

Many Rivers to Cross: Evaluating the Benefits and Limitations of Strategic Environmental Assessment for the Koshi River Basin

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Abstract

This paper assesses the value of using Strategic Environmental Assessment (SEA) to account for the spatially and temporally diverse and diffuse potential impacts of hydropower development in South Asia's Koshi basin. A policy and practice review and key stakeholder interviews identified opportunities for SEA to improve existing planning procedures, but also barriers to effective adoption. Whilst stakeholders are interested in employing SEA to evaluate cumulative impacts, institutional blockages and an economic development imperative for power generation leave little space for consideration of alternative scenarios as part of SEA. The analysis is conducted through the formulation and application of a conceptual framework for SEA best practice which is then used to identify priority next-steps for a more dynamic application of SEA in the region.

Introduction: Hydropower on the Koshi

South Asia's Koshi River basin is the largest in Nepal, a significant tributary to the Ganges and home to over 30 million largely impoverished people. Like many Himalayan basins, The Koshi offers unrealised potential for hydropower development, with only 3 of over 50 potential installations having been completed in the past 30 years. (Figure 1, Table 1) (JICA 1985, ICIMOD 2015).

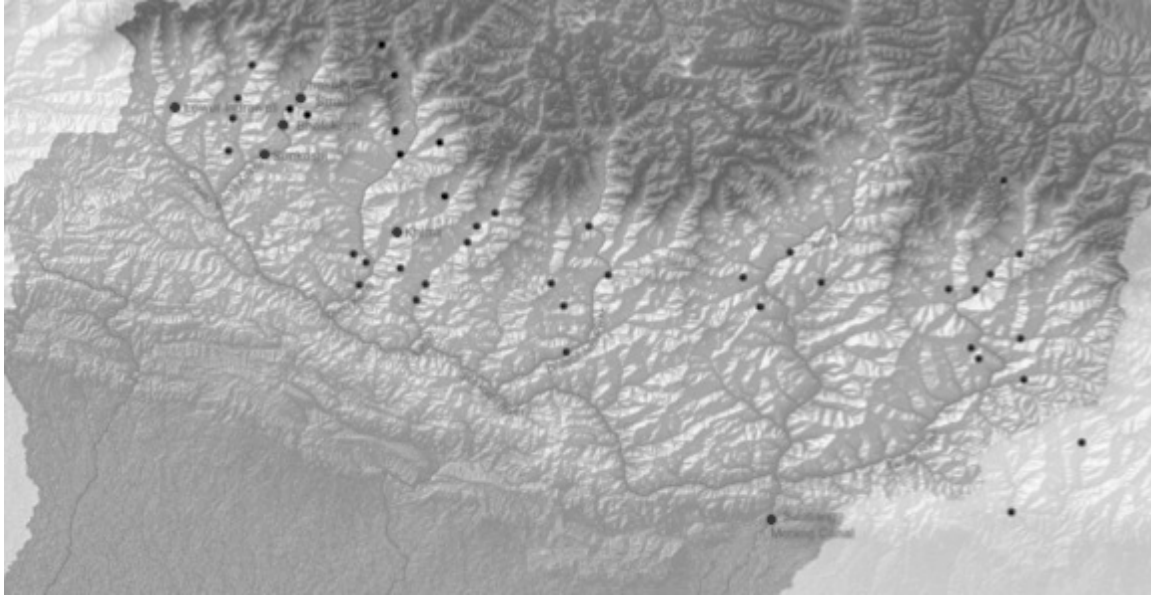


Figure 1: map of the Koshi Basin indicating current and planned hydropower stations (adapted from ICIMOD 2012).

As the region faces growing energy deficits a ‘power imperative’ has directed policy making towards the facilitation of major hydropower projects on the Koshi, with a view to driving Nepal’s development through the net export of power to India.

	Potential National Capacity (MW)	Economically Feasible Capacity (MW)	Current Installed (MW)	% Of potential capacity undeveloped	Target Capacity (MW)
India	-	144,586 (118,210 in Himalayas)	39,339	72.8%	61,339 (by 2022)
Nepal	83,000	42,000	636	98%	25,000 (by 2030)
Koshi Basin	-	10,860	118	99%	10,860

Table 1: Regional outline of actual and potential hydropower capacity (WECS 2010, CEA 2012)

Hydropower development on such a scale presents a range of well-documented risks, including reductions in food security, ecosystem services and hazard resilience for low-income rural communities (WCD 2000). Strategic Environmental Assessment (SEA) has emerged as a tool for capturing the diverse and synergistic impacts of numerous hydropower projects and identifying sustainable outcomes for basins which are undergoing development (Andrade and Dos Santos 2015, Dusik *et al* 2003, Erlewein 2013, Fischer *et al* 2014, Hirji and Davis 2009). Whilst increasingly dynamic in many

other areas, development and application of Environmental Assessment (EA) approaches has been considered limited and slow in the Koshi region. Environmental Impact Assessments (EIAs) are mandatory for larger projects but supplementary guidelines still struggle to handle second-generation EA issues of risk, scale, distribution and institutional regulation (Bragagnolo *et al* 2012, Erlewein 2013, Tetlow and Hanusch 2012). This paper therefore aims to evaluate the opportunities and barriers for SEA to improve strategic level planning in the relatively new context of Koshi hydropower development.

Methodology

The nascent development of the discipline in Nepal meant that it was not possible to establish the status of SEA related practices by reviewing pre-existing reports against set criteria (Fischer 2010, Fischer and Philip-Jones 2015). Furthermore, the complex and flexible nature of strategic level decisions merit a broader investigative approach in order to capture the informal issues and learning processes present behind official policy (Cherpa *et al* 2007, Fischer and Onyango 2012, Gazola *et al* 2011, Jha-Thakur *et al* 2009). This review therefore aimed to ascertain to what extent existing EA systems meet SEA best practice through the combination of a document review and interviews with key stakeholders (Acharibasama and Noblea 2014).

To reflect the flexible nature of SEA as a tool (Dalal-Clayton and Sadler 2005, Lobosa and Partidario 2014) a conceptual framework of Koshi-relevant SEA best practice was critically drawn from the World Commission on Dam's strategic priorities (WCD 2000), the EU SEA Directive (2001), the IAIA SEA principles (2002) and the OECD's SEA guidelines (2006). Specialist literature, such as the Hydropower Sustainability

Assessment Protocol (2011), was discounted due to its limited scope or project-level focus.

Four elements of SEA were critically identified as being key for its effective application to hydropower in the Koshi, these are:

- The consideration of developments' cumulative impacts.
- The consideration of alternative approaches to meeting energy demand.
- Strong institutional accountability in development decisions.
- An iterative approach to reviewing the effectiveness of past decisions.

In order to provide a fuller description of what best practice in the Koshi Basin would 'look like' the main features of each key element were then defined. Each feature was assigned qualitative indicators for example, 'transparent decision making between alternative development options' would be indicated by use of the precautionary principle and a mitigation hierarchy, consideration of the distribution of benefits and the commitment to an equal three 'pillars' approach to sustainability. As a whole, the key features and indicators of each element provide a conceptual framework (CFW) of best practice against which to assess current and potential practice (Table 2).

	Key Features	Qualitative Indicators
Cumulative Impact Analysis	Objectives correlate with relevant spatial and temporal scale of impacts and existing PPP	Includes PPP from beyond originating sector and regional transboundary environmental agreements.
		Identifies and maximise potential aggregate, incremental and synergistic beneficial impacts.
		Identifies and mitigates potential aggregate, incremental and synergistic negative impacts upon upstream and downstream receptors.
	Necessary climate change data available and knowledge gaps clearly identified	Potential impact of climate change upon infrastructure factored into design requirements and power generation targets.
		Synergistic impact of climate change and dams upon all water resource users considered, including disaster risk level.
	Ecosystem indicators used for	Watershed degradation: Riverine and estuarine system health.
		Environmental Flow Requirements (EFR).

	evaluating key impacts with thresholds and absorption capacity stated where possible	<p>Water quality.</p> <p>Social Indicators quantify secondary impact of environmental change upon vulnerable populations.</p>
Consideration of alternatives	Sustainable development options and alternatives Identified	<p>Range of reasonable alternatives developed and considered at the relevant tier, including:</p> <ul style="list-style-type: none"> • demand management • decentralised community level generation • spatial siting • phased implementation <p>Extra studies utilised to meet information gaps in scenarios.</p> <p>Potential decision outcomes clearly limited by pre-existing PPP and transboundary agreements.</p>
	Transparent framework criteria used for assessing and ranking alternative scenarios	<p>Stated equal weighting for biophysical, social and economic criteria. Temporal dimensions considered, including lifecycle analysis and the gestation of benefits and subsidies.</p> <p>Precautionary approach used for key irreversible impacts. Minimum standards of high ecosystem functions outlined and committed to. Main stem development avoided.</p> <p>Mitigation hierarchy used - avoid, reduce, offset.</p> <p>Distribution of benefits prioritises basic human needs.</p>
	Economic valuation of water resources and ecosystem services employed appropriately	<p>Social discount rates not too high</p> <p>Volatility of energy and agriculture markets considered in Cost Benefit Analysis (CBA)</p>
Accountable Institutions	Participatory process adopted	<p>Consultation plan engages all stakeholders on an ongoing basis from early consideration of initial options to monitoring outcomes. Clear responsibilities established for gathering, considering and responding to inputs.</p> <p>Civil Society involved at relevant spatial scale in designing benefit sharing, mitigation and compensation measures.</p>
	Power inequalities between stakeholders addressed through accountability enforcement mechanisms	<p>State engaged in broader electoral, judicial, transparency and corruption reform initiatives.</p> <p>Transparency established through rights to:</p> <ul style="list-style-type: none"> • Access information • Substantive input • Access dispute resolution mechanisms • Prior Informed Consent for highly marginalised groups. <p>Auditing and oversight review of activities.</p>
	Adequate capacity held	<p>Budget and timeframe adequate for Environmental Management Plan (EMP) implementation.</p> <p>Authorities hold broad skills-set from a range of relevant disciplines.</p> <p>Stakeholders provided with capacity and information required for full engagement, including linguistic and literacy concerns.</p> <p>State maintains final overseer role and issues sectoral investment guidance.</p>
	Trans-boundary institutions established	<p>Trans-boundary protocol for distribution of all benefits of mutual interest is translated into national policies and implemented.</p> <p>Independent regional coordinating body jointly funded. Additional financing reduces capacity variance between sectors and countries.</p> <p>Recourse to mutually agreed, independent dispute resolution body available.</p>

Iterative Approach	Roles and responsibilities coordinated	Institutional cross-overs mapped to avoid the duplication of roles for: <ul style="list-style-type: none"> • Dividing benefits • Creating EMP • Mitigating impacts • Generating and reviewing indicators • Conducting M and E activities • Enforcing compliance.
		Energy demand forecast body not responsible for supply infrastructure decisions.
		'Sector-neutral' decision-making institution holds clear responsibility for establishing basin-wide equitable water use through documented procedures.
	Additional provisions for Independent Power Producers (IPPs)	Account for market incentive failures. Unsubsidised liability for failure to meet targets.
		State maintains final overseer role and issues sectoral investment guidance.
		Independent regional coordinating body jointly funded. Additional financing reduces capacity variance between sectors and countries.
		Recourse to mutually agreed, independent dispute resolution body available.
	Flexible decisions made, clearly stating risks entailed by gaps in knowledge	Commitment to continuously improve knowledge generation, especially climate change and hydrological modelling.
		Lower level EIAs required but avoid replicating prior EIAs.
		Commitment to organisational learning, analysing outcomes for consistency with existing decisions and justifying instances of flexible interpretation.
	M and E procedures clearly set out and observed	Mandated actors formally review and monitor PPP outputs.
		5-10 year periodic project, basin, national and sectoral reports produced.
		SMART indicators used for consistent scheduled review.
	Additional provisions for IPPs	Accuracy of previous predictions and need for realignment clearly stated.
		Development licenses harmonised across basins for maximum 30-year term.
		Social bonds stipulated.
		IPPs required to share sensitive commercial information with regulators.

Table 2: Summarised Conceptual Framework of Best Practice for SEA in the Koshi

Using the OECD's generic entry points for SEA (OECD 2006), twenty-six Policies, Plans and Programmes (PPP)¹ relating to environmental planning and hydropower development were identified for review. In order to gain a full picture of the existing landscape, documents covering relevant lower tier activities, such as the assessment of cumulative effects in EIAs, were also included (Dusik *et al* 2003). Each policy document's legislative requirements were critically compared to each component of the CFW. The overall strength of all existing legislative requirements was then scored on an unweighted Likert scale depending on their breadth, depth and coherence (Figure 2).

1. Very weak: No, or virtually no elements of the best practice are present.

¹ For brevity, the term 'policies' or PPP shall be used interchangeably to refer to all documents reviewed despite having different specific meanings.

³ Full criteria and results available upon request to the authors.

- 2. Weak:** Non-mandatory best practice is broadly incorporated in a mix of different documents.
- 3. Moderate:** Best practice is fully included but is mainly non-mandatory and has little coordination between separate policy documents
- 4. Strong:** All best practice is covered with binding requirements but not entirely coherently.
- 5. Exemplary:** Existing documents work synergistically to establish binding requirements for all best practice criteria, exceeding it in some areas.

Figure 2: Likert scale for SEA requirements of existing policy documents (Bragagnolo and Geneletti 2012, Fischer 2010, Sadler 1998)

Document analysis was supplemented by twenty-one semi-structured primary interviews with twenty-four purposively sampled stakeholders (Table 3) (Fischer *et al* 2014). Informants were assigned to one of cultural theory's power groups (Gyawali 2003) which, whilst reductionist, provide useful shorthand for different stakeholders' approaches to policy-making.

Organisation type	Number of informants	Cultural Power Group
Independent Power Producers	3	Commercial
Government representatives	7	Heirarchist
International Donors	2	Heirarchist
Research and Policy Institutions	4	Varies
Environmental Assessment Specialists	5	Commercial
Water rights campaigners	3	Activist
International NGOs	3	Activist

Table 3: Summary of interview informants by organisation type and cultural power group (Gyawali 2003)

No interviews were conducted with residents of the Koshi basin due to their inaccessibility; instead the views of civil society activists in Kathmandu were gained.

Questions focused upon how existing EA practice was viewed, whether it could be improved for any of the principal elements of best practice and the dimensions of the Koshi's trans-boundary issues. The content of transcripts and detailed notes were categorised by areas of best practice and other themes, and then analysed to identify patterns in responses.

Results and Analysis

Overall, all areas of existing policy fall fairly short of best practice, highlighting the potential value of introducing SEA (Table 4). Whilst no features were entirely absent, they were usually only present as subsidiary elements of policies focusing on other areas.

Interviews provided a rich depiction of policymaking's current status on the ground, highlighting that in all areas, actual practice was weaker than the standards that were legally laid out. The main findings on how well existing policy and practice matches each of the CFW's four key priority areas were briefly summarised in turn.

	Main Features of existing SEA Best Practice guidelines	Qualitative Indicators	Scores by Indicator	Aggregate Scores
Cumulative Impact Analysis	Spatial Scale and Policy Level	Broader Policies considered	3	2.7
		Benefits maximised	3	
		Negative Impacts Managed	2	
	Climate Change	Impact upon infrastructure	3	3
		Synergistic Impact upon water resources	3	
	Ecosystem Indicators	Watershed degradation	2	1.75
		Stated Environmental Flow Requirement	1	
		Water quality	3	
		Social Indicators	1	
Consideration of Alternatives	Sustainable Development Focus	Scenario Generation	2	2.5
		Policy Hierarchy	3	
	Decision Making Criteria	Equal 'pillars'	3	3
		Precautionary principle	1	
		Mitigation hierarchy	4	
Accountable Institutions	Participatory Process	Benefit distribution	4	4
		Clear Plan	4	
	Accountability Enforcement mechanisms	Civil Society role(s)	4	1.7
		Broader State Reform		
		Transparency	2	
		Prior Informed Consent for marginalised stakeholders	1	
	Adequate capacity	Auditing and Monitoring	2	2
		Resources		
		Skills	1	

		Information available	3	
	Coordinated roles and responsibilities	Sectoral Delineation	4	4
		Conflict of Interests avoided	4	
		Coordinating Body	4	
		Private Provisions	Market Factors	
	State overview	4		
	Transboundary bodies	Benefit Distribution	3	3.3
		Coordinating body	3	
		Dispute Resolution Mechanism	4	
	Iterative approach	Decision Flexibility	Ongoing Knowledge Generation	3
Tiered EA			4	
Ongoing Learning			3	
Formal Review Procedure			4	4
M and E procedures		Clear Indicators	4	
		Conditional Terms of Operation	-	

Table 4: Scores for existing policy's alignment to CFW of SEA Best Practice for the Koshi³

Cumulative impacts

There was broad agreement that a lack of strategic hydropower coordination was a concern. One EA expert stated *'this is urgent ... what will it entail if we build 30,000MW in Nepal in the next 30 years? ... There has not been that kind of assessment'*.

Independent Power Producers (IPPs) operating in the Koshi do not share planning materials and policy only requires EIAs to consider impacts on directly cascading hydropower projects. As in other areas of intensive development, SEA was seen as potentially offering particular support to the coordination of infrastructure, such as storage facilities, roads and transmission lines (Bragagnolo *et al* 2012, Canter and Ross 2010, Fischer *et al* 2014).

Many informants felt that SEA could help identify and value basin-wide ecosystem indicators such as sediment releases, fish populations, flow rates and social income levels, as well as identifying biological thresholds and controls such as development phases and zones. Such measures could underpin an integrated Water Resource Management (IWRM) approach and inform an increase in existing Environmental Flow

³ Full criteria and results available upon request to the authors.

Requirements (GoN 2001, Geneletti 2015).

Planning for the uncertain and complex effects of climate change on the Koshi region are another key area to which informants believed SEA could contribute (EC 2013). Specifically, following the 2015 earthquake and 2008 avulsion, SEA could inform the current debate over the potential for dams to provide flood control (Das and Bhuyan 2012, ICIMOD 2012, Harshadeep 2011, Sharma *et al* 2009).

Consideration of alternatives

Current policy gaps indicate that SEA could also improve the consideration of alternatives in hydropower planning, but the gap between existing and best practice was extensive in this area. The Nepali government is increasingly focused upon approving larger hydropower installations solely on the basis of economic criteria such as the price per K/W (Dixit and Basnet 2005, Dixit *et al* 2004, Gyawali 2008). The precautionary principle and a clear definition of 'significant' policy effects are particularly conspicuous for their absence in any strategic documents and demand mitigation is only referred to in relation to combating of power leakages (Dixit and Basnet 2005). Instead, policy makers aim to develop out of the current infrastructure problems by creating a domestic industrial market that would generate ongoing demand for hydropower (GoN 2001). All respondents, including activists, therefore stressed a desire for 'no *bad* dams' as opposed to 'no dams' and pragmatic 'grey' instead of 'green' environmentalists. One government official also claimed that the environmental losses risked by not conducting a thorough SEA would be outweighed by the additional income generated from the early commissioning of hydropower stations (Bhatt and Khanal 2010, Dalal-Clayton and Sadler 2005).

Iterative approach

The region has made some moves towards tiered strategic-level assessment through Strategic Basin Assessments⁴ a Hydropower Sectoral Environmental Assessment and a National Water Plan SEA (GoN 1997, Imran *et al* 2006, Posas and Sanchez-Triana 2012). However, these exercises have been disjointed across a twenty-year period and failed to effect wider decision-making processes (Erlewein 2013, Hirji and Davis 2009, Slootweg 2009). The National Water Resource Strategy, National Water Plan and Koshi Basin Strategic Management Plan are the only PPPs which Nepal has developed in a coordinated manner, refining previous policy decisions at each sequentially lower tier. These documents also held the only official commitments to institutional accountability through the use of SEA and the creation of River Basin Organisations (RBOs). Unfortunately, as in other contexts, the weakness of existing institutions and the short-term priority of energy generation has prevented the realisation of such flexible and knowledge-based approaches (Lobosa and Partidario 2014, Victor and Agamuthu 2014).

Institutional Accountability and Decision-making

Lack of institutional accountability and transparency are seen as the main obstacles to the implementation of SEA. However, despite subordinating SEA in favour of unrestricted energy generation, the hydropower sector's development has also been perpetually undermined by state-state and state-civil society conflicts, which prevent broad-based planning and open dialogue. All actors separately expressed interest in SEA improving these institutional procedures, but as open information sharing is so central to SEA's effectiveness it would also currently meet considerable challenge from

⁴ Strategic Basin Assessments, Sustainability Assessments and Sectoral Environmental Assessments use similar characteristics. For simplicity SEA will be used through this article.

stakeholders who prefer maintaining their entrenched positions to negotiating genuine concessions within a formal SEA framework (Erlewein 2013, Jones *et al* 2012).

SEA presents the opportunity to consult communities at a much earlier stage of planning than EIA but basin-wide consultation is a logistical challenge (Andrade and Dos Santos 2015, Fischer *et al* 2014) and one government official considered it to be ‘pointless’ due to high levels of outward migration from rural communities. The engagement of pre-existing community networks, such as water users groups, was seen as a practical approach but many informants saw Kathmandu-based social activists as trying to become the default representatives of the ‘voiceless masses’ or even accused them of using their position to block necessary development. One government official viewed a researcher for this paper as being ‘contaminated’ for having even spoken to certain activists. Many activists in turn are also not focused upon compromise; on referring to ‘bad’ hydropower schemes one prolific activist stated “every time the snake raises its head, we’ll squash it”.

Within the government itself, hydropower and environmental planning are already fragmented between numerous ministries. The Ministry of Energy, is responsible for reviewing project-monitoring reports, The Ministry of Science Technology and Environment (MOSTE) conducts project audits and the Water and Energy Commission Secretariat (WECS) holds nominal responsibility for policy level reviews. Low capacity and poor communication often reduces many of these processes into ‘box ticking’ exercises.

Informants nominated six different bodies, or a combination of them, as appropriate lead agencies for SEA. In this context, one activist described SEA as ‘an absolute orphan ... no one wants to own it so it’s pointless’. Even ministries that stated a willingness to lead

on SEA are hampered by intra-governmental conflict; the MOSTE was described as an 'interloper' in the Ministry of Forestry and Soil Conservation, whilst WECS is seen as a think tank and 'political dumping ground'.

Beyond these numerous domestic barriers, involving both India and Nepal in a transboundary SEA of the Koshi basin presents additional challenges. Since the Koshi Treaty of 1954, commitments to share the down-stream benefits of storage projects on a rights-basis have not been realised (Salman and Updhyay 2011). Nepali commentators accuse India of refusing to monetise the downstream flood regulation and irrigation benefits that it receives from Nepali dams and of bribing Nepali officials and activists to reduce the possibility of a 'united front' in negotiations. Nepal wishes to avoid becoming an Indian 'protectorate' by entering into similar agreements to Bhutan, however, as the current fuel blockade cripples its economy, it is clear the country lacks a viable alternative energy trading partner (Dhungel 2008, MOWR 2011, Rahaman, 2012).

Given institutional weakness at all levels, most informants expected that SEA will remain something which is only conducted for, and by, international donors and consultants. A long period of political stability or the emergence of a charismatic leadership who can foment a 'critical mass' of support behind SEA's benefits were seen as prerequisites for its expanded use. At the time of writing, the aftermath of the 2015 Earthquake and ongoing constitutional conflict make this an unlikely possibility (Kathmandu Post 2016). Paradoxically however, achieving such conditions would raise sequentialist concerns over how fast they would remove barriers to hydropower's development. Given the 'power imperative', there is a strong likelihood that political stability would facilitate the implementation of the numerous projects which have been licensed across the Koshi (Figure 1) before an SEA is conducted to identify their irreversible cumulative

environmental impacts.

Moving SEA forward in the Koshi Basin: from principles to practice

Having analysed the region's policymaking landscape, this paper has established that existing strategic decisions relating to hydropower in the Koshi river basin are subject to major failings. Applying the principles for good SEA practice which this paper has conceived for the Koshi, could help tackle the region's energy deficit in a sustainable manner. Whilst previous attempts to legislate SEA from the centre have stalled, and existing institutional problems merit a cautionary approach, such issues have been overcome in similar contexts (Bina 2008, Fischer *et al* 2014). Instead, a more flexible and dynamic approach should be pursued to develop hybrid structures that can realise SEA's benefits. Particular opportunities lie in the facilitation of shared learning and understanding between stakeholders (Gazola *et al* 2011, Lobosa and Partidario and Sheate 2013, Partidario 2014, Partidario 2015, Tetlow and Hanusch 2012, Victor and Agamuthu 2014).

Three initial moves are recommended:

1. Identify a lead agency in Nepal

Strong ownership of the concept of SEA by one or more empowered actors is a prerequisite for its benefits to be realised. WECS has shown the greatest engagement with SEA as an IWRM tool thus far but a commitment to broad-based participation would be equally as important as technical capacity (Fischer *et al* 2014). An ideal mandate for

SEA would come from a Koshi RBO; this could be established by WECS with the support and involvement of MOSTE, civil society and IPPs.

2. Engage on a Transboundary level

Ongoing disputes may currently render a full scale transboundary SEA unfeasible, however initiating a non-binding process could help resolve some tensions by transparently accounting for the cumulative benefits and costs of hydropower (Partidario 2015). The involvement of a respected neutral body, similar to the Mekong River Commission, would be essential (ICEM 2010). As a leading Himalayan research agency, ICIMOD could fill this role, and is already engaged in transboundary management of the basin's water resource through the ongoing Koshi Basin Programme (KBP) (ICIMOD 2012).

3. Pilot a focused SEA

It would be beneficial to focus an initial WECS-led Koshi SEA on areas with fairly broad stakeholder support and interest such as cumulative effects, particularly climate change. Any such initiative should avoid accusations of being overly donor-led by engaging a broad range of stakeholders who have a genuine interest in the processes' outcomes.

This research has identified key considerations and potential next steps for SEA and hydropower planning in the Koshi Basin. We would recommend that these are considered and discussed by all of the stakeholder groups who engaged with the study as well as additional actors, in particular local communities and relevant Indian institutions. The huge scale of the Koshi Basin and the complexity of hydropower planning procedures mean that some areas were omitted from this paper and further

discussion could also benefit from more comprehensive research on EA's use in the region. This review has also identified several parallels between the Koshi context and wider current SEA theory, in particular the challenges of integration into complex decision making institutions and the resultant success of more flexible non-legislative approaches.

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