Construction of Scenarios used for Council Study

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Contents

• Council Study Scenarios
  • Future Vision
  • Main Scenarios
  • Sub Scenarios
Future Vision - Scenarios

- CS Examines **Scenarios** of change in **multiple sectors** which start and have benefits and impacts at **different times**.
- Scenario Changes based on **planning information and policies** from Member Countries for 2007, 2020 and 2040

**Prosperity**

**Loss**
Scenarios of Change

Exogenous
Climate Change
Socioeconomic condition

Water Sectors
Landuse
Agriculture
Irrigation
Water Supply
Sand Mining
Navigation
Flood Control
Hydropower

Infrastructure/
Social Development in specific years
1960, 2007, 2020, 2040

Integrated Multi-sector Cumulative Impact Assessment

Synthesis
Main benefits
Key negative impacts
Distribution
Knowledge gaps

Assess Impacts on Composite Indicators
Cross-sectoral
Sustainability
Transboundary

Water Resource Development Scenarios
Irrigation
Hydropower
Flood Control
Navigation
Agriculture and Landuse
Domestic & Industry

Disciplinary Impact Assessments
Hydrology
Sediments
Bio-resources
Economics
Social

Exogenous Trends & Scenarios
Demography, climate

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## Main Water Resource Development Scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Level of Development for water-related sectors</th>
<th>Climate Hydrological Variability</th>
<th>Flood-plain development</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALU</td>
<td>DIW</td>
<td>FPF</td>
<td>HPP</td>
</tr>
<tr>
<td>M3</td>
<td>Planned Development Scenario 2040</td>
<td>2040</td>
<td>2040</td>
</tr>
</tbody>
</table>

* ALU = Agric/Landuse Change; DIW = Domestic and Industrial Water Use; FPF = flood protection infrastructure; HPP = hydropower; IRR = irrigation; and NAV = Navigation
Main water resource development scenarios

• **Physical Changes** ie Landuse/Infrastructure such as Irrigation and Hydropower

• **Management** – ie flushing sediment from dams (MRC-Preliminary Design Guidance), flood zoning and protection standards adopted.

• **Exogenous development** Urbanisation and Climate Change, demographics

• **Socioeconomic Change** including livelihoods, assets at risk of flood, food requirements, economy.
Land use

<table>
<thead>
<tr>
<th>Area (million ha)</th>
<th>Cambodia</th>
<th>Vietnam delta</th>
<th>Vietnam highlands</th>
<th>Laos</th>
<th>Thailand</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>10.1</td>
<td>0.2</td>
<td>2.0</td>
<td>17.7</td>
<td>4.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area (million ha)</th>
<th>Cambodia</th>
<th>Vietnam delta</th>
<th>Vietnam highlands</th>
<th>Laos</th>
<th>Thailand</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>3.7</td>
<td>2.6</td>
<td>1.1</td>
<td>1.9</td>
<td>13.5</td>
</tr>
</tbody>
</table>
Land use

Area (million ha)

Cambodia: 7.1
Vietnam delta: 0.2
Vietnam highlands: 1.7
Laos: 18.9
Thailand: 4.2

2040
Dry Season Irrigation

Area (million ha)

Cambodia: 0.3
Vietnam: 2.0
Laos: 0.1
Thailand: 0.2

2007
Dry Season Irrigation

area (million ha)

Cambodia: 0.4
Vietnam: 2.0
Laos: 0.2
Thailand: 0.6

2020
**Dry Season Irrigation**

<table>
<thead>
<tr>
<th>Country</th>
<th>Area (million ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>0.8</td>
</tr>
<tr>
<td>Vietnam</td>
<td>1.9</td>
</tr>
<tr>
<td>Laos</td>
<td>0.4</td>
</tr>
<tr>
<td>Thailand</td>
<td>0.7</td>
</tr>
</tbody>
</table>

2040
Navigation

- 500 DWT
- 2000 DWT
- 3000 DWT
- Major inland port
- Khone Falls canal

2040
Hydropower

- Mainstream dam
- Tributary dam
Hydropower

Mainstream dam

Tributary dam
Hydropower

- Mainstream dam
- Tributary dam
Hydropower

- Mainstream dam
- Tributary dam

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Climate change
RCP4.5 Example Change
Factors – Temperature in October and December
IPSL October
Climate change
RCP4.5 Example Change
Factors – Rainfall
Change (%) in October and December

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Sub-scenario Formulation

Comparison

The analytical value of scenarios comes from their comparison

Thematic sector impacts

To understand the impacts of a sector need to kept at base level

- Scenarios and sub-scenarios are a key part of the design of the assessment
- The MRC Suite of Models predicts the physical changes in Hydrology, Sediment and Nutrients for each Scenario.
- Assessments for the linkages between each sector and the socioeconomics is then made
Sub-scenarios

Designed to show possible change relative to Main 2040 Scenario

1. ALU = Agriculture & Landuse Change;
2. IRR = irrigation
3. DIW = Domestic and Industrial Water Use and Sand Mining;
4. HPP = Hydropower
5. FPF = Flood protection/Floodplain infrastructure
6. NAV = Navigation

‘2040 Climate’ MRC Case Warmer and Seasonal Change is used based on IPSL RCP4.5. Other Climate Projections are tested under Climate Scenarios

<table>
<thead>
<tr>
<th>ID</th>
<th>Scenario</th>
<th>Scenario Category</th>
<th>Description</th>
<th>Climate &amp; Hydrological Variability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>T0</td>
<td></td>
<td>Pre-Development Scenario 1960</td>
<td>Historic</td>
</tr>
<tr>
<td>2</td>
<td>M1</td>
<td>MAIN</td>
<td>Early Development Scenario 2007</td>
<td>Historic</td>
</tr>
<tr>
<td>3</td>
<td>M2</td>
<td></td>
<td>Definite Future Development Scenario</td>
<td>Historic</td>
</tr>
<tr>
<td>4</td>
<td>M3</td>
<td></td>
<td>Planned Development 2040</td>
<td>2040 Climate</td>
</tr>
<tr>
<td>5</td>
<td>C1</td>
<td>Climate</td>
<td>M3 + no CC</td>
<td>2040 Climate</td>
</tr>
<tr>
<td>6</td>
<td>C2</td>
<td>Climate</td>
<td>M3 + RCP_45_GFDL_2040</td>
<td>2007</td>
</tr>
<tr>
<td>7</td>
<td>C3</td>
<td>Climate</td>
<td>M3 + RCP_45_GISS_2040</td>
<td>2007</td>
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<tr>
<td>8</td>
<td>A1</td>
<td>Agriculture &amp; Land Use</td>
<td>M3 + w/o ALU</td>
<td>2007</td>
</tr>
<tr>
<td>9</td>
<td>A2</td>
<td>Agriculture &amp; Land Use</td>
<td>M3 + High level ALU implementation</td>
<td>2007</td>
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<tr>
<td>10</td>
<td>F1</td>
<td>Flood Protection</td>
<td>M3 + w/o FPF</td>
<td>2007</td>
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<tr>
<td>11</td>
<td>F2</td>
<td>Flood Protection</td>
<td>M3 + FPF2</td>
<td>2007</td>
</tr>
<tr>
<td>12</td>
<td>F3</td>
<td>Flood Protection</td>
<td>M3 + FPF3</td>
<td>2007</td>
</tr>
<tr>
<td>13</td>
<td>I1</td>
<td>Irrigation</td>
<td>M3 + w/o IRR</td>
<td>2007</td>
</tr>
<tr>
<td>14</td>
<td>I2</td>
<td>Irrigation</td>
<td>M3 + High level IRR</td>
<td>2007</td>
</tr>
<tr>
<td>15</td>
<td>H1</td>
<td>Hydropower</td>
<td>M3 + w/o HPP</td>
<td>2007</td>
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<tr>
<td>16</td>
<td>H2</td>
<td>Hydropower</td>
<td>M3 + HPS1</td>
<td>2007</td>
</tr>
<tr>
<td>17</td>
<td>H3</td>
<td>Hydropower</td>
<td>M3 + HPS2</td>
<td>2007</td>
</tr>
<tr>
<td>18</td>
<td>N1</td>
<td>Navigation</td>
<td>M3 + w/o NAV</td>
<td>2007</td>
</tr>
<tr>
<td>19</td>
<td>D1</td>
<td>Water Use Sand Mining</td>
<td>M3 + w/o DIW</td>
<td>2007</td>
</tr>
</tbody>
</table>
Example - Flood protection sub-scenarios include options for increased level of flood protection and flood plain management

<table>
<thead>
<tr>
<th>Scenario and sub-scenarios</th>
<th>Level of Development for water-related sectors</th>
<th>Climate Hydrological Variability</th>
<th>Floodplain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ALU</td>
<td>DIW</td>
<td>FPF</td>
</tr>
<tr>
<td>M3 Planned Development Scenario 2040</td>
<td>2040</td>
<td>2040</td>
<td>2040</td>
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<tr>
<td>F1 Planned Development 2040 without FPD</td>
<td>2040</td>
<td>2040</td>
<td>2007</td>
</tr>
<tr>
<td>F2 Planned Development 2040 with FPF2</td>
<td>2040</td>
<td>2040</td>
<td>FPF2</td>
</tr>
<tr>
<td>F3 Planned Development 2040 with FPF3</td>
<td>2040</td>
<td>2040</td>
<td>FPF3</td>
</tr>
</tbody>
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# Climate change sub-scenarios

<table>
<thead>
<tr>
<th>Sub-scenarios</th>
<th>Level of Development for water-related sectors</th>
<th>Climate Hydrological Variability</th>
<th>Flood-plain</th>
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</thead>
<tbody>
<tr>
<td><strong>Sub-scenarios</strong></td>
<td>ALU</td>
<td>DIW</td>
<td>FPF</td>
</tr>
<tr>
<td>M3 Planned Development Scenario 2040</td>
<td>2040</td>
<td>2040</td>
<td>2040</td>
</tr>
<tr>
<td>C1 Planned Development 2040</td>
<td>2040</td>
<td>2040</td>
<td>2040</td>
</tr>
<tr>
<td><strong>No climate change</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C2 Planned Development 2040 + Wetter Climate</td>
<td>2040</td>
<td>2040</td>
<td>2040</td>
</tr>
<tr>
<td>C3 Planned Development 2040 + Drier Climate</td>
<td>2040</td>
<td>2040</td>
<td>2040</td>
</tr>
</tbody>
</table>

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Conclusions

• The design of the Council Study Scenarios is for a comprehensive vision of change for the main cumulative scenarios in 2007, 2020 and 2040.

• The data and assumptions used are based on working with MRC Member Countries and agreed with them.

• The Sub Scenarios provide variations of the possible future including high, low and no change in each water sector.

• 1960 Scenario for ‘Pre Development’ Comparison

• Future Climate Change Included