CHAPTER 1:

INTRODUCTION

Background

The Trishuli River Basin (TRB) covers an area of 32,000 square kilometers across the Central Development Region of Nepal and makes up approximately 13 percent of the Gandaki River Basin (one of the nine major river basins in Nepal). There are six operational hydropower projects totaling 81 megawatts (MW) along the Trishuli River and its major tributaries. In addition, seven hydropower projects (totaling 286 MW) are under construction and at least 23 hydropower projects are in the planning stage with survey licenses being issued by the Department of Electricity Development (DoED 2018).

This Cumulative Impact Assessment and Management: Hydropower Development in the Trishuli River Basin, Nepal was undertaken by the International Finance Corporation (IFC) to strengthen understanding of environmental and social impacts of hydropower development that go beyond individual project-level impact assessments by considering a multiproject, basin-wide understanding of potential cumulative impacts in the TRB. The CIA was conducted by ERM India Private in consortium with Hagler Bailly, Pakistan; Nepal Environmental and Scientific Services (NESS), Nepal; and Sweco, Sweden, and focused on valued environmental components (VECs). VECs are defined as fundamental elements of the physical, biological, or socio-economic environment (including the air, water, soil, terrain, vegetation, wildlife, fish, birds, and land use) that are likely to be the receptors most sensitive to the impacts of a proposed project or the cumulative impacts of several projects (IFC 2013).

This final CIA report is the outcome of stakeholder consultations, qualitative and quantitative data analysis, and strategic workshops from December 2017 to January 2019. It includes the following elements to enable sustainable hydropower development in the TRB:

- An overview of the basin along with the rationale for spatial and temporal boundaries and VECs identification
- A quantitative and qualitative understanding of potential cumulative impacts across VECs (to the extent feasible and using qualitative extrapolation) as identified by stakeholder groups
- Recommendations on mitigation measures along with a framework for the establishment of sustainable development pathways that may be implemented and monitored by hydropower developers, local communities, and national stakeholders
- A suggested institutional arrangement for implementation of sustainable development pathways through the Trishuli Hydropower Developers Forum (THDF), a community-based local management committee structure facilitated by hydropower developers

Project Overview

Figure 1.1 summarizes the overarching basin-level context of the Trishuli River.

In view of 81 MW of operational hydropower projects and 286 MW of under-construction hydropower projects, cumulative impacts are already evident within the TRB. These include aquatic habitat fragmentation, overall degradation of the catchment area, reduced water availability, and the increased risk of landslides (ESSA 2014). In April 2015, Nepal suffered a large earthquake; districts within the TRB (especially Rasuwa District) were among the worst affected areas in the country. The earthquake further altered environmental and social conditions within the basin (ERM 2018). While hydropower developers have prepared Environmental Impact Assessments (EIAs) for specific projects within the TRB, there have been limited efforts to provide a basin-level understanding of cumulative environmental, social and ecological impacts of hydropower development in the context of the "altered" baseline conditions and other stressors.

Figure 1.1 The Trishuli River Basin

- The Gandaki Basin is one of the largest river basins in Nepal and has the highest hydropower potential. Its rivers are critical for conservation with seven protected areas.
- The Trishuli River is one of seven confluent rivers of the Gandaki Basin. Trishuli is a transboundary river (originating from the Tibet Autonomous Region in the People's Republic of China) with a length of 106 kilometers across Nepal.

Photo F1.1.1 TRB in Rasuwa District

Photo F1.1.2 TRB at Benighat Rorang Confluence

The Trishuli River meets Budhi Gandaki at Benighat Rorand municipality (bordering Gorkha and Dhading districts) and continues into the Chitwan Annapurna Landscape (CHAL), an identified geographic area. The total catchment area of the Trishuli River up to its confluence with Budhi Gandaki is approximately 6,624.7 square kilometers.

The Trishuli River lies within the physiographic zones defined by average altitude range of 250 meters to 2,000 meters and high valley landscapes with gradients in the initial 40 km and rapids along its length up to the CHAL.

Hydropower Development in the Trishuli River (DoED June 2018)

six operational hydro projects aggregating to 81 MW

seven under-construction hydro projects aggregating to 286 MW

twenty-three committed/planned hydro projects that aggregate to 1,163 MW

Map F1.1.1 River Basin Terrain

CIA Study Context

The IFC defines cumulative impacts as the combination of multiple impacts from existing projects, the proposed project, and/or anticipated future projects that may result in significant adverse and/or beneficial impacts that would not be expected in the case of stand-alone projects. In the case of the TRB, cumulative impacts result from the successive, incremental, or combined effects of operational and under-construction hydropower development when considered with planned or reasonably anticipated future ones (for example, where survey licenses may have been awarded by the government of Nepal). Apart from the proposed Upper Trishuli-1 (UT-1) project (see Box 1.1), none of the other hydropower projects have considered the impacts arising from the combined operations of the existing and proposed plants in the area.

As noted, the current study was commissioned to establish a multiproject, basin-wide understanding of potential cumulative impacts in the TRB. While the CIA will entail a specific set of recommendations in terms of impacts and mitigation for identified VECs, it also intends to engage and facilitate collaborative assessment, monitoring, and management of cumulative impacts via the participatory development and implementation of the THDF along with other stakeholders at a community and basin level.

Box 1.1 Upper Trishuli-1

The Nepal Water and Energy Development Company Limited (NWEDC) is undertaking the development of the 216 MW Upper Trishuli-1 Hydropower Project on the Trishuli River. The project components will be located near Dhunche within the Rasuwa District of the Central Development Region of Nepal, approximately 70 kilometers northeast of Kathmandu. The plant is expected to generate 1,456.4 gigawatt hours of electricity per year, of which 1,149.7 gigawatt hours will be generated during the wet season and 306.7 gigawatt hours during the dry season. NWEDC is a joint venture company formed by three Korean companies (Korea South East Power Company, Daelim Industrial Corporation, and Kyeryong Construction Industrial Corporation), the IFC, and a Nepali investor. The government of Nepal formally executed the power purchase agreement with NWEDC for the development of UT-1 on January 28, 2018 (Urja Khabar 2018). As the proponents of UT-1 include the IFC and other international financial institutions as a part of the lender's consortium, a Summary Environment and Social Impact Assessment was developed for the purposes of public disclosure; it included implications and recommendations from the basin-level Cumulative Impact Assessment that were to be included in the management plans.

Source: *IFC 2019.*

Scope of Work

The scope of work for the CIA of the TRB included the following elements:

Upgrading the UT-1 CIA study to develop a multiproject, basin-level understanding of potential cumulative impacts through a scoping process:

- Creating revised spatial boundaries considering basin-wide river reaches
- Updating the temporal boundaries to align with basin-wide information on project development
- Screening and evaluating valued environmental and social components
- Reviewing the existing administrative framework relevant to the CIA and conducting a forward-looking assessment of the regulations that has implications for the mitigation measures proposed
- Identifying and consulting with stakeholders to scope the CIA and to determine baseline conditions of VECs screened into the assessment
- Consolidating information from available EIAs of other hydropower projects within the TRB to determine baseline conditions of the VECs
- Developing a specific assessment of ecological flows using a holistic model based on certain assumptions and available data
- Assessing the cumulative impacts and their significance on the VECs that are screened in
- Making suggestions for mitigation measures along with a framework for the THDF to manage, monitor, and supervise cumulative impacts identified along with any additional assessments that may be required

Scope Exclusions

The following scope exclusions are pertinent:

- No primary baseline data on social, environmental and ecological conditions of identified VECs were undertaken. Available information within existing EIA reports, secondary data in the public domain, and stakeholder perceptions at a basin level were compiled to develop a narrative to ascertain cumulative impacts.
- The study considers the portion of the Trishuli River within Nepal (up to an identified point as determined by the spatial boundary) and does not specifically consider the river in the Tibet Autonomous Region.

Approach and Methodology

Adapting the Conceptual CIA Approach

The CIA followed a modular and iterative approach (Figure 1.2) as recommended in the IFC *Good Practice Handbook on Cumulative Impact Assessment and Management* (IFC 2013). This approach was modified for the TRB on the basis of (i) frequent workshops convened in Kathmandu with developers of hydropower projects in the basin (the THDF), (ii) extensive stakeholder consultations out at the federal, district and community levels, and (iii) use of the Downstream Response to Imposed Flow Transformations (DRIFT) model to extrapolate qualitative analysis across identified VECs.

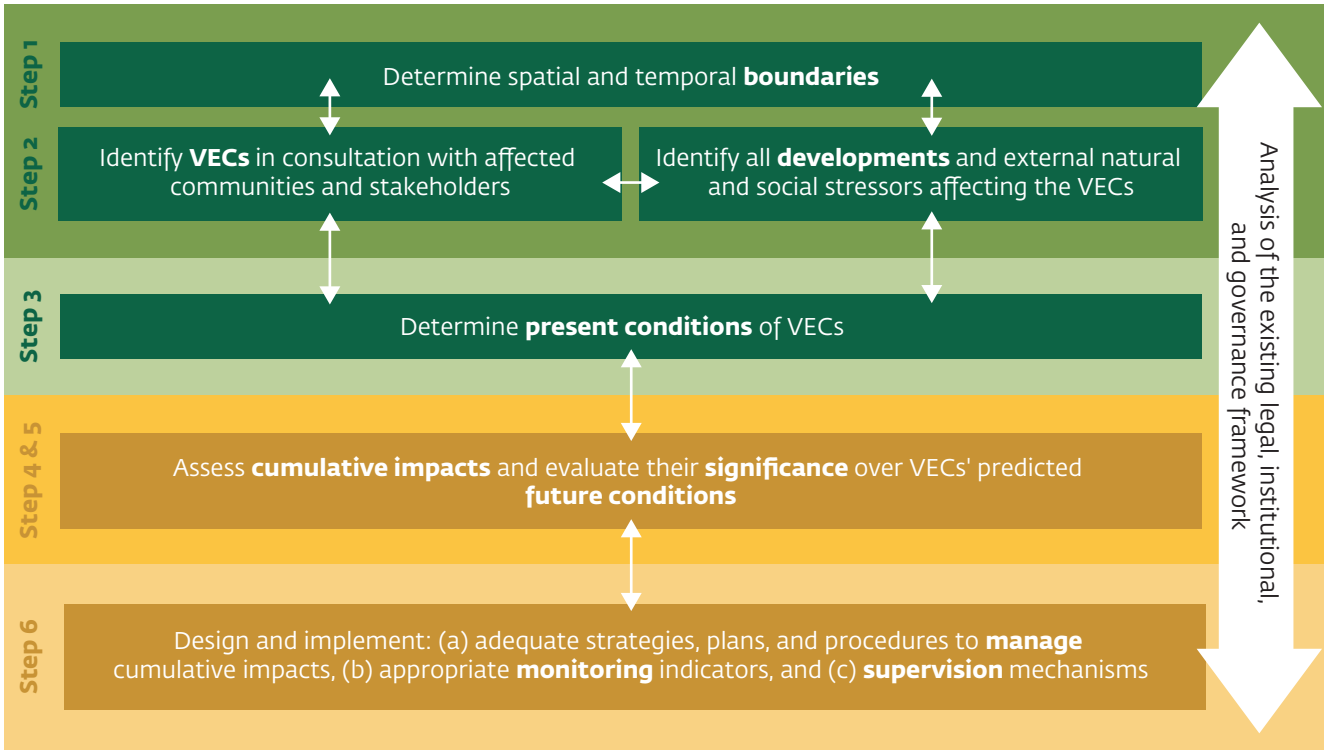
The specific methodology consisted of the following activities:

Establishing the study context:

- Available information on hydropower development (ongoing and proposed) was compiled and collated alongside a preliminary mapping of stakeholder groups;
- Key national stakeholders, i.e. Ministry of Forests and Environment (MoFE), Water and Energy Commission Secretariat (WECs), were consulted on potential VECs, any basin-level initiatives or interventions that may be expected within the TRB and insights on spatial and temporal boundaries;
- Facilitation of the First Hydropower Developers Forum (December 2017) since commencement of the study to introduce the study team, objectives and intended outcomes of the CIA and the proposed work plan.

Conducting field reconnaissance: A team of social, ecology, and environment experts undertook a reconnaissance trip in February 2018 to the TRB to undertake consultations in the vicinity of major settlements and operational hydropower projects in order to screen the perspectives of the local communities on VECs and potential cumulative impacts. In parallel,

Figure 1.2 Conceptual CIA Approach



Source: *IFC 2013.*

an Inception Report was submitted and a Second Hydropower Developers Forum (January 2018) was facilitated to provide an update on the CIA, challenges in terms of information gaps, and VECs for further assessment.

Selecting VECs: Chapter 4 provides a flow chart to summarize the process through which VECs were initially identified, screened, and finalized for inclusion as a part of the CIA.

Determining baseline conditions of the VECs: Further to establishing the study context and screening of VECs, a Stakeholder Identification and Consultation Plan was prepared to scope key groups and entities that are to be consulted in order to determine baseline conditions of the VECs screened into the assessment. Qualitative tools (ecosystem services and community perceptions on a CIA questionnaire, focus group discussions, and key informant interviews) were used to elicit feedback from stakeholders at national, provincial, and district levels and within the basin (municipalities, communities around both operational projects and those under construction and local nongovernmental organizations).

Collecting secondary data and reviewing the regulatory landscape: In parallel, a data-sharing platform was set up to obtain information on projects from the THDF on land acquisition, operational modalities, water quality information, baseline profile, and so forth.

Presenting findings and reporting: Further to the completion of data compilation and analysis, two key workshops helped to streamline stakeholder inputs into this final version of the CIA for the TRB:

- *Third Hydropower Developers Forum, June 2018:* This workshop presented the key results of the qualitative and quantitative analysis on the VECs screened, in terms of cumulative impacts, distinct from localized project impacts. The stakeholders were also asked to discuss mitigation options that consider regulators, local communities, and the developers for the cumulative impacts and stressors that were presented;

- *Fourth Hydropower Developers Forum, November 2018:* This workshop (Photo 1.1) presented the outcomes of hydropower development on the VECs based on data analysis of a business-as-usual development scenario. A recommended high-management action was introduced that incorporates sustainable development pathways to identify potential implications and provide solutions for cumulative impacts. Suggestions

Photo 1.1 Fourth Hydropower Developer's Workshop (November 2018)

Source: *IFC 2018.*

were thereafter invited on the implementation of the high-management action and its institutional structure through the developer-driven THDF and local impact management committees across the TRB.

Figure 1.3 illustrates key activities that were undertaken for the CIA. Specific aspects of the approach and methodology that determined the spatial and temporal boundaries and selection of VECs and their baseline data collection are further elaborated in Chapters 3 and 4 of this report. The methodology to assess cumulative impacts and its significance for each identified VEC is discussed across Chapters 5 to 8 of the CIA report.

Key Enablers

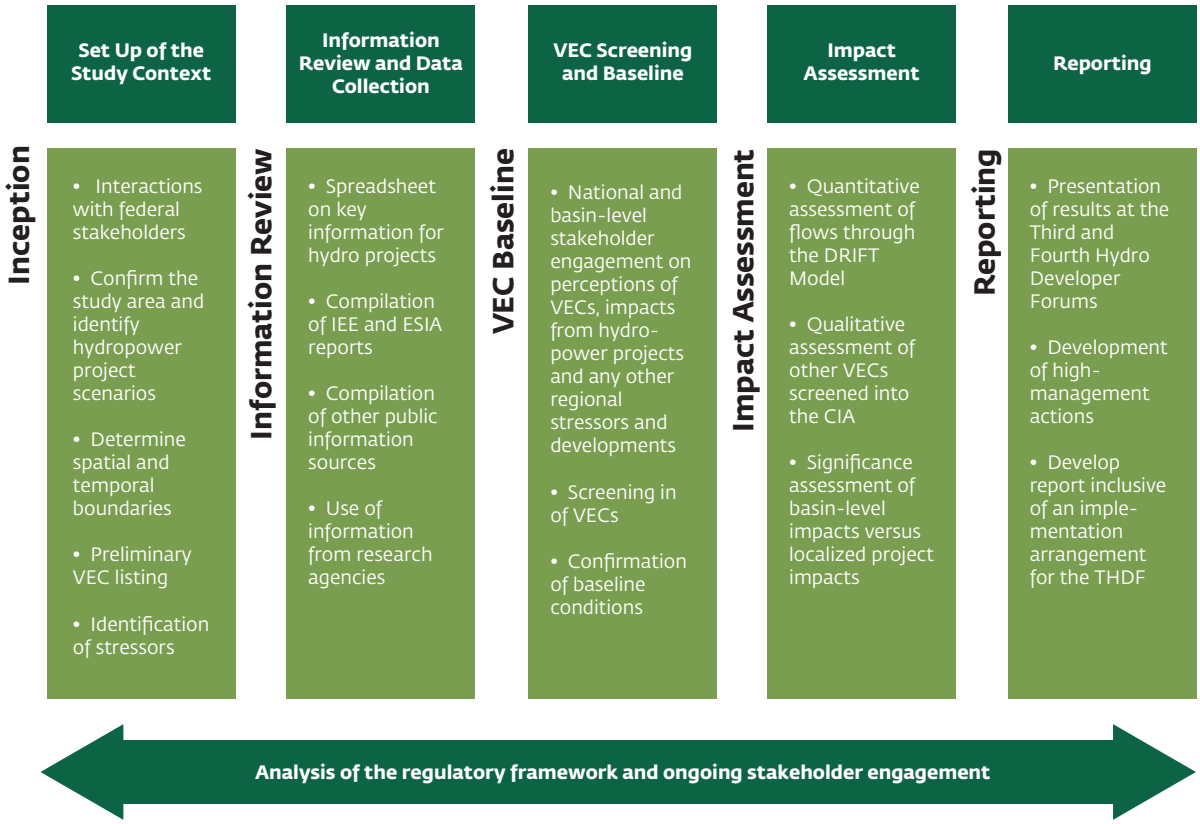
Ongoing engagement with the group of hydropower developers was deemed as key to appraising progress of the study and to provide insights from basin-level consultations with stakeholder groups. These workshops also included government entities and input on other river basin initiatives in Nepal to help stress the need for multistakeholder collaboration in addressing cumulative impacts in the TRB.

A Stakeholder Identification and Consultation Plan was developed and implemented to document the following:

- Stakeholder identification and mapping of their profile and influence
- Categorization of stakeholders in order to inform their involvement in confirming the spatial and temporal boundaries, identification of VECs, and opinions on projects resulting in individual and cumulative impacts
- A proposed plan and mechanism to engage the stakeholders

Based on the stakeholder identification, their interest, influence mapping, and feedback vis-à-vis suggested VECs, engagement mechanisms were designed to elicit their participation at national, provincial, and basin

Figure 1.3 Key Activities Undertaken in the Assessment



levels and the participation of communities living hydropower projects under construction (Table 1.1).

Appendix A captures key stakeholder consultations recorded for the CIA, and Appendix B includes the tools used for perceptions on determining baseline conditions of VECs and impacts.

Appreciation of the Regulatory Framework

The CIA of the TRB was drafted within the context of an evolving regulatory and administrative framework on water resources management, sustainable hydropower development, and decentralization. The Nepal Water and Energy Commission Secretariat, with support from the World Bank Group, is in the process of developing river basin plans across major rivers, including the Gandaki Basin.[1]

In parallel, the following regulatory initiatives are being driven by the government of Nepal and other organizations, with implications for basin-level planning:

- Revision of the Water Resources Strategy by the Ministry of Energy, Water Resources, and Irrigation to identify sectoral policies to access water within priority watersheds
- Effort to assess cumulative impacts in other river basins, for instance, in the Kabeli River
- Implementation of the revised EIA guidelines (2017) and Manual on EIA for Hydropower Projects (2018) by the MoFE
- Revisions to existing policies on climate change and forests along with some modifications of the National Park Act (1980)

Table 1.1 Engagement Mechanisms and Data Collection Tools

Tool/technique	Descriptions
Data-sharing platform	Based on the initial workshops, a spreadsheet-based data-sharing platform was developed for circulation among national-level government authorities and the independent power producers. This platform intended to capture critical information linked to project components, associated facilities, information on flows, and mitigation for the same as a part of the design as well as data on affected communities and compensation packages.
Ecosystem services and community perceptions on CIA questionnaire	A proprietary ecosystems screening tool was adapted based on World Resources Institute (WRI) guidance. The field team administered the tool through group consultations at the village and community level. This was complemented by a proprietary tool for stakeholder feedback on VECs, their stressors, their baseline conditions, and insights on impacts and mitigation. Some of the data to be collected includes use of compensation, any out-migration of physically displaced households, changes in livelihoods after compensation, health concerns during and after construction, and the general integration of gender and vulnerable communities into the process for identifying accrued development benefits.
Focus group discussions	A checklist of themes was developed to facilitate focus group discussions on the interplay between thematic areas and sustainable livelihoods, ecosystem services, and VECs that represent resources likely to be impacted at an overarching basin level.
Semi-structured interviews	Semi-structured interviews protocols were developed for provincial, district, and national stakeholders. For specific stakeholder groups, notably institutions and international NGOs, position statements on hydropower development and published sources of literature were considered.

1 While this initiative remains under way, the outcome of the river basin plans is expected to inform hydropower development master plans and implementation of recommendations of the CIA.

- Government of Nepal issuance of "Directives on Licensing of Energy Projects–2018," with safeguards on development timelines and the need for hydropower projects to be designed on the basis of flow exceedance

- Nepal Rastra Bank's issuance of Guidelines on Environmental and Social Risk Management, applicable for project lending above a certain threshold (mostly hydropower projects), effective June 1, 2018

- Government of Nepal updating of the Environment-Friendly Local Governance Framework (2013) to account for the new governance structures that will enable municipalities to provide indicator-based local development proposals

These ongoing initiatives indicate that an enabling policy environment for sustainable hydropower development is imminent. While mindful of these efforts, the key regulations, applicable standards, and initiatives that informed the CIA include the following:

- Constitution of Nepal (2015) and key acts, policies, and guidelines on environmental protection, soil and watershed conservation, biodiversity conservation, and land acquisition and resettlement

- International good practice:
    - IFC Performance Standards, 2012
    - IFC CIA Good Practice Handbook, 2013
    - IFC Environmental, Health, and Safety (EHS) Approaches for Hydropower Projects, 2018
    - WBG Environmental Flows for Hydropower Projects, 2018
- Review of strategies and implementation arrangements of the following:
    - Australian Aid in partnership with International Centre for Integrated Mountain Development (ICIMOD) and International Water Management Institute development of strategies to enhance ecosystem services and reduce poverty in the Koshi River Basin through a regionally coordinated water resources management plan
    - Chitwan Annapurna Landscape (CHAL) Strategy (2016–25)
    - USAID's PANI Project, which developed an Aquatic Animals and Biodiversity Conservation Bill, endorsed by three municipalities in the Karnali River

Use of a Holistic Ecological Model

DRIFT is a holistic model with which to study impacts of hydropower development on biodiversity and ecosystems. The CIA made use of DRIFT to predict impacts of hydropower project scenarios on the ecological integrity and fish abundance of habitats at selected sites along the main stem of the Trishuli River.

The following input parameters were used to set up DRIFT:

- Seven EFlows sites in the main river and four EFlows sites in the tributaries

- Daily time series hydrological data for the seven EFlows sites

- Four indicator fish species: Snow Trout (*Schizothorax richardsonii*), Golden Mahseer (*Tor putitora*), Baduna (*Garra annandalei*), and Indian Catfish (*Glyptothorax indicus*), which are dependent on the following indicators; geomorphology, algae, and macro-invertebrates

- Assumptions made on connectivity for upstream and downstream fish migration and connectivity for sediment flow

- Lessons learned by evaluating EFlows in other projects within the basin and elsewhere in the Himalayan region

- Appendix D includes the DRIFT Assessment Report (September 2018) along with its methodological set up

Limitations

The CIA report was drafted in view of the following limitations:

- The CIA includes a discussion of the cumulative impacts of 36 hydropower projects (including the six operational projects) based on information received from DoED's website as of June 30, 2018. Information on associated facilities of hydropower projects (transmission lines, quarries, and access roads) is depicted based on available data in the public domain and/or received from developers.

- Information within available Initial Environment Examinations and EIA reports on specific parameters within technical specifications of hydropower projects (for example, tunnels) and also the baseline used for the assessment. Data available within EIA reports and in the public domain were triangulated with stakeholder perceptions at a basin level to compile baseline social, environmental, and ecological conditions of identified VECs. Additional primary data collection on social and environmental parameters was not undertaken.

- Response curves as a part of DRIFT were developed for the identified scenarios only for aquatic habitat as a VEC and not for the other VECs under consideration.

- Geographic information system (GIS) mapping was used to demonstrate analysis and results but did not involve any spatial analysis for identification and demarcation of spatial boundaries. For that purpose, available maps and related nonspatial data were collected and collated from different government agencies and stakeholders and then utilized for preparing GIS layers.

- Where information was not available, information gaps are highlighted.

- The project team focused only on VECs identified by stakeholder groups during the scoping component of the CIA and in the inception report.

- ERM India Private has not developed a specific data-sharing platform but has relied on iterative information made available by developers.