IMPACTS OF CLIMATE CHANGE
TO THE MEKONG DELTA

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Director of SIWRP

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MEKONG RIVER
- Run through 6 countries
- Length: 4,200 km
- Catchment area: 795,000 km²
- One of the longest rivers in the world
CONTRIBUTION OF THE MEKONG DELTA TO THE VIETNAMESE ECONOMY

• Viet Nam MK Delta: 3.9 million ha (5% MK basin, 12% area of VN).
• Contribute: 50% rice production, 65% of aquaculture production and 70% of fruits.
• Accounts for 95% of VN rice exports and 60% of fish exports.
• One of the most productive agricultural regions in the world.
**Existing Land Use Map**

- **Agricultural Land**: 63%
- **Aquacultural Land**: 13%
- **Forestry Land**: 8%
- **Other Lands**: 16%

<table>
<thead>
<tr>
<th>Type</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural</td>
<td>2,550,637</td>
</tr>
<tr>
<td>Aquacultural</td>
<td>530,746</td>
</tr>
<tr>
<td>Forest</td>
<td>331,481</td>
</tr>
<tr>
<td>Other</td>
<td>638,971</td>
</tr>
</tbody>
</table>
INCREASE OF RICE PRODUCTION FROM 1975 TO 2012

Rice production (1,000 tons)
Rice crop area (1,000 ha)

<table>
<thead>
<tr>
<th>Year</th>
<th>Rice Production</th>
<th>Rice Crop Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1937</td>
<td>2,700</td>
<td>2,200</td>
</tr>
<tr>
<td>1975</td>
<td>4,600</td>
<td>2,300</td>
</tr>
<tr>
<td>1985</td>
<td>7,600</td>
<td>2,714</td>
</tr>
<tr>
<td>1990</td>
<td>9,500</td>
<td>2,969</td>
</tr>
<tr>
<td>1995</td>
<td>12,832</td>
<td>3,191</td>
</tr>
<tr>
<td>2000</td>
<td>16,703</td>
<td>3,946</td>
</tr>
<tr>
<td>2005</td>
<td>19,299</td>
<td>3,826</td>
</tr>
<tr>
<td>2010</td>
<td>21,596</td>
<td>3,946</td>
</tr>
<tr>
<td>2012</td>
<td>24,293</td>
<td>4,181</td>
</tr>
</tbody>
</table>
MAJOR IWRM ISSUES IN THE MEKONG DELTA

- Upstream development
- Delta development
- Flooding & inundation
- Drought & salinity intrusion
- Acid-sulphate soils
- Water quality deterioration (pollution from production systems)
- Loss of wetlands and forests
- Erosion & sedimentation
- Land subsidence
- Climate change & sea leve rise
Mainstream hydropower dams:

Upper Mekong (China): 8 existing and planned

Lower Mekong (Lao, Thailand, Cambodia): 11 under construction and planned

Hydropower dams on tributaries:

Existing and planned: 94 (only for hydropower – exclude irrigation dams)
INCREASED WATER ABSTRACTION

IRRIGATION AREAS

IRRIGATION DEMAND

DOMESTIC DEMAND
- Land elevation: 0.3 – 2.0 m
- Air temperature: 26 – 27°C
- Annual rainfall: 1200–2400 mm
  - Wet season: May-Nov (90%)
  - Dry season: Dec-Apr (10%)
SALINITY INTRUSION IN THE MEKONG DELTA

- Area: 1.4 - 1.6 million ha
- Length (4 g/l): 40 - 50 km
- Duration: 2-5 months
FLOODING & INUNDATION IN THE MEKONG DELTA

- Area: 1.2 - 1.9 million ha
- Depth: 0.5 - 4.0 m
- Duration: 3 - 5 months
• **Area:**
  1.4 - 1.6 million ha

• **“Problem soils”:**
  0.8 - 0.9 million ha

• **Duration:**
  3 - 6 months (pH=3.5-5)

• **Severe areas:**
  Plain of Reeds,
  Long Xuyen Quadrangle,
  Ca Mau Peninsula
A World Bank report: Vietnam would be one of the most severely affected countries in the world by sea level rise.
ANNUAL AVE. TEMP.; PAST TREND

0.5 – 0.9 °C. degree increase over 30 years
0.2 – 0.3 °C. degree increase over a decade

Source: Southern Regional Hydro-meteorological Center
ANNUAL AVE. TEMP.; PREDICTION

Source: Simulation by PRECIS Model (B2 Scenarios adapted)

0.2 – 0.3 C. degree increase per 10 years
Very similar to past trend of the increase
More than 2 C. degrees increase at around HCM City and Ca Mau in 2100
ANNUAL RAINFALL; PAST TREND

Different trend by station

Source: Southern Regional Hydro-meteorological Center (SRHMC)
ANNUAL RAINFALL; PREDICTION

Source: Simulation by PRECIS Model (B2 Scenarios adapted)

0.4 – 0.6 % increase per decade (B2).
FUTURE ANNUAL RAINFALL (B2)

Year 2020

Year 2050

Year 2070

Year 2090

6% increase to appear in the north-eastern area of the Delta in 2100
SEA LEVEL RISE: PAST TREND

4cm rise a decade at Vung Tau (East Sea)

6cm rise a decade at Rach Gia (West Sea)

Source: Southern Regional Hydro-meteorological Centre
### SEA LEVEL RISE: PROJECTION

Source: Simulation by PRECIS Model (B2 Scenarios adapted)

![Graph showing projected sea level rise (cm) from 2020 to 2100 for different locations such as Tien Giang, Ben Tre, Tra Vinh, Soc Trang, Bac Lieu, Ca Mau, and Kien Giang. The graph indicates a trend of about 8 cm rise per decade (B2) and more than the past trend.]

**Table 7. Sea Level Rise (cm) relative to period of 1980 - 1999**

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Decades in the 21 Century</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2020</td>
</tr>
<tr>
<td>Low emission scenario (B1)</td>
<td>11</td>
</tr>
<tr>
<td>Medium emission scenario (B2)</td>
<td>12</td>
</tr>
<tr>
<td>High emission scenario (A1FI)</td>
<td>12</td>
</tr>
</tbody>
</table>
IMPACTS CLIMATE CHANGE & SLR ON FLOODING IN THE MEKONG DELTA

Area affected by Flood risk
Baseline Scenario

Area affected by Flood risk
SLR 15 cm + CC 2030 window

Area affected by Flood risk
SLR 30 cm + CC 2050 window

High River Flow Scenarios

Inundation Depth (WL - LL) (m)

0 0.25 0.50 0.75 1.0 2.0 3.0

Inundation Area (10^3 ha)

Baseline
SLR15cm+CC2030w
SLR30cm+CC2050w

Non Inundation
Shallow Inundation (0.5-2m)
Deeper Inundation (>2m)
IMPACTS CLIMATE CHANGE & SLR ON SALINITY INTRUSION IN THE MEKONG DELTA

Baseline Low water year

SLR 30cm & CC 2050
SLR 15cm & CC 2030
Baseline LWY

<1 g/l 1-2 g/l 2-4 g/l >4 g/l Thousands ha

Sea Level Rise 15cm + Climate 2030 window

Sea Level Rise 30 cm + Climate 2050 window

Mekong
Bassac

Baseline SLR 15cm &CC 2030 SLR 30cm &CC 2050

64
69
72
52
56
58

Length of intrusion (km)
Further salinity intrusion in the main rivers up to fresh water intakes causing failure of “fresh water” projects.

Fresh water shortage is more seriously, especially in the dry season.

Existing dyke systems for flood and salinity protection will be ineffective at high tide.

Existing sluice systems will be less effective for drainage due to sea level rise.

Flooding and inundation period will be longer

Infrastructure such as roads, urban drainage systems will not be suitable.

However, some advantages will be possible such as expansion of area with irrigation by gravity, reducing acidity.
• To understand in sound way of the impacts from climate change-sea level rise.

• In order to mitigate against and adapt to climate change-sea level rise, we need to apply a combination of structural and non-structural measures.

• A good combination of structural measures and non-structural measures will increase benefits and decrease investment cost.
FLOOD CONTROL PLANNING IN THE MEKONG DELTA

- Floods have both positive and negative impacts
- The strategy in flood management and mitigation in Mekong Delta is “proactively living with floods”
- Populated areas and infrastructure as road network will be fully protected.
- Deeply flooded area will be protected from early flood (August flood)
- Shallow flooded area will be protected in the year-round (e.g. O Mon-Xa No project area)
- Crop diversification: limit triple rice crop area, increase rice-fish crops & rice-upland crops.
3 ecosystems in coastal area:
- Fresh water ecosystem
- Brackish water ecosystem (saline and brackish water)
- Mangrove ecosystem

Brackish water ecosystem is suitable for aquaculture production

Popular aquaculture systems:
- Intensive & semi-intensive shrimp
- Extensive & improved extensive shrimp
- Shrimp - rice
- Shrimp in mangrove forest
Freshwater ecosystem is located in between flooded area and salinity area.

Basic alternative in water management is increase of water flow into production fields in the dry season by irrigation systems for rice production, fruit gardens and fresh water aquaculture.
• This is a main brackish aquaculture area but fresh water for drinking and for production should be maintained.

• Water-related measures focus on freshwater supply, rainwater drainage, salinity management and control of pollution from aquaculture.
The shoreline in the Mekong Delta has been varied quite complicated. Since 2000, the erosion situation is dominated and occurs in many places resulted in loss of forest, dike unstability.

Therefore, prevention of coastal erosion and shoreline stabilization are the most important objective in current and future plans.

Measures to reduce wave forces and to create mudflats will be implemented to restore, maintain and develop mangrove ecosystem.
Protect and develop coastal mangrove forests, especially protected forests to reduce impacts and to protect the environment.

Select cropping calendars, cropping patterns, varieties and crop diversification etc... while taking into account climate change & SLR impacts.

Using irrigation water more efficiently, increase searching for more measures to create and exploit additional sources of water in dry season.

Develop a highly adaptable and strategic master plan for Mekong Delta in short-term and long-term.

Developing and improving legal system on water resources management and prevention of damage caused by water-related disasters

All stakeholders should be involved in adaptation and mitigation initiatives
ADAPTATION INITIATIVES

- Rice - Shrimp
- Fruit - Shrimp
- Forest - Shrimp

COMBINATION OF STRUCTURAL AND NON-STRUCTURAL MEASURES

Core zone
Canal
Buffer zone
Canal
Dyke
WATER RESOURCES

HARMONIC COMBINATION

ECONOMIC

ENVIRONMENT

SOCIETY

SUSTAINABLE DEVELOPMENT
With a close cooperation among all riparian countries and valuable supports from donors, we will be able to meet a sustainable development for the Mekong River Basin that increases the benefits to all the Mekong people.
THANK YOU FOR YOUR ATTENTION