Formulation of Development Scenarios

BDP2 Experience in Formulating Development Scenarios

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Content

I. Approach and process

II. Defining scenarios

III. Data used in formulating scenarios
**BDP Planning Cycle**

**BDP planning cycle**

1. **Stage 1:** Sub-area analyses and regional national sector reviews
2. **Stage 2:** Existing and planned project database
3. **Stage 3:** Development scenario analysis (regional and sub-area levels)
4. **Stage 4:** WWRM-based basin strategy
5. **Stage 5:** Project portfolio (short and long lists)
6. **Stage 6:** Update and evaluation

**Overall Process**

**Time**

1. (1) Preparation and Concept Described
   - Regional Technical Working Group
   - National and Sub-areas Forums
   - Regional Consultation/Dialogue
   - Peer Review
   - JC endorsement
2. (2) Basin-Wide Development Scenario Formulation
   - Regional Technical Working Group
3. (3) Model Simulations and Hydrological Impact Assessment
   - Regional Technical Working Group
   - National and Sub-areas Forums
   - Regional Consultation/Dialogue
   - Peer Review
   - Independence Expert Panel Review
4. (4) Transboundary Environmental, Social and Economic Impact Assessments
   - Regional Technical Working Group
   - National and Sub-areas Forums
5. (5) Basin-Wide Scenario Evaluation
   - Regional Technical Working Group
   - National and Sub-areas Forums
   - Regional Consultation/Dialogue
   - Peer Review
   - Independence Expert Panel Review
6. (6) Negotiation and Trade-off

**Mechanism**

- Regional Technical Working Group
- National and Sub-areas Forums
- Regional Consultation/Dialogue
- Peer Review
- Independence Expert Panel Review
Approach to formulate scenarios

Water and related sectors considered

**Active sector**
1) Water supplies (domestic and industrial uses)
2) Irrigated agriculture
3) Hydropower
4) Flood management and mitigation

**Passive sector**
5) Fisheries
6) Navigation
7) Tourism and recreation
8) Environment

**Consideration in formulation process**
Could significantly change the hydrological regime of the river
- Diversion
- Redistribution
- Infrastructure intervention

**Consideration in assessment process**
Depend upon and impact by hydrological regime of the river
Principles considered in formulating scenarios

The following key principles derived from other scenario studies have guided the definition of the basin-wide development scenarios:

- The number of scenarios must be restricted to the minimum necessary to permit coverage of reasonably possible future developments in the Basin. There is no point in defining a large number of scenarios, each slightly different from the others. Too many scenarios lead to “scenario fatigue” by providing more information to policy makers and their advisors than they can absorb.

- A reasonably possible scenario is a “plausible” scenario, or at least “not implausible”. However, scenarios that are low in probability but high in consequences could be of interest to the Mekong Basin. Such scenarios are considered in the longer term scenarios.

- With projection into the future, error rate of scenarios grows rapidly. Long-term scenarios (say more than 20 years) are typically totally off. Therefore, the economic, social and environmental impact of longer-term scenarios will be described (not assessed), based on the results of the assessment of their hydrological impact.

Key steps in formulating scenarios

1) Defining scenarios
2) Data collection
3) Projection
4) Data verification
5) Endorsement
**Defined scenarios**

**First stage**

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>No. Dams Install</th>
<th>Irrigable area ($10^6$ ha)</th>
<th>Water supply ($10^6$ m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Baseline 2000</td>
<td>11</td>
<td>3.8</td>
<td>1,620</td>
</tr>
<tr>
<td>2) Upper Mekong Dams</td>
<td>17</td>
<td>3.8</td>
<td>1,620</td>
</tr>
<tr>
<td>3) Definite Future</td>
<td>35</td>
<td>4.0</td>
<td>2,938</td>
</tr>
<tr>
<td>4) LMB 20-Year Plan</td>
<td>79</td>
<td>6.0</td>
<td>4,581</td>
</tr>
<tr>
<td>5) LMB 20-Year Plan without mainstream dams</td>
<td>69</td>
<td>6.0</td>
<td>4,581</td>
</tr>
<tr>
<td>6) LMB 20-Year Plan with 6 mainstream dams in north LMB</td>
<td>75</td>
<td>6.0</td>
<td>4,581</td>
</tr>
</tbody>
</table>

**Basin-Wide Scenario Formulation and Input Data**

![Map of basin-wide scenario formulation and input data](image)

- **First stage scenarios**
  - 1. Baseline line scenario
  - 2. Chinese Dam Scenario
  - 3. Definite Future Scenario

- **Second stage scenarios**
  - 4. LMB 20-Year Plan Scenario
  - 5. LMB 20-Year Plan Scenario without Mainstream Dams
  - 6. LMB 20-Year Plan Scenario without Mainstream Dams in the Middle and Lower LMB
  - 7. Mekong Delta Flood Management Scenario

- **Third stage scenarios**
  - 8. LMB Long-term Development Scenario
  - 9. LMB Very High Development Scenario
Mekong Delta flood management scenarios

Foreseeable Future scenario, up to the year 2030, in which the existing agreed plan for flood protection in the Mekong Delta in Vietnam is expected to be completed, and a mix of early and full flood protection in the Cambodia part of the delta is considered (FMMP C2).

Sub-Scenario 1: Early flood protection and full flood protection in Cambodia
- Takeo
- Prey Veng

Sub-Scenario 2: Early flood protection and full flood protection in Vietnam
- Long Xuyen Quídrangle
- Trans Bassac
- Plain of Reeds

Sub-Scenario 3: Flood protection in Cambodia and Vietnam

### Defined scenarios

#### Last stage

<table>
<thead>
<tr>
<th>No.</th>
<th>Short Title</th>
<th>Full Title</th>
<th>Interventions/Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BS</td>
<td>Baseline Scenario</td>
<td>Year 2000 infrastructure including 15 existing hydropower dams</td>
</tr>
<tr>
<td>2</td>
<td>2015-UWD</td>
<td>Upper Mekong Dam Scenario</td>
<td>Baseline extended to include 6 hydropower cascade on the Lancang</td>
</tr>
<tr>
<td>3</td>
<td>2015-CF</td>
<td>Definite Future Scenario</td>
<td>2015-UWD plus 20 additional hydropower dams in LB and 2008 irrigation and flood measures</td>
</tr>
<tr>
<td>4</td>
<td>2030-20Y-wo MD</td>
<td>LB 20 Year Plan Scenario without mainstream dams</td>
<td>2015-CF plus LB proposed irrigation, diversion, water supply, and 4 planned tributary dams without LB main stream dams</td>
</tr>
<tr>
<td>5</td>
<td>2030-20Y-wo LMB</td>
<td>LB 20 Year Plan Scenario with 6 mainstream dams in Northern Lake PDR</td>
<td>As 2030-20Y-wo MD plus 6 LB main stream dams in upper LB</td>
</tr>
<tr>
<td>6</td>
<td>2030-20Y-wo TMD</td>
<td>LB 20 Year Plan Scenario with 9 mainstream dams, except Thai Long Lan dams</td>
<td>As 2030-20Y-wo MD plus 9 LB main stream dams in LB excluding the 2 Thai main stream dams</td>
</tr>
<tr>
<td>7</td>
<td>2030-20Y-wo CMD</td>
<td>LB 20 Year Plan Scenario with 9 mainstream dams, except Cambodia dams</td>
<td>As 2030-20Y-wo MD plus 9 LB main stream dams in LB excluding the 2 Cambodia main stream dams</td>
</tr>
<tr>
<td>8</td>
<td>2030-20Y</td>
<td>LB 20 Year Plan Scenario with all 11 mainstream dams</td>
<td>As 2030-20Y-wo MD plus all 11 LB main stream dams in LB</td>
</tr>
<tr>
<td>9</td>
<td>2030-20Y+CC</td>
<td>LB 20 Year Plan Scenario with all 11 main stream dams and climate change</td>
<td>As above plus climate change for average year between 2050-50 and 17cm sea level rise</td>
</tr>
<tr>
<td>10</td>
<td>2030-20Y+PFD</td>
<td>Mekong Delta Flood Management Scenario</td>
<td>Baseline plus 3 options for flood control in Cambodia and Vietnam Delta</td>
</tr>
</tbody>
</table>

#### Long term future situation - Year 2050

<table>
<thead>
<tr>
<th>No.</th>
<th>Short Title</th>
<th>Full Title</th>
<th>Interventions/Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>2050-LTD</td>
<td>LB 20 Year Long Term Development Scenario</td>
<td>2030-20Y plus all possible infrastructure developments in LB</td>
</tr>
<tr>
<td>12</td>
<td>2050-LTD+CC</td>
<td>LB 20 Year Long Term Development Scenario and climate change</td>
<td>As above plus climate change for average year between 2050-50 and 0cm sea level rise</td>
</tr>
<tr>
<td>13</td>
<td>2050-HD</td>
<td>LB Very High Development Scenario</td>
<td>As above, extended to full potential infrastructure developments</td>
</tr>
</tbody>
</table>
Main features of considered scenarios

- Scenarios are defined by the level of active water resources development in the Mekong Basin including irrigation, hydropower, domestic and industrial water supply and significant flood management measures.
- Level of developments is derived from national plans sector reviews and trends.
- Input data are reviewed and verified with the member countries.

Why these kind of scenarios

- Responding to immediate needs of Lower Mekong Basin: how planning should take into account implications of upstream developments
- National water resources development plans is in place and large scale projects being studied: urgently require basin perspectives
- Assessment criteria respond to basin and national objectives and the needs for basin-scale decision making
Data used in formulating scenarios

1) Water supply
2) Irrigation
3) Hydropower
4) Flood management

Data used for water supply

• Population
• Population growth rate
• Domestic per capita demands
  ➢ Rural
  ➢ Urban
• Industrial demands as percentage of gross domestic demand
Projection of population

\[ P_t = P_0 \times (1+k)^{\Delta t} \]

Where
- \( P_t \) = Population at the projection year
- \( P_0 \) = Population at the base year (present time)
- \( k \) = Rate of growth
- \( \Delta t \) = Period of the projection

Table 1.3 Estimated populations in the Lower Mekong Basin

<table>
<thead>
<tr>
<th>Country</th>
<th>Population (person)</th>
<th>Growth rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year 2000</td>
<td>Year 2007</td>
</tr>
<tr>
<td>Scenarios (see table 1.2)</td>
<td>1-2</td>
<td>3</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>4,965,300</td>
<td>5,194,361</td>
</tr>
<tr>
<td>Thailand</td>
<td>22,270,914</td>
<td>23,079,129</td>
</tr>
<tr>
<td>Cambodia</td>
<td>10,830,483</td>
<td>12,953,880</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>18,133,661</td>
<td>18,652,986</td>
</tr>
<tr>
<td>Total LMB</td>
<td>56,200,358</td>
<td>59,880,356</td>
</tr>
</tbody>
</table>

Remark: * Projected data
Data used for irrigation

- Project location (existing and plan)
- Crop areas
  - Rice (1st, 2nd and 3rd seasons)
  - Non-rice
- Cropping calendar
Cropping calendar

Data used for hydropower

• Project location (existing and plan)
• Dam and reservoir characteristic
  ➢ Installed capacity
  ➢ Stage-Area-Volume curve
  ➢ Outlet capacity
  ➢ Spillway capacity
  ➢ etc
• Dam operation rules
Hydropower database
Hydropower database

- Single dam
- Dam cascade

Hydropower Operation Rule Model
Data used for flood management scenarios

- Flood protection areas/locations
- Flood protection infrastructures
- Management schemes (full/partial)
Thank you.