Status of Climate Change and Adaptation in the Lower Mekong Basin
preliminary findings from Researches and Studies of the MRC Climate Change and Adaptation Initiative

Nguyen Huong Thuy Phan
Programme Coordinator
MRC Climate Change and Adaptation Initiative
Outline

- Lower Mekong Basin
- CCAI
- Preliminary findings
  - Climate change
  - Impacts and vulnerability
- Adaptation in the LMB
- Summary remarks
Lower Mekong Basin

- 795,000 km²
- 475,000 million m³
- 4,800 km
- 8th longest
- 30th i.t.o. basin size
- 10th i.t.o. discharge.
Tropical climate and monsoon influence
Rich landscapes
Diverse ecosystems
Fishes ~ 850 species
Birds ~ 1,200 species
Plants ~ 20,000 species

“Giant River”
Vulnerable to climate change
Relative vulnerability of coastal deltas by the population potentially displaced by current sea-level trends to 2050
(Extreme = >1 million people displaced; High = 1 million to 50,000; Medium = 50,000 to 5,000). Source: IPCC (2007)
MRC-Climate Change and Adaptation Initiative (CCAI)

A regional collaborative initiative to support the MRC Member Countries in adapting to the impacts & new challenges posed by climate change
CCAI Researches and Studies

Climate change: past and future

Impacts and vulnerability to climate change of water and water related resource and sectors at basin level

Adaptation policy and capacity

Adaptation strategic priorities and options

Costs and benefits of adaptation options
Preliminary finding: Increase temperature 1951-2010
Change of rainfalls 1951-2010
Change of storm tracks 1951-2013

Tracks of all known Pacific Western Typhoons with a landfall in the LMB for the time period 1951-1980 (yellow lines) and 1981-2013 (red lines) (MRC-CCAI 2014h)
Climate change in the future—Scenarios approaches

- Based on Global Climate Models (GCM):
  - IPCC emission scenarios (AR4) / regional concentration pathways (AR5)
  - GCM and climate sensitivity
- Based on historical data (non-GCM):
  - Analogue approaches
  - Stochastic approaches
## Climate change scenarios based on GCMs

### Emission scenarios

<table>
<thead>
<tr>
<th>AR4</th>
<th>7</th>
<th>20</th>
<th>3</th>
<th>420</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR5</td>
<td>4</td>
<td>42</td>
<td>3</td>
<td>504</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>924</td>
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</tbody>
</table>

### Climate change scenarios based on GCMs

- **AR4**: 7 scenarios for 20 total scenarios with 420 in total.
- **AR5**: 4 scenarios for 42 total scenarios with 504 in total.
- **Total**: 924 scenarios.

### Global circulation model

- **GCMs Climate sensitivity**
- **Total number of scenarios**

### Downscaling

- **Emission scenarios**
- **GCMs**
- **Climate sensitivity**
- **Total number of scenarios**

### Regional climate model

- **Statistical model**
Time series of annual temperature change relative to 1986–2005 averaged over land grid points over Southeast Asia. Thin lines denote one ensemble member per model, thick lines the multi-model mean. On the right-hand side the 5th, 25th, 50th (median), 75th and 95th percentiles of the distribution of 20-year mean changes are given for 2081–2100 in the four RCP scenarios (IPCC 2013).
Application of climate change scenarios in the LMB
Choice of emission scenarios in the LMB

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1) A1B</td>
<td>1) RCP2.6</td>
</tr>
<tr>
<td>2) A1T</td>
<td>2) RCP4.5</td>
</tr>
<tr>
<td>3) A1FI</td>
<td>3) RCP6.0</td>
</tr>
<tr>
<td>4) A2</td>
<td>4) RCP8.5</td>
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<tr>
<td>5) B1</td>
<td></td>
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<tr>
<td>6) B2</td>
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Other studies: Other studies


Choice of emission scenarios in the LMB

- **AR5 (2013)**: RCP2.6, RCP4.5, RCP6.0, RCP8.5

Other studies: Other studies

### Choice of GCMs in the LMB

**AR4: 20 GCMs**

1. UKMO HadCM3  
2. UKMO HadGEM1  
3. CSIRO Mk3  
4. IPSL CM4  
5. MIUB_ECHO  
6. MICRO3_2_MEDRES  
7. MICRO3_2_MEHIRS  
8. BCCR_BCM2  
9. **ECHAM4 (TR 29 and BDP2)**  
10. MPI ECHAM5  
11. CCCMA(CGCM) 3.1  
12. CNRM_CM3  
13. GISS_AOM  
14. NCAR_CCSM3

**AR5: 42 GCMs**

1. GISS-E2-R-XX  
2. IPSL  
3. NCAR_CCSM3

Other studies

[Diagram of Earth with various terrestrial and oceanic processes]
Projected change to annual precipitation relative to baseline period (1986-2005) in the whole Mekong River Basin (MRB) under six recommended scenarios.
Projected change to annual temperature in 2050 relative to baseline period (1986-2005) in the Lower Mekong Basin (LMB) under six recommended scenarios.
Projected change to annual precipitation in 2050 relative to baseline period (1986-2005) in the Lower Mekong Basin (LMB) under six recommended scenarios.

Medium scenario
RCP 6.0
-16 - -10
-10 - -5
-5 - 0
0 - 5
5 - 10
10 - 14

Extreme scenario
RCP 8.5
-33 - -20
-20 - -10
-10 - 0
0 - 10
10 - 20
20 - 34
Sea level rise scenarios

- Vietnam: 0.10 – 0.15 m by 2030, 0.25 – 0.40 m by 2060 and 0.45 – 0.85 m by 2090 (MONRE, 2011)
- MRC (2011): 0.17 m by 2030 and 0.30 m by 2060 under B2 scenarios
- CCAI (2014) is proposing

<table>
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<tr>
<th></th>
<th>2030</th>
<th>2060</th>
<th>2090</th>
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<tbody>
<tr>
<td>Medium emission scenarios (RCP 6.0)</td>
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<tr>
<td>GFDL-CM3 (recommended)</td>
<td>0.15</td>
<td>0.33</td>
<td>0.57</td>
</tr>
<tr>
<td>GISS-E2-R-CC</td>
<td>0.15</td>
<td>0.35</td>
<td>0.59</td>
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<tr>
<td>High emission scenarios (RCP 8.5)</td>
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<tr>
<td>GFDL-CM3 (recommended)</td>
<td>0.16</td>
<td>0.40</td>
<td>0.75</td>
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<tr>
<td>GISS-E2-R-CC</td>
<td>0.16</td>
<td>0.42</td>
<td>0.78</td>
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</tbody>
</table>
Preliminary finding: Most obviously affected sectors

Natural resources
- Water resources
- Biodiversity and ecosystems
- Forestry
- Fish and aquatic resources
- Coastal zone

Socio-economic sectors
- Agriculture & irrigation
- Aquaculture
- Food security
- Hydropower
- Navigation
- Infrastructure
- Human health
- Poverty reduction: income generation & wellbeing
Impacts on water resources and related sectors

- Impacts of past climate change on water discharge are difficult to identify and not explicitly attributable to climate change.
- Impacts of snowmelt in the UMB due to increase temperature is important to dry flow.
- Change of drought and flood regimes are expected. The magnitude of change will depends on magnitude and spatial distribution of change in rainfall (most sensitive parameter).
- Impacts on key species and shifts of ecoregions are expected over the long term.
- Salinity intrusion, morphological change and loss of land are expected to increase in the Mekong Delta due to sea level rise.
## Adaptation in the LMB

### Current adaptation policy and institutions
- Global: UNFCCC
- Regional: ASEAN, MRC
- National

### Implementation of adaptation
- Types
- Sectors
- Capacity

To be presented in Plenary 5
Demonstration programmes and projects in the LMB

Projects & programmes in CCAI database

- **Types:**
  - Community projects
  - Few are municipal projects

- **Sectors:**
  - Agriculture
  - Flood,
  - Disaster risk reduction,
  - Social and livelihood,
  - Water resources management,
  - Land use management,
  - Planning,
  - Public health
Capacity gaps

- Coordination between sectors
  - Lack of comprehensive policies
  - Limited public awareness and education
  - Limited data and information
  - Limited technical capacity
- Health sector
  - Limited CC studies
- Agriculture sector
  - Weak institutional setup
- Limited finance resources
Summary remarks

- **Past climate analysis:**
  - Warming is detectable in the LMB, 0.09°C to 0.18°C per decade.
  - But no consistent rainfall trends in observations are found.
  - No clear spatial or temporal shifts of tropical storms, while there is some evidence that intensity has increased.

- **Future climate scenarios for 2090 and modeling**
  - A temperature increase in between 0.14°C to 0.36°C per decade
  - A rainfall change by -13% to +10% for RCP6.0 (medium)
  - Sea level rise 0.57m (medium) to 0.75m (high)
  - An increase in cyclone frequency and intensity on the global scale and on a national scale for Vietnam
Summary remarks (contd.)

- The preliminary finding provided us improved understanding on status of climate change and adaptation which is useful for adaptation planning.

- Further researches and studies are being conducted, including:
  - Detailed trends and changes analysis of climate in the LMB using observed data, including changes in climate indices such as ENSO
  - Assessment of baseline and future vulnerability of water resources and water related resources and sectors
  - Analysis of policies, projects and programmes to identify policy gaps and recommendations for actions

- Data and results of researches and studies will be made available on MRC data portal
Thank you