Strategic planning
- Hydropower sector –
SEA and other tools

Dr Arend Kolhoff, February 2020
Hydropower sector - characteristics

• Planned ~3700 new dams >1MW
• Doubling of existing capacity until 2050
  • Africa
  • Latin America
  • Asia
• Development
  • Led by private sector – supported by IFIs
  • Limited but emerging role of the government
Effects of hydropower projects

Conclusion

• Economic benefits overestimated, environmental and social costs underestimated

• More difficult to identify HPP financially feasible and environmentally and socially acceptable
How to identify good HPPs?

- Paradigm shift - Hydropower sector -

Project development → Strategic planning

- Strategic planning
  - Led by government
  - Jointly with private sector & civil society
  - Encouraged by IFIs
Benefits of strategic hydropower planning:

- **Government / civil society**
  - Exclusion of most vulnerable sites
  - Better balance of stakeholders interests
    - Increased acceptability selected sites (less conflict)
    - Benefit sharing mechanisms

- **Private sector and IFIs**
  - Optimization of financial benefits
  - Level playing field
  - Minimizes (reputation) risks
  - Saves time and funds (ESIAs, less delay)
Tools supporting sustainable development

**Energy sector**
- Nat. objectives (NDCs & SDGs)
- Scenarios (energy supply, demand)
- National fuel mix (int. connectivity)
- Hydropower % of renewables

**Key decisions**
- Exclusion zones
- Technical potential (baseline)
- Objectives (single, multi-purpose)
- Site selection (preliminary)

**Hydropower sector**
- Site selection
- Capacity (large, medium, small)
- Number and type of projects
- Optimization of projects

**Design**
- Mitigation hierarchy & off set
- Sustainability ambition
- Management (E-flow)

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**Strategic planning**

**Energy by Design**
- Initiated by:
  - Government
  - Government or private sector
  - Private sector / bank and government

**Hydropower by Design**

**Cumulative Impact Assessment**

**Hydropower Sustainability Assessment Protocol**

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**Project planning + mgmt**

**Strategic Environmental Assessment**

**Environmental Social Impact Assessment**
### Tools supporting sustainable development

<table>
<thead>
<tr>
<th>Energy sector</th>
<th>Hydropower sector</th>
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<tbody>
<tr>
<td><strong>Key decisions</strong></td>
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<td>Nat. objectives (NDCs &amp; SDGs)</td>
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#### Strategic planning

- **Strategic Environmental Assessment**

#### Project planning + mgmt

- **Environmental Social Impact Assessment**
- **Cumulative Impact Assessment**
- **Hydropower Sustainability Assessment Protocol**

### Voluntary tools

- **Energy by Design**
  - Initiated by: Government
  - Government or private sector
  - Private sector / bank and government

- **Hydropower by Design**

### Legal tools

- **Strategic Environmental Assessment**
- **Exclusion zones**
- **Technical potential (baseline)**
- **Objectives (single, multi-purpose)**
- **Site selection (preliminary)**
- **Site selection**
- **Capacity (large, medium, small)**
- **Number and type of projects**
- **Optimization of projects**
- **Design**
- **Mitigation hierarchy & off set**
- **Sustainability ambition**
- **Management (E-flow)**

### Government or private sector

- **Government**
- **Government or private sector**
- **Private sector / bank and government**
Countries with national SEA legislation established in Environmental law

Countries with voluntary SEA guidance and / or SEA experience
SEA – legal status (2018)

Number of countries (N=194)

- Adopted 106
- Partially adopted 33
- Nothing 58
- Unknown 7
Examples of SEA

- India
- Myanmar
Strategic Environmental Assessment for hydropower development in India

Thanks to: Asha Rajvanshi
Wildlife Institute of India
Benefits from Ganges River Basin

- Carries 28% of surface water
- 13 mkw hydroelectric potential
- Irrigates 47% of the country flood plains
- National aquatic animal
- Flow of nutrients and silt enrich mangroves forests
- Economic returns from rafting depend on flows
- Flow dependent golden mahseer
- 10-13 million people depend on 300 sp of fish for food and living
- Cultural and religious values linked to river flow
Flowing Ganges epitomises purity, holiness and godliness
Hydropower projects - Ganges River - Uttarakhand State

Potential: 20,000 MW
Commissioned: 3,164 MW
Planned: 12,235 MW

Total Projects: 70
14 underway
39 proposed
17 commissioned
Critical Habitats
Objective of SEA

Supporting decision-making on hydro-power projects in the upper Ganges river basin, identified in Uttarakhand State Energy Plan.

Funding by Government of India
Alternative 1

What if only existing projects? (17 projects)
Alternative 2

What if commissioned projects and those under construction (14 + 39 = 53 projects)
What happens if **ALL** (70) projects come up?
### Decisions on future dams (24 stopped of planned 53)

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Projects to be excluded</th>
<th>Sub-basin</th>
<th>Capacity (MW)</th>
<th>Aquatic</th>
<th>Terrestrial</th>
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SEA results & lessons learned

- Ganges Basin Authority chaired by president - key to SEA influence
- SEA has effectively contributed to the transparency of strategic decisions on dams (only key organisations involved)
- Revision of Uttarakhand State Energy Plan
- Decisions on future dams – 24 stopped of planned 53
- Policy regulating E-flow all dams in India
- Support to introduce SEA
Myanmar
SEA – National hydropower plan
National Hydropower Plan

Technical potential 240,000 MW

<table>
<thead>
<tr>
<th>Project Status</th>
<th>Number of Projects</th>
<th>Ayeyarwady (MW)</th>
<th>Thanlwin (MW)</th>
<th>Sittaung (MW)</th>
<th>Other (MW)</th>
<th>Total (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Built</td>
<td>29</td>
<td>2,100</td>
<td>302</td>
<td>810</td>
<td>86</td>
<td>3,298</td>
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<td>Under Construction</td>
<td>6</td>
<td>1,372</td>
<td>81</td>
<td>-</td>
<td>111</td>
<td>1,564</td>
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<tr>
<td>Proposed/Identified</td>
<td>69</td>
<td>24,604</td>
<td>16,110</td>
<td>410</td>
<td>2,724</td>
<td>43,848</td>
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<td>Total</td>
<td>104</td>
<td>28,076</td>
<td>16,493</td>
<td>1,220</td>
<td>3,291</td>
<td>48,710</td>
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</tbody>
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Out of 69 proposed projects:

- 51 - little or no environmental and social considerations
- 8 - on mainstems or the main basin tributary
- 8 - on hold due to public protest
SEA support Strategic Hydropower Plan

**Purpose of the SEA:** Provide a “sustainable hydropower development framework” in each major river basins to ensure both basin health and hydropower generation.

**Funding:** IFC - Australian Aid
Sub Basin Zoning

- Determined by totaling the evaluation scores for geomorphology, aquatic ecology, and terrestrial ecology:
  - High value
  - Medium value
  - Low value
Result: Hydropower Development Framework

• Mainstem reservation

• Sub Basin Zoning
  ➢ Development Restrictions for High Value Zone Sub-Basins
  ➢ Balancing the Utilization of Low and Medium Value Zone Sub-basins

• Priority Sub-Basins for Hydropower Development
  1. Low zone sub-basins with existing (operational and under construction) cascade hydropower development;
  2. Medium zone sub-basins with existing cascade hydropower development;
  3. Low zone sub-basins without any existing medium/large HPPs; and
  4. Medium zone sub-basins without any existing medium/large HPPs.

Potentially suitable for development total 7,323 MW
Actions supporting strategic planning?

- Guidelines supporting strategic planning of hydropower developed and adopted by IHA, ICOLD, IAIA
  - Strategy note prepared by TNC / NCEA (November, 2019)
  - Good practice SEA cases (NCEA: May, 2020)
  - SEA / HbD in 2 countries

- Who is interested to join this initiative?
<table>
<thead>
<tr>
<th>Main decisions</th>
<th>Main issues</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>National energy plan</strong></td>
<td><strong>SEA</strong></td>
</tr>
<tr>
<td>• Energy demand and supply</td>
<td>• Scenarios (pop. / econ. / CC)</td>
</tr>
<tr>
<td>• Fuel mix - composition of energy resources</td>
<td>• Alternatives for fuel mix</td>
</tr>
<tr>
<td>• Import and export of energy resources</td>
<td>• Alternatives for import and export</td>
</tr>
<tr>
<td>• Social CBA</td>
<td>• Social CBA of main alternatives</td>
</tr>
<tr>
<td>• Priority setting of investments</td>
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</tr>
<tr>
<td><strong>National hydropower plan</strong></td>
<td><strong>SEA</strong></td>
</tr>
<tr>
<td>• Technical capacity assessed for each river basin</td>
<td>• Alternatives for capacity (macro to micro) location, size and type for each river basin</td>
</tr>
<tr>
<td>• Composition of type / capacity divided in micro, small, meso and macro HPP</td>
<td>• Comparison of the selected main alternatives between the river basins</td>
</tr>
<tr>
<td>• Preliminary selection of sites for hydropower development</td>
<td>• Zoning of river basin sections</td>
</tr>
<tr>
<td>• Economic feasibility</td>
<td>• Social CBA of main alternatives</td>
</tr>
<tr>
<td><strong>Hydropower project</strong></td>
<td><strong>EIA</strong></td>
</tr>
<tr>
<td>• <em>(Location)</em></td>
<td>• Alternatives</td>
</tr>
<tr>
<td>• Type, capacity</td>
<td>• Environmental and social impacts</td>
</tr>
<tr>
<td>• Management</td>
<td>• Mitigation measures</td>
</tr>
<tr>
<td>• Financial feasibility</td>
<td>• Compensation and resettlement</td>
</tr>
<tr>
<td></td>
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