Netherlands Commission for
Environmental Assessment

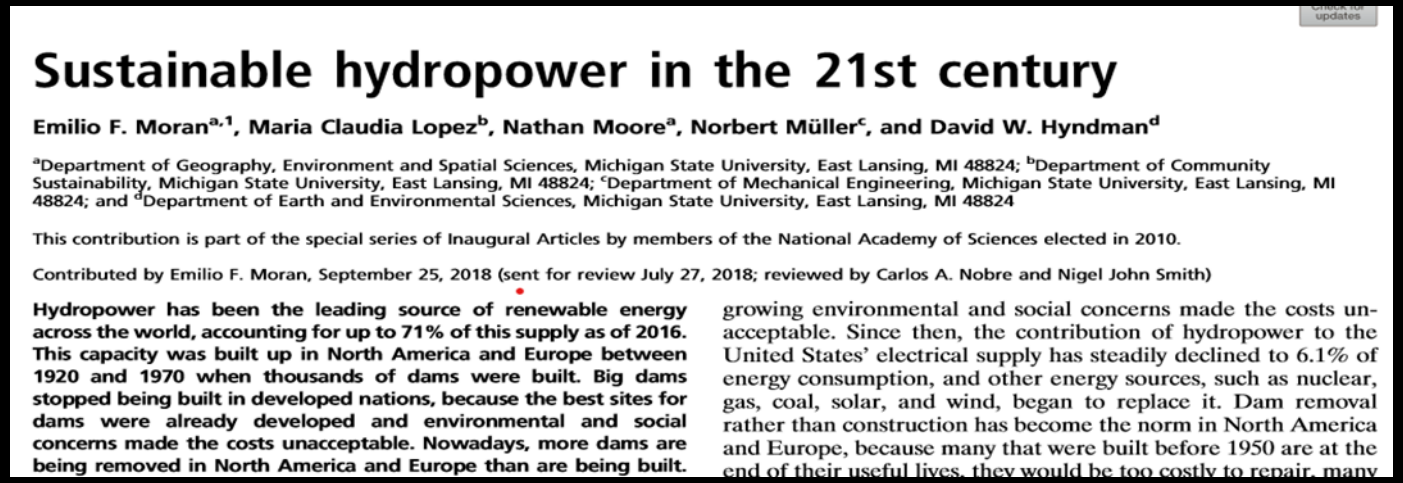
Strategic planning
- Hydropower sector –
SEA and other tools

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



Sustainable hydropower in the 21st century

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This contribution is part of the special series of Inaugural Articles by members of the National Academy of Sciences elected in 2010.

Contributed by Emilio F. Moran, September 25, 2018 (sent for review July 27, 2018; reviewed by Carlos A. Nobre and Nigel John Smith)

Hydropower has been the leading source of renewable energy across the world, accounting for up to 71% of this supply as of 2016. This capacity was built up in North America and Europe between 1920 and 1970 when thousands of dams were built. Big dams stopped being built in developed nations, because the best sites for dams were already developed and environmental and social concerns made the costs unacceptable. Nowadays, more dams are being removed in North America and Europe than are being built.

growing environmental and social concerns made the costs unacceptable. Since then, the contribution of hydropower to the United States' electrical supply has steadily declined to 6.1% of energy consumption, and other energy sources, such as nuclear, gas, coal, solar, and wind, began to replace it. Dam removal rather than construction has become the norm in North America and Europe, because many that were built before 1950 are at the end of their useful lives, they would be too costly to repair, many

Moran et al. 2018

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 -

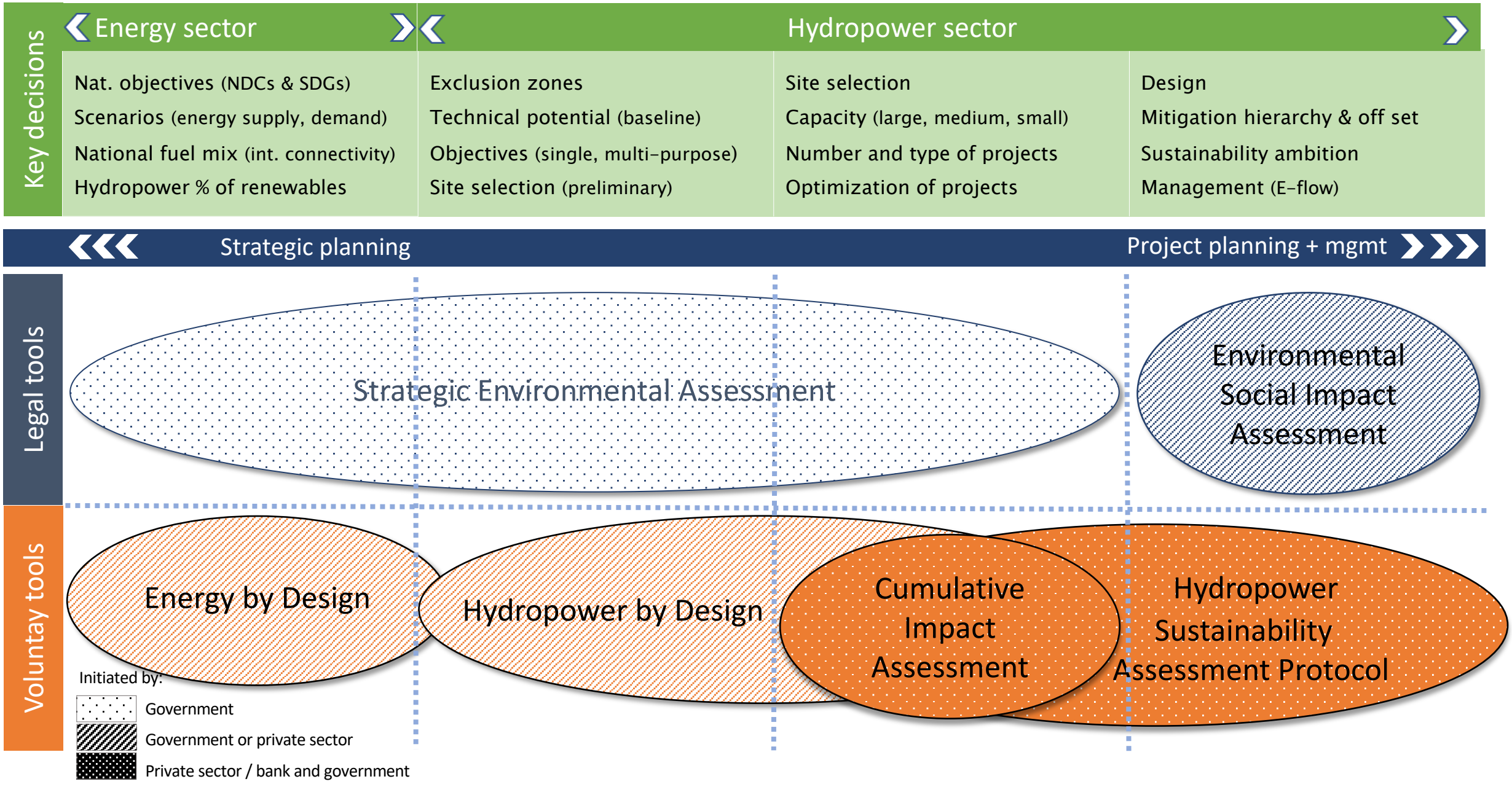
Project development → Strategic planning

- Strategic planning
  - Led by government
  - Jointly with private sector & civil society
  - Encouraged by IFIs

Benefits 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



Tools supporting sustainable development

Key decisions

Energy sector	Hydropower sector		
Nat. objectives (NDCs & SDGs)	Exclusion zones	Site selection	Design
Scenarios (energy supply, demand)	Technical potential (baseline)	Capacity (large, medium, small)	Mitigation hierarchy & off set
National fuel mix (int. connectivity)	Objectives (single, multi-purpose)	Number and type of projects	Sustainability ambition
Hydropower % of renewables	Site selection (preliminary)	Optimization of projects	Management (E-flow)

Strategic planning → Project planning + mgmt

Legal tools

Strategic Environmental Assessment

Environmental Social Impact Assessment

Voluntay tools

Energy by Design

Hydropower by Design

Cumulative Impact Assessment

Hydropower Sustainability Assessment Protocol

Initiated by:

- Government
- Government or private sector
- Private sector / bank and government

1969 2019

SEA – legal status (2018)

Number of countries (N=194)

- Adopted 106
- Partially adopted 33
- Nothing 58
- Unknown 7

Examples of SEA

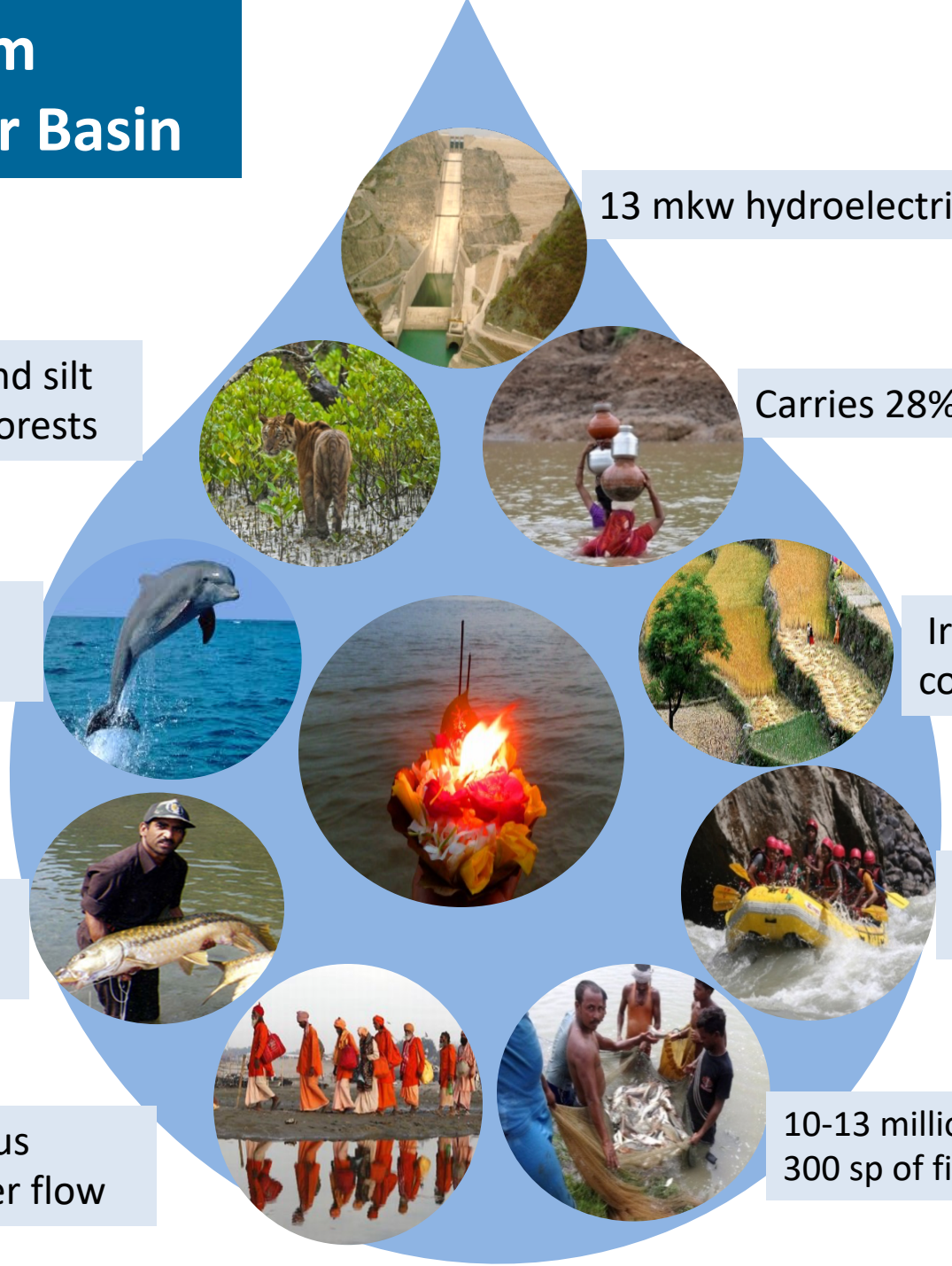
- India
- Myanmar

Strategic Environmental Assessment for hydropower development in India

Thanks to: Asha Rajvanshi

Wildlife Institute of India

Benefits from Ganges River Basin



13 mkw hydroelectric potential

Carries 28% of surface water

Irrigates 47 % the country flood plains

Economic returns from rafting depend on flows

10-13 million people depend on 300 sp of fish for food and living

Cultural and religious values linked to river flow

Flow dependent golden mahseer

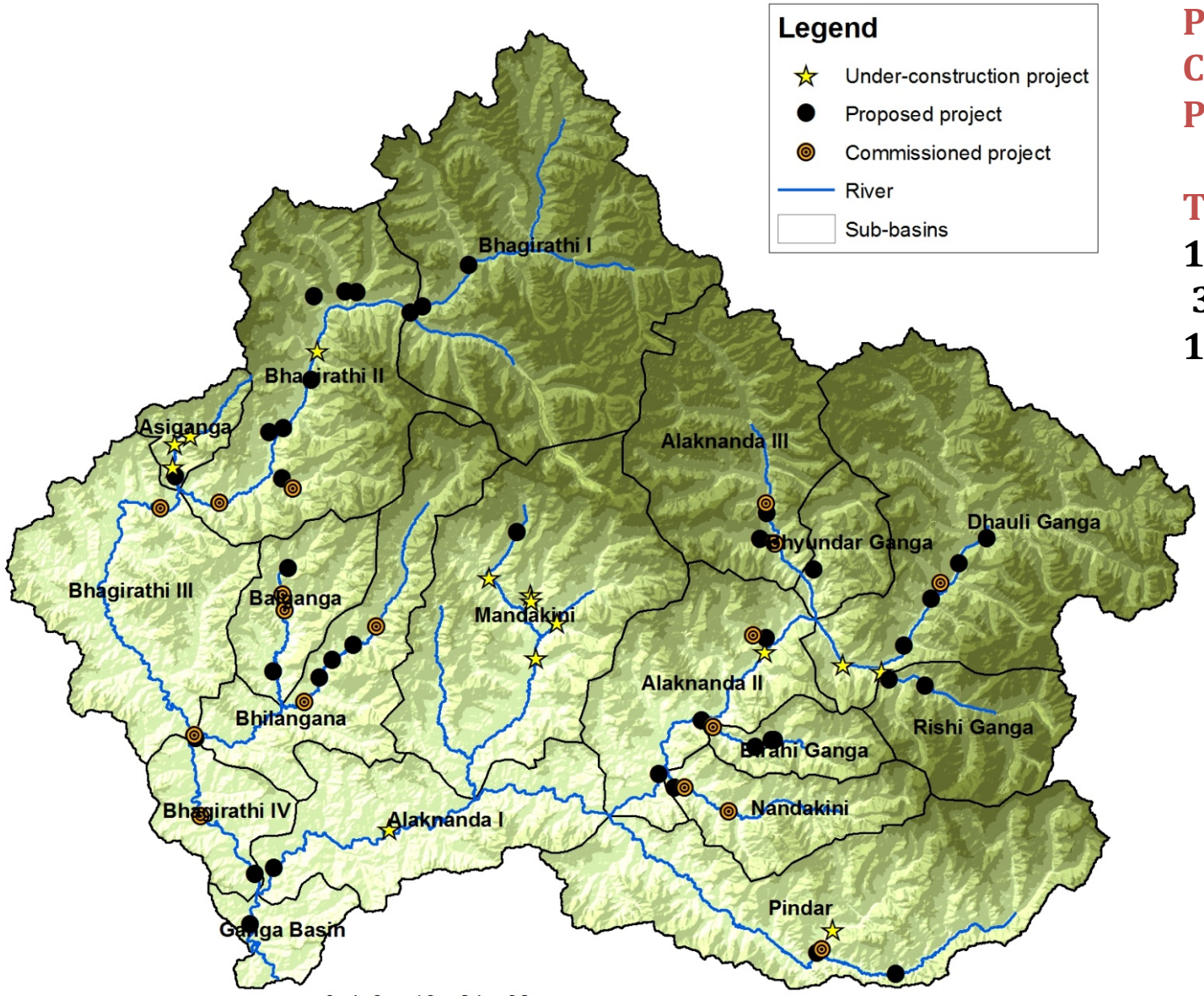
National aquatic animal

Flow of nutrients and silt enrich mangroves forests

Flowing Ganges epitomises purity, holiness and godliness

http://www.loupiote.com/

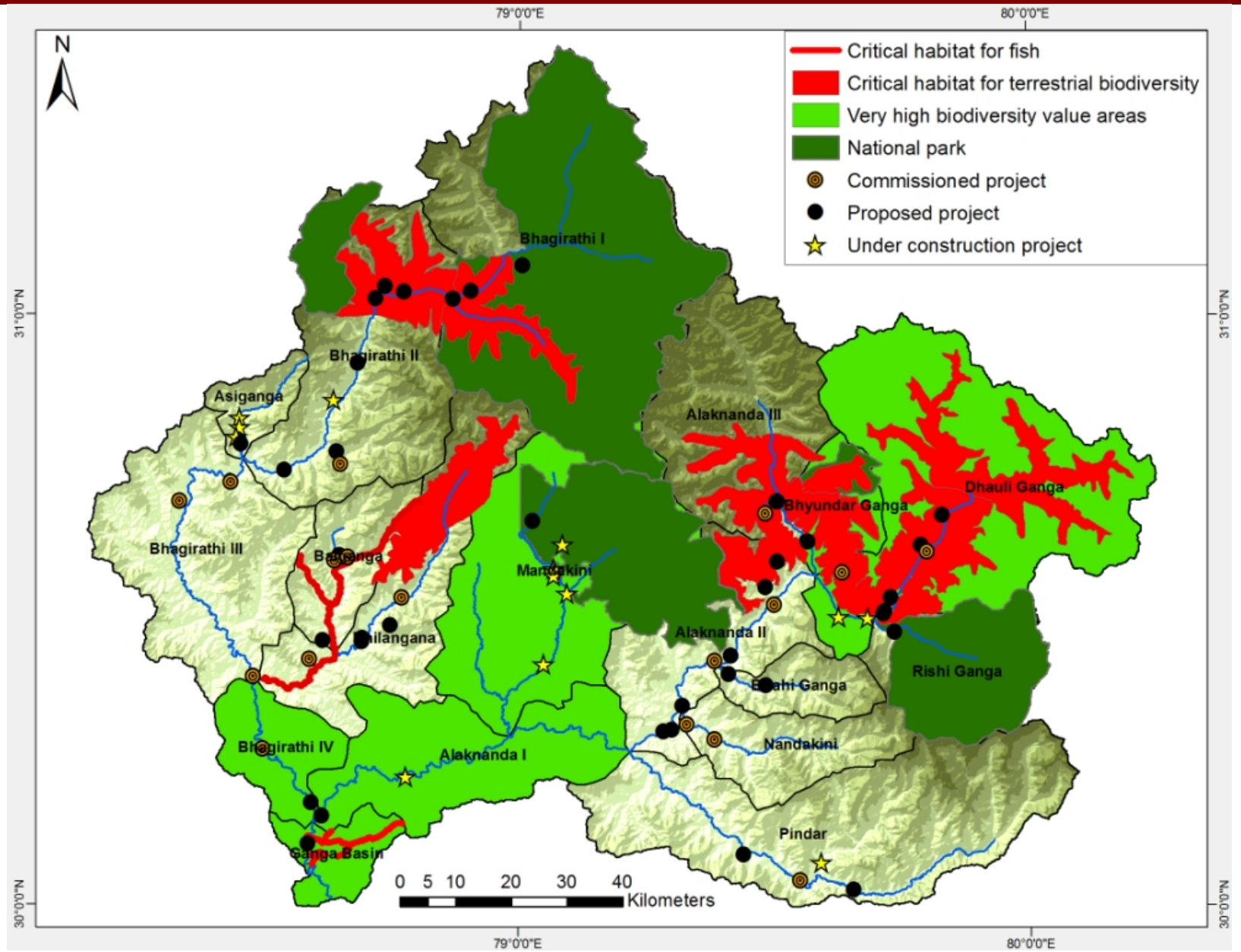
Hydropower projects -Ganges River - Uttarakhand State



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.

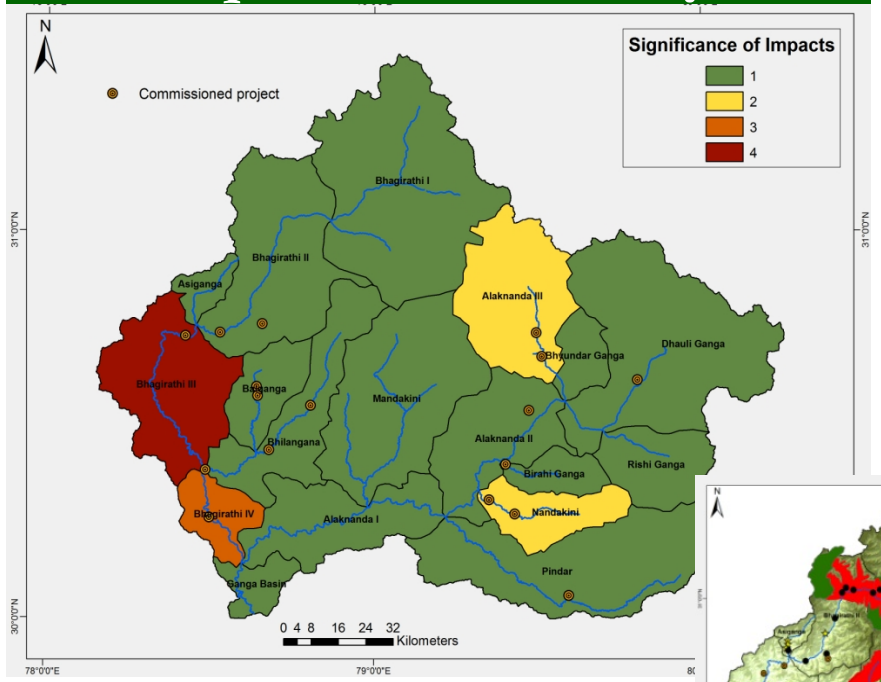
Funding by Government of India

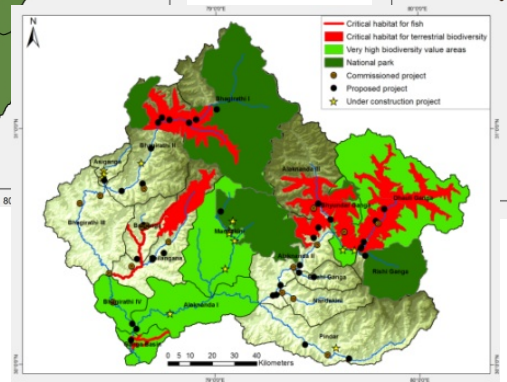
Alternatives Assessment

Alternative 1

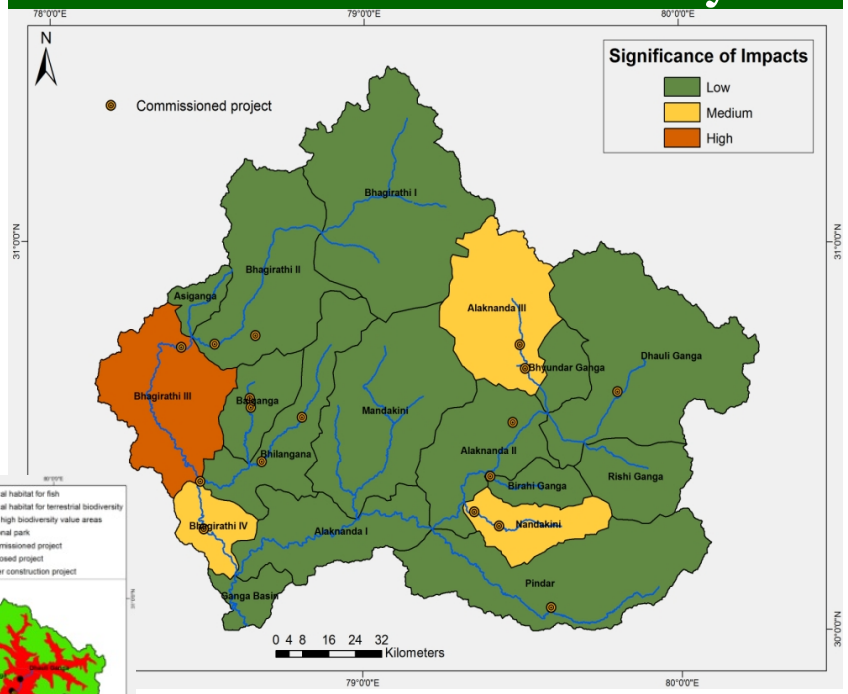
What if only existing projects? (17 projects)

Aquatic Biodiversity





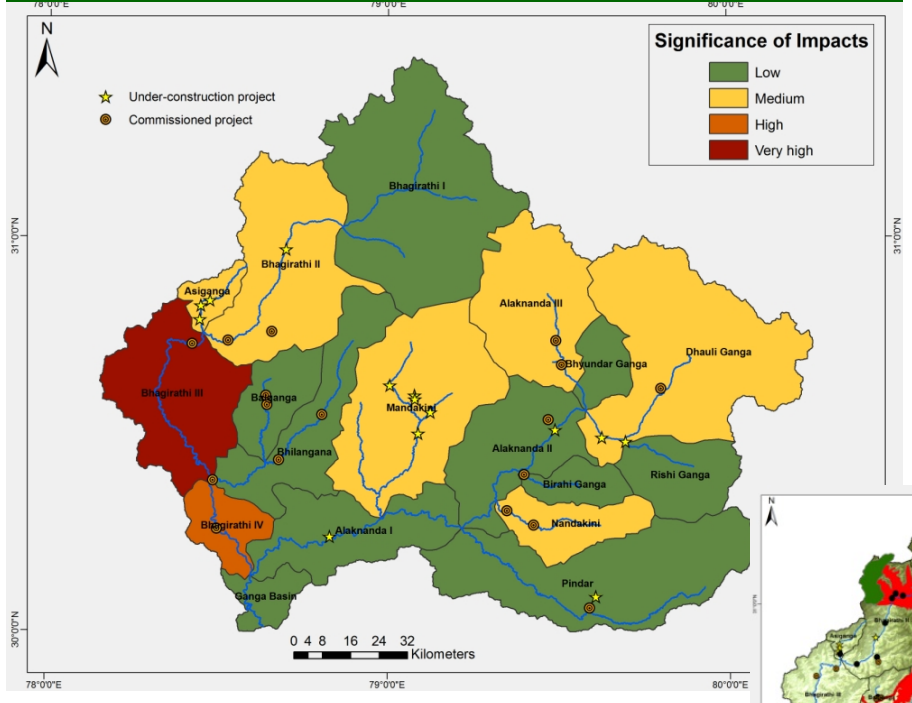
Terrestrial Biodiversity

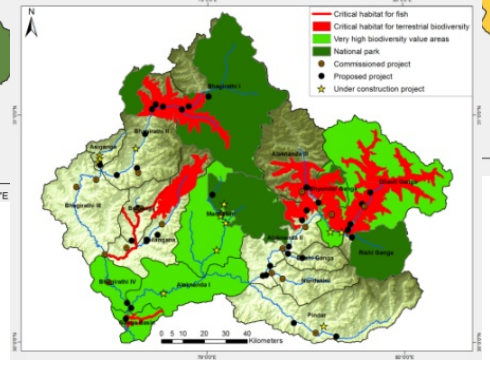


Alternative 2

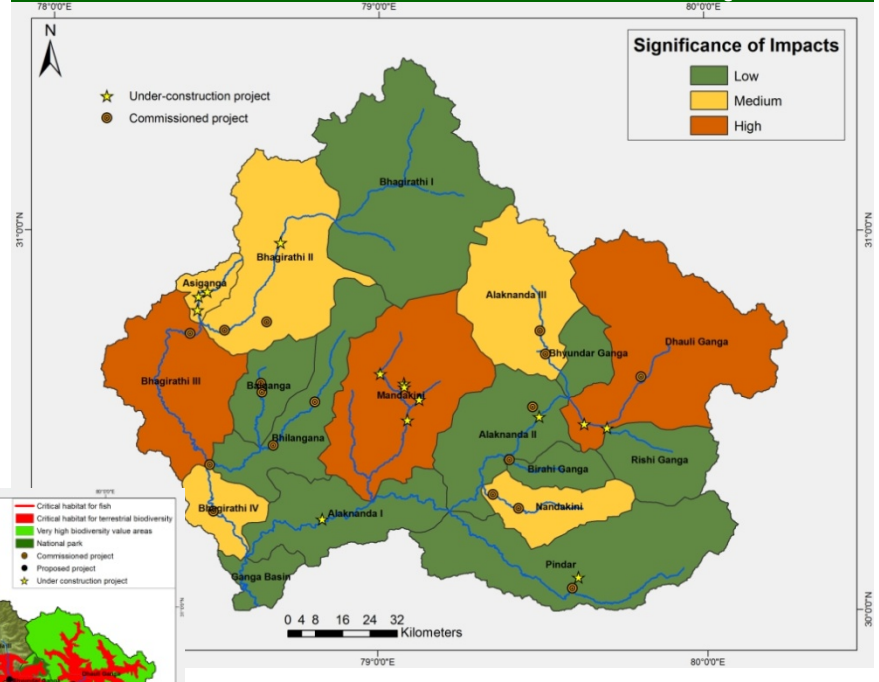
What if commissioned projects and those under construction (14 + 39 = 53 projects)

Aquatic Biodiversity





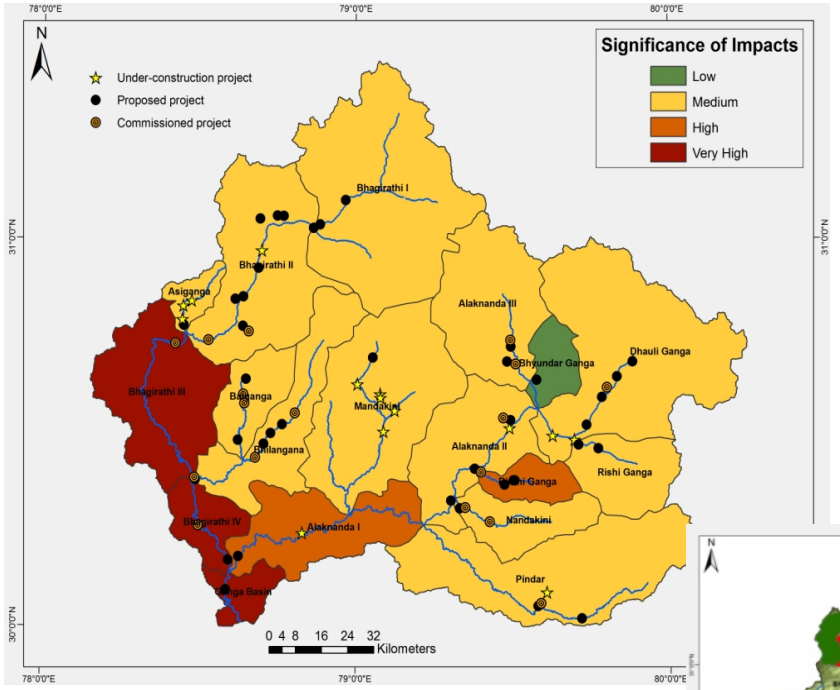
Terrestrial Biodiversity

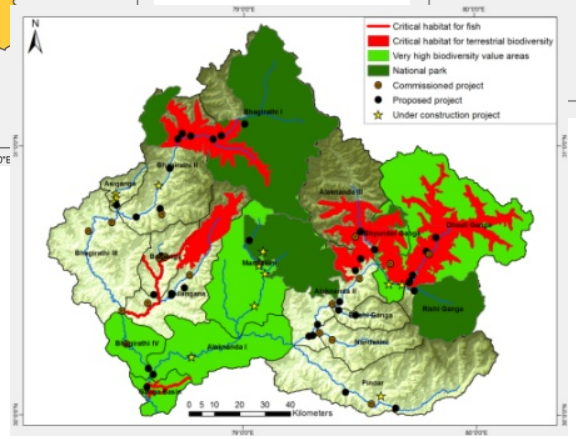


Alternative 3

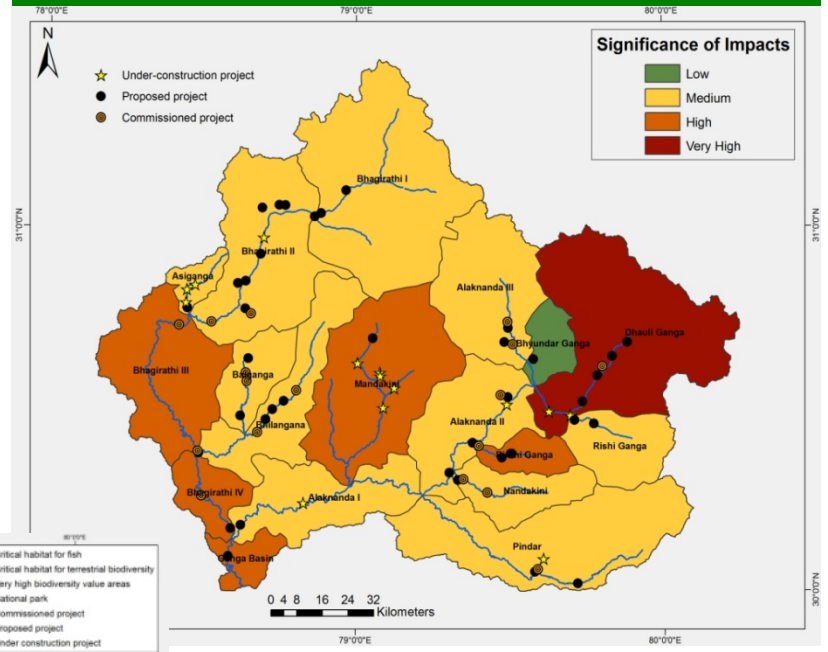
What happens if **ALL** (70) projects come up?

Aquatic Biodiversity





Terrestrial Biodiversity



Decisions on future dams (24 stopped of planned 53)

S.No.	Projects to be excluded	Sub-basin	Capacity (MW)	Aquatic	Terrestrial
1	Bal ganga II	**Bal ganga**	7.00	√	
2	Jhala koti		12.50	√	
3	Bharon ghati	**Bhagirathi II**	381.00		√
4	Jalandrigad		24.00		√
5	Siyangad		11.50		√
6	Kakoragad		12.50		√
7	Kotlibhel IA	**Bhagirathi IV**	195.00	√	√
8	Karmoli	**Bhagirathi I**	140.00		√
9	Jadhganga		50.00		√
10	Rambara	**Mandakini**	24.00		√
11	Kotlibhel IB	**Alaknanda I**	320.00	√	
12	Alaknanda		30.00		√
13	Khirao ganga		4		√
14	Urgam II	**Alaknanda II**	3.		√
15	Lata tapovan	**Dhauliganga**			√
16	Malari jhelam		11		√
17	Jhelam tamak		12		√
18	Tamak lata		25		√
19	Bhyundar ganga	**Bhyundar ganga**	24		√
20	Rishi ganga I	**Rishi ganga**	70		√
21	Rishi ganga II		35.00		√
22	Birahi ganga I	**Birahi ganga**	24.00	√	√
23	Gohana Tal		50.00	√	√
24	Kotlibhel II	**Ganga**	530.00	√	√

SEA results & lessons learned

- Ganges Basin Authoriy 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

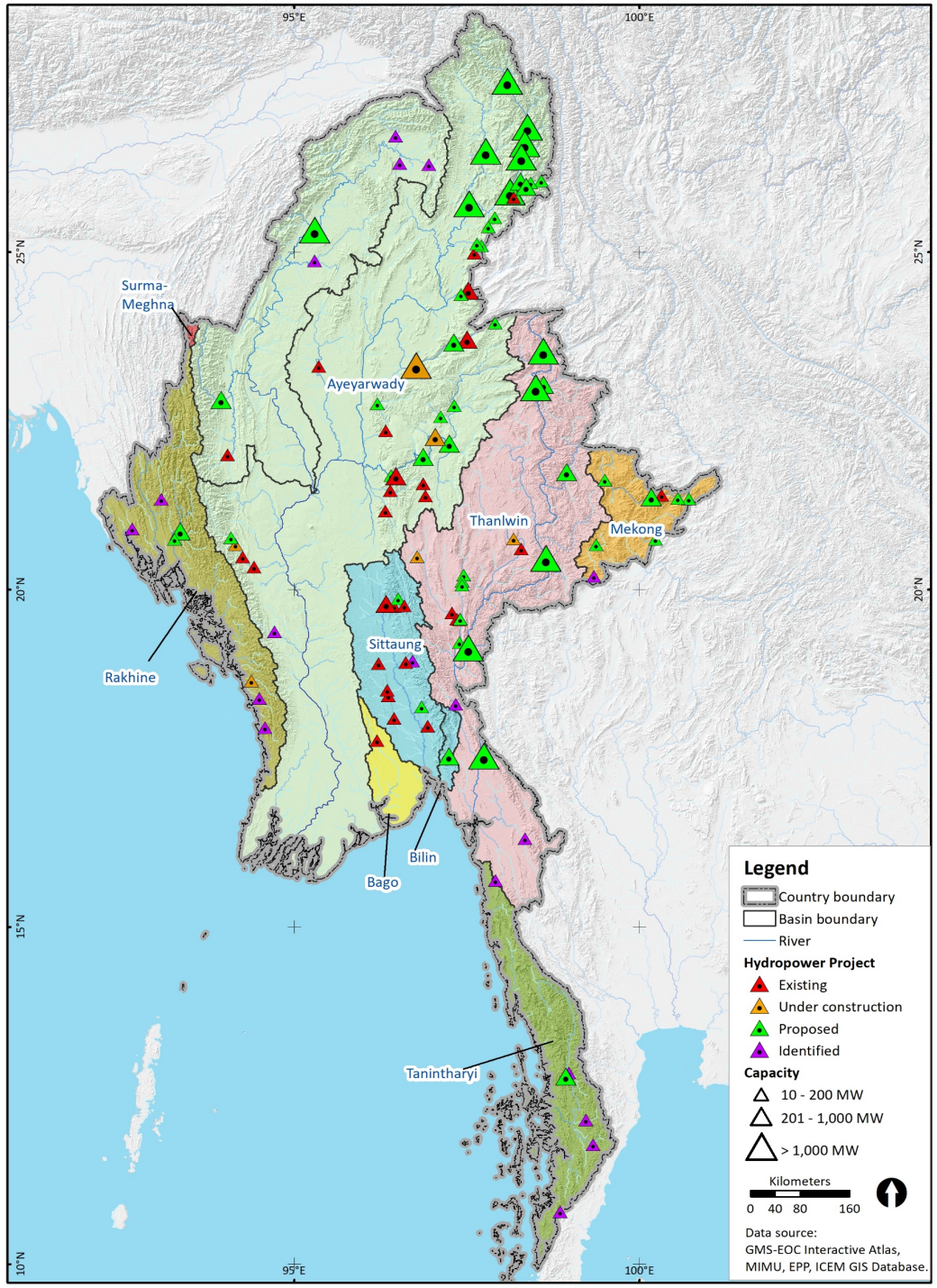
National Hydropower Plan

Technical potential 240,000 MW

Project Status	Number of Projects	Ayeyarwady (MW)	Thanlwin (MW)	Sittaung (MW)	Other (MW)	Total (MW)
Built	29	2,100	302	810	86	**3,298**
Under Construction	6	1,372	81	-	111	**1,564**
Proposed/Identified	69	24,604	16,110	410	2,724	**43,848**
Total	**104**	**28,076**	**16,493**	**1,220**	**2,921**	**48,710**

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



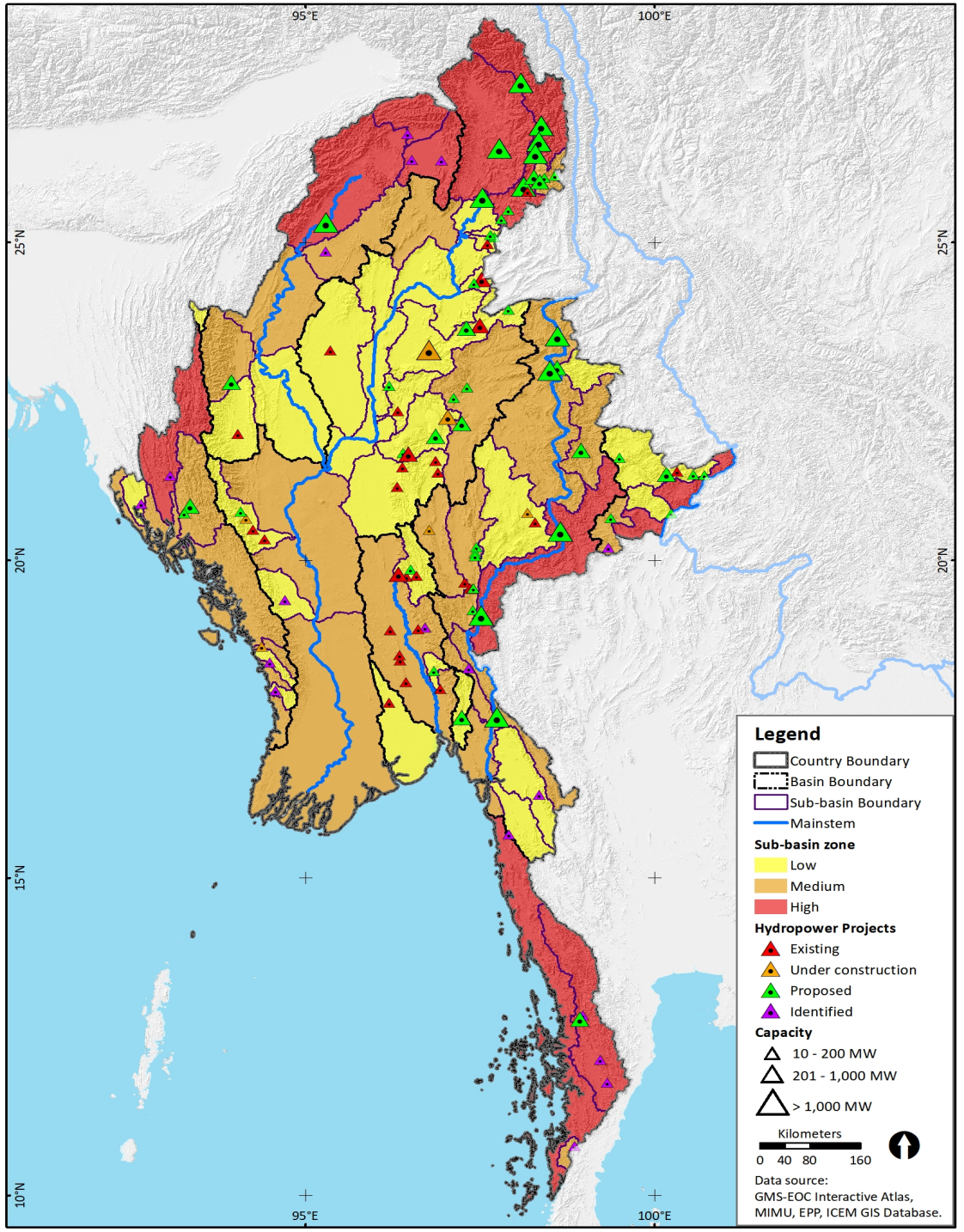
SEA support Strategic Hydropower Plan

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?

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