



# A Strategic Approach to Hydropower Development

*Applying Hydropower by Design within the context of Strategic  
Environmental Assessment to achieve hydropower goals in a sustainable  
and equitable manner*

## THE INITIATIVE

Energy development is essential for the prosperity of any country but it is never without negative impacts. Though trade-offs are inevitable, science and practice prove that many of the consequences can be reduced or even avoided. Traditional planning approaches miss opportunities to capitalize on system-scale insights. Considering multiple project options and their consequences collectively – particularly at early stages of development – is crucial to identifying and encouraging the best possible choices. It is at this stage when many possibilities remain open, before individual projects are selected, which, once finalized, limit the options for future development and management considerations.

Countries can improve outcomes of energy development by applying a strategic, system-scale approach, particularly in the context of hydropower planning. Such an approach can identify hydropower systems that achieve energy goals with greater economic values to countries and financial values to developers, while significantly lessening nega-

tive and irreversible impacts to environmental and social values compared to traditional approaches.

The Nature Conservancy (TNC) and the Netherlands Commission for Environmental Assessment (NCEA) are partnering to offer their international experience in hydropower development. This document summarizes how incorporating Hydropower by Design (HbD) within the framework of Strategic Environmental Assessment (SEA) would benefit hydropower planning and illustrates what this merger would look like in practice.

This document is aimed at those involved in various stages of hydropower planning, assessment and decision-making (i) in the context of a national energy policy or plan, (ii) at different locations within a river basin or multiple basins, (iii) in a basin with potentially conflicting water uses or expected to be affected by climate change, (iv) in a transboundary river basin, or (v) in the context of upgrading, expanding or decommissioning of existing facilities.

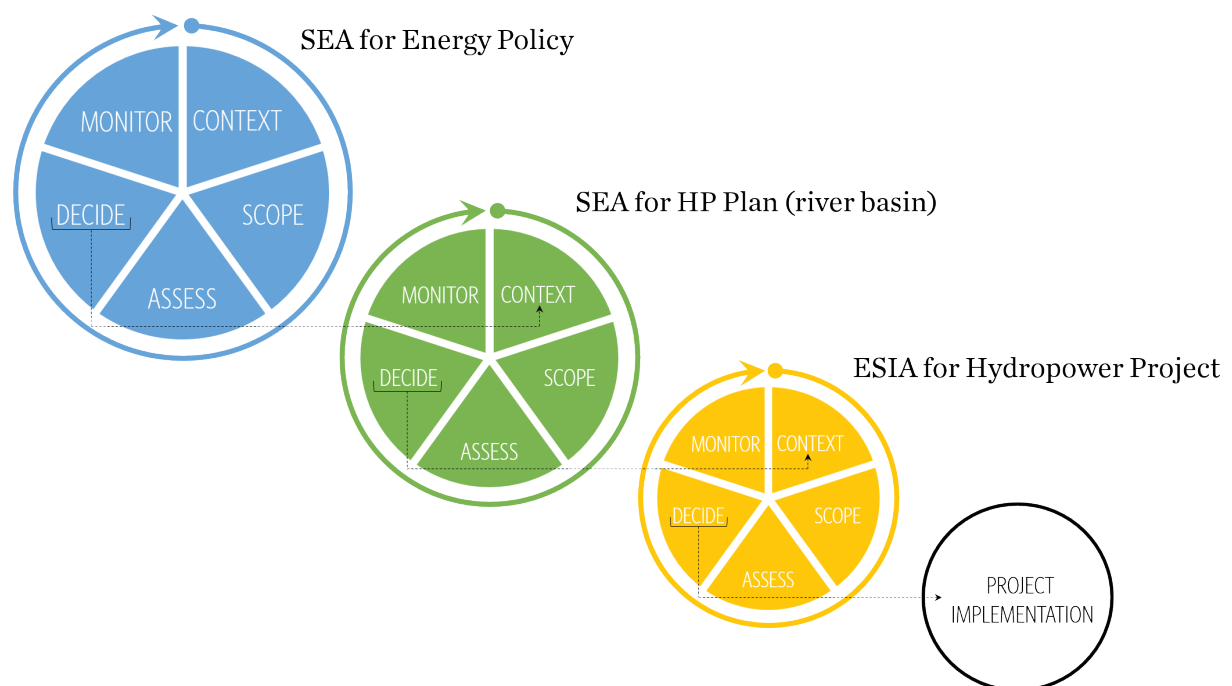


Figure 1. SEA is both a cyclic process and informs lower levels of decision-making

## WHAT ARE SEA AND HBD?

**Strategic Environmental Assessment (SEA)** is defined by the Organization for Economic Cooperation and Development OECD as analytical and participatory approaches that aim to integrate environmental considerations into government policies, plans, and programmes and evaluate the interlinkages with economic and social considerations. SEA is an internationally established instrument, to assess the environmental and social consequences of new policies, plans or programmes prior to decision making and is legally required in an increasing number of countries (presently 106 countries).

SEA is widely applicable. It aims to inform and improve strategies, such as country-wide development policies, sectoral policies (e.g. energy policy) or spatial plans (e.g. river basin management plan), to name a few. It is tailored to the information needs of decision makers at critical points in a planning process. The hydropower potential in high income countries has to a large extent already been utilized. However, hydropower is high on the agenda of many low- and middle-income countries; a recent inventory showed that over the last decade over 20 countries have implemented SEAs for hydropower development policies and plans with widely varying quality and influence on government decision making.

**Hydropower by Design (HbD)** is a framework that utilizes participatory processes and a suite of analytical tools to integrate effects of reservoirs, project sites, roads, transmission lines, and downstream flow alteration on social and environmental values along with energy generation, costs, and financial performance of different combinations of sites and operations. It illustrates the potential trade-offs for stakeholders across the range of development alternatives and identifies those options that achieve energy goals while best addressing the collective concerns of stakeholders engaged in or affected by hydropower planning decisions. HbD can be integrated into planning guidelines and policies to improve future decisions for energy, infrastructure, and water resource development and management.

SEA and HbD are not substitutes for environmental and social impact assessment (ESIA) of individual projects, but make ESIA easier by assessing potential consequences of plans in a much earlier phase at broader geographic and temporal scales.

The application of Hydropower by Design has helped identify hydropower development options that achieve energy targets with better outcomes for rivers in terms of reduced fragmentation, as illustrated by Figure 2. Beyond fragmentation, the Hydropower by Design methodology can also strive to optimize for other values, for example by avoiding impacts to communities and/or terrestrial biodiversity (from reservoir inundation) or avoiding or reducing impacts from flow alteration on downstream ecosystems and communities that rely on them.

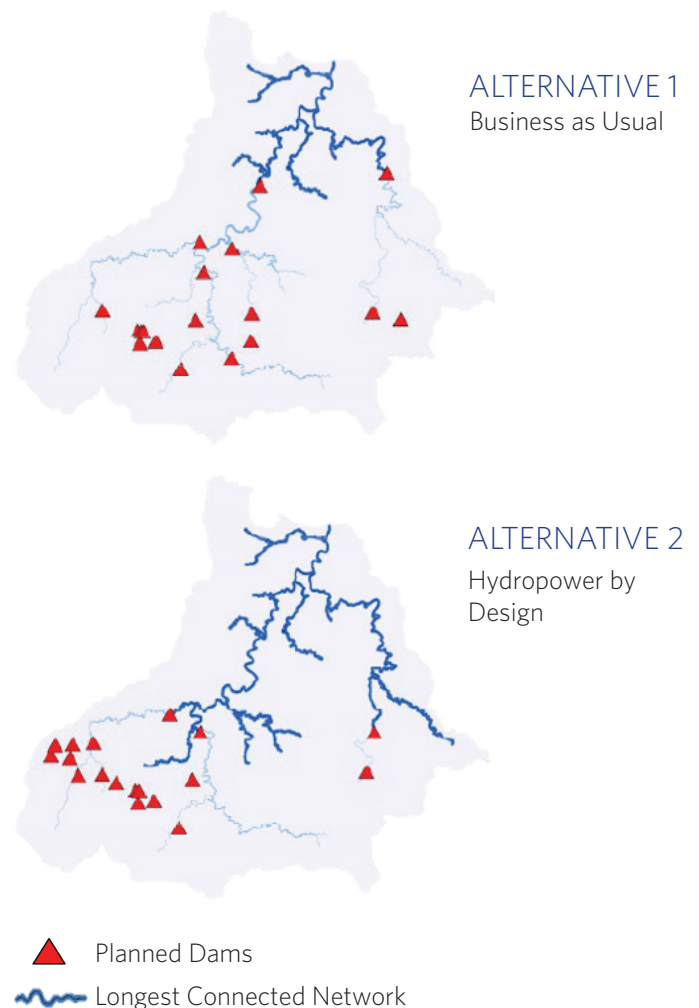


Figure 2. Alternatives for project portfolios that would deliver an optimal amount of energy while minimizing impacts to rivers.

## COMBINING SEA AND HbD FRAMEWORKS TO IMPROVE HYDROPOWER PLANNING

SEA and HbD have similarities and core values making them compatible with one another. They both emphasize the importance of stakeholder engagement and applying a long-term and comprehensive perspective to hydropower planning.

Both approaches work best when applied in early planning stages, are iterative, and applied in a case-specific and cost-effective manner. The added value of combining HbD with the SEA framework lies in their different strengths.

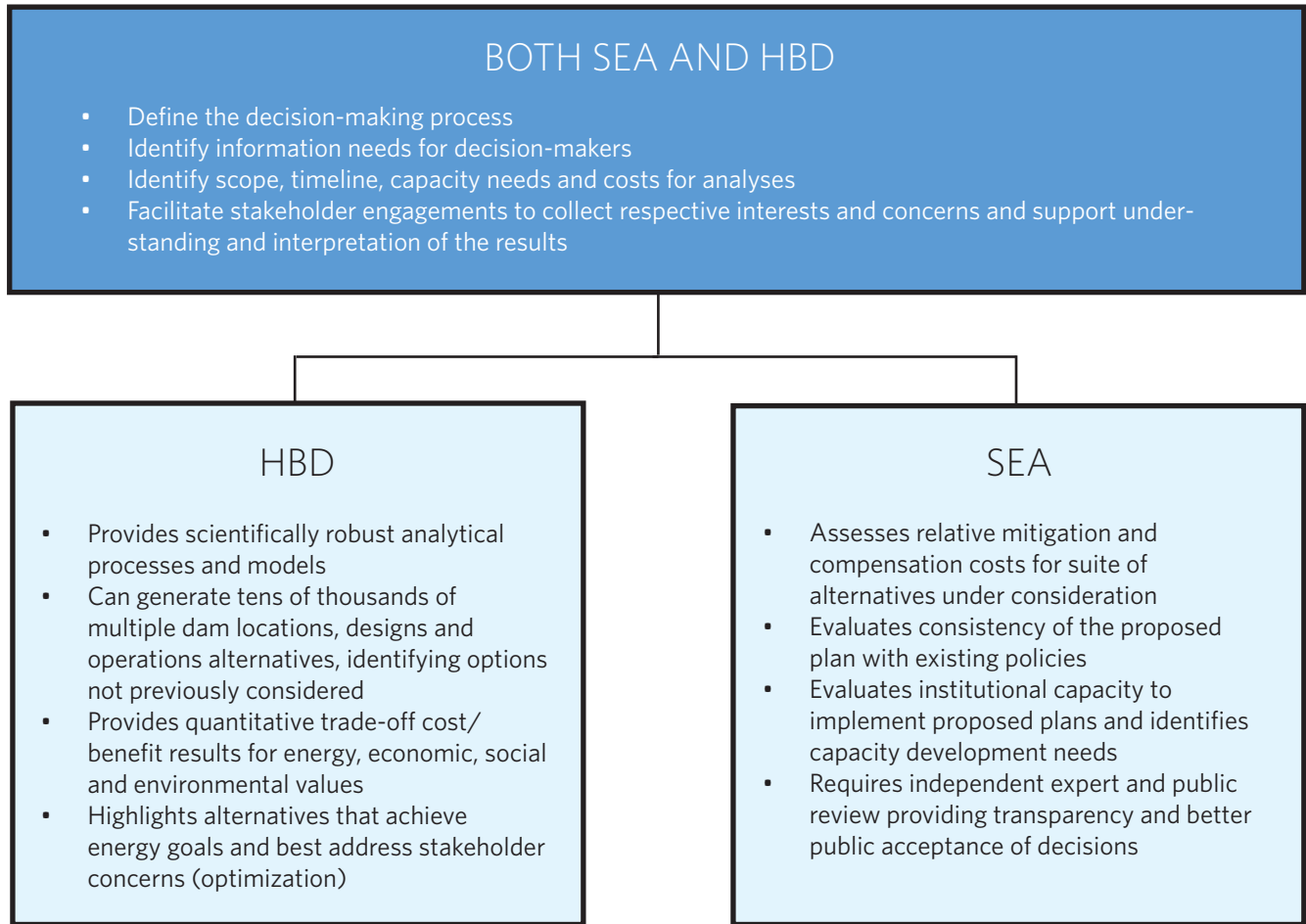


Figure 3. Shared principles and complementary strengths of SEA and HbD

### WHAT DOES THE INTEGRATED PROCESS LOOK LIKE?

A government entity with decision making authority for hydropower planning may want to be informed on ways to improve the social, environmental and economic performances for its plans or to develop plans that provide better outcomes while achieving energy goals. The entity may also want to know the consequences of potential development plans for specific local communities. A SEA may

be legally required or voluntarily applied. HbD provides the processes and models that elevate the rigor and informative power for decision making of a SEA in a hydropower context. The process is tailored to national regulations and contexts. Therefore, among different applications, the steps described below may vary in order and emphasis, and the actors involved may differ.

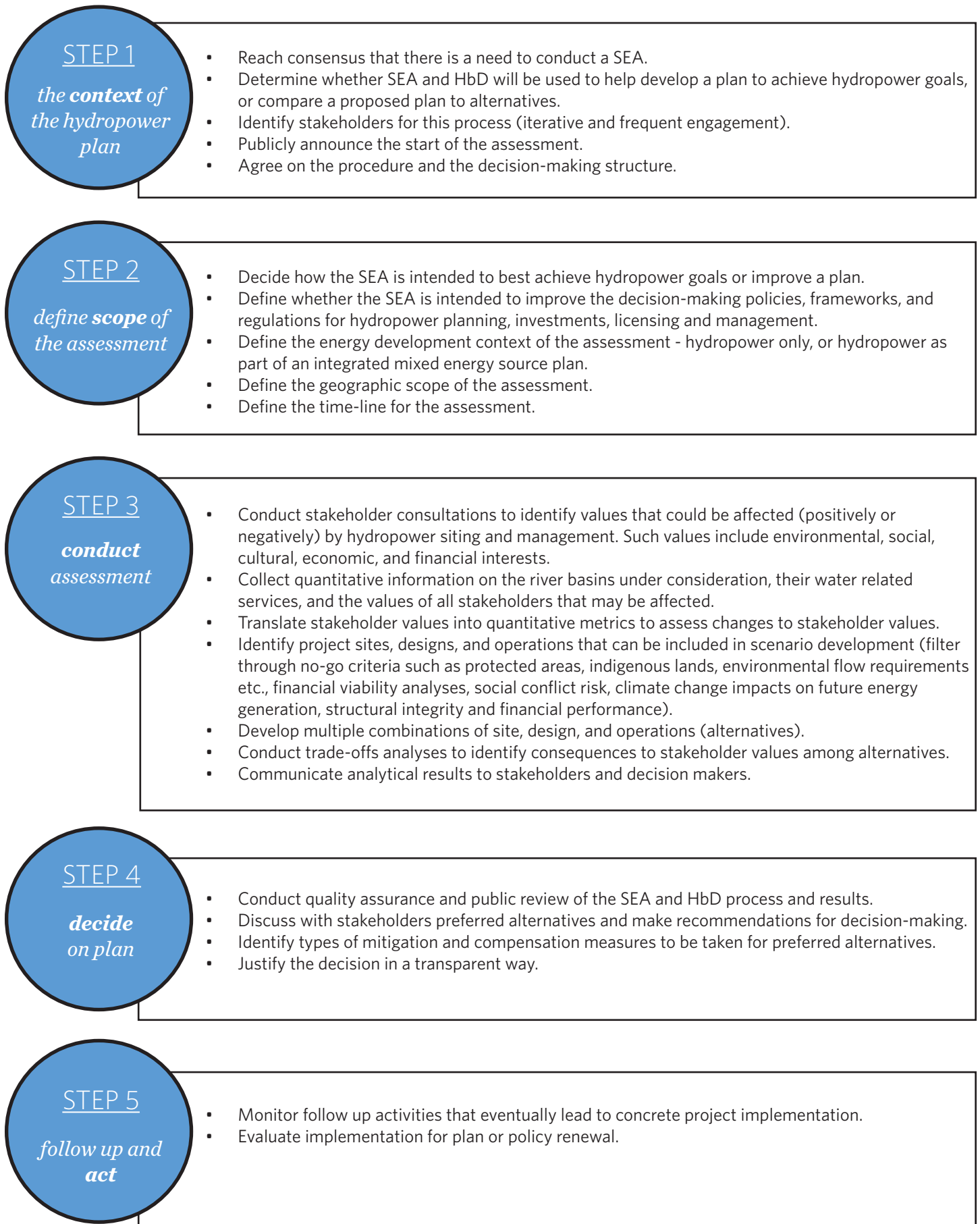


Figure 4. HbD integrated into a SEA framework

## WHAT WOULD SEA AND HbD BRING?

Cases where the described approaches have been used reveal numerous benefits:

**Generating sound information for decision making.** Information is effective if it is scientifically valid (credible), addresses stakeholder concerns (relevant), and is presented to decision makers at the right moments in the right language and format (timely and accessible). This is what HbD and SEA are explicitly designed to do.

**Preventing costly mistakes.** Studying the consequences of major decisions at an early stage and looking at their wider social, economic and environmental implications may reveal potential causes of conflicts or hidden costs for the government, investor, developer, or society at large that may jeopardise the viability of a plan, or result in significant future consequences.

**Identifying opportunities.** Illustrating alternatives and potential for unexpected advantages, including multi-sector, financial, and social benefits.  
**Building public support.** Involving stakeholders from the start, addressing their concerns, and

jointly determining mitigation and compensation measures for unavoidable negative consequences, often results in greater public acceptance of decisions on investment plans.

**Integrating environment, social and development.** SEA and HbD provide an integrated view on the overall contribution of hydropower plans to sustainable development, such as those defined by the Sustainable Development Goals.

**Facilitating transboundary cooperation.** Major development decisions in a river basin shared by multiple countries are reasons for concerns regarding consequences. A SEA and HbD can be used by multiple countries to jointly identify conflicts and challenges, and to propose options and solutions to address them

**Creating a fit-for-purpose institutional setting.** Creating plans may be complex; implementation is generally even more so. Assessing the implementation steps and capacity needs provides relevant information to select the most feasible option among alternative plans.

## REQUIREMENTS

Time and money required to conduct a full SEA with HbD process depends on several factors. These include the type of information that is being developed for decision makers, the scope and magnitude of the plan, the context and complexities of the geographies under consideration, the institutional capacity within the region, and data availability.

Time requirements for a SEA with HbD for a major hydropower plan would run between six and eighteen months. Funding requirements may range from \$50,000 for a relatively small river basin to several millions of USD for a national energy policy.

Expertise requirements are determined by the characteristics of the SEA and its context, and may

include but not be limited to specialists in ecology, hydrology, civil engineering, fisheries, sociology, spatial planning, economics, water resource management, community consultation, and governance. In-country expertise is preferred, but will at first time application be complemented with guidance, coaching and other inputs from international experts.

## HOW WE CAN HELP

TNC and NCEA can provide assistance to implement an HbD-based SEA in a number of ways. The Netherlands Commission for Environmental Assessment is an independent foundation established in 1985 and funded by the Government of the Netherlands. It has a statutory role in environmental assessment in the Netherlands. Since 1993 it also has a mandate to provide support in the implementation of SEA in low and middle income countries, but only at the request of a formal government entity in a country.

Support from NCEA can include: (i) institutional development support to introduce or improve in-country application of SEA; (ii) advice on scope and quality review of individual SEAs; (iii) awareness raising and training on SEA for public, private and civil society organisations, and; (iv) coaching and on-the-job training of SEA and planning teams. NCEA does NOT have the mandate to conduct assessments themselves.

Founded in 1951, the Nature Conservancy's mission is to conserve the land and waters on which all life depends. Through a results-oriented, science-

based approach, TNC addresses the most pressing conservation threats at large-scales, pursuing pragmatic solutions for nature and people by partnering with indigenous communities, the private sector, governments, multilateral institutions, universities, and other non-profits. TNC is a global organization with approximately 4,000 staff and has substantial on-the-ground experience in more than 35 countries, and is currently working to influence efforts in over 70 countries.

Support from TNC can include: (i) training in-country capacity or contractors on the HbD approach, use of models and tools, and reporting results; (ii) conducting HbD assessments as a contracted entity; (iii) providing guidance and review of approaches, applications of models and tools, results, and communication products, and; (iv) presenting HbD to decision makers to illustrate the benefits of the approach for inclusion in an SEA.

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