



## CHAPTER 4:

# VALUED ENVIRONMENTAL COMPONENTS

## Initial VEC Identification

Valued environmental components (VECs) are defined as fundamental elements of the physical, biological, or socioeconomic environment, (including the air, water, soil, terrain, vegetation, wildlife, fish, birds, and land use) that are likely to be the most sensitive receptors to the impacts of a proposed project or the cumulative impacts of several projects.

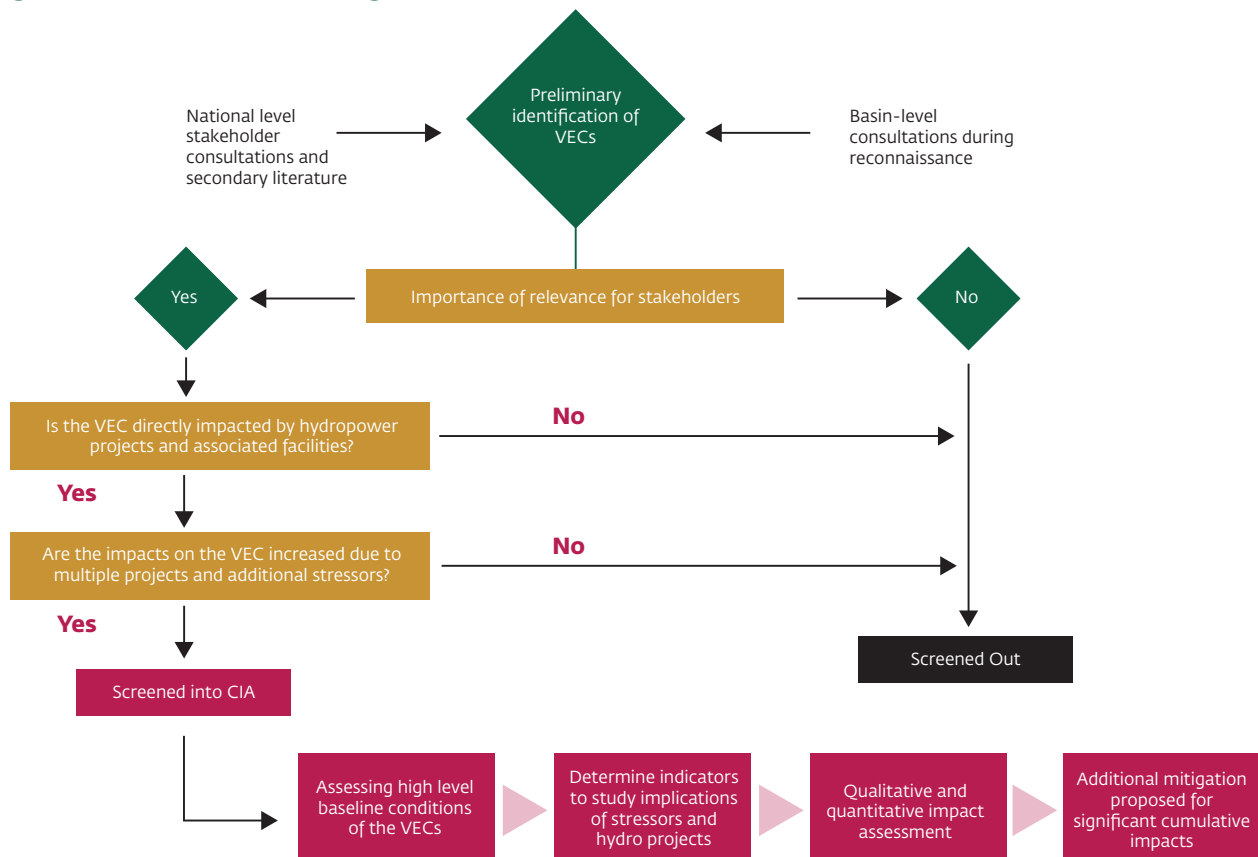
After setting up the study context and identifying relevant stakeholders, a set of preliminary VECs was developed as summarized in “Initial VEC Identification,” Chapter 3. This list was supported by research agencies and established secondary data sources. Figure 4.1 illustrates the VEC screening process adopted for the Cumulative Impact Assessment and Management:

Hydropower Development in the Trishuli River Basin, Nepal.

## Stakeholder Perception and Feedback

To confirm the VECs to be screened into the CIA, a national- and basin-level stakeholder consultation was undertaken (Table 4.1). Data from this information-gathering process helped confirm the identified baseline conditions and helped to identify basin-level impacts versus localized project impacts. A qualitative assessment of the information collected from these initial consultations was an essential step to screen the VECs into the CIA of hydropower development in the TRB.

Figure 4.1 VEC Screening Process



**Table 4.1 Screening Process of Identified VECs**

VECs	Direct impacts from hydropower projects	Specific stakeholders that indicated relevance for further considerations	Cumulative implications and decisions for screening
<b>Aquatic habitat</b>	Alterations in downstream flow and sediment volume can lead to impacts on aquatic habitat, barriers to fish migration, and so forth.	<ul style="list-style-type: none"> <li>• Bidur Municipality (Nuwakot)</li> <li>• UHSM Bidur Municipality (Nuwakot)</li> <li>• Kispang Rural Municipality (Nuwakot)</li> <li>• Rafting Association of Nepal (Dhading)</li> <li>• Langtang Area Conservation Society (Rasuwa)</li> <li>• Nepal Agro-forestry Foundation (Rasuwa)</li> <li>• Kalika Rural Municipality (Rasuwa)</li> </ul>	<ul style="list-style-type: none"> <li>• EFlows assessment points to changing water temperature across the study area due to different operational modalities which is likely to affect aquatic ecology.</li> <li>• Specific stressors such as sand and gravel mining are exacerbating adverse impacts to aquatic habitat, necessitating a basin-wide approach at assessment and mitigation.</li> <li>• Fifty-six percent of stakeholder respondents felt that aquatic biodiversity was an important VEC, cumulatively impacted by future hydropower development.</li> </ul>
<b>Terrestrial habitat and Langtang National Park</b>	Fragmentation of the river corridor and improvement of access may trigger illegal hunting and poaching and loss of vegetation and biodiversity.	<ul style="list-style-type: none"> <li>• District Forest Office (Rasuwa)</li> <li>• Nepal Agro-forestry Foundation (Rasuwa)</li> <li>• Rafting Association of Nepal (Dhading)</li> <li>• District Forest Office (Nuwakot)</li> <li>• Jalpa Community Forest User Group (CFUG) (Nuwakot)</li> </ul>	<p data-bbox="1040 825 1430 877"><b>Screened into the CIA as Aquatic Habitat.</b></p> <ul style="list-style-type: none"> <li>• Forest land requirement and proposed transmission lines for four proposed HPPs from within park zone to build infrastructure and access roads may impact wildlife corridors and migratory species;</li> <li>• Cumulatively, terrestrial habitat and Langtang National Park were assessed as relevant VECs by 60 percent of the stakeholders consulted;</li> </ul> <p data-bbox="1040 1234 1463 1308"><b>Screened into the CIA as Terrestrial Habitat and Langtang National Park.</b></p>
<b>Surface water quality</b>	Decline in use of river water has reduced dependence in favor of springs. Reports suggest that water springs have diminished, a decline linked to the earthquake and tunneling and blasting activities	<ul style="list-style-type: none"> <li>• Siddhalek Rural Municipality (Dhading)</li> <li>• PB-CFUG (Nuwakot)</li> <li>• District Soil Conservation Office (Rasuwa)</li> <li>• Women’s Group CFUG (Nuwakot)</li> </ul>	<ul style="list-style-type: none"> <li>• Approximately 32 percent of stakeholder groups were concerned about water quality of the Trishuli Main stem and a majority also noted changes in the hydrogeological patterns reportedly linked to construction activities, especially in the aftermath of the earthquake;</li> <li>• Water availability is a key issue across the basin and is directly linked to health of communities and thus was assessed as a resource that needs to be considered at a basin level;</li> </ul>

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VECs	Direct impacts from hydropower projects	Specific stakeholders that indicated relevance for further considerations	Cumulative implications and decisions for screening
<b>Slope stability</b>	<p>Change in river contours due to HPP construction and tunneling may trigger landslides on the flanks of reservoirs.</p> <p>Deposition of gravel from landslides damages forest cover and arable land.</p>	<ul style="list-style-type: none"> <li>• BZ-CFUG (Rasuwa)</li> <li>• District Soil Conservation Office (Rasuwa)</li> <li>• District Forest Office (Rasuwa)</li> <li>• Nepal Agro-forestry Foundation (Rasuwa)</li> </ul>	<p>Assessed by stakeholder consultations as a localized impact wherein specific indicators (such as increased landslides) could not be attributed to hydropower development alone in view of the implications of road construction.</p> <p><b>Not screened into the CIA.</b></p>
<b>Cultural and Religious sites</b>	<p>Insufficient flows immediately upstream of these sites during the festivals and seasons are linked to pilgrimages and other specific time periods.</p>	<ul style="list-style-type: none"> <li>• Bidur Municipality (Nuwakot)</li> <li>• FECOFUN, District Chapter (Nuwakot)</li> <li>• UHSM Bidur Municipality (Nuwakot)</li> <li>• BZ-CFUG (Rasuwa)</li> <li>• Kispang Rural Municipality (Nuwakot)</li> <li>• Benighat Rural Municipality (Dhading)</li> <li>• Siddhalek Rural Municipality (Dhading)</li> <li>• Gajuri Rural Municipality (Dhading)</li> <li>• Galchhi Rural Municipality (Rural)</li> <li>• District Forest Office (Rasuwa)</li> <li>• Kalikamai CFUG Dhaibung (Rasuwa)</li> <li>• Nepal Agro-forestry Foundation (Rasuwa)</li> <li>• Kalika Rural Municipality (Rasuwa)</li> <li>• Community and Rural Devt. Society (Nuwakot)</li> </ul>	<ul style="list-style-type: none"> <li>• Gosaikunda Lake (within LNP), Devighat, and Uttargaya are regionally and nationally significant cultural and tourist sites that are also contributors to the local economy.</li> <li>• The significance of these sites emanate from religious/mythological value, holy bathing/cremation site for Hindus, cultural significance, and river basin civilization.</li> <li>• Approximately 66 percent of stakeholder groups considered religious/cultural sites as a VEC for which impacts could be attributed only to the hydropower projects immediately upstream and where cascading projects have an implication on flows.</li> </ul> <p><b>Screened into the CIA as Cultural and Religious Sites.</b></p>
<b>Livelihoods of local communities around hydropower projects</b>	<p>General impoverishment due to compensation policies not having considered in-kind compensation, specific category of land users and livelihood restoration.</p> <p>Flow transformations also influence river-based livelihoods and ecosystem services linked to the river basin.</p>	<ul style="list-style-type: none"> <li>• Bidur Municipality (Nuwakot)</li> <li>• FECOFUN, District Chapter (Nuwakot)</li> <li>• Local NGO (Dhading)</li> <li>• UHSM Bidur Municipality (Nuwakot)</li> <li>• BZ-CFUG (Rasuwa)</li> <li>• Kispang Rural Municipality (Nuwakot)</li> <li>• Janajati Mahasangh (Nuwakot)</li> <li>• Benighat Rural Municipality (Dhading)</li> <li>• Rafting Association of Nepal (Dhading)</li> </ul>	<p>Seventy-six percent of stakeholders consulted indicated relevance of assessing livelihood impacts at a basin level due to inconsistent land-acquisition policies and procedures, limited influence of the government to account for livelihood restoration and consideration of fishing communities, and the interdependencies across multiple other activities with livelihoods (for example, religious and cultural sites, white water rafting, and sand mining).</p> <p><b>Screened into the CIA as Livelihoods.</b></p>

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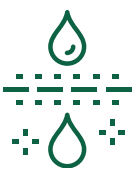
VECs	Direct impacts from hydropower projects	Specific stakeholders that indicated relevance for further considerations	Cumulative implications and decisions for screening
<b>Livelihoods of local communities around hydropower projects (continued)</b>		<ul style="list-style-type: none"> <li>• Siddhalek Rural Municipality (Dhading)</li> <li>• Gajuri Rural Municipality (Dhading)</li> <li>• Galchhi Rural Municipality (Rural)</li> <li>• Langtang Area Conservation Society (Rasuwa)</li> <li>• Kalikamai CFUG Dhaibung (Rasuwa)</li> <li>• Nepal Agro-forestry Foundation (Rasuwa)</li> <li>• Kalika Rural Municipality (Rasuwa)</li> <li>• Community and Rural Devt. Society (Nuwakot)</li> <li>• Jalpa Community CFUG (Nuwakot)</li> <li>• Women Group CFUG (Nuwakot)</li> </ul>	
<b>Indigenous communities</b>	<p>In-migration is influencing change in the demographics and cultural identity of the basin.</p> <p>A threat to supplementary livelihoods is linked to the river.</p>	<ul style="list-style-type: none"> <li>• FECOFUN, District Chapter (Nuwakot)</li> <li>• UHSM Bidur Municipality (Nuwakot)</li> <li>• Janajati Mahasangh (Nuwakot)</li> <li>• Fishing/Indigenous Communities (Nuwakot)</li> </ul>	<p>The profile and spread of indigenous communities across the basin varies, with the highest proportion being in Rasuwa. Specific indigenous peoples (IPs) communities' interests are interlinked with the livelihood and aquatic biodiversity VEC. Impacts to IP communities is a localized issue that hydropower developers are to address as a part of stakeholder engagement, indigenous peoples development plans, and free, prior, and informed consent.</p> <p><b>Not screened into the CIA.</b></p>
<b>Community forests</b>	<p>An impact on available CFUG resources is due to the land footprint of HPPs (especially the submergence areas of reservoirs).</p>	<ul style="list-style-type: none"> <li>• FECOFUN, District Chapter (Nuwakot)</li> <li>• PB-CFUG (Nuwakot)</li> <li>• District Forest Office (Rasuwa)</li> <li>• District Forest Office (Nuwakot)</li> <li>• Jalpa Community CFUG (Nuwakot)</li> <li>• Women Group CFUG (Nuwakot)</li> </ul>	<p>While CFUGs may be situated along the river, their spatial extent extends upward on the slopes, and access to these areas has reportedly improved because of hydropower development.</p> <p><b>Not screened into the CIA.</b></p>
<b>Community health</b>	<p>IEE/EIA reports of prior hydropower construction indicates pressure on health infrastructure, shortages in water supply, decline in water quality, and the introduction of communicable and sexually transmitted diseases</p>	<ul style="list-style-type: none"> <li>• Bidur Municipality (Nuwakot)</li> <li>• FECOFUN, District Chapter (Nuwakot)</li> <li>• Local NGO (Dhading)</li> <li>• BZ-CFUG (Rasuwa)</li> <li>• Benighat Rural Municipality (Dhading)</li> </ul>	<p>Stakeholder groups ascertained that health implications are localized issues and need to be monitored by municipalities and the Department of Health.</p> <p><b>Not screened into the CIA.</b></p>

**Note:** See Table 3.3 for descriptions of the stakeholders.

## Finalization of VECs

The results of the stakeholder perceptions during field surveys in April and May 2018, data analysis of information in the EIA reports, and the literature review resulted in the inclusion of the following VECs presented in Table 4.2.

**Table 4.2 Approach for Final VECs**

Identified VEC	Available information	Key basin-level impacts to consider	Assessment approach
<b>Aquatic Habitat</b> 	<ul style="list-style-type: none"> <li>Hydrological time series data</li> <li>Select parameters on operational hydropower projects</li> </ul>	Reduction in flows that may lead to degradation of ecosystem integrity and fish habitat	Set up of the Downstream Response to Imposed Flow Transformations (DRIFT) model and assessment of outcomes linked to scenarios
<b>Terrestrial Habitat and Langtang National Park</b> 	<ul style="list-style-type: none"> <li>Location of HPPs and associated facilities around LNP</li> <li>Biodiversity values and data on the LNP</li> </ul>	Impact on biodiversity values from LNP linked to footprint of project components and illegal and unregulated resource extraction due to stressors	Qualitative assessment of impacts from hydropower, transmission lines, and stressors working in concert
<b>Cultural and Religious Sites</b> 	<ul style="list-style-type: none"> <li>Mapping of specific cultural and religious sites along with their significance</li> <li>Information on local dependence and links to practices of indigenous peoples</li> </ul>	<ul style="list-style-type: none"> <li>Insufficient flows to carry out religious and culturally significant activities</li> <li>Livelihood implications on the local economy dependent upon these resources</li> </ul>	Qualitative assessment of low flow areas using the results from DRIFT in order to ascertain feasibility of controlled releases
<b>Livelihoods</b> 	<ul style="list-style-type: none"> <li>River-based livelihoods</li> <li>Ecosystem services-based livelihoods</li> <li>Information on land and natural resource-based impacts of eight hydropower projects</li> </ul>	<ul style="list-style-type: none"> <li>Change in flows may affect river-use based livelihoods</li> <li>Poor mitigation and compensation policies of land-based impacts may exacerbate economic vulnerabilities.</li> </ul>	<ul style="list-style-type: none"> <li>Interpretation of DRIFT results for river-based livelihoods and ecosystem services</li> <li>Impact significance of impact and mitigation information of 8 hydropower projects</li> </ul>
<b>Water Resources</b> 	<ul style="list-style-type: none"> <li>Water quality information from IEE and EIA reports and secondary sources</li> <li>Dependence of local communities on surface water and springs</li> </ul>	Deterioration of water quality linked to muck disposal and other stressors such as waste management from urban areas	<ul style="list-style-type: none"> <li>Qualitative assessment of implications on water resources on springs</li> <li>Mapping of specific sites where high TDS/fecal coliform has been detected to under-construction projects and urban areas</li> </ul>

**Note:** A discussion on indigenous communities and health has been provided as a context to the social VECs in Chapter 7.