Council Study: Cumulative Impact Assessment

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Overview of Council Study

CIA: Integrate and synthesize the findings from disciplinary and sector assessments

Solicit stakeholder inputs on design and interpretation

Transparent in communication
Cumulative means...

• Multiple changes
  (Council Study through scenario design)

• Multiple disciplines
  (Council Study through team assessments
   hydrology + environmental + social + economic)

**but**

• Combining many metrics into
  one (or a few) meaningful ones
Cumulative Impacts = Add Value

• Council Study includes disciplinary/thematic assessments
  • Hydrological impact incl. sediments
  • Environmental impacts
  • Land use change and agricultural production
  • Navigation
  • Socio-economics
  • Macro-economics

• How do all these different impacts add up
  → 1. Synthesis
  → 2. Meta indicators
Synthesis

Qualitative assessment of disciplinary results based on two frameworks

→ **a. Resilience**
  - Ability to absorb/recover from shocks
  - Multiple shocks at the same time
  - Identifying thresholds

→ **b. Vulnerability**
  - Community level vulnerability
  - Considering multiple drivers/disciplines
  - Considering adaptation (i.e. migration)
Meta-Indicator 1: Sustainability

- 40 indicators from CS mapped into SDGs
- Absolute values $\rightarrow$ score [0-40]

Country 1

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic loss due to disasters in percent of GDP</td>
<td>4%</td>
</tr>
<tr>
<td>Average farming household income</td>
<td>$2,000</td>
</tr>
<tr>
<td>GDP per energy input (in kg of oil equivalent)</td>
<td>$1.00</td>
</tr>
<tr>
<td>Annual growth rate of real GDP per capita</td>
<td>3.0%</td>
</tr>
</tbody>
</table>

For each indicator: **Worst** 0 0.33 **Best** 1

Expert-based normalisation
Meta-Indicator 1: Sustainability

- 40 indicators from CS mapped into SDGs
- Absolute values → score [0-40]
- Scenario comparison of values

Mock-up
Meta-Indicator 2: Sector Synergies

- Economic value of four MRC sectors
- Calculate the sum of MRC sector changes [$]
- Divide sector value differences

\[
\frac{\text{Fisheries sector [M2]} - \text{Fisheries sector [M1]}}{\text{Hydropower sector [M2]} - \text{Hydropower sector [M1]}} = \frac{\$3b - \$7b}{\$2b - \$1b} = -4
\]

Mock-up!
Meta-Indicator 2: Sector Synergies

- Economic value of four MRC sectors
- Calculate the sum of MRC sector changes [$]
- Divide sector value differences
- How much is gained/lost in sector 2 (in $) to increase value in sector 1 (in $)
- Magnitude and direction of trade-off/synergy
- Negative result → trade-off
- Positive result → synergy
Meta-Indicator 2: Sector Synergies

Mock-up
Meta-Indicator 2: Sector Synergies

Mock-up

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Meta-Indicator 3: Transboundary impact

• Percent attribution of 1 and 2: How much due to transboundary impact?

Step 1
Quantify the weight of each sector for M1, M2, M3…
→ Hydropower 70%
→ Irrigation 20%
→ Flood protection 10%

Step 2
Where do the investment occur?

i.e. Hydropower M2 → Lao PDR 100%
Irrigation → Thailand 40%
→ Lao PDR 30%
→ Cambodia 20%

Step 3
Multiply both sector weights with country weights → Scenario specific coefficients

Step 4:
Multiply transboundary coefficients with Sustainability results & sector synergy results
Meta-Indicator 3: Transboundary impact

- Percent attribution of **sustainability effect**: How much is transboundary contribution?

Mock-up

Transboundary contribution to Sustainability effect

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Domestic effect</th>
<th>Trans-boundary effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1 -&gt; M2</td>
<td>94.7%</td>
<td>5.3%</td>
</tr>
<tr>
<td>M1 -&gt; M3</td>
<td>78.7%</td>
<td>21.3%</td>
</tr>
</tbody>
</table>

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Meta-Indicator 3: Transboundary impact

• Percent attribution of **cross-sector effect**: How much is transboundary contribution?

Mock-up

Transboundary contribution to sector trade-offs

Domestic effect

Trans-boundary effect
Overview of Council Study

Integrate and synthesize the findings from disciplinary and sector assessments.

Solicit stakeholder inputs on design and interpretation.

Transparent in communication.

Integrated Multi-sector Cumulative Impact Assessment

Synthesis
- Main benefits
- Key negative impacts
- Distribution
- Knowledge gaps

Assess Impacts on Composite Indicators
- Cross-sectoral
- Sustainability
- Transboundary

Stakeholder inputs

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

Disciplinary & Sector Impact Assessments

irrigation
- Hydropower
- Flood Control
- Navigation
- Agriculture & Landuse
- Domestic & Industry

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Thank you

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FLOW OF INDICATORS

FLOW OF INDICATORS

WATER RESOURCE DEVELOPMENT SCENARIOS

HYDROLOGICAL MODELS

BIORA

SOCIAL

SECTOR VALUES
GDP CONTRIBUTION

HABITAT BIODIVERSITY

ECONOMIC

INFRASTRUCTURE LAND-USE

FLOW SEDIMENT QUALITY

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Sustainability: economic indicators

- Economic loss due to disasters in percent of GDP
- Average farming household income
- GDP per energy input (in kg of oil equivalent)
- Annual growth rate of real GDP per capita
- Annual growth rate of real GDP per employed person
- Tourism as a proportion of total GDP
- Proportion of domestic budget funded by domestic taxes
- Net official development assistance, as a proportion donors' gross national income (GNI)
- Foreign direct investments (FDI), official development assistance and South-South Cooperation as a proportion of total domestic budget
- Debt service as a proportion of exports of goods and services
## Sustainability: Environment Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water stress</td>
<td>Freshwater withdrawal in % of available freshwater resources</td>
</tr>
<tr>
<td>Degree of integrated water resources management implementation</td>
<td></td>
</tr>
<tr>
<td>Proportion of transboundary basin with an arrangement for water cooperation</td>
<td></td>
</tr>
<tr>
<td>Change in the extent of water-related ecosystems over time</td>
<td></td>
</tr>
<tr>
<td>Renewable energy share in the total final energy consumption</td>
<td></td>
</tr>
<tr>
<td>Ratio of land consumption rate to population growth rate</td>
<td></td>
</tr>
<tr>
<td>Proportion of fish stocks within biologically sustainable levels</td>
<td></td>
</tr>
<tr>
<td>Coverage of protected areas in relation to marine areas</td>
<td></td>
</tr>
<tr>
<td>Proportion of illegal fishing compared with total catch</td>
<td></td>
</tr>
<tr>
<td>Sustainable fisheries as a percentage of GDP</td>
<td></td>
</tr>
<tr>
<td>Forest area as a proportion of total land area</td>
<td></td>
</tr>
<tr>
<td>Proportion of important sites for biodiversity covered by protected areas</td>
<td></td>
</tr>
<tr>
<td>Proportion of land that is degraded over total land area</td>
<td></td>
</tr>
</tbody>
</table>
### Sustainability: social indicators

- Proportion of population below national poverty line
- Proportion of small-scale land holders with secure land titles
- Loss of human life due to disasters
- Proportion of Government spending on education
- Proportion of population undernourished
- Proportion of population with low food security
- Proportion of children under 5 with malnutrition
- Under-five mortality rate
- Mortality rate attributed to unsafe water
- Proportion of population using safe drinking water
- Proportion of wastewater safely treated
- Proportion of population with access to electricity
- Proportion of youth not in education, employment or training
- Proportion of people living below 50 per cent of median income