Mekong Adaptation and Resilience to Climate Change (Mekong ARCC)

Paul Hartman, Chief of Party
Goal: Increase adaptation capacity & resilience of communities

• Use climate change downscaling techniques to identify vulnerable crops, fisheries and ecosystems in Lower Mekong countries
• Work at field level on climate planning that supports community development of adaptation and resilience strategies
• Collect extensive data to:
  – quantify ecosystem services
  – ascertain investment impact
  – develop project proposals for adaptation financing
• Disseminate project results and best practices across the region via platform partners to broaden/sustain impact
Top commercial crops:
- Vietnam
- Laos
- Thailand
- Cambodia

Rice, paddy
Coffee, green
Maize
Rubber
Cassava
Cashew nuts, with shell

Fruit trees:
- Bananas
- Mangoes

Vegetables:
- Sweet potatoes, tomatoes, beans, chilli

Traditional crop varieties:
- Rice (more than 13,000 identified in Lao)
- Eggplant (more than 3000 in Lao)
- Papaya
- Banana (centre of origin)
- Mango (centre of origin)
- Pineapple
- Watermelon
- Passion fruits

Wild plants:
- Cardamom
- Rattan and bamboo
- Orchids
- Mushrooms

Cropl wild relatives:
- Glutinous rice (centre of origin)
- Eggplant (centre of origin)

Centre of origin for:
- Coconut palm
- Sugarcane
- Clove
- Nutmeg
- Black pepper
- Onion
- Cucumber

Ecozones in the Lower Mekong Basin

Shifting Climate Zones
CC assessment parameters

1. Max/min daily Temperature
2. Seasonal rainfall
3. Timing of the monsoon
4. Peak rainfall events
5. Erosion potential
6. Drought
7. Storms & cyclones
8. Soil water availability
9. River flow
10. Hydro-biological seasons
11. Flooding (depth & duration)
12. Non-climate Drivers
% change in max annual temperature by 2050

Present max annual temperature in the Lower Mekong Basin:
- Current max annual temperature:
  - 17.5 - 20
  - 20.1 - 23
  - 22.1 - 24
  - 24.1 - 26
  - 26.1 - 28
  - 28.1 - 30
  - 30.1 - 32
  - 32.1 - 34

Climate change (temperature in 2050) in the Lower Mekong Basin:
- Change in max annual temperature (Deg C):
  - +5-7%
  - +10-15%
% change in annual rainfall by 2050
Comfort Zones: where temperature, rainfall, & soil conditions create favorable growing/productive environment.

Land suitability across basin: areas suitable for different species under differing conditions of climate, topography and soils

Crop yields in specific ‘hot spot’ provinces:
- Losses or gains in crop yields within hot spots caused by:
  - impact of water availability
  - heat stress
  - water stress
  - salinity intrusion in the delta
Land Suitability

Suitability of six crop species with projections of future changes in climate together with topographical characteristics.

- rainfed rice
- soya
- maize
- cassava
- robusta coffee
- rubber
Hot Spot Provinces

Basis for Selection

1. Representative of the ecosystems found across the Basin
2. Contain a mix of staple and commercial crops, fisheries and livestock that are common to LMB,
3. Projected to experience the greatest relative increase in average temperature and/or rainfall, and;
4. where such shifts would significantly impact important livelihood/subsistence options for communities.

Mid elevation dry broadleaf forest - Mondulkiri

_Ecosystem comfort zone:_ The range of precipitation or temperature that was experienced during 50% of the baseline around the mean.
### Provincial Climate Change Impacts at 2050 – Mondul Kiri

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Precipitation</th>
<th>Storms</th>
<th>Droughts</th>
<th>Soil Moisture</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 3.7 Deg C. increase in annual mean temperature; the avg. daily maximum temperature will rise from 38 to 42 Deg C.</td>
<td>Annual rainfall will increase from 1,935 mm/yr to 2,117 mm/yr (+182 mm/yr); Aug-Oct will see 10% increase in monthly rainfall, while Feb will see a 12% reduction</td>
<td>Projected increase from 9 days of large rainfall events (&gt;100 mm/day) to 21 days</td>
<td>April, the historical transition from the dry to wet season, will be drier and prolong water stress at the end of the dry season</td>
<td>Upland: Overall decline, peaking at -20% reduction in May; Lowland: Overall decline, peaking at -10% reduction in Aug</td>
</tr>
</tbody>
</table>

### Sectoral Vulnerabilities – Mondul Kiri

<table>
<thead>
<tr>
<th>Exposed Species</th>
<th>Illustrative Climate Vulnerability*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td></td>
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<tr>
<td>Lowland Rainfed Rice</td>
<td>Increased large rainfall events (waterlogging) &amp; above optimal temperatures</td>
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<tr>
<td>Soya</td>
<td>Increased large rainfall events (waterlogging) &amp; heat stress above 35°C</td>
</tr>
<tr>
<td>Cassava</td>
<td>Increased large rainfall events (waterlogging) &amp; heat stress above 35°C</td>
</tr>
<tr>
<td>Rubber</td>
<td>Dry season (Mar-May) will see increase in days above 35°C (heat stress)</td>
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<tr>
<td>Livestock</td>
<td></td>
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<tr>
<td>Smallholder Cattle/Buffalo</td>
<td>Heat stress impacts fodder availability and reproduction rates, while flood events increase the spread of disease and herd loss</td>
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<tr>
<td>Scavenging Chicken</td>
<td>Primary exposure comes from flood event population loss</td>
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<tr>
<td>Banteng</td>
<td>High adaptive capacity; exposure to heat stress will impact reproduction rates</td>
</tr>
<tr>
<td>Fishery</td>
<td></td>
</tr>
<tr>
<td>Upland/Forest Stream Fish</td>
<td>Flash floods may lead to heavy erosion and excess sedimentation levels, particularly in deforested areas</td>
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<tr>
<td>Migratory White Fish</td>
<td>Prolonged drought will limit stocks in all but the deepest refuge pools at the end of the dry season</td>
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<tr>
<td>Semi-Intensive Catfish Ponds</td>
<td>Flash floods will lead to stock loss, particularly when ponds located in a stream valley</td>
</tr>
<tr>
<td>Extensive Tilapia-Carp Polyculture</td>
<td>Temp increase and drier dry season means reduced oxygen levels, higher ammonia, reduced survival</td>
</tr>
<tr>
<td>Non-Timber Forest Products &amp; Crop Wild Species</td>
<td></td>
</tr>
<tr>
<td>Russula Mushroom</td>
<td>Prolonged dry seasons will impact soil moisture and potentially the abundance of this high value species</td>
</tr>
<tr>
<td>False Cardamom</td>
<td>Heat stress (days above 36°C) and prolonged dry season during April/May flowering may push to higher elevations</td>
</tr>
<tr>
<td>Wild Orchid</td>
<td>Heat stress and prolonged dry season will impact growth; intense storms will damage high tree canopy growth</td>
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<tr>
<td>Rattan</td>
<td>Heat stress &amp; prolonged dry season beyond comfort zone; flash floods will impact young seedlings</td>
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<tr>
<td>Paper Mulberry</td>
<td>Heat stress (days above 38°C) and longer season during flowering period (May/June) may push it to higher elevations</td>
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<tr>
<td>Giant Honeybee</td>
<td>More days above 33°C comfort zone threshold will likely cause out migration earlier, impacting pollination</td>
</tr>
<tr>
<td>Wild Rice (O. nivara, O. officinalis)</td>
<td>Heat stress to exceed comfort zone for all life stages; decreased soil moisture in flowering period; as temperature approaches and exceeds 44°C O. officinalis will becomes sterile</td>
</tr>
</tbody>
</table>
Strengthen capacity to ‘act, learn, act again’ by building communities’ ability to:

a) understand climate risks
b) identify and prioritize adaptive responses to those risks
c) Take action to implement adaptive responses
d) monitor and adjust along an iterative adaptation pathway