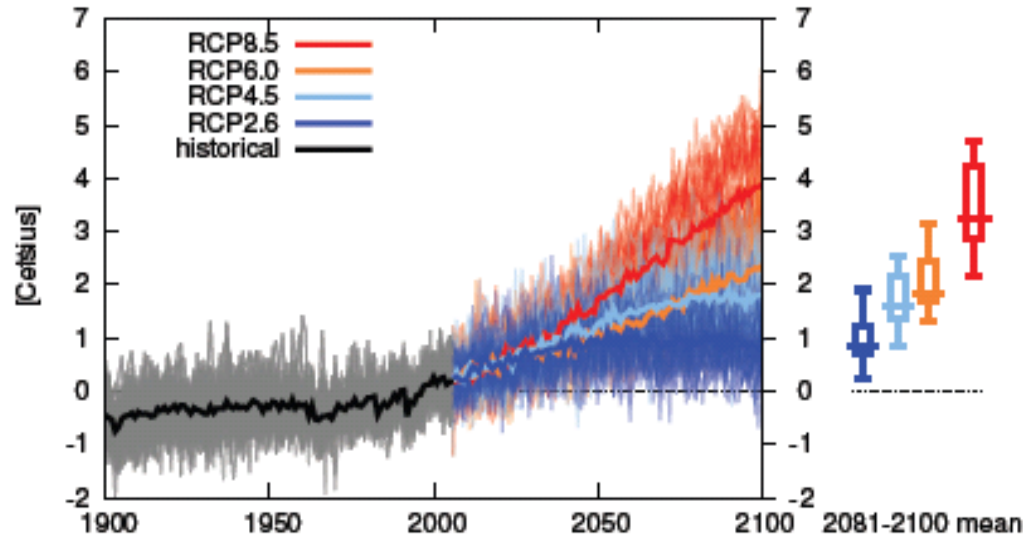
Table SPM.2 [TABLE SUBJECT TO FINAL COPYEDIT]

Variable	Scenario	2046–2065		2081–2100	
		mean	<i>likely range</i> <sup>c</sup>	mean	<i>likely range</i> <sup>c</sup>
Global Mean Surface Temperature Change (°C) <sup>a</sup>	RCP2.6	1.0	0.4 to 1.6	1.0	0.3 to 1.7
	RCP4.5	1.4	0.9 to 2.0	1.8	1.1 to 2.6
	RCP6.0	1.3	0.8 to 1.8	2.2	1.4 to 3.1
	RCP8.5	2.0	1.4 to 2.6	3.7	2.6 to 4.8
			mean	<i>likely range</i> <sup>d</sup>	mean
Global Mean Sea Level Rise (m) <sup>b</sup>	RCP2.6	0.24	0.17 to 0.32	0.40	0.26 to 0.55
	RCP4.5	0.26	0.19 to 0.33	0.47	0.32 to 0.63
	RCP6.0	0.25	0.18 to 0.32	0.48	0.33 to 0.63
	RCP8.5	0.30	0.22 to 0.38	0.63	0.45 to 0.82

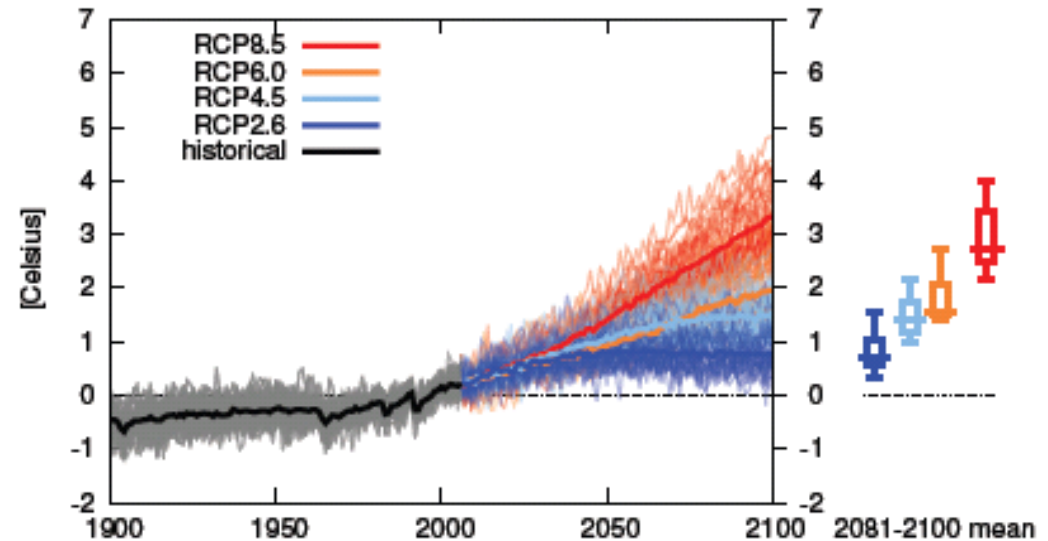
Source: IPCC, 2013

# Southeast Asia: Temperature changes – Dec-Jan

Temperature change Southeast Asia (land) December-February

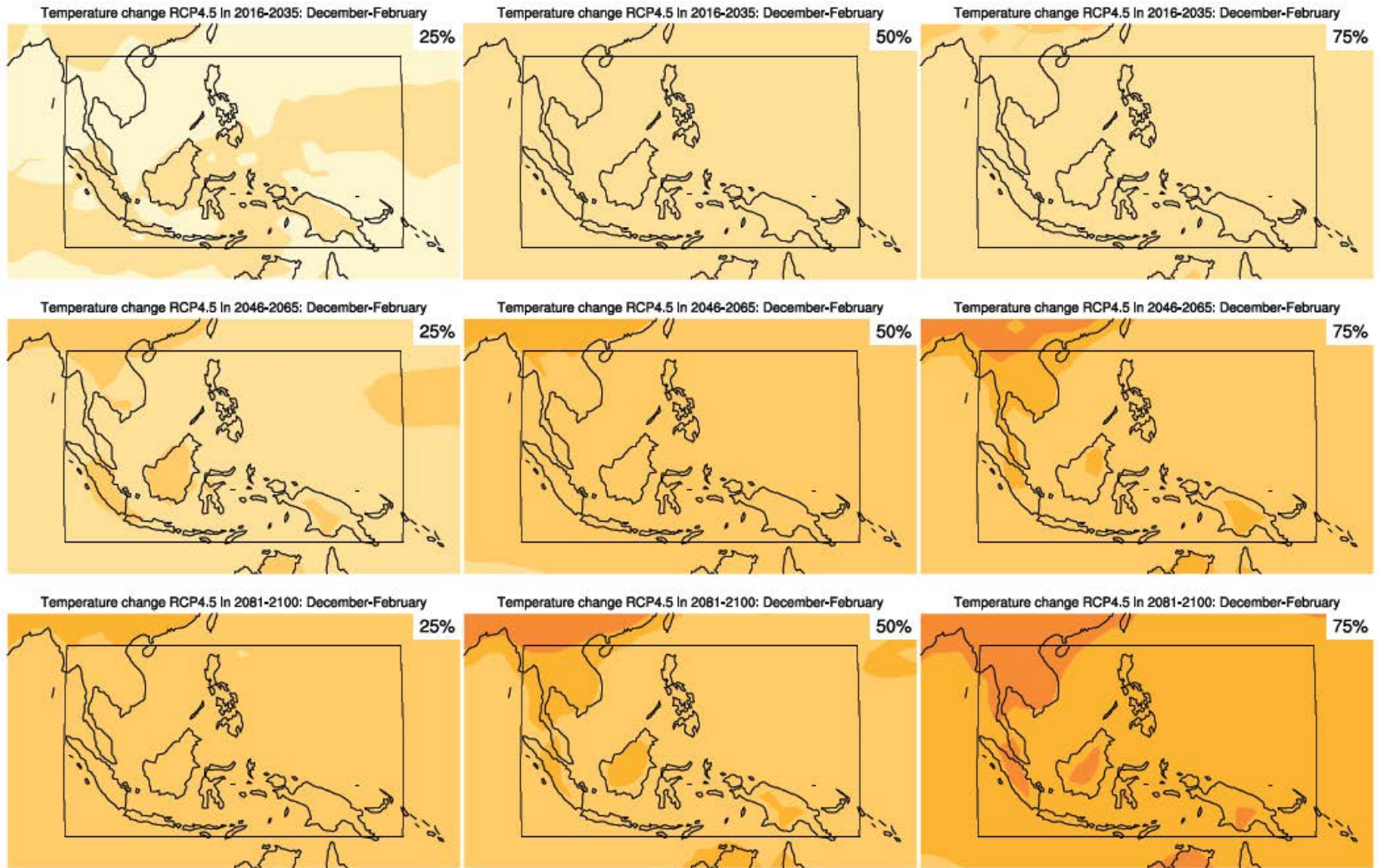


Temperature change Southeast Asia (sea) December-February



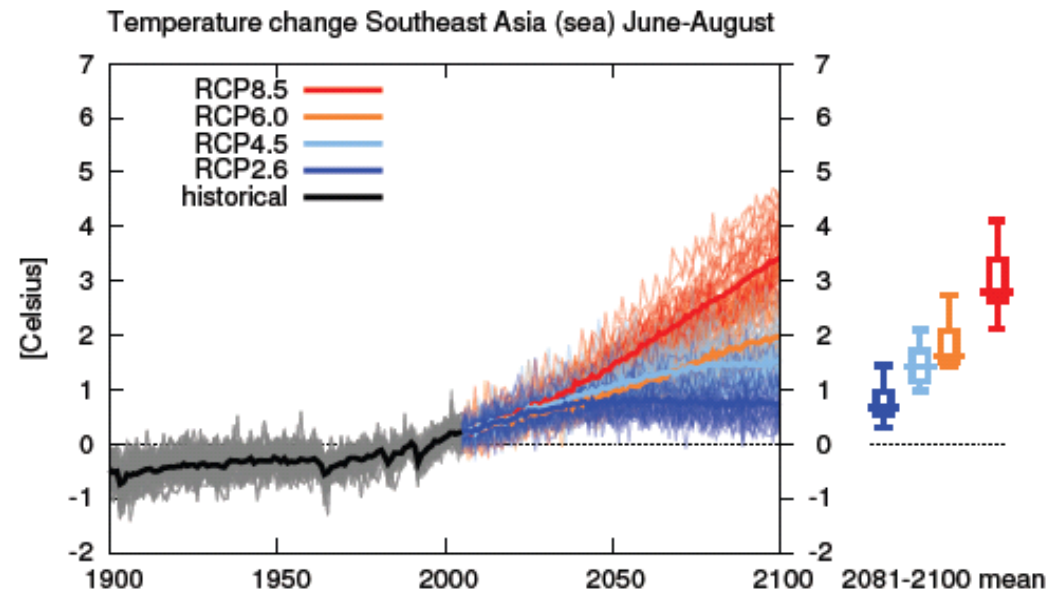
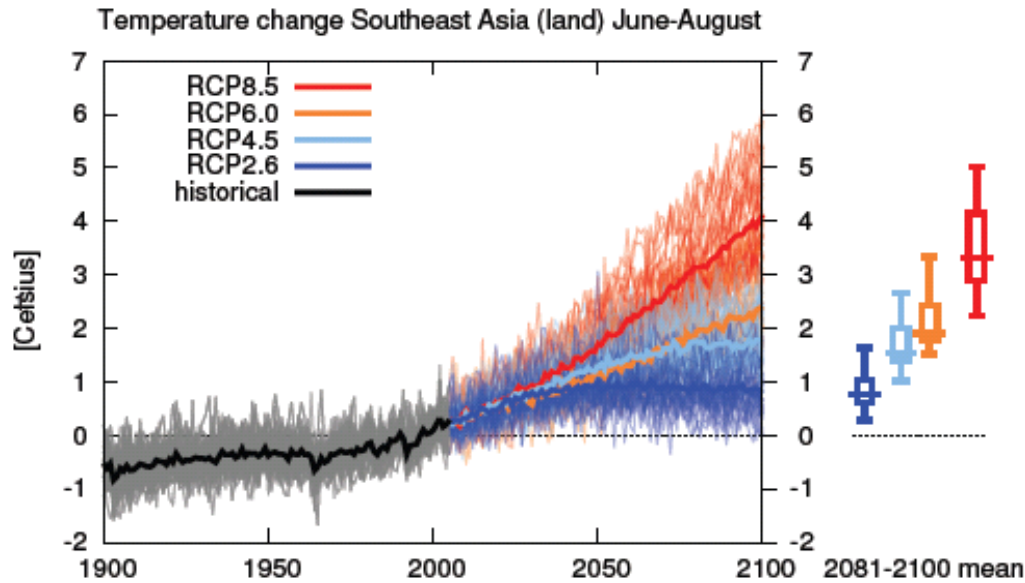
Source: IPCC, 2013

# Southeast Asia: Temperature changes – Dec-Jan



Source: IPCC, 2013

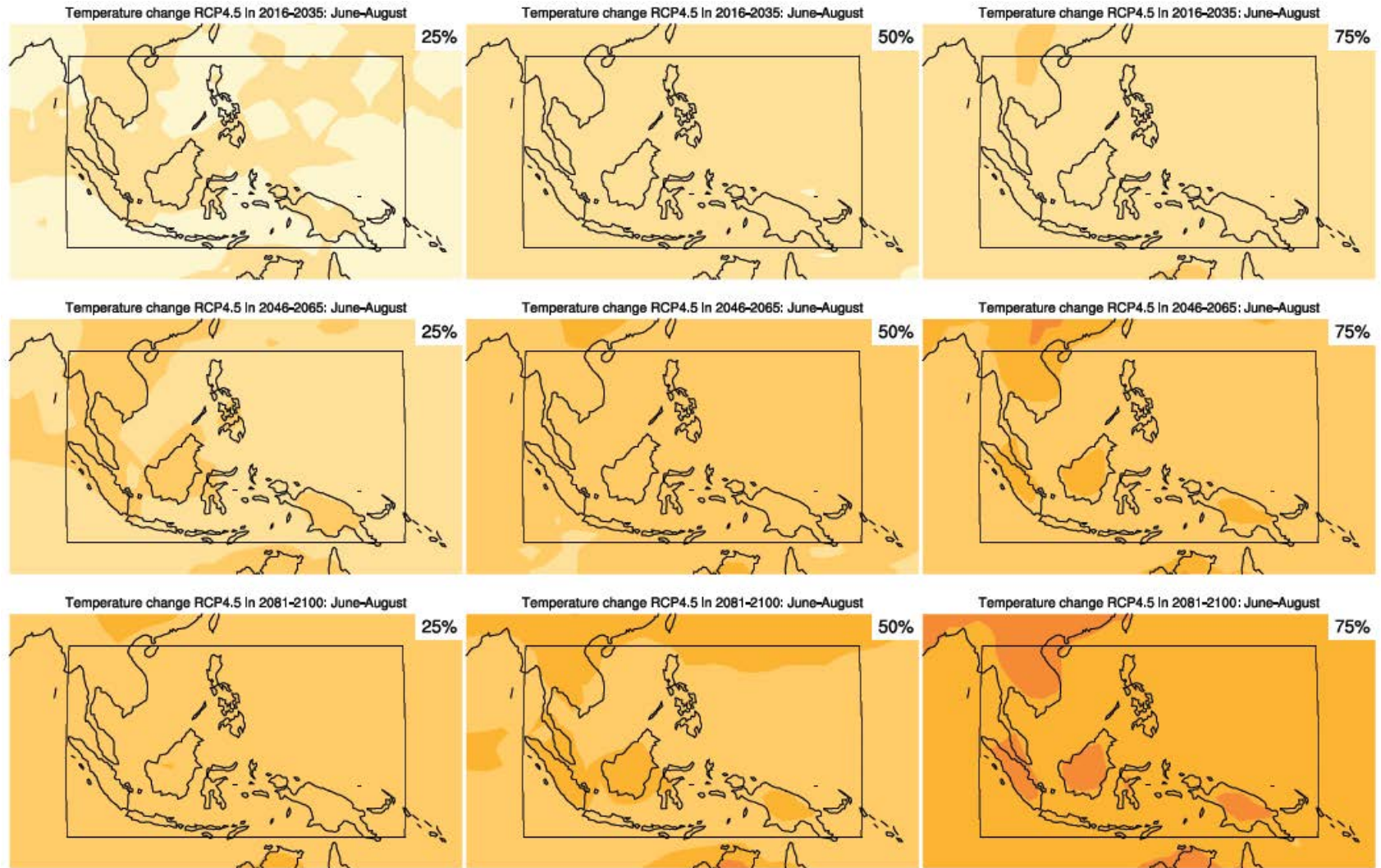
# Southeast Asia: Temperature changes – Jun-Aug



Source: IPCC, 2013



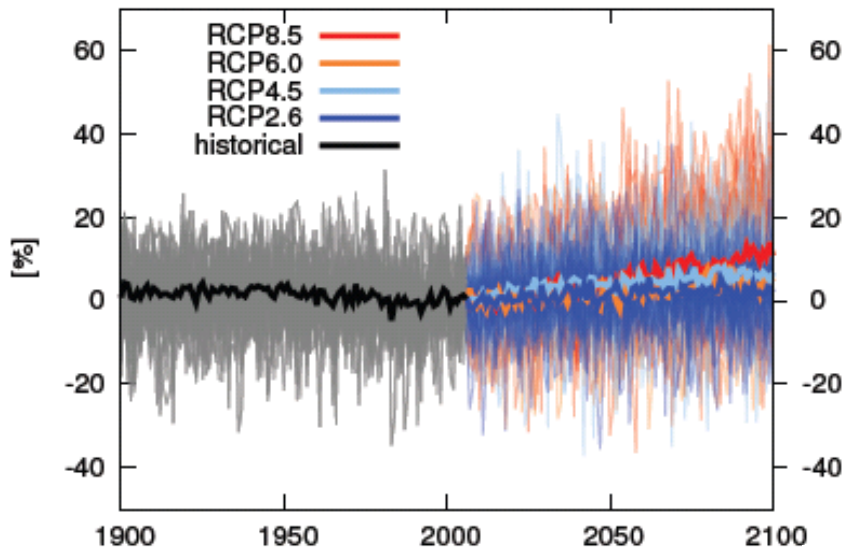
# Southeast Asia: Temperature changes – Jun-Aug



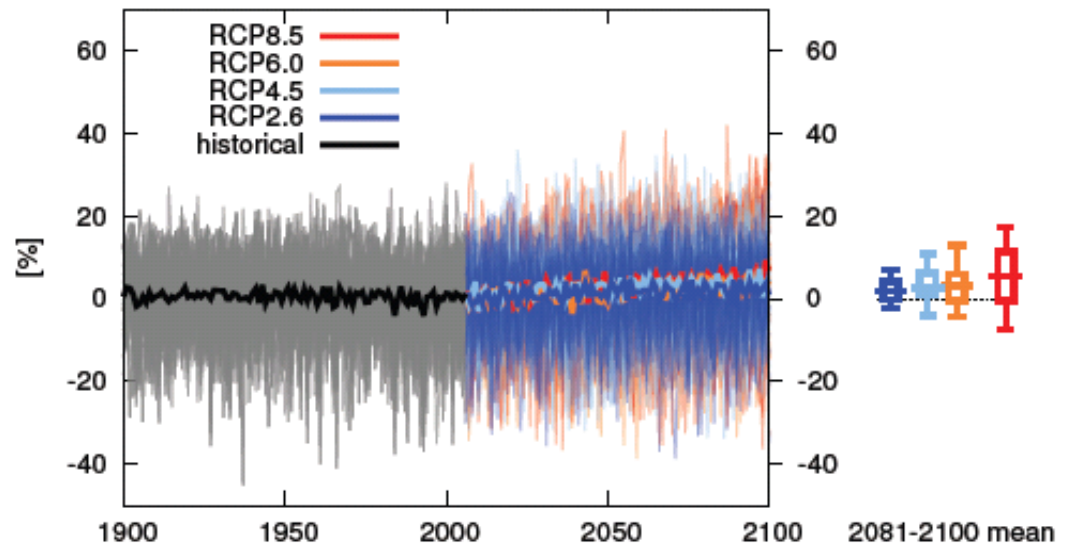
[°C]

# Southeast Asia: Precipitation changes – Oct-Mar

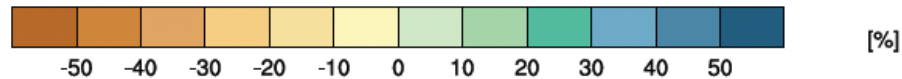
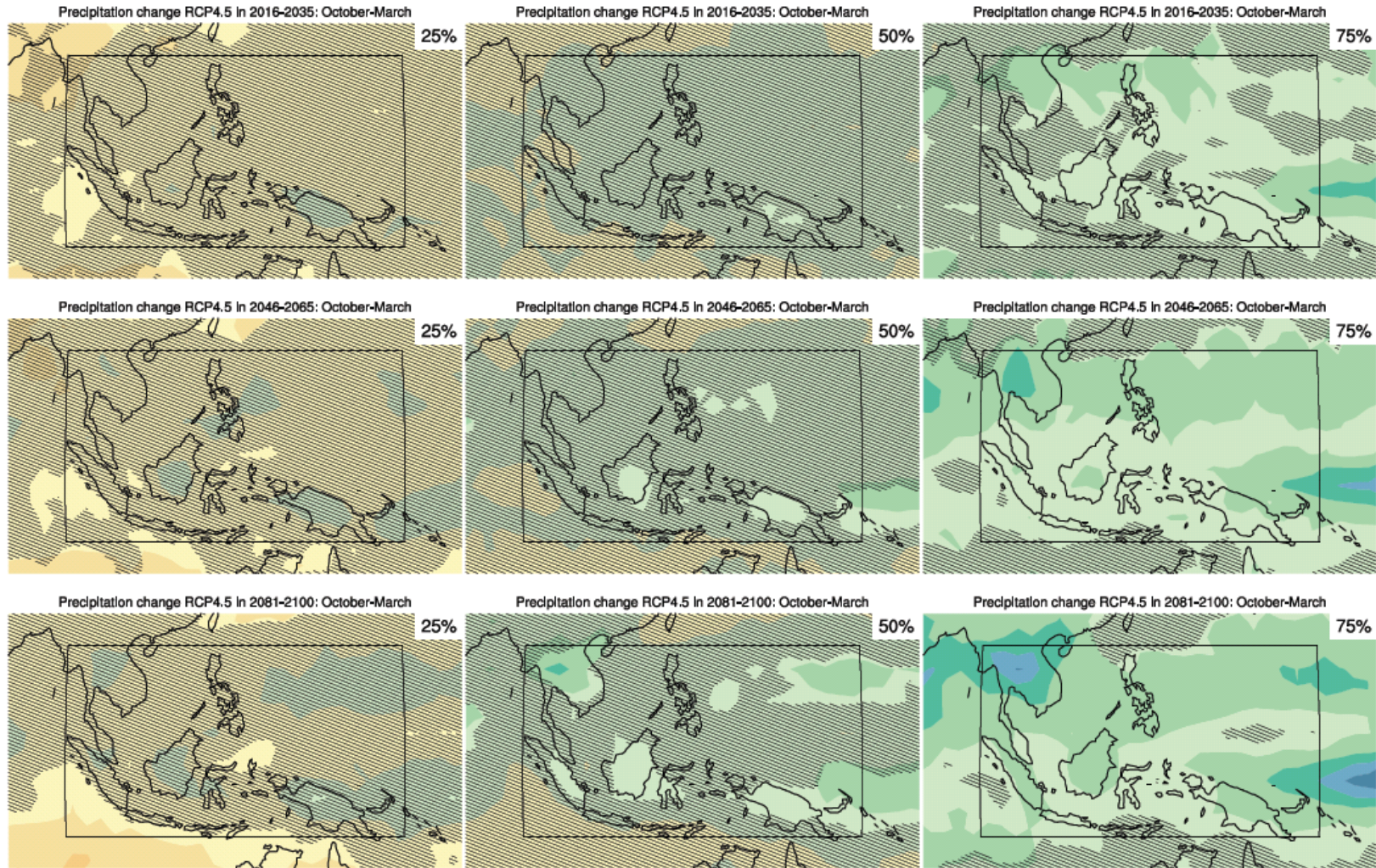
Precipitation change Southeast Asia (land) October-March



Precipitation change Southeast Asia (sea) October-March



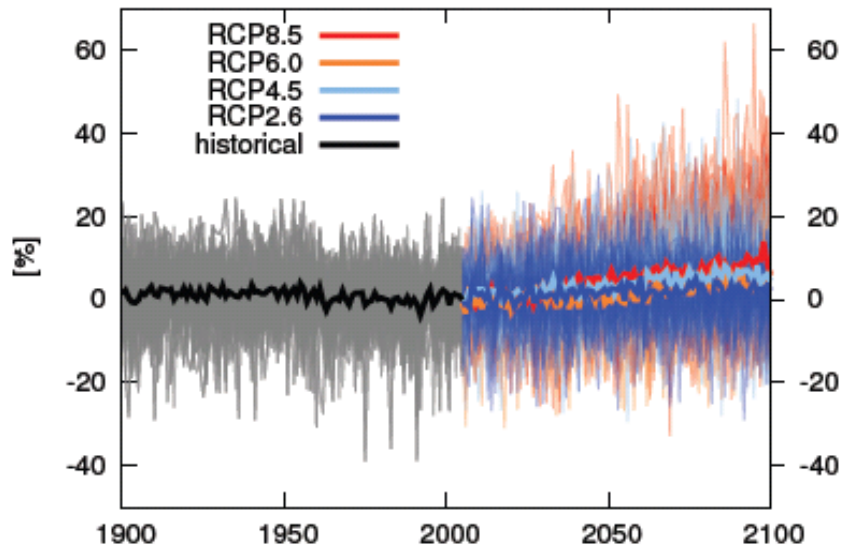
# Southeast Asia: Precipitation changes – Oct-Mar



Source: IPCC, 2013

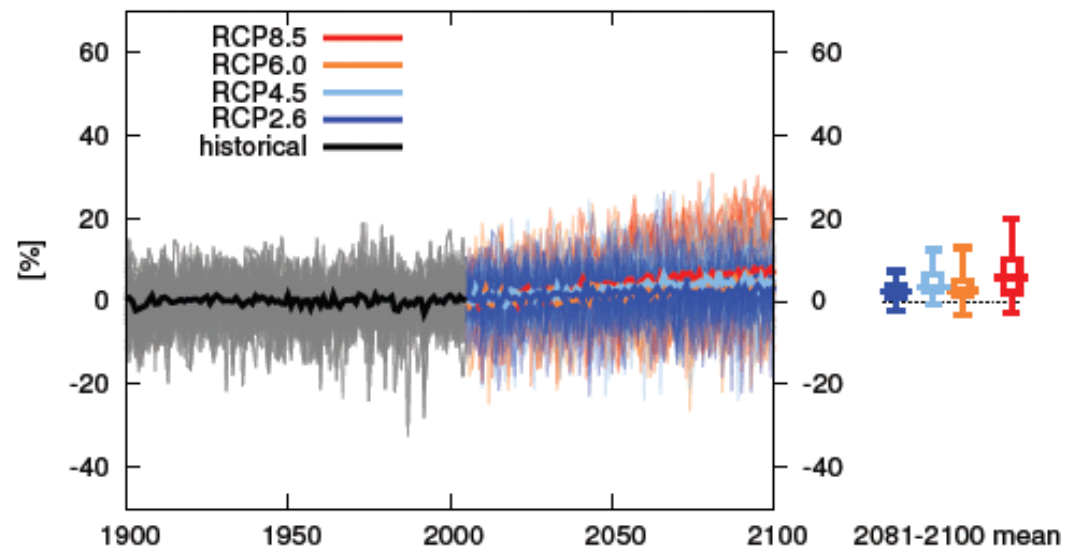
# Southeast Asia: Precipitation changes – Apr-Sep

Precipitation change Southeast Asia (land) April-September



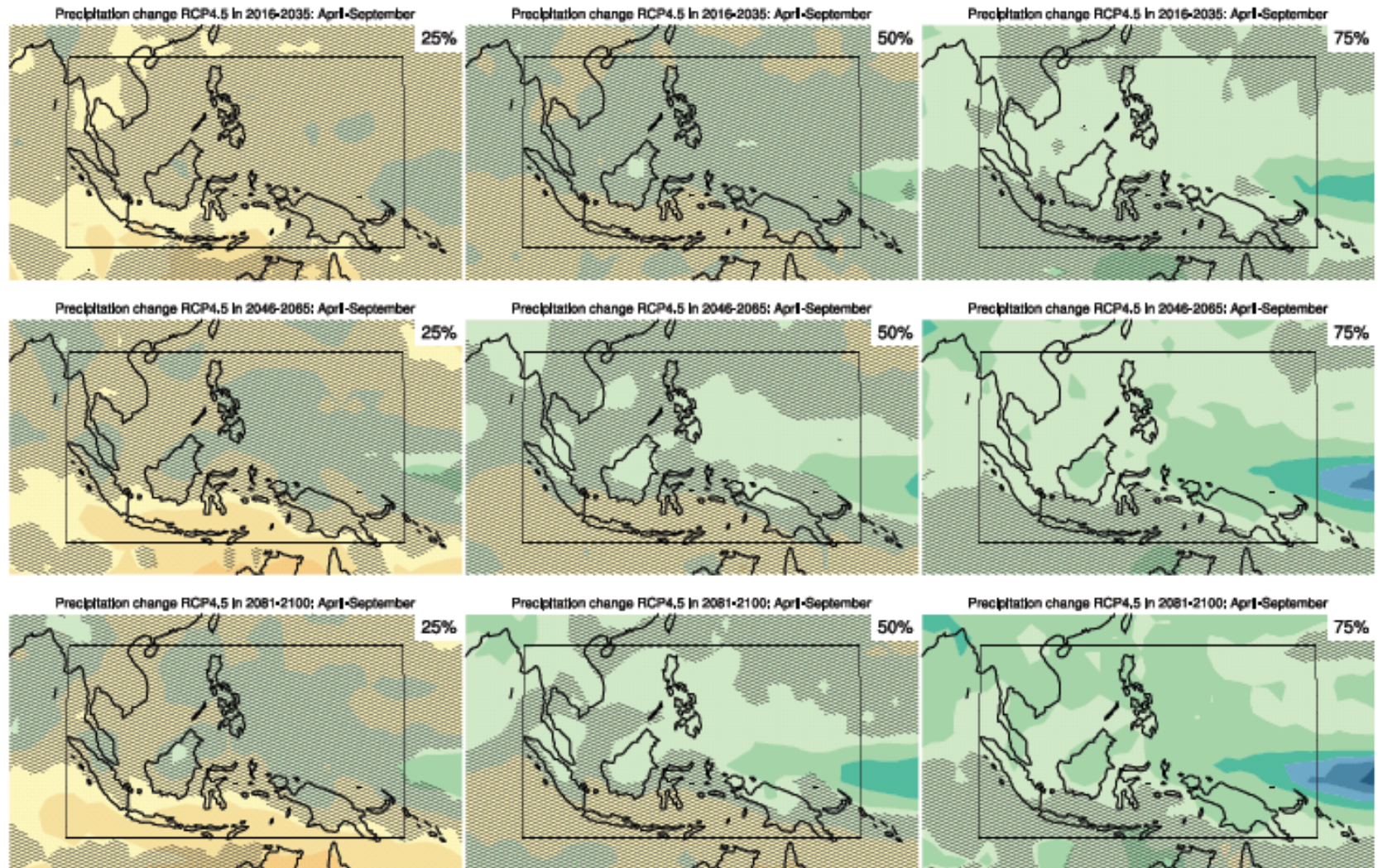
2081-2100 mean

Precipitation change Southeast Asia (sea) April-September



2081-2100 mean

# Southeast Asia: Precipitation changes – Apr-Sep



Source: IPCC, 2013

# CC in AP Region – visible & challenge is big

## Glacial lake outburst flood

- Afghanistan
- Bhutan
- Nepal
- Pakistan
- .....

## Flood

- Bangladesh
- Cambodia
- China
- India
- Philippines
- Thailand
- .....

## Across the region

- Increasing trends and temperature extremes
- Increase in the frequency of extreme precipitation
- Increase in heat waves

## Natural resources

- Scarcity of water
- Loss of biodiversity
- Degradation of ecosystem and services
- .....

## Sea level rise

- Bangladesh
- Cambodia
- Pacific islands
- Philippines
- Indonesia
- Thailand
- Vietnam
- .....

## Crop failure

- Cambodia
- India
- Thailand
- Vietnam
- .....

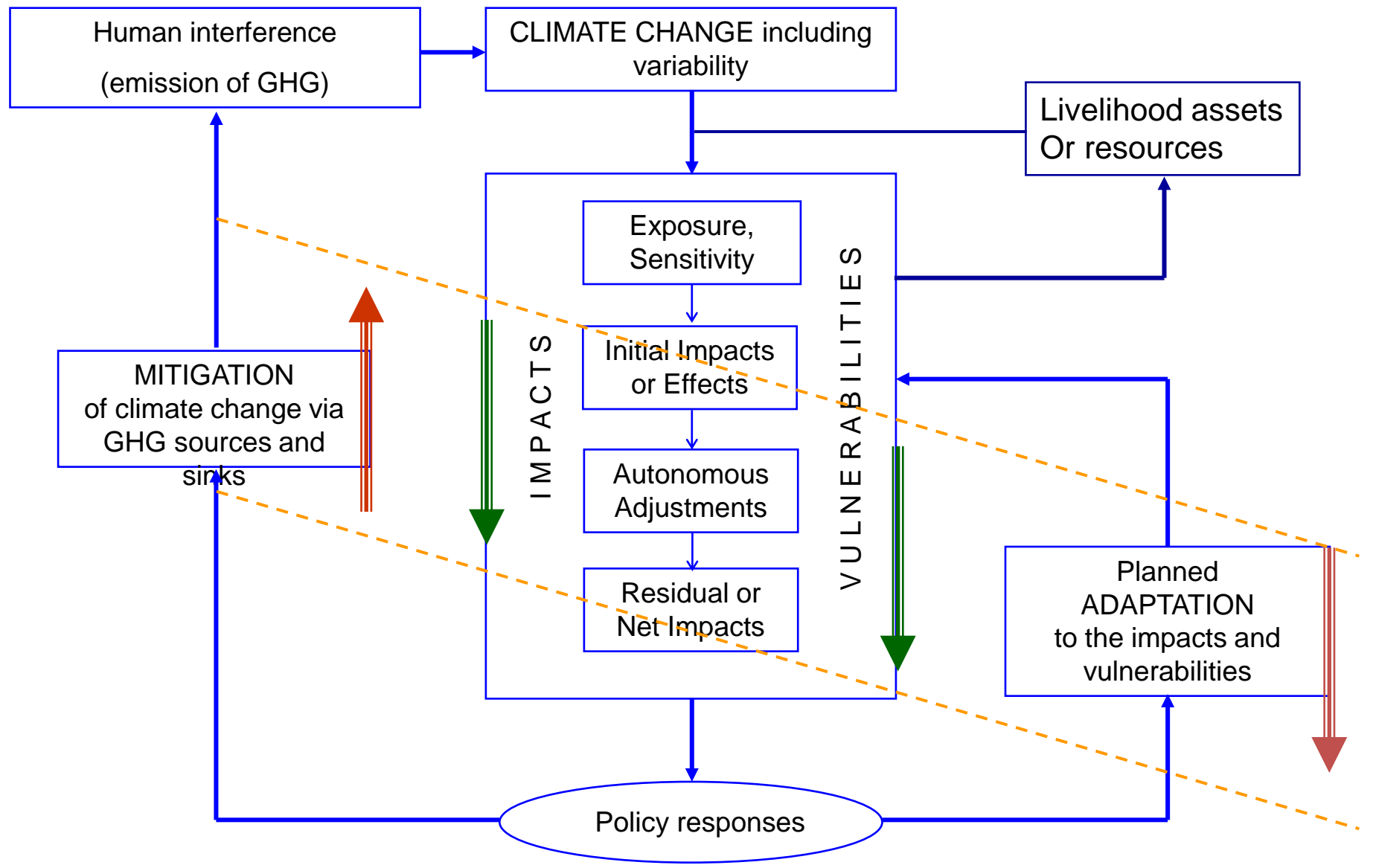
## Drought

- Australia
- China
- India
- .....

## Impacts

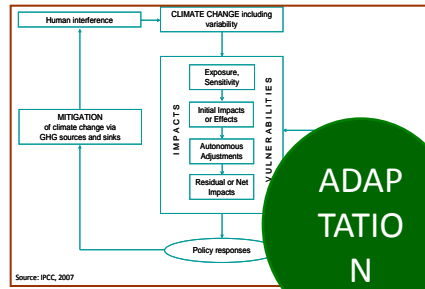
- Human health, livelihood, security, and poverty - different magnitude and types
- Vary by country, sub-region, and within country

# Mitigation and Adaptation: Inter-linkages



Source: Modified, IPCC, 2007

# Why Adaptation May Fail: Multiple Aspects



**ADAP TATIO N**

**Adaptation objectives**  
 Maintaining functional property of assets and ensuring outputs

**Constraints:** factors that make planning and implement adaptation actions harder

**Adaptation Options/Actions**

**Opportunities:** factors that make implement of adaptation and achieve adaptation objectives easier

**Option universe**  
 (High to Low)  
 (Local to global)

**Capacity and Resources (Constraint)**

**Types of actors**  
 (local to global)

Awareness, learning, innovation etc.  
**(Opportunities)**

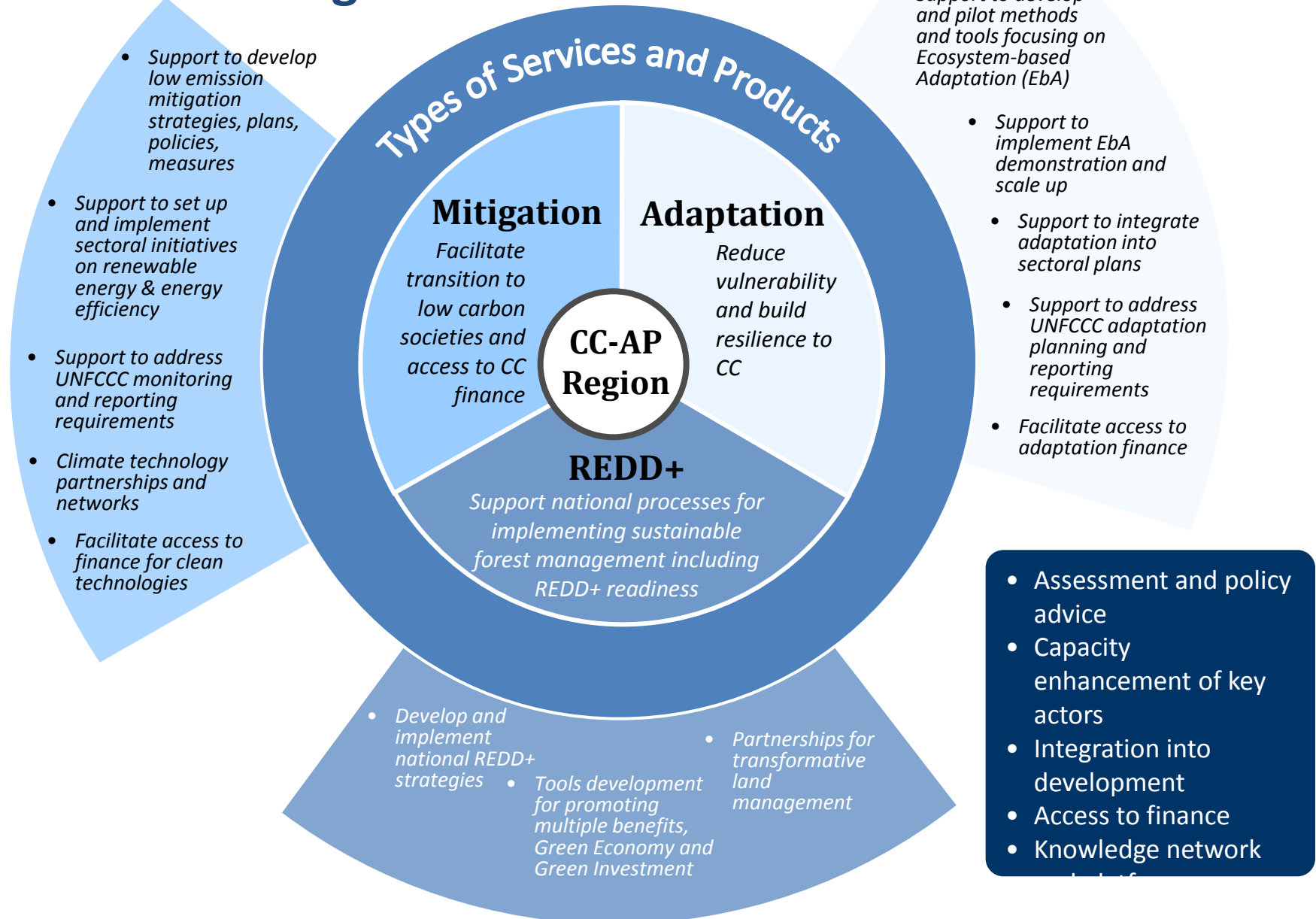
**Levels**  
 (local to global)

- Limit to adaptation:** no adaptation options exist
- Biophysical
  - Technological
  - Economic and finance
  - Social and cultural
  - Institutional and polices

**Hierarchy of limits**  
 (local to global)



## Climate Change



## Climate Change

- Asia Pacific Adaptation Network (APAN):** Adaptation Forum become a flagship event in the Asia and the Pacific Region for adaptation practitioners
- Ecosystem-based Adaptation:** emerging adaptation concept promoted and building wider partnership in Nepal focusing on mountain ecosystem
- NIE accreditation support programme:** challenges recognized by the key national actors and support required for direct access to Adaptation Fund
- Climate Technology Network and Finance Centre:** Building partnership among technology centre to support technology transfer
- Finance Access to Clean Technology:** Partnership build with local financial institutes to promote cleaner technology at end user level
- Network of Climate Change Focal Points Office:** Established climate change focal points and expert network in the region

# Thank You !

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## CAMBODIA CLIMATE CHANGE ALLIANCE

