Aquatic ecosystem connectivity, ecosystem processes, and watershed integrity under Mekong dam development

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• develop a science-backed environmental narrative that guides strategic
decision-making on dam impacts and connectivity, work towards a
globally-applicable template

• test river network connectivity visualizations on the Mekong with a
focus on dam development

• propagate an ecosystem inclusive, basin-wide, approach to dam
development
1. Aquatic ecosystem classification
   - captures relevant basin-wide processes
   - incorporates essential migration triggers
   - open-sourced, transparent, replicable

2. Connectivity visualization
   - upstream-downstream network analysis
   - allows multiple scales
   - globally replicable to any river system

3. Dam locations
   - location based; not data-based
   - configuration of multiple dams, river system perspective

4. Consistent connectivity metric
   - network algorithm; no environmental valuation
   - comparative and scalable
   - not a silver bullet; part of much broader assessment

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Aquatic ecosystem classification

Classifier | Association, representative of:
---|---
elevation |  
slope |  
karsts |  
river length |  

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Our dam database contains over 50 of the largest or most prominent dams in the basin, and includes hydropower and agricultural dams. It excludes a large amount of smaller, agricultural dams.
In our initial analysis we found out that the current layout of dams ‘blocks’ 40% of the Mekong.
Connectivity applied to dams and large tributaries

Number of connected ecosystems:
- 1
- 2
- 3
- 4
- 6
- 11

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Using a network connectivity algorithm, we were able to determine that currently **45%** of ecosystem connectivity is preserved in the Mekong according to this ecosystem classification.
# Impacts on Mekong-wide ecosystem connectivity

<table>
<thead>
<tr>
<th>Project name</th>
<th>Capacity</th>
<th>Impact on connectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sayaboury</td>
<td>1,260 MW</td>
<td></td>
</tr>
<tr>
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<tr>
<td>Sayaboury</td>
<td>1,260 MW</td>
<td>5.0 % decrease</td>
</tr>
<tr>
<td>Nam Theun 2</td>
<td>1,070 MW</td>
<td>0.8 % decrease</td>
</tr>
<tr>
<td>Se San cascade</td>
<td>1,540 MW</td>
<td>1.2 % decrease</td>
</tr>
</tbody>
</table>

Overall ecosystem connectivity is very vulnerable to dam development on the main stem; the reproduction of ecosystem processes in the Mekong is extremely sensitive to the impacts of main stem dams because of its layout; a very long main stem fed by relative short tributaries.
Conclusions and recommendations

• Work towards an open, consistent and reliable database of all existing dams in the Mekong basin, include planned dams

• Dams on the mainstream have disproportional impacts on the connectivity of the ecosystems, compared to tributary dams

• Incorporate ecosystem processes connectivity as a guideline in basin-wide dam planning
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