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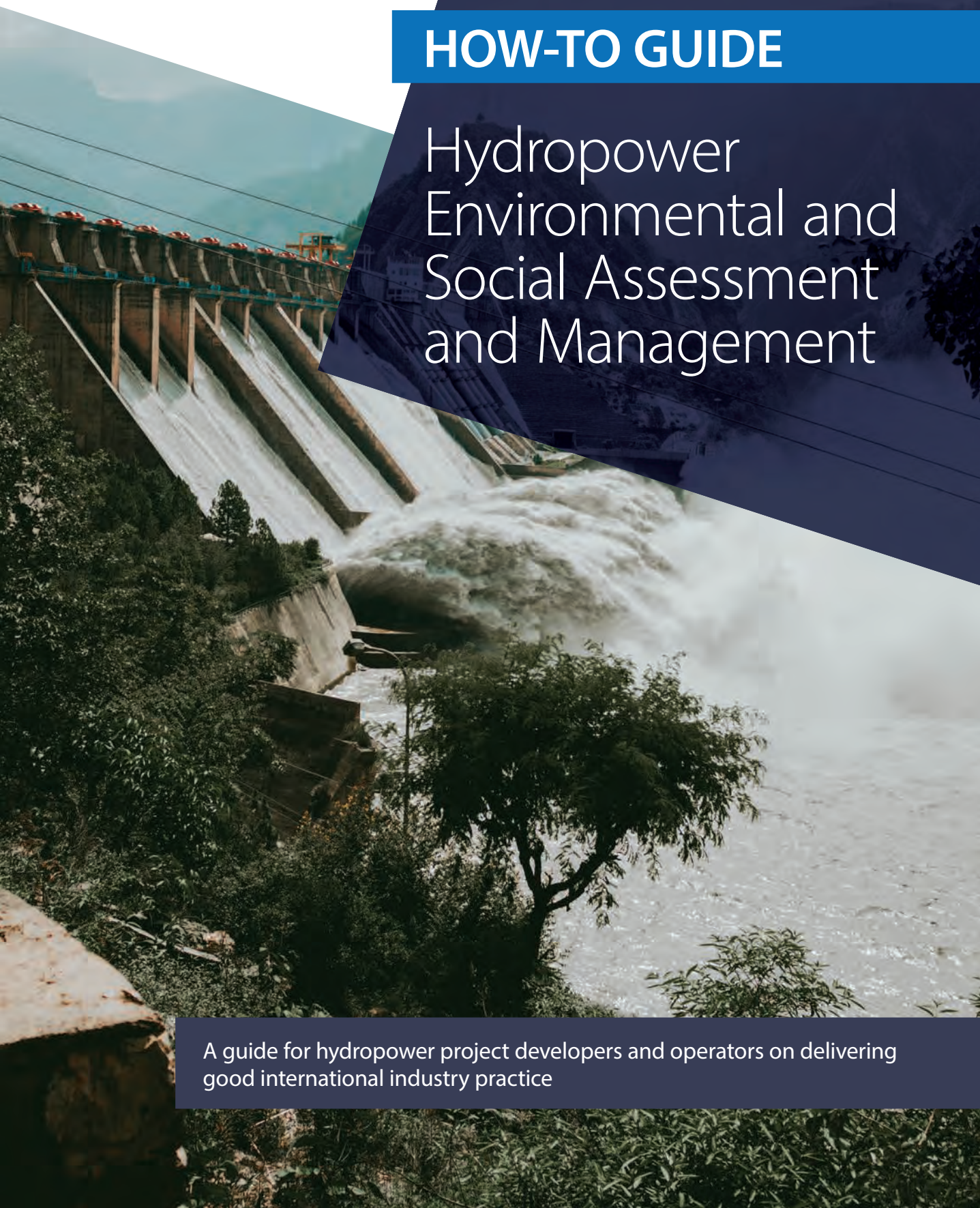
HOW-TO GUIDE

Hydropower Environmental and Social Assessment and Management



A guide for hydropower project developers and operators on delivering good international industry practice

International
Hydropower Association

One Canada Square
Canary Wharf
London E14 5AA
United Kingdom

T: +44 20 8652 5290
F: +44 20 8643 5600
E: iha@hydropower.org

IHA Regional and
National Offices
IIHA China Office

c/o China Institute of Water
Resources and Hydropower
Research
A1 Fuxing Road
Beijing, 100038
China
E: china@hydropower.org

IHA South America Office
c/o Itaipu Binacional
Av. Tancredo Neves, 6.731
CEP 85856-970 Foz do Iguaçu
Paraná, Brasil
E: southamerica@hydropower.org

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Drafting:

Doug Smith, Lead Author

Reviewed by:

Elisa Xiao, Asian Development Bank (ADB)

Jørn Stave, Multiconsult

Mohamad Irwan Aman, Sarawak Energy Berhad

Sam Walker, European Bank for Reconstruction and Development (EBRD)

Contents

Fish monitoring on hydro reservoir in Tasmania.
Photo Credit: Joerg Hartmann

Acronyms

AoI	Area of Influence
BAP	Biodiversity Action Plan
BOQ	Bill of Quantities
BSR	Business for Social Responsibility
CBO	Community-based Organisation
CDC	UK Development Finance Institution
CEIA	Cumulative Environmental Impact Assessment
CIA	Cumulative Impact Assessment
COVID	Coronavirus Disease
CV	Curriculum Vitae
dBA	Decibels (A)
DFID	Department for International Development
DG	Directorate Générale
EBRD	European Bank for Reconstruction and Development
Eflows	Environmental Flows
EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMS	Environmental Management System
EPC	Engineering, Procurement, and Construction
EPFI	Equator Principles Financial Institution
ES	Environmental and Social
ESG	Environmental, Social and Governance
ESHIA	Environmental, Social, and Health Impact Assessment
ESHS	Environmental, Social, Health and Safety
ESIA	Environmental and Social Impact Assessment
ESMMP	Environmental and Social Management and Monitoring Plan
ESMP	Environmental and Social Management Plan

ESMS	Environmental and Social Management System
ESS	Environmental and Social Standards
EU	European Union
FAO	Food and Agriculture Organisation
FSL	Full Supply Level
GBV	Gender-based Violence
GBVH	Gender-based Violence and Harassment
GHG	Greenhouse Gas
GIIP	Good International Industry Practice
GIS	Geographic Information Systems
GN	Guidance Note
GPN	Good Practice Note
GPS	Geographic Positioning System
GW	Giga Watt
HESG	Hydropower Sustainability Environmental, Social and Governance Gap Analysis Tool
HGIIP	Hydropower Sustainability Guidelines on Good International Industry Practice
HIA	Health Impact Assessment
HIV	Human Immunodeficiency Virus
HSAP	Hydropower Sustainability Assessment Protocol
HSE	Health, Safety and Environment
HSES	Health, Safety, Environment and Social
IA	Impact Assessment
IADB	Inter-American Development Bank
IAIA	International Association for Impact Assessment
IEA	International Energy Authority
IEA	Institute of Environmental Assessment
IFC	International Finance Corporation
IFI	International Financial Institutions
IHA	International Hydropower Association
IIED	International Institute for Environment and Development
ILO	International Labour Organisation
IRR	Internal Rate of Return
ISO	International Standards Organisation
ISWA	International Solid Waste Association
IUCN	International Union for Conservation of Nature
KPI	Key Performance Indicator

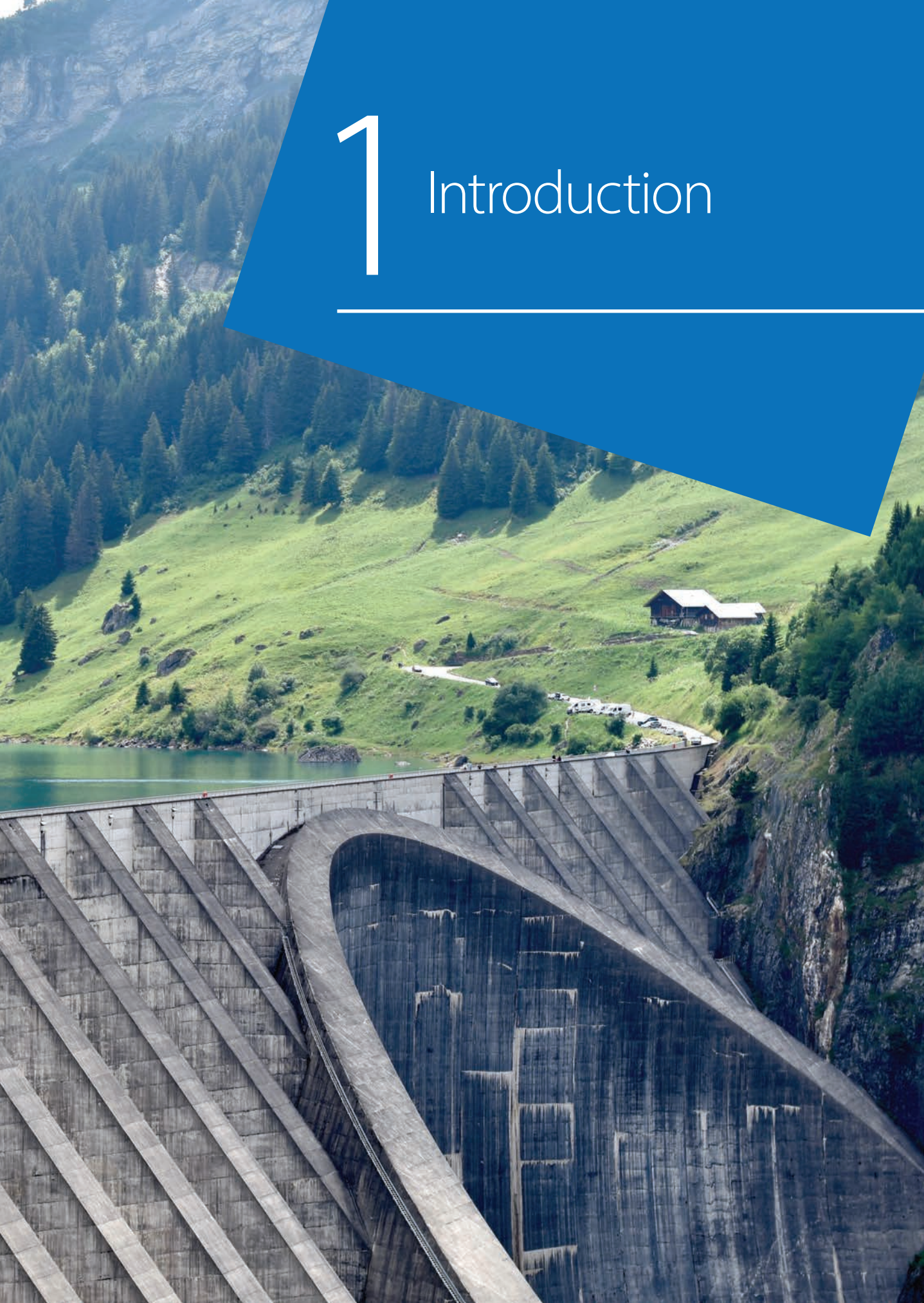
LGBT	Lesbian, Gay, Bisexual or Transsexual
MFI	Multilateral Financial Institution
MRC	Mekong River Commission
MW	Mega Watt
NCR	Non-compliance Report
NGO	Non-governmental Organisation
NPV	Net Present Value
OE	Owner's Engineer
OHCHR	Office of the High Commissioner on Human Rights
OHS	Occupational Health and Safety
OHSAS	Occupational Health and Safety Authority Standard
PM	Particulate Matter
PR	Performance Requirement
RAP	Resettlement Action Plan
RFP	Request For Proposals
SA	Social Accountability
SEA	Strategic Environmental Assessment
SEP	Stakeholder Engagement Plan
SIA	Social Impact Assessment
UK	United Kingdom
UN	United Nations
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
USA	United States of America
USD	United States Dollar
VEC	Valued Environmental Component
VOC	Volatile Organic Compounds
WHO	World Health Organisation
WQ	Water Quality
WWF	World Wide Fund for Nature

Glossary

Adaptive management	The process of adapting environmental and social management in response to information on its effectiveness.
Area of Influence	The geographical area in which impacts of a project will be felt. Separate Areas of Influence are often defined, for the infrastructure footprint, upstream and downstream, or direct and indirect impacts.
Associated facilities	Facilities that would not be constructed if the project were not constructed, including facilities that may be separately funded, owned, constructed or operated; for example, access roads and transmission lines.
Audit	A formal, on-site evaluation against a defined set of criteria.
Baseline	A set of measurements, statistics or conditions used as a basis for later comparison. The baseline refers to the pre-project conditions, against which post-project changes can be compared.
Conformance/ Compliance	The main difference between compliance and conformance is the source of the implementation of whichever guideline or standard is in question. Adherence to legal requirements, policies and public commitments is a matter of compliance. Conformance addresses the level to which implementation measures conform to the most up-to-date project related plans.
Continuous improvement	A process through which measures are implemented, monitored and adapted, to continuously improve their effectiveness.
Cumulative impacts	Impacts that result from the incremental impact of the project when added to other past, present, and reasonably foreseeable future actions.
Cumulative Impact Assessment	The assessment of the combined impacts of a number of identified existing and planned developments.
Direct impacts	Impacts that result from a direct interaction between a planned project activity and the receiving environment/receptors.
Fatal Flaw	A potential risk or impact of a proposed project that is not acceptable to the developer, regulator or financers, and which stops any further development of the project.
Grievance Mechanism	The processes by which stakeholders are able to raise concerns, grievances and legitimate complaints, as well as the project procedures to track and respond to any grievances.
Human rights	The basic rights and freedoms to which all humans are entitled, encompassing civil, political, economic, social and cultural rights, and which are enshrined in international declarations such as the Universal Declaration on Human Rights, 1948.
Indirect impacts	Impacts that result from other activities that happen as a consequence of the project.
Induced impact	A type of indirect impact, resulting from activities that occur in response to the changes brought by a new development.
Inspection	A rapid and frequent on-site check of adherence to environmental and social management measures, conducted by the developer's or the contractor's internal environmental personnel.
Legacy issues	Impacts of previous projects that are unmitigated or not compensated, or long-standing issues with a present (existing) project, or pre-existing issues in the present location of a new project.

Management review	A formal part of an Environmental and Social Management System (ESMS), through which senior management are engaged in checking ESMS implementation and reaffirming senior management commitment.
Mitigation hierarchy	An approach to environmental management which involves the sequential application of measures to avoid, minimise, restore or rehabilitate; and compensate for adverse impacts. Measures to avoid or prevent negative or adverse impacts are always prioritised, and where avoidance is not practicable, then minimisation of adverse impacts is sought. Where avoidance and minimisation are not practicable, then mitigation and compensation measures are identified and undertaken commensurate with the project's risks and impacts.
Non-compliance	A non-compliance is an occurrence or incident that does not meet the requirements of an environmental and social management system or plan, including legal, licence/permit and contractual obligations.
Polluter pays principle	A principle in environmental management that all costs of avoidance, minimisation, mitigation and compensation are covered by the 'polluter'; in the case of hydropower, by the developer. No costs of environmental and social management should be externalised to the government or the public.
Precautionary principle	The principle of avoiding activities or planning to implement environmental and social management measures to avoid and manage impacts, even when there is scientific uncertainty regarding whether those impacts will occur, or their magnitude.
Primary suppliers	First-tier suppliers who are providing goods or materials essential for the project.
Receptor	Environmental resources such as water resources, land, habitats, species, landscapes, etc., which are valued by society for their intrinsic worth and/or their social or economic contribution, or people and communities that may be affected by the project.
Refurbishment	The upgrading of an existing hydropower facility, usually concerning additional or new electromechanical equipment (for example higher efficiency turbines). It may also include some infrastructural works.
Rehabilitation	Major refurbishment of an existing hydropower facility including those that are defunct or operating at less than capacity, commonly including both electro-mechanical and infrastructural works and major infrastructural works.
Residual impacts	Those predicted adverse impacts which remain after avoidance and minimisation measures have been applied.
River basin	The area drained by a river and all of its tributaries.
Scoping	The process of determining the scope of work for an ESIA or impact assessment; through this process, the terms of reference are determined for detailed surveys and analysis, to assess potential issues, risks and impacts.
Significance	The magnitude of the impact relative to the sensitivity of the receptor. Impacts that are not significant (NS) do not require any management. Impacts that are significant (S) must be avoided, minimised, mitigated or compensated, so that the residual impact is not significant.
Social inclusion	The process of improving the terms on which individuals and groups take part in society; also, improving the ability, opportunity and dignity of those disadvantaged on the basis of their identity.
Supervision	The overall process of oversight regarding adherence to environmental and social management measures and commitments; for example, the developer conducting supervision of its contractor, or a regulator conducting supervision of the developer and operator.
Third parties	Parties other than the developer or operator; for example, local and national government agencies. Some third parties may play a critical role in environmental and social assessment and management.

Valued Environmental Component (VEC)	Any environmental or social receptor that is considered important by the proponent, stakeholders, community, and environmental and social specialists involved in the assessment process.
Vulnerable	Marginalised or impoverished, with very low capacity and means to absorb change.

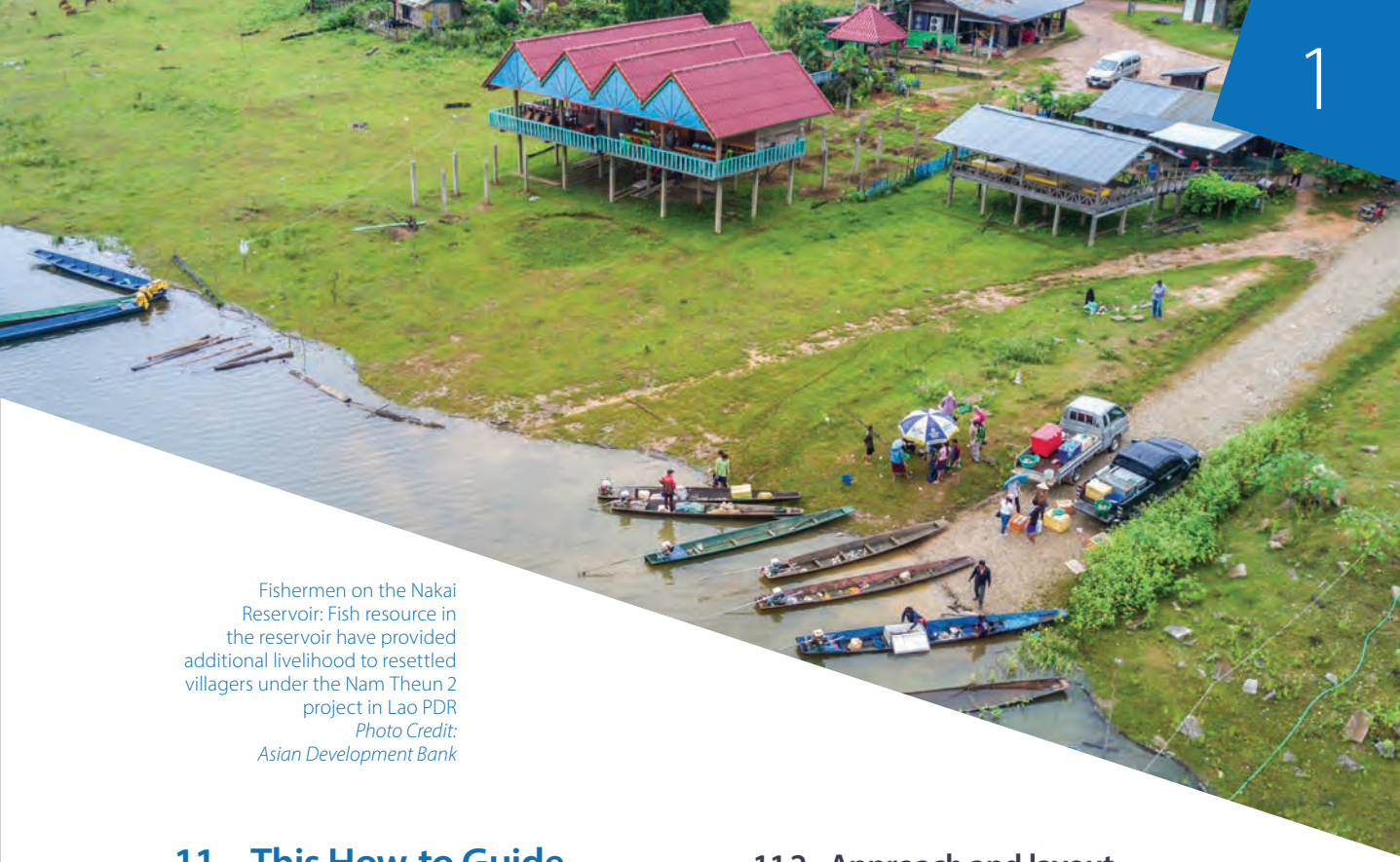


1 Introduction

Introduction

The assessment and management of the environmental and social impacts and issues of hydropower projects are vital to their sustainability, and are necessary from the earliest concept stages of a hydropower project, during its preparation and construction, and through its ongoing operation.

Environmental and social impact assessment (ESIA) of a project in its design or preparation stage is universally practised. It is a legal and permitting necessity, and is used to identify risks for the project or the business, and to meet the requirements of stakeholders such as lenders and the public. While ESIA has become widely established, there is an increasing focus on (1) avoiding adverse impacts, by the strategic planning of one or more projects across a wider area; on (2) social and health impacts; and on (3) systematic and adaptive management, through the use of environmental and social management systems.



Fishermen on the Nakai Reservoir: Fish resource in the reservoir have provided additional livelihood to resettled villagers under the Nam Theun 2 project in Lao PDR
Photo Credit: Asian Development Bank

1.1 This How-to Guide

1.1.1 Aim

This How-to Guide aims to further understanding of the practical measures that can be undertaken to meet good international industry practice, in conformance with the internationally recognised Hydropower Sustainability Tools (see Box 1.1).

This guide expands upon the Hydropower Sustainability Guidelines on Good International Industry Practice (IHA, 2018), and is designed to provide practical support to practitioners and stakeholders in the assessment and management of the environmental and social impacts and issues associated with a hydropower project. It is one of a series of How-to Guides published by IHA.

The guide is targeted at key decision-makers in environmental and social assessment and management, i.e. the hydropower companies that develop, own and operate projects; consultants that advise on the engineering, environmental and social aspects of projects; and governments. The guide can help developers and operators to recognise environmental and social impacts caused by the project, to engage with stakeholders with regard to their perspectives on the impacts, and to manage these impacts responsibly; thus meeting business and stakeholder values and minimising risk.

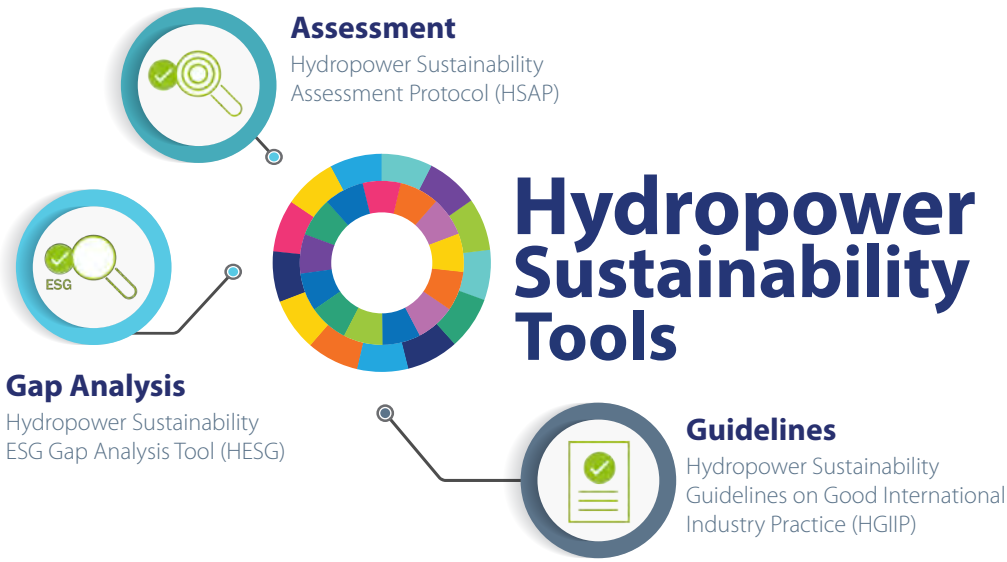
1.1.2 Approach and layout

The guide contributes to build knowledge of the practical measures that can be implemented to meet good international industry practice (GIIP) in hydropower development and operation.

The approach is to map out the necessary steps or deliverables that must be achieved in order to meet GIIP, in relation to the project life cycle, from early concept through to detailed design, construction, and operation.

The guide is presented in five chapters and two annexes:

- **Chapter 1** – Introduction
- **Chapter 2** – Understanding environmental and social assessment and management in hydropower
- **Chapter 3** – Achieving good international industry practice
- **Chapter 4** – Methodologies and approaches
- **Chapter 5** – Conclusions
- **Annex 1** – Bibliography
- **Annex 2** – Project examples


Assessment
Hydropower Sustainability Assessment Protocol (HSAP)
ESG
Hydropower Sustainability Tools
Gap Analysis
Hydropower Sustainability ESG Gap Analysis Tool (HESG)
Guidelines
Hydropower Sustainability Guidelines on Good International Industry Practice (HGIIP)


26 topics
PROCUREMENT
COMMUNICATIONS AND CONSULTATION
GOVERNANCE
DEMONSTRATED NEED AND STRATEGIC FIT
SITING AND DESIGN
ENVIRONMENTAL AND SOCIAL ISSUES MANAGEMENT
INTEGRATED PROJECT MANAGEMENT
BIODIVERSITY AND INVASIVE SPECIES
HYDROLOGICAL RESOURCE
ASSET RELIABILITY AND EFFICIENCY
INFRASTRUCTURE SAFETY
RESERVOIR MANAGEMENT
EROSION AND SEDIMENTATION
PUBLIC HEALTH
CULTURAL HERITAGE
LABOUR AND WORKING CONDITIONS
INDIGENOUS PEOPLES
RESETTLEMENT
PROJECT AFFECTED COMMUNITIES AND LIVELIHOODS
CLIMATE CHANGE MITIGATION AND RESILIENCE
DOWNSTREAM FLOW REGIMES
WASTE, NOISE AND AIR QUALITY
WATER QUALITY
FINANCIAL VIABILITY
PROJECT BENEFITS
ECONOMIC VIABILITY

The Hydropower Sustainability Tools are governed by the Hydropower Sustainability Assessment Council, a multi-stakeholder group of industry, government, financial institutions, and social and environmental NGOs. The tools are supported by the International Hydropower Association (IHA), the council's management body.

Sustainability guidelines

The Hydropower Sustainability Guidelines on Good International Industry Practice define expected sustainability performance for the sector across a range of environmental, social, technical and governance topics. Released in 2018, the 26 guidelines present definitions of the processes and outcomes related to good practice in project planning, operation and implementation. As a compendium, the guidelines are a reference document for meeting the expectations of lenders, regulators and consumers. Compliance with each guideline can be specified in commercial contracts between financiers and developers, and between developers and contractors. The guidelines are based on the performance framework of the Hydropower Sustainability Assessment Protocol.

Environmental and Social Issues Management

The Environmental and Social Issues Management good practice guideline addresses the management of environmental and social issues with the hydropower project or operating facility. Adherence with this guideline is measured using the HSAP and the HESG.

Further information

Visit Hydrosustainability.org

Assessment protocol

The Hydropower Sustainability Assessment Protocol offers a framework for objective assessments of hydropower project performance. It was developed between 2007 and 2010 following a review of the World Commission on Dams' recommendations, the Equator Principles, the World Bank Safeguard Policies and IFC Performance Standards, and IHA's own previous sustainability tools. Assessments are delivered by independent accredited assessors and can examine different stages of a project's life cycle. Evidence collected during an assessment is used to create a sustainability profile and benchmark performance against both good and best proven practice. The assessment protocol was updated in 2018 with a new topic covering hydropower's carbon footprint and resilience to climate change.

Gap analysis tool

The Hydropower Sustainability ESG Gap Analysis Tool enables hydropower project proponents and investors to identify and address gaps against international good practice. Launched in 2018, the tool is based on the assessment framework of the HSAP's environmental, social and governance topics.

It provides a gap management action plan to help a project team address any gaps and is divided into 12 sections that are compatible with both the IFC Environmental and Social Performance Standards and the World Bank's Environmental and Social Framework.

1.2 Environmental and social assessment and management in the Hydropower Sustainability Tools

The hydropower sector now has a suite of sustainability tools to harmonise the understanding of sustainability in hydropower. A separate topic on environmental and social assessment and management is included in all three of the main HSAP tools, which correspond to the project life cycle stages:

- In the Preparation stage, the topic is P-5 Environmental and Social Impact Assessment and Management.
- In the Implementation stage, the topic is I-3 Environmental and Social Issues Management.
- In the Operation stage, the topic is O-3 Environmental and Social Issues Management.

In the HESG the corresponding topic is addressed in Section 1 – Environmental and Social Assessment and Management.

These tools provide a definition of good international industry practice in the assessment and management of environmental and social impacts and issues, in relation to criteria on Assessment, Management, Stakeholder Engagement, Conformance and Compliance, and Outcomes.

The intent of the topic is that (with variation between the stages noted in brackets):

- environmental and social impacts are identified and assessed [Preparation stage] and are managed [Implementation and Operation stages];
- avoidance, minimisation, mitigation, compensation and enhancement measures are designed [Preparation stage] and implemented [all stages]; and
- environmental and social commitments are fulfilled [Implementation and Operation stages only].

1.2.1 Objectives of this How-to Guide

The guide:

- presents the systems and processes used in environmental and social assessment and management, through the development, implementation and operation of hydropower projects;
- explains the terminology used in environmental and social assessment and management;
- identifies the steps that are necessary to meet GIIP in relation to the project cycle;
- maps a range of Methodologies and approaches in relation to these steps and the project cycle; and
- catalogues these Methodologies and approaches, describing further sources of information for each.

The objective is to inform the reader how to approach the assessment and management of environmental and social impacts and issues using a range of strategies, approaches and methodologies. This How-to Guide also directs readers to further guidance and examples. It is intended for those engaged in the development and operation of hydropower projects, as well as stakeholders with interests in these projects and the wider hydropower industry.

1.2.2 Scope

The scope of the guide covers:

- the basic good practice requirements for environmental and social assessment and management, set out in the HSAP and associated tools;

- all stages of a project's life, from the early stage, through preparation, implementation, and operation;
- all scales and schematic designs of hydropower, from small hydropower to mega-dams, and including storage and run-of-river projects;
- the assessment of impacts and issues, including scoping, analysis and assessment as well as their management, through management plans and systems;
- key concepts used in environmental and social assessment and management, such as the mitigation hierarchy, significance of impacts, and adaptive management;
- all types of impacts, i.e. direct, indirect, induced, and cumulative; and
- social as well as environmental impacts and issues.

This How-to Guide is only one of a range of relevant tools developed by IHA to support the delivery of the HGIIP. There are clear linkages with other How-to Guides, including: benefit sharing, downstream flow regimes, erosion and sedimentation, biodiversity and invasive species, and resettlement.

This How-to Guide focuses on the systems and processes used for the assessment and management of environmental and social issues through the project cycle. It is not a How-to Guide for all specific environmental and social issues, although these systems and processes may be used to assess and manage those substantive issues.

As an example, the assessment of a project's impacts on water quality may be undertaken as part of an ESIA. This How-to Guide describes the process of undertaking the ESIA and of assessing the significance of those impacts. However, it does not provide guidance on what is meant by water quality, water quality parameters that should be measured, sampling methodologies, or acceptable standards of water quality. Similarly, this How-to Guide refers to stakeholder engagement, because of the important role of stakeholder engagement in environmental and social assessment; but it is not a How-to Guide on stakeholder engagement.

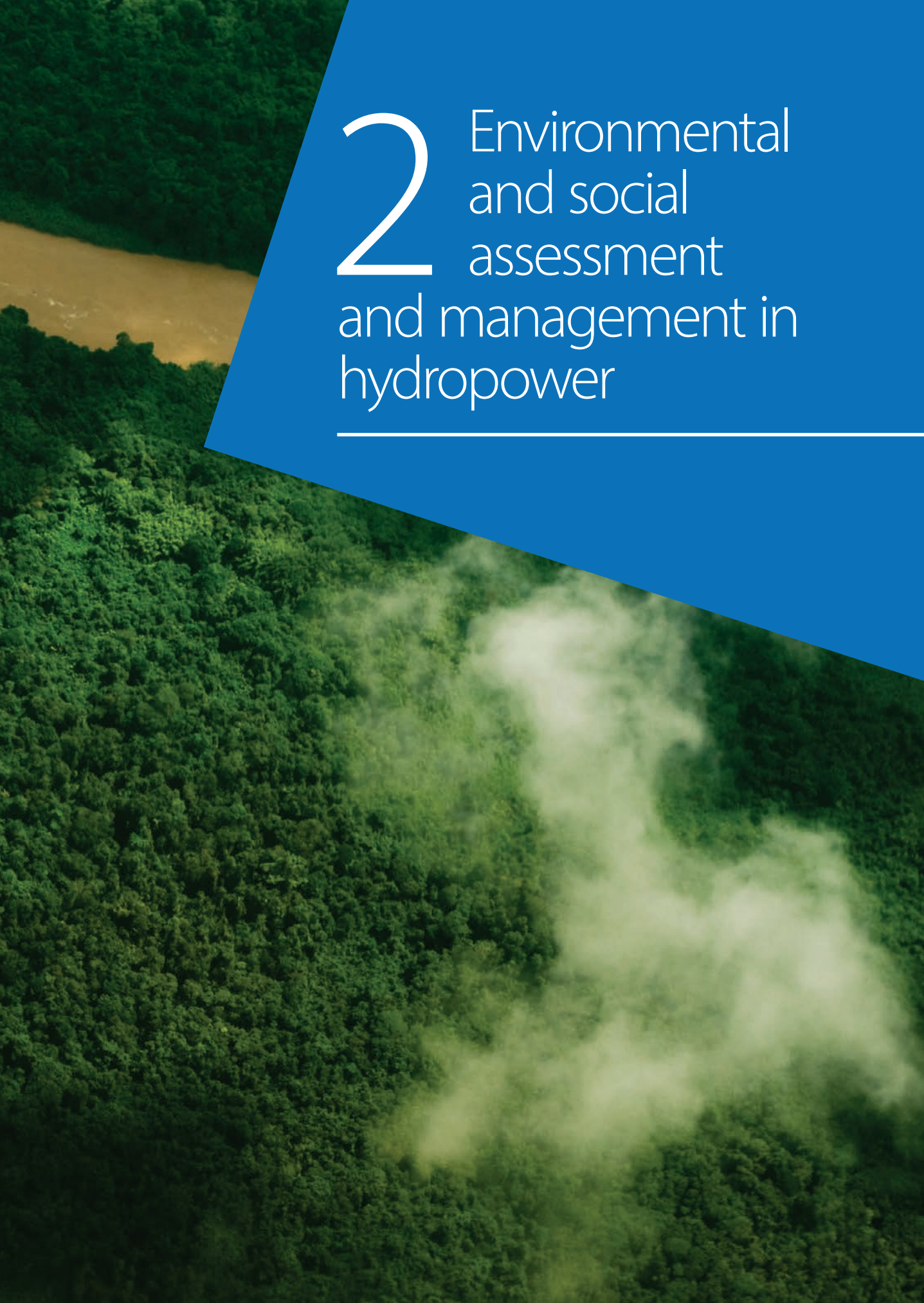
Furthermore, this How-to Guide does not identify legal or statutory requirements – for example, for Environmental Impact Assessment (EIA) – in any particular jurisdiction. As the How-to Guide concerns GIIP, the guidance may be different from these statutory requirements, which may be of a higher or lower standard, or different in specific ways.

1.2.3 Key Sources

This How-to Guide draws on a number of key resources that are available regarding environmental and social assessment. They are:

- The publications and resources of the International Association for Impact Assessment (IAIA) Including best practice guidelines, 'Fastips', and the Key Citations series, in a range of aspects of impact assessment:
  - www.iaia.org/resources
- Guidelines of various international financial institutions, in particular the IFC (International Finance Corporation), but also CDC (the UK Development Finance Institution), EBRD (European Bank for Reconstruction and Development), and the World Bank.
  - https://www.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/Sustainability-At-IFC/Publications/
  - https://toolkit.cdcgroup.com/
  - https://www.ebrd.com/who-we-are/our-values/environmental-and-social-policy/implementation.html
  - https://www.worldbank.org/en/projects-operations/environmental-and-social-framework/brief/environmental-and-social-framework-resources

Three key international journals on IA are published, notably *Impact Assessment and Project Appraisal* (the journal of IAIA), *EIA Review* (Elsevier) and the *Journal of Environmental Assessment, Planning and Management* (Imperial College Press).



2 Environmental and social assessment and management in hydropower

Environmental and social assessment and management in hydropower

This chapter presents an overview of the assessment and management of environmental and social impacts and issues in hydropower. Hydropower projects inevitably result in environmental and social impacts, and most hydropower projects will have impacts that are:

- wide-ranging;
- extensive in their geographical range;
- complex; and
- permanent.

Fish monitoring on hydro reservoir in Tasmania
Photo Credit: Joerg Hartmann

Table 2.1 'The potential physical, biological and social impacts of hydropower' summarises some of the key potential environmental and social impacts of hydropower. The purpose of environmental and social assessment and management in any sector is to identify or predict these impacts, and to propose and put in place solutions, so that the benefits of the development can be delivered while avoiding or limiting impacts on the environment and society.

2.1 The origins of environmental assessment

Environmental assessment is now 50 years old. Following increasing environmental awareness in the 1960s, the United States was the first to adopt environmental impact assessments, under the National Environmental Policy Act in 1969. The World Bank published a sourcebook on environmental assessment almost 30 years ago in 1991, and adopted a procedure for the application of environmental assessment to dam and reservoir projects in 1999 (an annex to its environmental assessment safeguarding policy).

Environmental Impact Assessment (EIA) was adopted and formalised in many developed and developing countries during the 1980s and 1990s. Almost all countries now require the assessment of environmental impacts as a prerequisite for permitting a development. However, some of the statements of the World Commission on Dams in 2000 regarding EIA of hydropower, presented in Box 2.1, still ring true in 2020.

2.2 Assessment is both technical and procedural

Environmental and social assessment concerns both a technical assessment and a process: **technical** refers to the substantive identification of impacts and issues that potentially result from or are resulting from a project; and it is a **process** through which a regulatory approval is obtained and maintained, stakeholders are engaged and stakeholder relations maintained, and a 'social licence' is obtained. These aspects are linked, especially for social issues. For example, stakeholder engagement is important in itself for gathering affected people's predictions of potential impacts.

Environmental and social assessment and management has developed in both of these dimensions, prior to and since the World Commission on Dams report in 2000. Technically, it has extended from a narrow focus on the environment, to first include social impacts (the adoption of Social Impact Assessment – SIA, and the move from EIA to ESIA), and further, to

Table 2.1 The potential physical, biological and social impacts of hydropower*
** This table is not intended to be exhaustive. Assessments of projects are necessary to identify the impacts specific to the project and its context.*

Physical	Biological	Social
(I) Potential impacts of the key permanent features of a hydropower project (conversion of land for infrastructure and the reservoir, damming of the river, and the diversion and/or regulation of river flows)		
• Altered volumes and timing of river flows • Raised groundwater levels around the reservoir • Reduced groundwater levels around the dewatered downstream rivers • Disruption of sediment movement in the river system • Deposition of sediment in the reservoir and at the reservoir tail and tributaries • Reduced sediment load downstream, with associated bank and riverbed erosion • Altered water quality in the river system, in the reservoir and downstream • Release of methyl mercury in the reservoir • Emission of greenhouse gases (GHG) from the reservoir • Induced increased frequency or seismicity of seismic events	• Loss of terrestrial habitat in the reservoir or infrastructure area • Conversion of riverine (lotic) aquatic habitat to lacustrine (lentic) habitat • Prevention of upstream fish migration • Prevention of downstream fish migration • Barrier to movement of terrestrial species due to the reservoir or infrastructure • Toxic bioaccumulation of methyl mercury • Reduced ecological quality of downstream rivers • Effects on habitats in the floodplain of downstream rivers • Induced loss of habitat due to improved access • Reduced abundance of biota including protected species, due to the above ecological changes, with some species pushed further towards extinction or made extinct	• Physical and economic displacement of households and settlements • Loss of agricultural land or productive forest (or other habitats, e.g. reedbed) in the reservoir or infrastructure area • Loss of prime agricultural land along river banks • Reduced riverine fishing resources • Loss of livelihood assets and decline in living standards • Reduction in beneficial flooding and deposition of sediment for downstream floodplain agriculture • Loss or use of Indigenous Peoples' lands and river resources • Inundation or destruction of sites of cultural heritage • Loss of the spiritual or intangible cultural values of the affected river and lands • Permanent visual impact

(II) Potential impacts of construction		
• Conversion of land for quarries, disposal of spoil, and disposal of solid wastes • Temporary use of land for temporary facilities and access roads • Emissions to air (vehicles, dust) • GHG emissions from construction (fuel use, embedded in cement, etc.) • Noise • Temporary diversion of river waters from river sections • Run-off of sediment-laden water from project sites • Discharges of polluted drainage water from sites, wastewater from camps to surface waters • Contamination of land and surface water from spills of hazardous substances	• Disturbance to fauna, including nesting, spawning and migrating fauna • Reduced survival of biota due to air, noise and water pollution • Poaching of threatened species by workers or camp followers • Increased pressure on fishing resources and forest (fuel wood) resources from workers or camp management • Introduction of invasive species into the area • Direct loss and drowning of biota during reservoir filling	• Occupational safety risks for workers, especially when working on water, at height, during tunnelling, and in vehicles • Safety risks for community members passing through or around the construction site • Safety risks for community members from project traffic • Gender-based violence (GBV) and sexual exploitation and harrassment of women and girls and the local community • Conflict between workers and local community members • Influx of camp followers with anti-social behaviour and environmental impacts • Bites or injury from wildlife moving out of the reservoir area during filling • Visual and amenity impacts
(III) Potential impacts of operations		
• H^2S odour in initial years of impoundment (common in tropical zones, due to decomposition of vegetation) • Noise and vibration • Erosion and landslips around the downstream river due to abrupt changes in flow • Wind erosion of exposed drawdown area • Surface water pollution from oil leakage from the power station or other sites	• Death and injury of aquatic biota due to turbine entrainment • Accumulation of invasive species in the reservoir • Ongoing loss of habitat due to encroachment, and ongoing hunting, using project roads and reservoir for access	• Occupational safety risks for workers • Safety risks for community members entering the power station or switchyard, etc. • Safety risks for community members on the reservoir • Safety risks for community members on the downstream river • Safety risks for community members on project access roads • Emergence of vectors of disease from the reservoir (lentic) habitat

Box 2.1 Too little, too late – conclusions of the World Commission on Dams (2000) on EIA

Scope and adequacy

- The environmental risks and social implications associated with large dam projects have not been generally incorporated as key factors in the decision-making process.
- The quality of assessments and their ability to genuinely influence outcomes is still under-developed.
- Initial assessment has not been comprehensive, and it has frequently been incorrectly assumed that impacts can be effectively mitigated.
- Social impacts remain inadequately assessed, and efforts at mitigation, development and resettlement remain unsatisfactory.
- EIAs are often done with inadequate baseline data on demographic trends, sociocultural systems and ecosystem functioning.

Early stage or strategic decision-making

- EIA consists mostly of measures to compensate or mitigate the planned impacts and render them acceptable, when the decision to proceed has already been taken.
- Decisions are made to proceed with financing or construction before an effective EIA is completed.
- EIA results often have no significant influence on the choice of a dam as the preferred option, due to political pressures and tight schedules.
- The EIA process is also not well suited to options assessment, as it was meant solely for identifying impacts and associated mitigation measures.

Administrative Issues

- Most dam proponents see EIA as an administrative hurdle to be cleared, or a requirement to secure funding.
- EIA operates under considerable constraints due to the political and administrative pressures imposed by project schedules, as it is seen as 'delaying' the project.

Implementation

- The transition from a planning mode, based on voluminous assessments and reports, to an implementation mode during project construction, creates severe challenges; and in many cases the measures are either not implemented or are not effective.
- Where capacity for environmental management is weak, mitigation measures prove difficult to manage, particularly when compared with the designing and building of the dam.
- Monitoring of impacts and assessments of the effectiveness of environmental mitigation measures have been absent.

incorporate health impacts (HIA – Health Impact Assessment, and ESHIA – Environmental, Social and Health Impact Assessment). More recently, this has extended to gender, human rights impacts, cumulative impacts, transboundary impacts, and more.

Procedurally, it has extended 'upstream' to include strategic environmental assessment and planning, and 'downstream' to place greater emphasis on environmental and social management plans, and environmental management systems; this emphasis continues through construction and operation. It has become more formalised in procedures for stakeholder engagement and public consultation, public hearings and disclosure, and the regulatory requirement for specific methodologies or specialist studies.

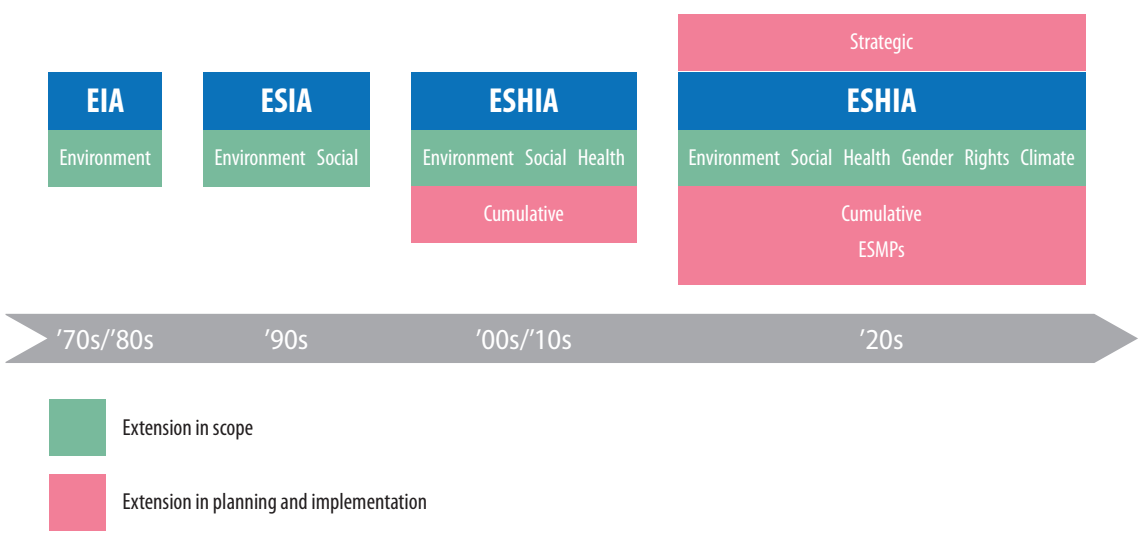
Figure 2.1 presents this horizontal and vertical expansion diagrammatically.

2.3 'Do the right dams': strategic planning and early stage assessment

Effective assessment and management of impacts requires initial assessment of potential impacts at an early stage, so that the most damaging of impacts (which cannot be effectively mitigated) can be avoided and minimised. Avoidance of impacts is the first stage of the mitigation hierarchy, and avoidance continues through to the design of the selected project option. The mitigation hierarchy is central to environmental and social assessment and management, and is described in Section 4.6.3.

Huge political, technical and financial investment in a project has often already been made before an Environmental Impact Assessment of that project is launched. Even if impacts are severe, they may be unavoidable if it is too late to cancel this particular project, or to change its design. For this reason, strategic planning to select the optimum combination of hydropower projects, river basin planning, or strategic environmental assessment (SEA) of the power-sector master plan, are increasingly advocated and used.

Figure 2.1 The extending scope and process of EIA



Other terminology for strategic approaches includes integrated water resource management, hydropower-by-design, power sector planning, and landscape approaches, for example. These approaches are discussed in further detail in Section 4.1.

2.4 'Do dams right': impact assessment

During project preparation, assessment of the potential environmental and social impacts, and the planning of measures to address these impacts, should be as important in project preparation as the engineering feasibility studies and financial appraisal. It is essential to identify the measures to 'do the project right' (i.e. in the best possible way).

An Environmental and Social Impact Assessment (ESIA), EIA or Environmental Impact Statement (EIS) is a legal requirement in possibly all jurisdictions, and is necessary to obtain a licence or permit for the project. It is most often conducted as a single exercise contracted out by the developer to an environmental consulting firm, perhaps with separately contracted specialist studies. The impact assessment is a process that:

- fosters a clear understanding of the proposed development among regulators and stakeholders;
- focuses detailed analysis on the most significant potential impacts and issues, thus avoiding wasted effort on analysing impacts of negligible significance or those that are easily mitigated;
- establishes a baseline assessment of the aspects of the environment and society that may be affected by the project;
- identifies the legal requirements, and policy requirements of stakeholders such as the developer and financers, that the project must comply with through its development and operation;
- predicts all potential environmental and social impacts on the basis of technical analysis, as well as stakeholder perspectives;
- integrates design solutions for potential impacts into the detailed feasibility design of the project;
- evaluates and proposes avoidance, minimisation, mitigation and compensation measures for all impacts;
- identifies the positive effects or benefits of the hydropower project, opportunities to enhance these benefits, and how to turn risks into opportunities;
- culminates in a project that, with its proposed mitigation, meets regulators' criteria for permitting, and obtains the project's social acceptance (or 'social licence to operate'); and
- provides the developer with a practical route for implementing the proposed measures.

The process of conducting the ESIA is as important as the technical analysis of impacts, and the developer should avoid commissioning a consultant to deliver an ESIA as a stand-alone report. The ESIA process should be closely linked to the developer's wider process of stakeholder engagement, and be tasked with delivering plans for easy adoption by the developer and their contractors. It is all too common for a hydropower project to be implemented while the ESIA report sits on a shelf, ignored.

2.5 Consultation and public disclosure

Consultation and public disclosure are integral to environmental and social assessment, particularly during, but not limited to, the ESIA stage (Preparation stage) of a project. Public disclosure refers to the making available of key ESIA reports – including the scoping report, and the ESIA, often including a Non-technical Summary – written in a style that is accessible to the public. Consultation and public disclosure are especially important in hydropower, due to its wide-ranging and complex impacts, a legacy of environmentally damaging hydropower projects, and the likelihood of public opposition.

In most jurisdictions, there will be a regulatory requirement to conduct public consultation during the ESIA or its equivalent, and possibly the public disclosure of reports. Consultation events are normally conducted at least during the scoping stage and the draft impact assessment stage of an ESIA, and may be legal requirements. There are further opportunities for consultation through the specialist studies conducted for the ESIA, especially those on social impacts, resettlement planning, and heritage. A specific challenge for hydropower with transboundary impacts – i.e. impacts in another country, normally due to altered flow regimes – is to consult with stakeholders in the affected country.

Most international lenders require consultation; for example, the IFC (International Finance Corporation) Performance Standard 1, on the Assessment and Management of Environmental and Social Risks and Impacts, places significant emphasis on consultation with affected and communities. In addition, one of the EBRD's (European Bank for Reconstruction and Development) 10 Environmental and Social Performance Requirements focuses on Information Disclosure and Stakeholder Engagement (PR-10). Stakeholder Engagement is one of the Equator Principles, adopted by 108 private financial institutions (Equator Principles Financial Institutions, EPFIs).

It is important that consultation and public disclosure continues through the implementation and operation of the project. Even older projects, which may have been initially developed with limited or no consultation, can begin consultation with affected stakeholders, and establish periodic or routine consultation events and disclosure of project information. The timing of stakeholder engagement for environmental and social assessment and management in the project cycle is discussed in Section 3.4, and how to use consultation and disclosure for environmental and social assessment and management is addressed in Sections 4.5 and 4.15.

2.6 Positive impacts

Apart from renewable power generation, hydropower can deliver a range of positive impacts or benefits, which are typically social. These might include, for example, the curtailment of the most damaging floods, employment during construction, improved access and economic development in the region, reservoir fisheries, and the creation of recreational and tourism opportunities at the reservoir. In some cases, the hydropower developer may plan to provide additional benefits to affected communities or other communities, as discussed in depth in the IHA How-to Guide on Benefit-Sharing.

2.7 Cumulative impact assessment

Cumulative impact assessment (CIA, or cumulative environmental impact assessment: CEIA) refers to the assessment of the combined impact of the proposed project with other existing and planned developments. CIA is important for hydropower environmental and social assessment because there are often existing or planned hydropower projects upstream or downstream of the proposed project, and the combined impact of the 'cascade' of projects will be greater than or different from the proposed project alone. CIA for hydropower would normally be conducted at the scale of the affected river basin, and may be a good option for influencing the strategic development of the basin, especially in the absence of a prior strategic plan or basin plan.

CIA should not be limited to the cumulative impacts of the project with other hydropower projects. There may be other existing or planned uses of the river: for example, an irrigation scheme that will extract water from the river or disposal of effluent from an industrial facility. The proposed hydropower project will combine with this, leading to intensified or changed impacts.

2.8 Associated facilities

It is important that environmental and social assessment and management is conducted for the facilities that are associated with the hydropower project. These are facilities that would not be constructed if the hydropower project were not developed, and the project would not be viable without them. They are typically the transmission line and access roads. The scope of an ESIA for the hydropower project may be extended to include these associated facilities, which is most likely if they

are small in scale or being developed by the main project developer. Otherwise, entirely separate ESIA processes may be conducted for them, which is most likely if they are large in scale, and are to be developed by another party, such as the electricity distributor, utility, or offtaker.

2.9 ESMPs and management systems

It is essential that the ESIA process delivers environmental and social management plans (ESMPs), based on mitigation measures linked to each potential impact, for execution during implementation and operation stages. There is increasing emphasis on the effective use of coherent ESMPs, which evolve into and become plans within the developer's and contractors' environmental and social management systems (ESMSs). This point is discussed in detail in a number of sections below, including Sections 4.10, 4.12, and 4.13).

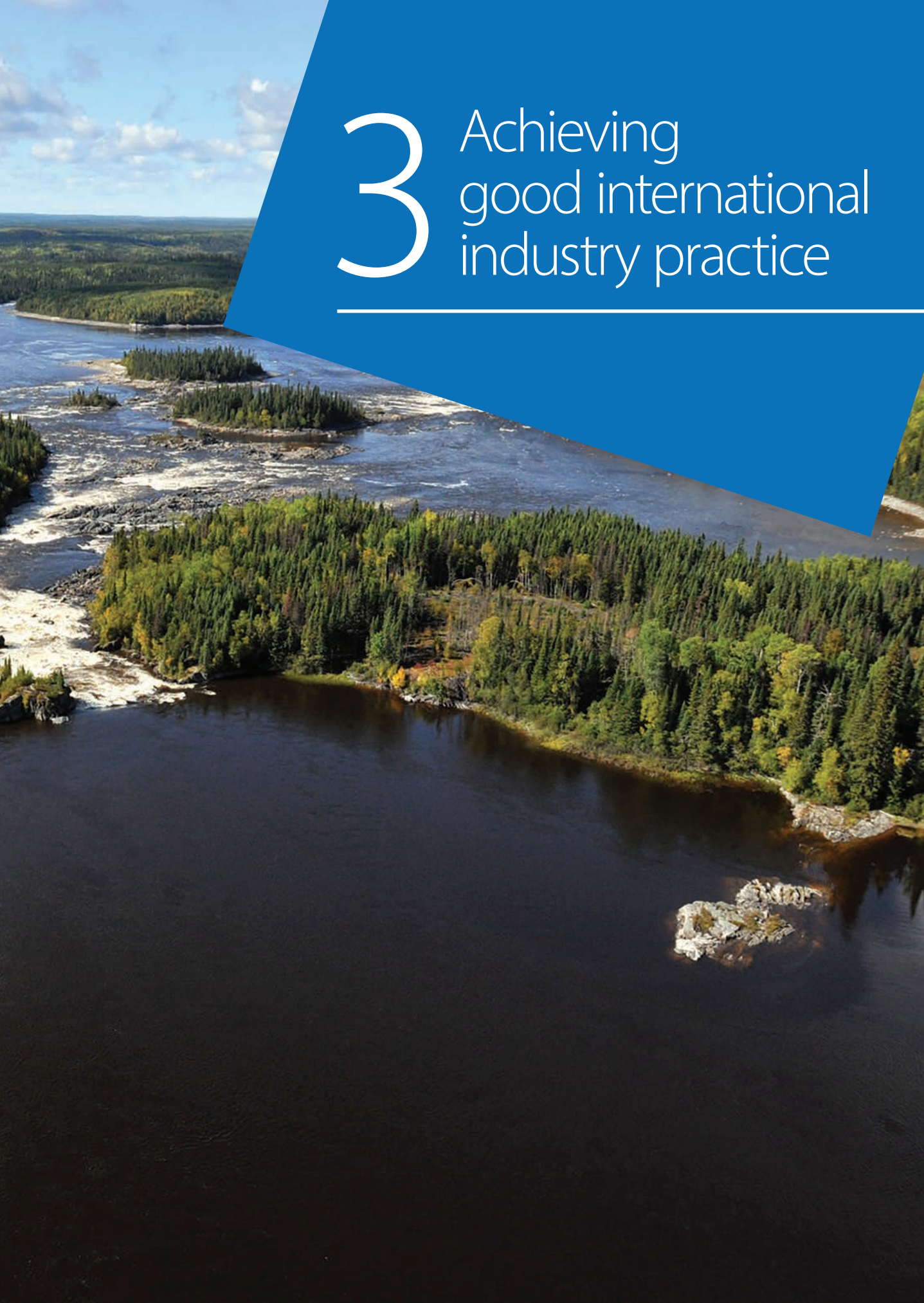
ESMSs are systematic or methodological approaches to the management of environmental and social impacts and issues or risks, and are increasingly recognised as vitally important for effective environmental and social management. In Performance Standard 1, IFC defines an effective Environmental and Social Management System (ESMS) as a dynamic and continuous process initiated and supported by management, which involves engagement between the client, its workers, local communities directly affected by the project (the Affected Communities), and, where appropriate, other stakeholders. It should be appropriate to the nature and scale of the project, and applies a 'plan, do, check, and act' process. ESMSs are often certified to international standards, such as ISO 14001.

2.10 International standards, conventions and agreements

The headline performance standard or performance requirement of all international development finance institutions, such as the World Bank, IFC or EBRD, is the Assessment and Management of Environmental and Social Risks and Impacts (or Impacts and Issues), which underlines the importance of environmental and social assessment and management. The Equator Principles also centre on environmental and social assessment and management, with Principle 2 (on Environmental and Social Assessment) committing the EPFI to require its clients to conduct an appropriate assessment process, in order to address the relevant environmental and social risks, and the scale of the proposed project's impacts.

In international conventions and agreements, Principle 17 of the Final Declaration of the United Nations Conference on Environment and Development (the Rio Summit) in 1992 is dedicated to EIA. In addition, Article 14 of the Convention of Biological Diversity requires each contracting party, to (among other things) introduce procedures requiring environmental impact assessment of its proposed projects that are likely to have significant adverse effects on biological diversity, with a view to avoiding or minimising such effects, and to allow public participation in such procedures. Certain regional conventions directly concern environmental and social assessment: for instance, the UNECE (United Nations Economic Commission for Europe) Espoo Convention on Environmental Impact Assessment in a Transboundary Context requires early-stage assessment of environmental impacts, and obliges states to notify and consult each other on all major projects that have a significant adverse environmental impact across boundaries. Also, the UNECE Aarhus Convention concerns Access to Information, Public Participation in Decision-Making, and Access to Justice in Environmental Matters.

Eastmain-1-A/Sarcelle/Rupert weir and spur shown serve to maintain upstream water levels to protect hunting and fishing zones on the Rupert river in Québec, Canada
Photo credit: Hydro-Québec



3 Achieving good international industry practice

Achieving good international industry practice

This chapter maps out the methodologies and approaches that are necessary to meet Good International Industry Practice (GIIP). They are presented according to the HSAP criteria of Assessment, Management, Stakeholder Engagement, and Conformance and Compliance. Most methodologies and approaches relate to one life cycle stage of a hydropower project, but some may be applicable in more than one particular stage. Box 3.1 describes how the HSAP topic on environmental and social assessment relates to the project life cycle.

Separation of contaminated soils at the Cahora Bassa project in Mozambique
Photo Credit: Doug Smith

3.1 Environmental and social assessment and management in the project life cycle

The measures that can be taken to manage environmental and social issues, and their effectiveness, are very strongly influenced by the choice of the project option and its location. It is important to avoid and minimise the most challenging or controversial impacts that will be most difficult or costly to mitigate or compensate for. This has led to strategic-level planning (e.g. river basin or power sector planning), as well as early-stage screening and assessment of projects, including the Early Stage tool of the HSAP.

The HSAP topics of P-3 Demonstrated Need and Strategic Fit, and P-4 Siting and Design, also reflect lessons on the need to integrate environmental and social considerations into decision-making and the local siting and design of the project, in order to avoid or minimise costly impacts and risks. These topics are summarised in Box 3.2 'GIIP in P-3 Demonstrated Need and Strategic Fit, and in P-4 Siting and Design'. In addition, their criteria are integrated into the HESG Preparation stage tool section on Environmental and Social Assessment and Management.

3.1.1 New projects

For a newly developed project there is a logical sequence, from strategic planning to the scoping of issues and risks during the early stage of the project's development. This is then followed by further detailed assessment, and the planning of measures to address the issues during preparation. Next, during construction and operation, there will be implementation of the measures, monitoring of their effectiveness, and the identification and management of unanticipated or emerging issues.

Figure 3.1 depicts this sequence in further detail in relation to the project stages. In summary, a developer of a new project should take the following steps:

During the **Early Stage**, through strategic planning and screening:

- Avoidance of sites with the most significant environmental and social impacts, issues and risks.
- Identification of sites with the least significant environmental and social impacts, issues and risks.
- Identification of environmental and social risks.

- Early stakeholder engagement on project options.
- Project siting or selection to avoid or minimise issues.

During the **Preparation** stage, through an ESIA process, and the preparation of ESMPs and ESMS:

- Scoping and detailed assessment of potential environmental and social impacts of project implementation and operation.
- Detailed stakeholder engagement on project impacts and issues, and proposed management measures.
- Planning of avoidance, minimisation, mitigation, and compensation measures for project implementation and operation.
- Planning of stakeholder engagement for project implementation and operation.

During the **Implementation** stage, through implementation of the ESMPs and ESMS:

- Construction according to the required designs, to avoid or minimise impacts.
- Mitigation of construction-stage impacts, or when mitigation is not feasible, compensation.
- Continuing stakeholder engagement.
- Monitoring and reporting to regulators and stakeholders.

During the **Operation** stage, through implementation of the ESMPs and ESMS:

- Operations to minimise and mitigate environmental and social impacts.
- Implementation of mitigation measures.
- Identification and management of ongoing or emerging issues.
- Continuing stakeholder engagement.
- Monitoring and reporting to regulators and stakeholders.

3.1.2 Preparation and Implementation stage projects

A project in either the Preparation or Implementation stage that has not sufficiently considered environmental and social issues to date (for instance, a particular issue that was overlooked) would still have opportunities to assess impacts and identify management measures. Project proponents should refer to the steps in Figure 3.1 (and the corresponding approaches and methodologies in Section 4) for the Early Stage, and (if already in implementation) Preparation stage.

3.1.3 Operating projects, rehabilitation, refurbishment and expansion

An operator of an existing project may not have considered environmental and social issues during the development of the project, or may not have considered all issues. In these cases, the project operator should refer to the steps identified in Figure 3.1 for the Operation stage, but should also consider the applicability of the methodologies and approaches that correspond to the earlier stages. Even older projects, developed before environmental and social issues were considered at all, can instigate new approaches to environmental and social assessment management, with associated stakeholder engagement.

The planning and implementation of rehabilitation, refurbishment, or expansion projects should follow the same steps as a new project in its preparation and implementation stages:

During the **Preparation** stage, through an ESIA process, and the preparation of ESMPs and ESMS:

- Scoping and detailed assessment of potential environmental and social impacts of the implementation of the rehabilitation, refurbishment or expansion project, and of the ongoing operation of the scheme.

Box 3.1 Synopsis of GIIP criteria on the topic of Environmental and Social Assessment and Management

The HSAP topics on Environmental and Social Assessment and Management are based on definitions of basic good practice in relation to criteria of Assessment, Management, Stakeholder Engagement, Conformance and Compliance, and Outcomes. Related guidelines provide further detail on these standards of Good International Industry Practice.

In an HSAP or HESG assessment, a project's performance is evaluated against carefully defined scoring statements. However, the structuring of HSAP and HESG tools by stage does not mean that actions taken during preceding stages are not considered, or that actions concerning subsequent stages are not assessed. The scoring statements are formulated to enable any stage tool to be used without prior use of the previous tool(s). For example, this principle is reflected in the Implementation stage requirements for topic I-3: 'Environmental and social issues relevant to project implementation and operation have been identified through an assessment process' (first part of Assessment), and plans are in place for the Operation stage for ongoing environmental and social issues management (second part of Management).

The methodologies and approaches in this guide are presented in a number of groups relating to HSAP criteria of Assessment, Management, etc. Some methodologies/approaches are applicable at more than one stage in the life cycle, and can be used at any stage, including by operating projects. The detailed HSAP criteria presented below may concern more than one life cycle stage; and some approaches (e.g. using appropriate expertise), cut across the criteria.

		P-5 Environmental and Social Impact Assessment and Management	I-3 Environmental and Social Issues Management	O-3 Environmental and Social Issues Management
Assessment	Assessment of impacts and issues	Assessments of project environmental and social impacts have been undertaken for project implementation and operation	Environmental and social issues relevant to project implementation and operation have been identified through an assessment process	Systematic processes are in place to identify any ongoing or emerging environmental and social issues associated with the operating hydropower facility
	Specific content	Including evaluation of associated facilities, scoping of cumulative impacts, role and capacity of third parties, and impacts associated with primary suppliers		–
	Appropriate expertise	Using appropriate expertise		
	Monitoring	A baseline has been established and well documented, for the pre-project condition against which post-project changes can be compared	Monitoring is being undertaken during the project implementation stage, appropriate to the identified issues	Monitoring programs are in place for identified issues

Management	Plans and processes	Environmental and social issues management plans and processes have been developed for project implementation and operation	Processes are in place to ensure management of identified environmental and social issues, and to meet any environmental and social commitments relevant to the project implementation stage Plans are in place for the operation stage for ongoing environmental and social issues management	An environmental and social management system is in place to manage measures to address identified environmental and social issues
	Specific content	In addition to key social and environmental issues relating to the hydropower project, plans address construction-related waste, noise, air quality, land disturbance and rehabilitation	–	–
	Appropriate expertise	Utilising appropriate expertise (internal and external)		
	Public disclosure	The environmental and social impact assessment and key associated management plans are publicly disclosed		
Stakeholder Engagement	ESIA engagement	The environmental and social impact assessment and management planning process has involved appropriately timed, and often two-way, engagement with directly affected stakeholders		
	Ongoing processes	Ongoing processes are in place for stakeholders to raise issues and get feedback		
Conformance and Compliance		–	Processes and objectives in the environmental and social management plans have been and are on track to be met with no major non-compliances or non-conformances, and environmental and social commitments have been or are on track to be met	
Outcomes	Outcomes	Environmental and social plans avoid, minimise and mitigate negative impacts.	Negative environmental and social impacts of the project are avoided, minimised and mitigated	Negative environmental and social impacts associated with hydropower facility operations are avoided, minimised and mitigated
	Specific content	–	–	Land disturbance associated with development of the hydropower project is rehabilitated or mitigated.

Box 3.2 GIIP in P-3 Demonstrated Need and Strategic Fit, and P-4 Siting and Design

	P-3 Demonstrated Need and Strategic Fit	P-4 Siting and Design
Assessment	An assessment has been undertaken of needs for water and energy services; of options to meet water and energy needs; and of national and regional policies and plans relevant to those needs, with no significant gaps.	Technical information has been analysed at an early stage, alongside social, environmental, economic, financial and regulatory considerations, in order to develop a preliminary project design and some options relating to this.
Management		An optimisation process has been undertaken to assess the project siting and design options.
Stakeholder Engagement	The results of the assessment of strategic fit are publicly disclosed.	The siting and design optimisation process has involved appropriately timed, and often two-way, engagement with directly affected stakeholders; ongoing processes are in place for stakeholders to raise issues and get feedback.
Outcomes	The strategic fit of the project with needs for water and energy services, and relevant policies and plans can be demonstrated.	The final project siting and design has responded to many sustainability considerations for siting and design.

- Detailed stakeholder engagement on impacts and issues of the rehabilitation, refurbishment or expansion project, and those of ongoing operations; and proposed management measures.
- Planning of avoidance, minimisation, mitigation and compensation measures for the implementation of rehabilitation, refurbishment or expansion, and ongoing operation.
- Planning of stakeholder engagement for the implementation of rehabilitation, refurbishment or expansion, and ongoing operation.

During the **Implementation** stage, through implementation of the ESMPs and ESMS for the rehabilitation, refurbishment or expansion project:

- Construction to the required designs, to avoid and minimise impacts.
- Mitigation of construction stage impacts, or when mitigation is not feasible, compensation.
- Continuing stakeholder engagement.
- Monitoring and reporting to regulators and stakeholders.

3.2 Assessment

3.2.1 Strategic planning and early stage assessment

As discussed in Section 2.3, strategic planning and assessment at an early stage is necessary to avoid projects with unavoidable and unacceptably significant impacts, and minimise environmental and social impacts. In the HSAP, this is reflected in the Assessment criterion of topic P-3 Demonstrated Need and Strategic Fit; also, in the Early Stage tool topics ES-1 Demonstrated Need (requiring an assessment of identified needs for water and energy services that includes environmental, social and economic considerations); and in ES-2 Options Assessment (requiring an assessment of the policy, institutional, management and technical options available to meet those demonstrated needs).

Screening of a specific project – for example, by an additional investor in the developer, or a provider of loan finance – is also important at an early stage, though it is based on a single project. In the HSAP, this is reflected in ES-7 Social Issues and Risks and ES-8 Environmental Issues and Risks (requiring an assessment of the environmental and social risks most relevant to the project), as well as P-4 Siting and Design, and ES-2 Options Assessment, requiring

Figure 3.1 Requirements to meet GIIP through the project life cycle

Strategic Planning, Options Assessment, Siting, Avoidance and Minimisation

- Strategic planning at power sector, hydropower sector, or river basin levels
- Comparison of the environmental and social impacts of alternative options
- Initial scoping of environmental and social issues
- Avoidance of options with unavoidable unacceptably significant impacts
- Selection of options with minimum environmental and social impacts
- Preliminary identification of management options, e.g. replacement land for displaced households

Environmental and Social Impact Assessment and Planning Mitigation

- Scoping of potential impacts; identification of impacts requiring detailed analysis and planning
- Stakeholder engagement during scoping
- Specialist studies and plans: e.g. resettlement planning, habitat analysis and biodiversity action planning, environmental flows management planning, heritage assessment, etc.
- Detailed identification of each impact and assessment of its significance
- Integration of design measures, to avoid or minimise risks in engineering designs
- Development of detailed ESMPs

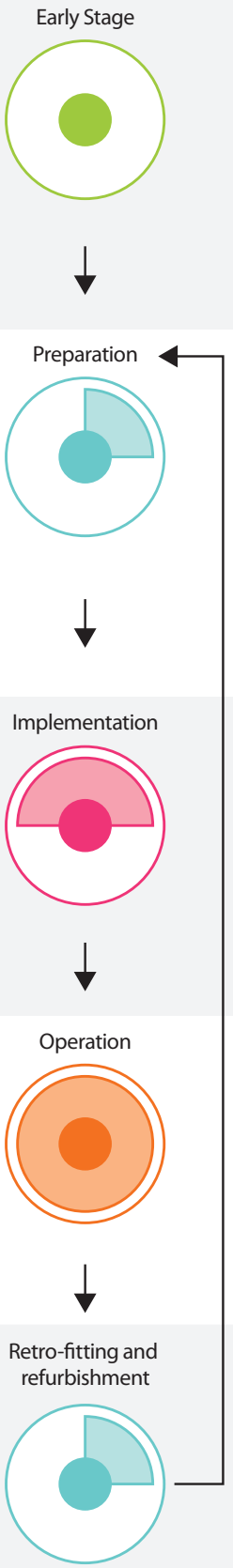
Implementation of ESMPs, including Design and Mitigation Measures

- Construction to required designs
- Implementation of construction-stage ESMP
- Mitigation of construction site impacts
- Environmental and Social Management Systems
- Ongoing stakeholder engagement
- Monitoring and supervision, adaptive management and reporting
- Construction site rehabilitation
- Detailed planning of operation-stage ESMPs

Operations to Minimise Impacts, and Implementation of ESMPs

- Operation of facilities to manage environmental and social issues
- Environmental and Social Management Systems
- Maintenance of facilities to manage environmental and social issues
- Implementation of operation-stage ESMPs
- Continuing implementation of specialist plans, e.g. Livelihood Restoration Plan, Biodiversity Action Plan
- Identification and management of ongoing or emerging issues
- Ongoing stakeholder engagement
- Monitoring and supervision, adaptive management and reporting

Preparation and Implementation of Retro-fitting and Refurbishment



assessment of the range of siting and design options for the project.

The need for strategic planning also creates challenges. In the case that a project concept is presented to a decision-maker (such as a developer, investor or regulator) but a strategic-level plan for the sector or basin is absent, they may or may not reject the concept.

The Methodologies and approaches chapter therefore details:

- Section 4.1.1 Strategic Environmental Assessment
- Section 4.1.2 Basin-level planning
- Section 4.1.3 Cumulative impact assessment
- Section 4.1.4 What if there is no strategic-level assessment?
- Section 4.1.5 Screening of projects for key environmental and social issues, and fatal flaws
- Section 4.1.6 Integration of environmental and social issues with project design

3.2.2 Environmental and Social Impact Assessment (ESIA)

ESIA is a fundamental process in project development; thus, a developer should know what it is, and how to contract a service provider to undertake an ESIA. An ESIA process can be guided by the range of environmental and social topics in the HSAP, from communications and consultation to climate change mitigation and resilience.

GIIP emphasises using appropriate expertise in all project stages. It will be necessary to contract a range of specialists on specific impacts during the preparation and later stages, as well as the ESIA contractor during preparation.

The Methodologies and approaches chapter therefore details:

- Section 4.2.1 What is ESIA?
- Section 4.2.2 Contents of an ESIA report
- Section 4.2.3 Identifying and contracting appropriate and specialist expertise
- Section 4.2.4 Contracting a firm to conduct an ESIA
- Section 4.2.5 Using the HGIIP, HSAP and HESG tools in contracting ESIA consultants
- Section 4.2.6 Developing terms of reference for the ESIA

3.2.3 Scoping of environmental and social impact assessment

Scoping refers to the initial identification of issues, and definition of the scope of further investigation or assessment that should be undertaken. For a new project, scoping of potential environmental and social issues must be carried out at an early stage, in order to inform the siting of the project and the main project components.

Scoping is normally a formal first stage of an ESIA process, and it is likely that the environmental regulator requires a scoping stage that culminates in agreement on the terms of reference for the full impact-assessment stage. The scoping stage will develop a clear project description, and confirm whether or not this ESIA process includes associated facilities. It will also define areas of influence, identify necessary use of maps and satellite imagery, identify applicable legal requirements and standards, and possibly present initial baseline information. Initial stakeholder engagement will be included in this stage, but otherwise it is based mainly on existing readily available secondary information[1].

1 'Secondary information' or 'secondary data' refers to information or data that have been previously gathered by other parties, i.e. they are not the primary data gathered by the developer or operator.

The Methodologies and approaches chapter therefore details:

- Section 4.3.1 Scoping, explaining the critical importance of the scoping stage in ESIA/EIA
- Section 4.3.2 What should be in the Project Description?
- Section 4.3.3 Defining the Area of Influence (AoI), including directly and indirectly affected areas
- Section 4.3.4 Geographical Information Systems (GIS) and mapping
- Section 4.3.5 Identifying legal requirements and international standards
- Section 4.3.6 Consultation during Scoping, and
- Section 4.3.7 Associated facilities

3.2.4 Baselines

A mandatory component of an ESIA is the establishment of a baseline, presented in the baseline or 'environmental and social context' part of the ESIA report. Some parts of the baseline will be used for comparison with post-project changes.

The Methodologies and approaches chapter therefore details:

- Section 4.4.1 What is meant by 'baseline'?
- Table 4.3 Checklists for the contents of an ESIA baseline
- Section 4.4.2 Establishing survey requirements for a baseline
- Section 4.4.3 Valued Environmental Components (VECs)

3.2.5 Impact assessment and mitigation measures

The impact assessment process is pivotal to ESIA, and to the subsequent identification of mitigation measures and ESMPs. It should be undertaken systematically, using recognised methodologies to assess the significance of each impact based on the baseline and stakeholder views. This process should be closely aligned with the project feasibility studies, and with sufficient precision in the identification of impacts so that specific management measures can be adequately identified and costed.

The Methodologies and approaches chapter therefore details:

- Section 4.6.1 Linking project activities with the baseline
- Section 4.6.2 Methodologies for assessing the significance of impacts
- Section 4.6.3 The mitigation hierarchy
- Section 4.6.4 Residual impacts
- Section 4.6.5 Design measures to be integrated into project designs and feasibility
- Section 4.6.6 Identifying mitigation measures
- Section 4.6.7 Positive impacts and benefits

3.2.6 Gender and cross-cutting issues

A number of important environmental and social issues are not presented as separate HSAP topics, and instead are referred to in the HSAP as cross-cutting issues: for example, gender, vulnerable groups, and legacy issues. They are of equal importance to HSAP topics, and should not be overlooked.

The Methodologies and approaches chapter therefore details:

- Section 4.7.1 Gender and social inclusion
- Section 4.7.2 Legacy issues
- Section 4.7.3 Human rights

3.2.7 Waste, noise and air quality

Waste, noise and air quality is not presented as a separate Preparation stage topic in the HSAP, but it is nonetheless necessary to assess these issues and devise necessary management measures during preparation.

The Methodologies and approaches chapter therefore details:

- Section 4.8.1 Air quality and noise
- Section 4.8.2 Waste management: reduce, reuse, recycle

3.2.8 Third parties and primary suppliers

A number of third parties may have roles in the assessment of issues and impacts, and in the implementation of management measures. The HSAP explicitly requires an assessment of the roles and capacity of third parties, and impacts associated with primary suppliers.

The Methodologies and approaches chapter therefore details:

- Section 4.9.1 Roles of third parties such as the government environmental regulator
- Section 4.9.2 ESIA reports to meet regulatory and additional requirements
- Section 4.9.3 How to assess and manage impacts associated with primary suppliers?

3.3 Management

3.3.1 Environmental and social management plans

The ESIA process will deliver environmental and social management plans based on mitigation measures linked to each potential impact. There may be a range of additional plans or sub-plans linked to the project ESMP(s), depending on the scale of the project and its impacts. Examples of the more significant associated plans are the SEP (Stakeholder Engagement Plan), RAP (Resettlement Action Plan), and BAP (Biodiversity Action Plan); however, there may also be a range of specific plans which are not as detailed, such as an Air Quality Management Plan. The responsibility for implementation of each management measure should be clearly identified, and it is often the case that there will be a construction stage ESMP, which is the responsibility of the contractor that will be contracted to construct the project, and an owner's ESMP, which is the responsibility of the developer.

The Methodologies and approaches chapter therefore details:

- Section 4.10.1 Linking mitigation measures to the ESMP(s)
- Section 4.10.2 Contents of an ESMP document and a sub-plan
- Section 4.10.3 Range and focus of ESMPs
- Section 4.10.4 Construction Stage ESMP (C-ESMP) for contractor implementation
- Section 4.10.5 The role of third parties in ESMP implementation

3.3.2 Budgets

If management measures are not costed and allocated a budget, they will not be implemented. Budgeting adequately for management measures, commensurate with the scale of impacts to be mitigated, is highly important; and stakeholders such as lenders will be interested to see whether environmental and social management has been

realistically costed. One of the principal reasons for cost overruns in hydropower (as well as delays to implementation) is the escalating cost of environmental and social mitigation, especially social measures such as livelihood restoration.

The Methodologies and approaches chapter therefore details:

- Section 4.11.1 Costing the ESMP(s)
- Section 4.11.2 Contingency

3.3.3 Environmental and social issues in procurement

Even the best environmental planning in the world will be of no consequence unless environmental and social requirements are integrated into the contractual requirements of the developer's main contractors. Most owners of hydropower projects will procure a single turnkey contract to be delivered by an engineering, procurement and construction (EPC) contractor. If the owner is managing construction, it will need to procure contractors for separate components of construction. In all cases, during implementation, an owner's engineer will be necessary.

The Methodologies and approaches chapter therefore details:

- Section 4.12.1 Incorporating environmental and social capacity into pre-qualification
- Section 4.12.2 Incorporating environmental and social requirements into tender documents and contracts
- Section 4.12.3 The role of the owner's engineer in environmental and social management

3.3.4 Environmental management systems

As discussed in Section 2.9, systematic or methodological approaches to the management of environmental and social impacts and issues or risks have been increasingly recognised as important for effective environmental and social management. GIIP in implementation requires processes for the management of environmental and social issues, and in operation it requires systematic processes to identify ongoing and emerging issues. These are referred to as environmental and social management systems.

The Methodologies and approaches chapter therefore details:

- Section 4.13.1 Establishing the owner's ESMS, including Environmental and Social Policy
- Section 4.13.2 Contractor's ESMS
- Section 4.13.3 Certification of management systems, such as ISO-14001
- Section 4.13.4 What are processes and procedures?

3.3.5 Monitoring, supervision and adaptive management

GIIP requires monitoring of identified issues in the implementation and operation stages; not only for topics that are explicitly focused on environmental and social issues management, but also for the range of environmentally and socially related topics. Monitoring includes both (i) monitoring of the implementation and effectiveness of management measures, including basic supervision and inspections of, for example, the adherence of a contractor to the environmental requirements in its contract; and (ii) monitoring of the status of environmental and social outcomes in specific issues such as water quality. All are important for the identification of emerging risks, and of opportunities to enhance effectiveness or positive impacts, through adaptive management.

The Methodologies and approaches chapter therefore details:

- Section 4.14.1 Inspections and reporting
- Section 4.14.3 Key performance indicators

- Section 4.14.4 Reporting on ESMP implementation and commitments
- Section 4.14.5 Reporting to regulators
- Section 4.14.6 Adaptive management
- Section 4.14.7 Auditing
- Section 4.14.8 Management review
- Section 4.14.9 Periodic reviews of environmental and social performance

3.4 Stakeholder engagement

Stakeholder engagement is a vital component of ESIA, and appropriately timed engagement with directly affected stakeholders during ESIA is a specific requirement of GIIP. GIIP also requires the public disclosure of the ESIA and management plans in the preparation and implementation stages.

The Methodologies and approaches chapter therefore details:

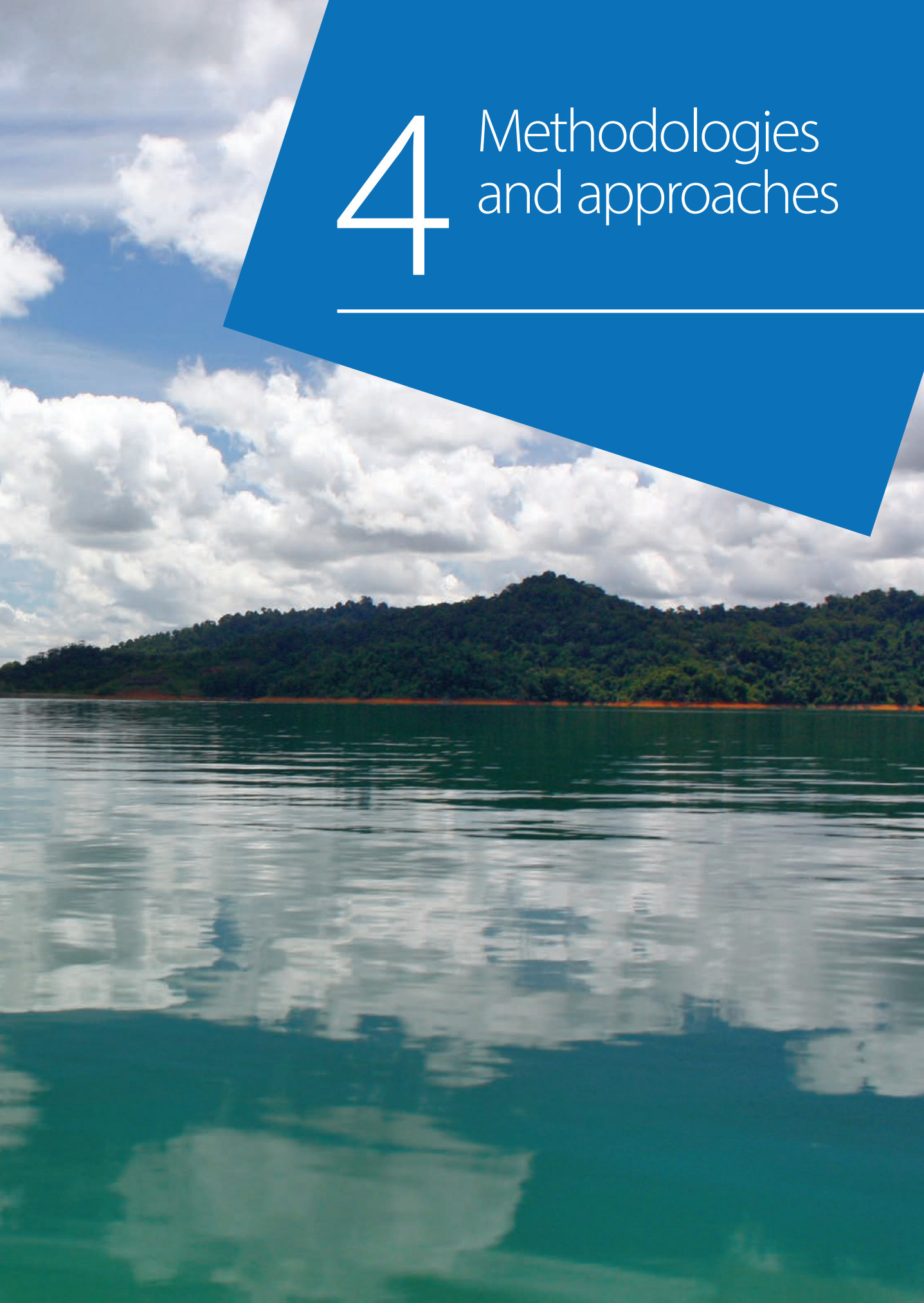
- Section 4.5.1 Ensuring appropriate stakeholder engagement in the ESIA process
- Section 4.5.2 Public disclosure through the ESIA process
- Section 4.15 Engaging with stakeholders throughout the project cycle

3.5 Conformance and compliance

GIIP requires that the processes and objectives set out in ESMPs for implementation and operation are on track, and that environmental and social commitments are on track. All of the above approaches concern this requirement. However, it is important to report on the implementation of these plans and commitments, including to stakeholders, who may wish to check conformance with commitments and corporate objectives, as well as regulators, who are required to check legal compliance.

The Methodologies and approaches chapter therefore details:

- Section 4.14.2 Incident and non-compliance reports and register of non-compliances
- Section 4.14.4 Reporting on ESMP implementation and commitments
- Section 4.14.5 Reporting to regulators



4 Methodologies and approaches

Methodologies and approaches

This chapter catalogues the methodologies and approaches used for: strategic planning and early-stage assessment; ESIA, including scoping; environmental and social management planning; management systems; monitoring, supervision and adaptive management; stakeholder engagement; and conformance and compliance. Each section describes a range of methodologies and approaches, pointing towards sources of further information and guidance.

Waste separation in the powerhouse at the Reventazón project in Costa Rica
Photo Credit: Doug Smith

4.1 Conducting strategic assessment and planning

4.1.1 Strategic Environmental Assessment

Strategic Environmental Assessment (SEA) is a similar procedure to Environmental Impact Assessment (EIA), but applies to policies, plans and programmes of a government, rather than individual projects.

SEA applies a systematic approach to identifying and assessing the environmental implications of such policies, plans and programmes, usually including public and stakeholder engagement. The scope of the SEA may be a policy, plan or a programme at any level of government or sector. For example, in the EU, the European Directive on SEA, in force since 2004, applies to a wide range of plans and programmes prepared by statutory agencies, regional planning bodies, local authorities and others. Precisely whether SEA or related sustainability appraisals are required, and how they must be conducted, varies from jurisdiction to jurisdiction, with patchy implementation even in developed countries.

In relation to hydropower, SEA may be applied to a master plan for energy or hydropower development, and can be used to inform strategic decisions on the development of the energy sector, or the location and number of hydropower developments, in order to minimise the overall impact of the sector's development. SEA will have greater positive influence on the sustainable development of the sector if it is conducted as part of, or alongside master planning, rather than as an exercise to analyse impacts after the plan has become established.

Some good examples of SEA in the hydropower sector are:

- The Icelandic Master Plan for Nature Protection and Energy Utilization, which seeks to reconcile nature conservation with geothermal and hydropower development on a national scale; it is now in its fourth phase, due to be completed in 2021.

- A nationwide SEA of the hydropower sector in Myanmar, conducted by the Myanmar Ministry of Natural Resources and Environmental Conservation (MONREC) and the Ministry of Energy and Electricity (MOEE), with the support of IFC and the Australian Government. This was a comprehensive SEA process, involving extensive engagement with development partners and civil society.

Box 4.1 Lessons and considerations in strategic approaches (SEA, CIA and basin-planning)

Strategic approaches:

- offer significant value in optimising hydropower sector benefits, while minimising impacts;
- require careful positioning and government buy-in;
- are political, and require a political strategy;
- can be easily criticised if they are inconclusive (for example, due to a lack of available data);
- have most value if they provide practical guidance to governments on how to meet generation targets;
- require an enforceable spatial planning regime in the long term if the environmental benefits of the strategic approach are to be maintained.

Strategic approaches vary according to their:

- range of aspects included (only environmental and social, or energy generation as well)
- levels of inclusiveness and participation;
- use for capacity-building purposes;
- depth of scientific analysis and associated primary research to gather new data (for example, on sediment transport or biodiversity);
- basis in regulations and environmental law;
- use in subsequent enforcement of planning decisions.

SEA and other strategic approaches have wide support in the hydropower sector globally, and from partners such as the World Bank, as well as from civil society. There is a spectrum of approaches to strategic planning, including basin-level planning and CIA (discussed below), as well as SEA. They encompass a combination of desktop analysis, capacity-building (building understanding of government and the public on the concepts of strategic planning), and stakeholder engagement, and may or may not be embedded in a regulatory process. Their conclusions may or may not be upheld by a regulatory planning regime. Box 4.1 provides some lessons of strategic approaches and dimensions of the various approaches.

Further reading

- IAIA (2002). *Strategic Environmental Assessment – Performance Criteria.* Special Publication Series No.1.
- IAIA (2011). *Key Citations Series: Strategic Environmental Assessment.*
- *Icelandic Master Plan for Nature Protection and Energy Utilization*: http://www.ramma.is/english
- IFC, MONREC, Australian Aid (2018). *Strategic Environmental Assessment of the Myanmar Hydropower Sector.*

Resources on the SEA in Myanmar: https://www.ifc.org/wps/wcm/connect/industry_ext_content/ifc_external_corporate_site/hydro+advisory/resources/sea+of+the+hydropower+sector+in+myanmar+resources+ page

4.1.2 Basin-level planning

A river basin is the whole catchment that is drained by that river and its tributaries. Strategic assessment and planning of hydropower development is increasingly applied at the level of a river basin, to ensure the optimal selection of hydropower developments with the greatest potential generation of power, and the least environmental and social impact.

The basin is used as the unit of analysis, because the position of hydropower developments in the basin will affect the extent of fragmentation of the river system caused by these developments. Increasing fragmentation will have greater and greater impacts on river flows, upstream and downstream migration of biota, and the pattern of sediment transport.

Conducting basin-level planning may be as simple as planning to position any new hydropower developments on a tributary in the basin that has existing hydropower developments, while leaving other tributaries without any developments to remain unmodified and free-flowing. More complex approaches involve steps of:

1. Identifying alternative combinations or 'scenarios' of proposed hydropower developments;

2. Identifying the parameters or aspects using which they will be compared;

3. Making a comparison or ranking of the alternative scenarios, for example by:

   - the length of river that will remain unmodified (i.e. free-flowing);

   - generation potential and firm power, based on hydrological modelling;

   - net present value (NPV) and internal rate of return (IRR);

   - effects on sediment transport, based on sedimentological modelling;

   - effects on the movement of identified migratory species (up- and downstream);

   - position of the projects in relation to settlements and the magnitude of population displacement;

   - indigenous populations affected;

   - position in relation to natural habitats (some of which may be prioritised as critical habitat) and protected areas; and

   - any other cumulative environmental and social impacts of each combination.

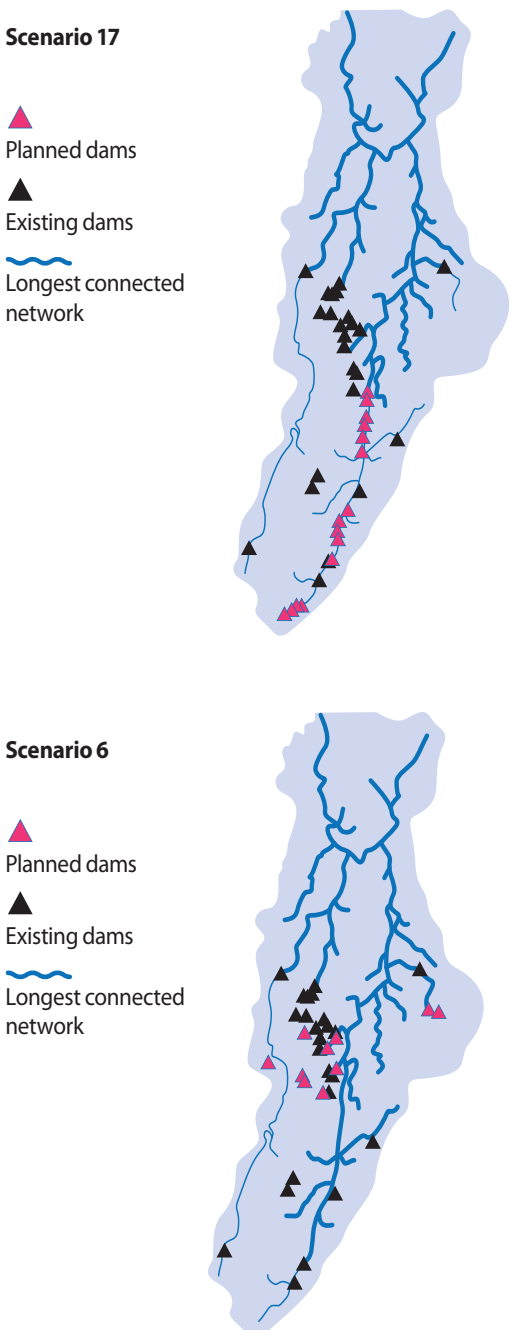
Figure 4.1 shows an example of basin-level planning using the Power of Rivers approach.

The principle of basin-scale planning can be extended to improving the coordination of operations of existing hydropower across a basin to maximise generation while minimising environmental and social impacts. For example, Hydro Tasmania has applied these principles in its Water Management Review programme, which reviews its activities across the six major hydropower catchments of Tasmania. Basin-level coordination underpins an operator's forum convened for the Zambezi Basin, and a basin-level reporting tool developed with World Bank support in the Zambezi Basin in southern Africa. On its grandest scale, basin-level planning and coordination is inherent in the work of the major river basin commissions, and initiatives such as the Nile Basin Initiative and Mekong River Commission.

Cumulative Impact Assessment (CIA), which examines the cumulative impact of hydropower projects and other water infrastructure and extraction in a river basin, without including other non-water sources of impact, is in effect a basin-planning approach.

Figure 4.1 Power of rivers: case study of the Magdelena Basin in Colombia.

The figure indicates how one scenario of planned dams results in nearly 1,000 km more fragmentation than another.



Source: Opperman, J., Grill, G. and Hartmann, J. (2015). The Power of Rivers: Finding Balance Between Energy and Conservation in Hydropower Development. The Nature Conservancy: Washington D.C.

Further reading:

- Hydro Tasmania (2017). *Pieman Sustainability Review – Outcomes and Commitments Report.*
- Mekong River Commission (2011). *Planning Atlas of the Lower Mekong River Basin.*
- Opperman, J., G. Grill and J. Hartmann (2015). *The Power of Rivers: Finding Balance Between Energy and Conservation in Hydropower Development.* The Nature Conservancy: Washington D.C.
- Opperman, J., Hartmann, J. and Raepple, J. (2017). *The Power of Rivers: A Business Case.* The Nature Conservancy: Washington D.C.
- The Nature Conservancy, WWF and The University of Manchester (2016). *Improving Hydropower Outcomes Through System-Scale Planning: An Example from Myanmar.*
- World Bank (2018). *Application of the Hydropower Sustainability Assessment Protocol in the Zambezi River Basin.* World Bank: Washington D.C.

4.1.3 Cumulative impact assessment

Cumulative impacts are impacts that result from the successive, incremental, and/or combined effects of an action, project or activity, when added to other existing, planned, and/or reasonably anticipated future ones.

Cumulative impact assessment (CIA) is the assessment of the combined impacts of a number of identified existing and planned developments (not only hydropower). It is most often conducted as part of an EIA, so that the cumulative impact of the project with existing and planned developments is predicted, in order to inform decision-making on whether to proceed with the project, and to identify the additional measures that may be required to

avoid, minimise and mitigate cumulative impacts. For example, the EIA would assess the cumulative impact on flow volumes of (i) diverting waters from the river for hydropower generation, and (ii) planned extraction for an irrigation scheme. A further example is the cumulative impact on the prevalence of sexual harassment of women in the local community due to (i) the hydropower construction workforce, and (ii) a local mine workforce. CIA is also applied as a strategic assessment tool: for example, as a CIA of a range of proposed hydropower developments across a basin.

A basic, project-focused CIA will be reported as a section within the EIA, and should at a minimum:

- clearly identify the existing and planned developments that will be assessed (this may also include activities and trends that are not specific developments, such as increasing effluent disposal in the river);
- scope the environmental receptors or valued environmental components (VECs) that may be affected by a combined impact of the developments, and identify the necessary qualitative or quantitative analysis;
- conduct and report on the analysis; and
- design strategies, plans and procedures to manage cumulative impacts, and related monitoring and supervision requirements.

Further reading:

- European Commission (1999). *Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions.*
- IAIA (2017). *Fastips No. 16: Cumulative Effects Assessment.*
- IAIA (2012). *Key Citations: Cumulative Effects.*
- IAIA (2019). *Trends, Issues and Insights in Cumulative Effects Assessment: A Review of International Academic Literature 2008–2018.*
- IFC (2013). *Good Practice Handbook: Cumulative Impact Assessment and Management – Guidance for the Private Sector in Emerging Markets.*
- IFC (2017). *Tafila Region Wind Power Projects Cumulative Effects Assessment* (an example of a CIA focused on specific aspects or VECs, in this case the cumulative effects of wind power developments on bird species migrating through the Rift Valley/Red Sea flyway).
- IFC, Norwegian Ministry of Foreign Affairs, Australian Aid (2019). *Cumulative Impact Assessment and Management: Hydropower Development in the Trishuli River Basin, Nepal.*
- IFC resource page on CIA: https://www.ifc.org/ wps/wcm/connect/industry_ext_content/ifc_external_corporate_site/hydro+advisory/resources/cumulative+impact+assessment+resource+page
- MONRE (Myanmar) and IFC (2017). *Nam Ou River Basin Profile Summary Document: Environmental and Social Characteristics of a Key River Basin in Lao PDR.*

4.1.4 What if there is no strategic-level assessment?

The need for strategic planning also creates challenges. In the case that a project concept is presented to a decision-maker (e.g. a developer, investor or regulator) but a strategic-level plan for the sector or basin is absent, the decision-maker would have the following options:

- Encourage or require the conduct of a strategic-level assessment or plan before their further involvement in this project.
- Engage in this project while promoting a strategic-level assessment that may influence planning on a wider level (or may determine localised project siting and design, and planned operations of this project).

- Conduct a detailed cumulative impact assessment of the project.
- Reject the project.

Their decision would depend on factors such as whether the basin is undeveloped for hydropower (or other water infrastructure) or is relatively developed; the expected environmental and social values in the area (for example, a basin in a region of high biodiversity would support the need for a strategic approach); and their leverage over the project (the extent to which the project is proceeding with or without their involvement). Even in the case of investment in an existing project, for example in rehabilitation, there may be an opportunity to use the investment to leverage a strategic plan for the wider basin, coupled with new operational rules for the existing, rehabilitated facility.

4.1.5 Screening of projects for key environmental and social issues, and fatal flaws

Developers of hydropower projects may have a range of potential hydropower alternatives, and can apply a screening process to prioritise those that are most attractive financially or economically while having the least technical, environmental and social risk, and to rule out those with unacceptable risks or impacts (i.e. 'fatal flaws'). Investors and financers in hydropower also apply screening to determine whether they should proceed with further studies to assess the project's suitability for financing.

Strategic environmental assessments or basin-level planning may provide useful data and context for project-level screening. For example, the Myanmar SEA ultimately offers a system for screening projects on the basis of zonation of the country into zones where hydropower is more or less sustainable.

Box 4.2 sets out some basic criteria that are frequently used in screening, and some examples of fatal flaws. Criteria for screening can be derived

Box 4.2 Criteria that are frequently used in screening, and examples of fatal flaws

Criteria for screening	Examples of fatal flaws
• Located on a 'main stem' (not preferred) or tributary (preferred) • On a previously developed tributary (preferred) or an unmodified river (not preferred) • Length of dewatered reaches • Estimated number of physically displaced households (compared to MW capacity) • Location in / outside a conflict zone • Transboundary issues • Affects Indigenous Peoples • Location in relation to, and effects on natural habitats, critical habitat and protected areas • Location in relation to sites of critical cultural heritage importance • Power density (W per m^2) or emissions intensity (gCO_2e per kWh) • Previous experience and capacity of the developer • Governance context is acceptable	• On the main stem of a significant transboundary river basin • Downstream flow impacts will affect a Category I Protected Area (National Park) • Inundates the only remaining habitat of a threatened species in this country • A cultural heritage site, designated a UNESCO World Heritage Site, will be inundated • Excessive level of displacement compared to generation • Strong public and/or political opposition to the project • Evidence of developer involvement in unethical practices • Located in an area of high seismic activity

Box 4.3 Due diligence, international standards, and HSAP/HESG

Preparing for the environmental and social due diligence conducted by potential lenders or investors is an important function of environmental and social assessment and management during the preparation stage. Most lenders or investors will appoint an independent consultant to determine whether the project has been prepared to, and whether it will be implemented to, international standards. These standards will be the potential lender or financer's own environmental and social performance standards, or (as in the case of financial institutions that have adopted the Equator Principles, or lenders and investors that do not have their own standards) the IFC Environmental and Social Performance Standards.

HSAP/HESG assessments can be used as due diligence reporting tools in principle, and the HESG tools have been designed for that function. They may also be used alongside IFC or other standards, as a means to ensure that hydropower-specific criteria and issues are properly addressed by the due diligence team.

using HSAP/HESG criteria and the requirements of IFI standards. Some investors may apply relatively sophisticated systems of screening, through gathering information on the adequacy of the assessment of environmental and social impacts, sufficiency of proposed management plans, and capacity of the developer. Some may conduct specific studies to identify the key environmental and social risks and fatal flaws of the project at an early stage.

If a project passes a potential lender or investor's initial screening, they may proceed to conduct detailed due diligence of the project, concerning technical and financial issues as much as environmental and social. Box 4.3 presents the importance of due diligence, and the potential use of the HSAP/HESG as due diligence reporting tools.

Further reading:

- European Commission (2001). *Guidance on EIA: Screening.*
- IAIA (2015). *Fastips No. 11: Alternatives in Project EIA.*
- World Bank (2007). *Ghana: Country Environmental Analysis.*
- World Bank (2003). *Good Dams and Bad Dams: Environmental Criteria for Site Selection of Hydroelectric Projects. Latin America and Caribbean Region,* Sustainable Development Working Paper 16.

4.1.6 Integration of environmental and social issues with project design

Considering environmental and social issues in the earliest designs and options for project development can provide opportunities to avoid significant impacts. Section 4.6.5 describes how mitigation measures may be design measures that are integrated into the engineering designs of the project. The same principle applies at earlier stages: for instance, the integration of a requirement to minimise environmental and social risks and impacts, into the scope of work of pre-feasibility consultants or other engineering and financial studies.

Taking this a step further, the maximisation of environmental and social benefits of the project can be made an explicit aim of project development, as a component of integrated river basin development.

4.2 Planning an Environmental and Social Impact Assessment (ESIA)

4.2.1 What is ESIA?

The International Association of Impact Assessment (IAIA) defines Environmental Impact Assessment (EIA) as "the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made". In hydropower, this process should be undertaken prior to the decision on whether the project should proceed.

Depending on the jurisdiction, the process may be referred to as an Environmental Impact Assessment (EIA), Environmental and Social Impact Assessment (ESIA), Environmental Impact Statement (EIS), or other terms.

ESIA requires both a technical assessment and a process: the technical assessment concerns the identification and qualitative or quantitative assessment of potential impacts on, and risks for, the environment and human well-being, and identification of measures to eliminate and mitigate these impacts; the process concerns engaging stakeholders with the proposed development, and its impacts and risks, and reaching a democratic, legal decision on whether the project is to be developed, and under what conditions.

The EU EIA Directive defines 'environmental impact assessment' as a process consisting of: the preparation of an EIA report by the developer; consultations; examination of the EIA report and consultation findings by regulatory authorities; the conclusion of these authorities regarding the project's significant effects on the environment; and the integration of the authorities' conclusion into decision-making on the development.

At the outset of considering a new hydropower development, it is imperative to become familiar with environmental permitting requirements at sub-national, national and regional (e.g. EU) levels, as these will define the requirements for ESIA and regulatory approvals. ESIA will be necessary for hydropower in all except specific cases; for example, micro- and small hydropower.

Further reading:

- IAIA (2009). *What is Impact Assessment?* (IAIA\Publications\What Is IA.indd)
- IAIA (2012). *Fastips 1: Impact Assessment.*
- IAIA and the Institute of Environmental Assessment (IEA) (1998). *Principles of Environmental Impact Assessment Best Practice.*

4.2.2 Contents of an ESIA report

The overall structure of ESIA reports is similar, but the exact structure tends to vary, depending on the structure stipulated in legislation, lenders' requirements, and the preference of the developer or its consultants. The World Bank environmental and social standard (ESS) on the Assessment and Management of Environmental and Social Risks (ESS1) provides an indicative outline for an ESIA, including an executive summary, legal and institutional framework, project description, baseline data, environmental and social risks and impacts, mitigation measures, analysis of alternatives, and design measures. Table 4.1 presents a proposed detailed structure for an ESIA of a hydropower project.

Further reading:

- IAIA (2020). *Fastips 20: What should an EIA contain?*
- IAIA (2018) (updated). *Social Impact Assessment.* Key Citations Series.
- IFC (2018). *Good Practice Note: Environmental, Health, and Safety Approaches for Hydropower Projects* – Annex B: Suggested Aspects of an Environmental Impact Assessment of Hydropower Projects.
- IUCN (2020). *Environmental and Social Impact Assessment (ESIA).*

Table 4.1 Proposed structure for an ESIA for a hydropower project

VOLUME I	
Non-technical Summary	This is a concise summary of the key aspects and impacts of the project, written in language that is understandable by ordinary members of the public, and with clear visual plans and pictures.
VOLUME II	
1. Introduction	• Objectives of the project • Summary project description and location • Project rationale (fit with global, regional and national goals, including Sustainable Development Goals, Paris Agreement commitments, national targets, etc.) • The proponent (developer) • ESIA requirements • ESIA team • ESIA report structure
2. Legal and Administrative Framework	• ESIA regulations and requirements • Environmental regulations • Regulations on labour and occupational health and safety • Regulations on social issues and impacts (e.g. gender equality) • National institutional framework • Applicable international standards
3. ESIA Process and Methodology	• ESIA process and dates • Scoping and Terms of Reference • Data collection for baseline studies • Direct and indirect Areas of Influence • Impact assessment methodology
4. Project Description	• Location and regional setting, with maps • Overview and layout, with plans • Project component structure • Associated facilities, with maps and plans • Site preparation • Construction activities, sequence and timing, materials and energy requirements, waste types and volumes, and workforce requirements, and construction site closure • Operations, including operating regime, environmental flows, materials requirements, waste types and volumes, and workforce requirements

5. Analysis of Alternatives	• Definition of needs and objectives • Identification of alternative options to the project • Comparison of environmental and social impacts of these options • Identification of site layout and design alternatives • Comparison of environmental and social impacts of these alternatives
6. Public Participation and Engagement	• Stakeholder identification • Consultation and engagement methods and process • Findings of consultation • Grievance redress mechanism • Ongoing consultation
7. Baseline	*Please refer to Section 4.4* • Physical baseline • Biological baseline • Social baseline
8. Impact Assessment and Mitigation	• Climate change vulnerability • Greenhouse gas emissions • Air quality and odours • Noise and vibration • Geology and soils • Hydrology • Water quality • Wastes • Aquatic habitats and biodiversity • Terrestrial habitats and biodiversity • Physical and economic displacement • Community health and safety • Cultural heritage • Landscape and visual amenity • Positive impacts and benefits
9. Environmental and Social Management Plan	*Please refer to Section 4.10.2 for detailed content.* This may be in a separate third volume.
10. Monitoring Requirements	
11. Implementation Schedule and Costs	• Schedule • Costs

- UNECE (2017). *Convention on Environmental Impact Assessment in a Transboundary Context* (Espoo Convention)
- Vanclay, F. (2015). *Social Impact Assessment: Guidance for Assessing and Managing the Social Impacts of Projects*. IAIA
- Smyth, E. and Vanclay, F. (2017). The Social Framework for Projects: a conceptual but practical model to assist in assessing, planning and managing the social impacts of projects. *Impact Assessment and Project Appraisal,* 35:1, 65–80, DOI: 10.1080/14615517.2016.1271539.

4.2.3 Identifying and contracting appropriate and specialist expertise

The HSAP defines appropriate expertise as "specialists with experience in the key identifiable topical areas of the assessment and management plans, giving particular attention to the differences between environmental areas and social impact areas." Specialist expertise for ESIA, and continuing beyond the ESIA through environmental and social assessment and management in later stages, is essential. The number of specialist experts involved, and their specialist foci, will depend on the issues presented by the hydropower project in question. For example, the ESIA of a relatively small hydropower project with few impacts could be prepared by a smaller number of experts, with more general expertise. By contrast, a large, complex project with impacts across a number of environmental and social aspects will require a large team of specialists, some of whom may continue to be involved beyond preparation.

The range of specialist experts will be similar to the range of baseline and impacts areas, discussed in Section 4.4 below. For most hydropower projects, this will encompass at least hydrology and environmental flows, terrestrial biodiversity, aquatic biodiversity, heritage, and social and gender specialists.

The developer should identify an initial list of the required specialist expertise at an early stage of project development, when the environmental and social issues of the project are initially identified. The developer may develop and refine these further in discussion with potential ESIA consultants, and use the scoping stage of the ESIA to confirm the necessary specialist expertise.

Some specialist experts will be employees of the developer, i.e. internal experts. It is not usual practice that such internal experts are part of the ESIA team,

Box 4.4 Using an independent panel of environmental and social experts

Developers of large, complex or sensitive hydropower projects may wish to appoint an independent panel of experts. Some potential lenders to the project may require this. An independent panel can provide continuous advice and guidance from the earliest stages of development, through preparation and implementation, into the initial years of operation. They can be thought of as equivalent to the owner's engineer for the project, i.e. they provide specialist advice to the developer, equivalent to the engineering advice that the owner's engineer provides. The most effective panels are those that bring practical knowledge and experience of hydropower and can advise on specific issues, rather than panels of figureheads who serve a political purpose. The combination of experts on the panel may reflect the most significant or challenging issues of the project – for example, a project with significant impacts on heritage sites may require a specialist heritage expert – but normally they consist of at least one environmental and one social expert. Environmental and social panels are often combined with dam safety panels. Independent panels of experts should not be confused with panels of stakeholders which may be convened to gather a wider range of stakeholder perspectives.

which is normally an externally appointed team, but some internal experts (for example, the developer's hydrologist) will contribute data for the ESIA process. It is essential that the developer appoints personnel for the continuing implementation of environmental and social measures, and it is good to have these personnel in place during preparation and the ESIA, so that they are fully conversant with the issues identified through the ESIA process. The developer may wish to use an independent panel of experts for guidance, as described in Box 4.4.

Note that many national laws require the use of government-licensed or registered consultants or agencies for conducting the ESIA.

Further reading:

- Hubbel, D. and Shoemaker, B. (2018). Independent Guidance and International Credibility: The Panel of Experts. In: Shoemaker, B. and Robichaud, W. (Eds.) (2018). *Dead in the Water: Global Lessons from the World Bank's Model Hydropower Project in Laos*. University of Wisconsin Press.
- IAIA (2010). *Guideline Standards for IA Professionals.*

4.2.4 Contracting a firm to conduct an ESIA

The vast majority of developers appoint a consulting firm to conduct an ESIA on their behalf. Indeed, in some jurisdictions, it may be a legal requirement to appoint an external firm. Appointing an external firm will provide the necessary expertise and credibility for the ESIA. A wide range of consulting firms are available that provide these services, ranging from small firms that specialise

Box 4.5 Minimum criteria for selection of an ESIA consultant

- A strong track record in hydropower ESIA;
- Experience in the project area, especially regarding the social aspects of developments in the area;
- Previous experience of delivering ESIA to meet the requirements of the regulator in that jurisdiction;
- Effective approaches to stakeholder consultation;
- Ability to provide specialist experts;
- Willingness to sub-contract specialist experience; and
- A good grasp of the probable issues and challenges of this particular project.

Box 4.6 What should an ESIA cost?

The cost of an ESIA should reflect the effort necessary to meet the scope of work in conducting the ESIA process, including stakeholder consultations. The developer should avoid estimating the ESIA cost, or the cost of the preparation of all environmental and social plans, as a percentage of the development cost, as this may result in an excessively high allocation for a project with few or mainly simple impacts; or an allocation that is significantly lower than necessary for a complex project with a range of significant impacts, which requires specialist studies and significant primary data collection.

in ESIA in their country or region, through to large multinational firms with a presence in all global regions.

For a developer that is relatively new to hydropower, it may not be easy to find the right individuals within such large companies. It is important to scope out the potential ESIA service providers with a track record in the project location, and hear testimonies from developers of similarly complex projects. Networking within the range of IHA members, attending IHA's World Hydropower Congress, and use of the IHA's HydroPro may help to identify potential candidate firms. A further means of identifying individual experts is the International Association of Impact Assessment (IAIA, iaia.org). IAIA is a membership organisation which individual experts can join; it has nearly 1,100 members from 110 nations, holds an annual conference, and organises national country-level networks.

When selecting firms to provide an ESIA, it is important to establish clear criteria for selection. These criteria should at a minimum include those listed in Box 4.5. Care must be taken to avoid appointing a firm that has not understood the full scope of the requirements, and has under-priced their tender: this will result in an inadequate ESIA and additional costs later in the process. Box 4.5 provides some indications of what an ESIA should cost.

A common difficulty in ESIA is that the appointment of a firm to conduct an ESIA results in the ESIA centring on the ESIA report to be delivered to the client/developer. This places too much emphasis on the ESIA report as a technical deliverable, and too little emphasis on the ESIA as a process to obtain both practical proposals on management measures, as well as stakeholder agreement and support for the project.

4.2.5 Using the HGIIP, HSAP and HESG tools in contracting ESIA consultants

In contracting appropriate experts and consultants, the developer can make explicit reference to the HGIIP, HSAP and HESG in the procurement process and terms of reference. The terms of reference would then mandate the ESIA consultant to consider HGIIP, and the topics and criteria contained therein, during proposal preparation (e.g. including experts in the team to address all HGIIP topics), scoping, and deliverables.

For example, Sarawak Energy Berhad (SEB) has applied this approach to an Integrated Environmental and Social Impacts Assessment (ESIA) in North Kalimantan, Indonesia. They used the HSAP Early Stage (ES) tool to guide the scope of a pre-feasibility stage social and environmental screening and a preliminary ESIA, and the Preparation (P) tool to guide the scope of the ESIA and Community Development Plans. SEB has also required the inclusion of IHA-accredited HSAP assessors as advisors in ESIA teams and supervision teams for projects in Sarawak.

4.2.6 Developing terms of reference for the ESIA

It is important to establish clear terms of reference for a consulting firm to conduct an ESIA, so that its scope of work is very clear. In some cases, it is necessary to contractually separate the scoping and impact assessment phases, as the scoping stage will be used to refine and re-focus the terms of reference for specialist studies. For example, this may be a regulatory requirement, where the regulator must approve the terms of reference produced by the scoping stage, or it may be most appropriate where the potential impacts are poorly understood before scoping.

Table 4.2 provides a checklist of items to include in an ESIA terms of reference. It is important that the terms of reference:

- establishes the standards to be met in the ESIA (i.e. whether the ESIA process is required to meet regulatory requirements for ESIA, whether it should meet the requirements of potential international lenders, etc.). Most international lenders include requirements in their headline environmental and social performance requirement, such as the IFC's Performance Standard 1 or EBRD's Performance Requirement 1;

Table 4.2 Contents of ESIA Terms of Reference and Checklist

Contents	Checklist
Project description and background	• Project location • Maps • Characteristics of infrastructure (dam height, capacity, etc.) • Reservoir area • Affected river reaches and operating regime • Settlements affected • Alternative project options • Associated facilities • Findings of early stage identification of environmental and social issues
Objectives of the assignment	• Clarity on whether the scope includes the full ESIA process or is more limited
Standards	• Clear responsibility for liaison with the regulator • ESIA regulations to be met • International standards to be met • Reference to HGIIP, HSAP and HESG • Corporate policies and commitments to be met • Mitigation hierarchy is to be applied
Tasks: Scoping	• Identifying legal requirements for (i) ESIA, and (ii) the project • Baseline identification, based on secondary information • Stakeholder consultation for scoping • Definition of terms of reference for the impact assessment
Tasks: Impact Assessment	• Baseline confirmation, based on primary data and specialist studies • Impact assessment using recognised methodology • Significance rating of all impacts • Identification of mitigation measures • Significance of residual impacts • Stakeholder consultation on impacts
Tasks: Environmental and social management planning	• ESMP stand-alone or part of ESIA report • Identification of measures • Monitoring requirements • Structuring of measures and monitoring into implementable plans, with allocated responsibilities • Identification of staffing requirements and responsibilities
Report preparation	• Refer to required table of contents

Responsibilities to be clearly allocated between the developer and consultant	• Provision of detailed data on project design and operation • Liaison with feasibility study consultants • Arrangement of stakeholder events • Facilitating stakeholder events • Presenting information at stakeholder events • Use of community liaison assistants • Public disclosure of scoping and ESIA reports • Introductions • Logistics
Data handover	• All gathered data are to be handed over to the developer for continued use

- identifies the consultant's role in the process of conducting the ESIA, and not only the delivery of a technically sound report;
- clarifies the separate roles and responsibilities of the consultant and the developer in the ESIA process, such as arranging consultation events, introductory meetings with traditional leaders, and logistics.

4.3 Scoping an ESIA

4.3.1 Scoping

The scoping stage is the first stage of an ESIA process, and is critical in defining the detailed studies that will be necessary in the impact assessment stage. The objectives of the scoping stage are to:

- develop a clear and agreed understanding of the project activities and associated drivers of impacts, so that the ESIA team can identify impacts on the basis of this understanding;
- define the area of influence of the project, which will be the geographical scope of the impact assessment;
- identify the legal requirements in all environmental and social areas that the project will be required to comply with, and the international standards and guidelines and corporate policy requirements that the project must meet;
- obtain stakeholders' views and concerns on the proposed project, so that the impact assessment will take these views into account;
- assemble baseline data using secondary information, i.e. information that is available without further primary data collection; and
- identify which potential impacts require further baseline data collection or specialist analysis to determine impacts (i.e. are 'scoped in') and which do not (are 'scoped out').

The scoping stage should then result in the definition of the scope (i.e. terms of reference) for the subsequent primary data collection, analysis and consultation to be conducted for the full impact assessment. The scoping report should include initial versions of sections of the ESIA report – the project description, legal and administrative, and secondary baseline information – as well as the scoping of potential impacts.

Even for an existing project, an assessment of emerging issues should begin with a scoping exercise to determine which data, methods, issues, or areas should be the focus of the assessment. For example, a fishing community or fishing businesses may complain persistently of lower downstream fisheries production early in the operation stage. To investigate the concern, it would be necessary to scope an assessment methodically, based on the

issues raised, stakeholder consultation, identification of parameters to be measured, and fish species to be assessed.

Further reading:

- IAIA (2018). *Fastips 18: Scoping.*
- European Commission (2001). *Guidance on EIA: Scoping.*

4.3.2 What should be in the Project Description?

The purpose of the project description in the scoping report and ESIA report is both to:

- enable all stakeholders who have interests in the project to obtain a clear and comprehensive understanding of the project; and
- identify the features, activities, and resource use of the project with sufficient precision that, with the receptors identified in the baseline, impacts on those receptors can be predicted.

For a hydropower project, the project description should include at least the items listed in Table 4.1. It is useful to distinguish the key permanent features of, or changes arising from, the project – such as the damming of the river, the disruption or diversion of river flows, and the acquisition of land and its conversion to a reservoir – from the temporary activities of construction, and the activities that occur during operations (similar to the three groups in Table 2.1). To predict construction impacts, it is essential that the project description identifies the volumes of materials and energy required, waste types and volumes, and the size of the workforce required. To predict impacts of operations, it is vital that it includes the operating regime and environmental flows. Some approaches in ESIA may produce analysis of 'impact factors' – such as hydrology, which is an extension of the project description, and is used to predict impacts, e.g. of altered hydrology on fish species. The technical and quantitative details of the project, as set out in Box 4.6, should be presented in tabular format.

The project description is the basis upon which the impacts will be analysed. If changes are made to the technical project details during the ESIA process (for example, as a result of ESIA findings), the project description would need to be updated accordingly, including with design-related mitigation measures.

Box 4.7 Technical project details to be presented clearly in the Project Description

- Installed capacity (MW)
- Construction start date (planned or actual)
- Commercial operations date (planned or actual)
- Annual average generation (GWh / year)
- Associated infrastructure: road(s) (length)
- Transmission lines and sub-stations (names, lengths and capacities)
- Total cost (USD m)
- Annual operating costs (USD m)
- Project development cost not including transmission (USD m)
- Transmission costs for project development (USD m)
- Specific investment cost (USD m / MW)
- Levelised energy cost (USD / kWh)
- Dam type
- Dam height (m)
- Dam length at crest (m)
- Units (number, type, MW)
- Full supply level (FSL) and minimum operation level (MOL)
- Reservoir area at Full Supply Level (FSL) (km^2)
- Reservoir volume (active and dead storage) (m^3)
- Average net head at FSL (m)
- Average flow (m^3/s)
- Design flow (m^3/s)
- Environmental flow (e.g. minimum flow (m^3/s)
- Load factor

4.3.3 Defining the Area of Influence (AoI)

It is common practice to define the proposed project's area, or areas, of influence (AoI) in an ESIA. These define the geographical scope within which the impacts of the project are assessed. Often, a 'direct area of influence' and an 'indirect area of influence' are identified, with the latter being a wider zone of influence in which indirect impacts may be experienced. However, in hydropower, the geographical area across which impacts will be felt will vary considerably depending on each impact, and it is not always clear whether an impact is direct or indirect. A better approach is to identify zones based on the components or activities of the project: for example, the infrastructure zone of impact (around the dam and construction sites), upstream/reservoir zone of impact, downstream zone of impact (reaching as far downstream as the alteration in flows becomes limited, probably after a major confluence), and project transmission corridor.

4.3.4 Geographical Information Systems (GIS) and mapping

Geographical information and maps will be important to presenting the details of the project throughout its life cycle, and very useful in the analysis of potential and actual impacts; and even in monitoring. Reference to satellite imagery and maps will begin in the earliest stages of project concept identification.

GIS and mapping are now far cheaper than in the past, and basic mapping can be produced at no cost, using freely available satellite imagery. The use of scanned blurry images of an old map showing the project location, or of unreadable Google Earth screenshots, should now be avoided.

Detailed maps of the project location, layout, Areas of Influence, and the wider environmental and social context, will be necessary for scoping during the EIA stage. However, geographical information is extremely valuable in the assessment of impacts (for example, overlaying the project footprint and social infrastructure that will need replacing); the planning of mitigation measures (such as replacement infrastructure); storage and presentation of monitoring data; and the generation of maps for communications and presentational purposes. For instance, the Jirau project in Brazil (see Annex 2) developed a GIS-based data storage system for environmental and social monitoring.

The principle of using visual, geographical information can be extended to the use of 3-D mapping and computer generated imagery to present the 'before' and 'after' of the project during the preparation stage.

Further reading:

- https://www.arcgis.com/index.html
- Digital Environmental Impact Assessments: A StoryMap of how the ArcGIS platform can support the EIA process. https://www.arcgis.com/apps/Cascade/index.html?appid=3a570d38b19c4bb388a04d9915882e28
- https://www.esri.com/en-us/home

4.3.5 Identifying legal requirements and international standards

The scoping stage should deliver at least an initial identification of the legal requirements relating to environmental and social legislation that will be applicable to the project, and any international standards and guidelines that the developer intends to follow, including the requirements of potential lenders. Legal requirements must clearly distinguish the requirements for the ESIA process itself, and those pertaining to the project.

A good consulting firm, appointed to conduct the ESIA, should know how to identify relevant environmental and social legislation. There are also information services on environmental law, such as ECOLEX web (www.ecolex.org), operated jointly by FAO, IUCN and UNEP. The ECOLEX database includes information on treaties, international soft-law and other non-binding policy and technical guidance documents, national legislation, judicial decisions, and law and policy literature.

In some jurisdictions, the government or transboundary basin management organisations will have established guidelines for ESIA in hydropower, as in the examples of the Mekong and Bhutan, listed under Further Reading.

It is also important to identify the project-specific legal requirements. For example, an implementation agreement or a concession agreement between the government and the developer will set out project-specific conditions related to environmental and social issues.

The international standards of potential lenders can be found easily, as listed under Further Reading below. These international standards may include specific guidelines in certain areas, e.g. acceptable water quality standards of effluents.

It is also important to identify the corporate policy requirements of the developer itself, or the companies that are joint venture partners or investors in the developer.

Further reading:

- www.ecolex.org, a Joint initiative of IUCN, UNEP and FAO, providing a web-based searchable database of environmental legislation and guidelines.
- UNEP (2018). *Assessing Environmental Impacts – A Global Review of Legislation.*
- Mekong River Commission (2019). *MRC Hydropower Mitigation Guidelines – Guidelines for Hydropower Environmental Impact Mitigation and Risk Management in the Lower Mekong Mainstream and Tributaries.*
- *Bhutan Hydropower Guidelines.* Section B – ESIA and ESMP Processes, Methods and Topics Section.

4.3.6 Consultation during Scoping

An initial round of stakeholder consultation is essential during scoping, and public hearings at this stage may be a legal requirement. This is important for identifying the concerns of stakeholders to be integrated into the scope of the impact assessment. For example, if operators of recreation and tourism businesses are concerned about potential reduced custom, the impact assessment should place sufficient emphasis on the scale of impacts on tourism, and measures to be taken to minimise and mitigate these impacts.

4.3.7 Associated facilities

The scoping stage is also used to define which associated facilities, such as the transmission line and access road, are included in this ESIA process, and which are subject to separate ESIA processes. For example, a transmission line above a certain voltage or length may be required under environmental legislation to undergo a separate ESIA process of its own. Clarifying which facilities are within scope and which are outside the scope is important, to ensure that all concerned are confident of what has or has not been permitted, and what are the additional ESIA processes to instigate.

4.4 Preparing baselines

4.4.1 What is meant by 'baseline'?

The HSAP defines a baseline as a "set of measurements, statistics, or conditions used as a basis for later comparison. The baseline refers to the pre-project conditions, against which post-project changes can be compared." The baseline of an ESIA serves to both:

- present the context that will be affected by the project, and is therefore necessary to predict impacts; and
- identify the conditions that future monitoring results can be compared against, in order to check and improve the effectiveness of management measures.

The baseline section of an ESIA can be a lengthy and detailed section, and it may be necessary to develop a summary, leaving details of the baseline in specialist areas for annexed specialist studies or management plans. The baseline is built up

Table 4.3 Checklists for the contents of an ESIA baseline

Physical baseline	Social baseline	Biological baseline
Climate change Climate Climate change and its impacts GHG emissions	**Aquatic biological environment** Regional biogeography Aquatic habitats in the affected reaches Macrophytes Macroinvertebrates Fish species potentially occurring and confirmed in the affected reaches IUCN Red-list status of aquatic species Nationally listed status of aquatic species Migratory species and timing of migration and spawning Endemic species Invasive species Ecostatus and ecological integrity	**Regional context** Administrative and traditional authorities Population and demography Ethnicity Status of women Business and industry Social infrastructure and services • Health • Education • Roads • Ports and navigation
Air quality and noise Air quality Noise and vibration		
Geology and soils Regional geology Seismicity Geology of the site Topography and geomorphology Soils	**Terrestrial biological environment** Regional biogeography Riparian vegetation Riparian fauna Species potentially occurring and confirmed in the affected area • Flora • Birds • Mammals • Reptiles • Amphibia IUCN Red-list status of: • Flora • Birds • Mammals • Reptiles • Amphibia Migratory species and migration routes Endemic species Invasive species	**Affected population** Settlements and population Age and gender composition Literacy and education Ethnicity and Indigenous Peoples Land use and tenure Occupations and incomes Livelihoods • Farming • Flood recession farming • Fishing • Livestock • Tree crops Social networks Transport and mobility Access to public services Gender dynamics Vulnerable groups
Water resources Surface water hydrology Sedimentology Hydrogeology Climate change impacts on hydrology		**Amenity and heritage** Cultural heritage Tourism and recreation Landscape and visual amenity

	Protected areas Nationally protected areas Internationally recognised areas	**Community health and safety** HIV and sexually transmitted diseases Status of pandemic diseases (e.g. COVID-19) Vector-borne diseases Gender-based violence and sexual exploitation and abuse Flood risk Traffic-related injuries and fatalities
	Critical Habitat Analysis	
	Ecosystem services	

progressively through the progress of the ESIA; it is initially based on secondary information at the scoping stage, and then complemented with the results of primary surveys carried out for the project. Most specialist studies – for example, the household survey for a Resettlement Action Plan, water quality surveys, aquatic biodiversity, noise and air quality, etc. – should present baseline information using the same indicators that will be measured in subsequent monitoring.

Table 4.3 provides checklists for the content of the physical, biological and social baselines of an ESIA. The exact contents of the baseline will vary depending on the context and characteristics of the project in question. In some jurisdictions, it will be necessary to identify aspects of the environment related to international agreements and conventions – for example, habitats and species identified in the EU Habitats Directive, the Convention on the Conservation of Migratory Species of Wild Animals, or the Ramsar Convention.

4.4.2 Establishing survey requirements for a baseline

The necessary surveys to gather primary data for the baseline will depend on each environmental or social aspect, and the specialist experts in the ESIA team or conducting the specialist studies should be tasked with designing these surveys. The scoping phase should deliver a conclusion on which items of the baseline require primary surveys, and on the scope and methodology for the surveys. The geographical scope of baseline surveys should be at least as extensive as the Areas of Influence; i.e. they should extend to the geographical scope of potential impacts.

In some aspects, longitudinal surveys over a number of seasons and years may be necessary to obtain a true understanding of the baseline; for example, in sediment yields of the river. It is necessary to design surveys to take seasonal, annual and long-term variation into account, especially in biological and social aspects. Details of establishing baselines according to each aspect are discussed in separate How-to Guides on the various HGIIP topics.

The surveys that are necessary for the baseline are likely to be more extensive, in terms of the range of parameters surveyed and geographic scope, than will be necessary for subsequent monitoring. However, baseline surveys should be designed to enable subsequent monitoring to be based on comparable indicators. To achieve this, it is good practice to task the baseline surveyors with the design of subsequent monitoring.

In practice, the impact assessment could be carried out on an initial baseline for some aspects, and the gathering of data to establish a more complete or robust baseline in these aspects will continue beyond the ESIA. For example, if the baseline assessment discovers a fish species new to science, surveys can continue beyond the ESIA to better understand its abundance and habitat requirements.

4.4.3 Valued Environmental Components (VECs)

In some methodologies for ESIA, the preparation of the baseline results in the articulation of 'Valued Environmental Components' (VECs). VECs are any part of the environment and social context that is considered important by the proponent, stakeholders, community, and environmental and social specialists involved in the assessment process. VECs can include but are not limited to biological, cultural, ecological, environmental, physical and social issues. Their value may be related to their cultural or social value, as much as to any scientific understanding of their value.

Defining VECs clearly can be useful for signalling to regulators and to public and private stakeholders that their values are well understood. They allow the clear identification of impacts on VECs, within a defined area of influence, and a transparent assessment of significance of the impact.

4.5 Engaging with stakeholders through the ESIA process

4.5.1 Ensuring appropriate stakeholder engagement in the ESIA process

The range and diversity of approaches to and methodologies for stakeholder engagement – ranging from approaches to planning engagement, principles to follow, survey and consultation methodologies, to digital and multi-media technologies – is too great to summarise in a short section of this How-to Guide. The reader is advised to refer to the resources set out under Further Reading below.

Stakeholder engagement is a fundamental part of ESIA, as it is central to identifying the values of the public and affected communities, and their views on how the project may affect those values. Stakeholder engagement in the ESIA process should include, at minimum:

- Stakeholder identification and analysis during the scoping stage; distinguishing stakeholders that are directly and indirectly affected by the project; and identifying those whose interests or responsibilities determine them as stakeholders.
- Using stakeholder analysis and identification to strategically plan and prioritise engagement (i) through the ESIA, and (ii) beyond the ESIA stage, while recognising the specific needs for consultation with particular groups (for example, to ensure the process is inclusive of women, or that the necessary process for engagement with Indigenous Peoples is followed).
- Identification of the legal or regulatory requirements for stakeholder engagement, which may specify the exact timing of engagement meetings and whether the developer or regulator leads them, for example.
- Public hearings or public consultation meetings during the scoping stage, using clearly understandable summary descriptions of the project and the areas and communities likely to be affected, and ensuring that the findings of scoping are documented and publicly disclosed.
- Specialist consultations or surveys; for example, with directly-affected households or livelihood groups.
- Public hearings or public consultation meetings to present the impacts identified and proposed management measures, with accompanying understandable presentation materials, including a Non-technical Summary.
- Documentation of the findings of stakeholder engagement, and how they have been incorporated into the impact assessment and ESMPs.
- Publication of the full ESIA report.
- The establishment of a grievance mechanism at an early stage, through which members of the public may raise concerns about the ESIA process.

The Scoping Report prepared during the ESIA process should set out how engagement is to be conducted through the remaining ESIA process. However, the ESIA should result in a

Box 4.8 Principles of stakeholder engagement for environmental and social assessment and management

Stakeholders are persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively. Stakeholders may include: locally affected communities or individuals, and their formal and informal representatives; national or local government authorities, politicians, religious leaders, civil society organisations and groups with special interests; the academic community; or other businesses.

Stakeholder engagement should be planned and implemented to ensure that consultation is:

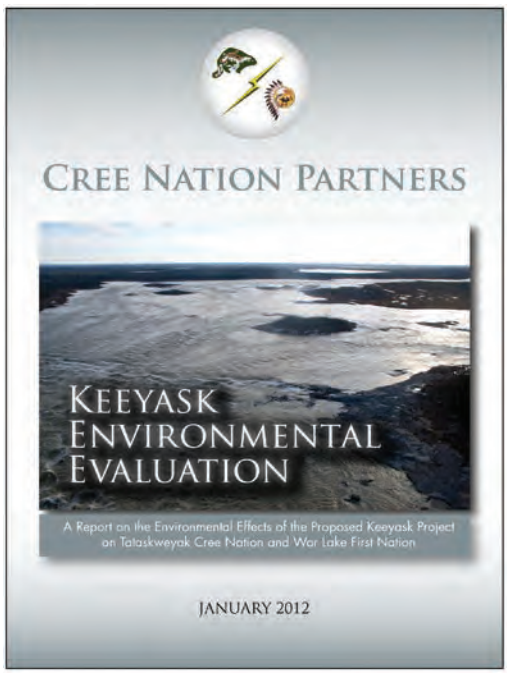
- **Early**, so that issues raised, and plans to address them, can be integrated into project designs and planning;
- **Focused** on those most likely to be affected by the project (or during construction and operations, those who are most affected);
- **Informed**, i.e. stakeholders are informed using understandable and clearly presented information in advance and through consultation, including in some circumstances by the involvement of independent experts or expert witnesses;
- **Meaningful** because it is early, there is sufficient time for consultation, and those consulted can express their views on the basis of being informed about the project (and not misinformed inadvertently);
- **Culturally appropriate**, i.e. appropriate to the culture, livelihoods and lifestyles of the stakeholders, in its timing, language, length, location, etc.;
- **Two-way** so that participants have the opportunity to provide their views, and the developer has the opportunity to provide information and explain key issues;
- **Good faith**, i.e. undertaken with honest intent to reach a mutually satisfactory understanding of the issues raised;
- **Gender-inclusive** through awareness that men and women often have differing views and needs;
- **Localised** to reflect appropriate timeframes, context, and local languages;
- **Free from** manipulation or coercion;
- **Documented** to keep track of who has been consulted and the key issues raised; and
- **Reported** back in a timely way to those consulted, with clarification of next steps.

Adapted from: IFC (2007). Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets.

Box 4.9 An Example of an Innovative Approach in ESIA Consultation: Keeyask Project, Canada

As part of the environmental licensing of the 695 MW project in northern Manitoba Province, Canada, a series of stand-alone environmental assessments were conducted by the four First Nations peoples (Indigenous Peoples) affected by the project. These were conducted by the affected First Nations peoples, and separate from the formal environmental assessment conducted for regulatory purposes.

https://keeyask.com/project-timeline/environment-assessment-process/activites/keeyask-cree-nations-enviro-evaluation-reports/



Stakeholder Engagement Plan (SEP) for the ongoing development and operation of the project. The SEP will be a controlled ESMS plan, as described in Section 4.13, and updated regularly. A common pitfall is that an ESIA consultant asked to develop an SEP will do so only for the ESIA stage for which it is responsible.

Further reading:

- André, P., Enserink, B., Connor, D. and Croal. P. (2006). *Public Participation International Best Practice Principles. Special Publication Series No. 4*. Fargo, USA: International Association for Impact Assessment.
- BSR (2016). *The Future of Stakeholder Engagement Transformative Engagement for Inclusive Business*. https://www.bsr.org/reports/BSR_Future_of_Stakeholder_Engagement_Report.pdf
- EBRD (2020). *Stakeholder engagement (PR10) – COVID-19*. EBRD briefing note.
- IFC (2007). *Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets*.
- IHA (2017). *Hydropower Sustainability Good International Industry Practice,* Chapter 1 – Communications and Consultation.
- Kvam, R. (2019). *Meaningful stakeholder engagement: a joint publication of the MFI working group on environmental and social standards*. Inter-American Development Bank.
- IADB (2019). Meaningful Stakeholder Engagement. Joint Publication of the Multilateral Financial Institutions Group on Environmental and Social Standards.
- UNECE (2014). Protecting your environment – the power is in your hands: Quick guide to the Aarhus Convention.
- UNECE. Good Practice Recommendations on Public Participation in Strategic Environmental Assessment (prepared under the Protocol on SEA to the Espoo Convention).

4.5.2 Public disclosure through the ESIA process

Public disclosure of documents and presentations – not only the ESIA report – is an important and useful part of stakeholder engagement. It is a requirement of international lenders, and is often a regulatory requirement, for at least a fixed period in the case of the ESIA report.

Disclosure is normally achieved by uploading the documentation to a website, preferably a project-dedicated website. However, if there are stakeholders or affected communities who will not be able to access the documents from a website – as is the case with many stakeholders (for example, many elderly people in most developed countries do not use the internet) – additional efforts should be made to make key ESIA reports and findings accessible to them.

A non-technical summary is a common way of summarising the key findings of the ESIA. This should use numerous graphics and pictures, avoid technical language (so that any member of the public will understand the language used), and be short (a few pages).

Further reading:

- IAIA (2015). *Fastips 9: Non-Technical Summary.*

Box 4.10 Some examples of websites for public disclosure of environmental and social assessments, including non-technical summaries

https://keeyask.com/the-project/

http://www.selihydropower.sl/

https://www.tina-hydro.com/

https://www.itaipu.gov.br/ https://www.itaipu.gov.py/

https://hvammur.landsvirkjun.is/

4.6 Identifying impacts, significance, and mitigation measures

4.6.1 Linking project activities with the baseline, to identify impacts systematically

The assessment of impacts involves four main stages, namely (1) identification and prediction, (2) determination of significance, (3) identification of mitigation measures, and (4) evaluation of residual impact.

Impacts may be direct or indirect, adverse (negative) or positive, induced or cumulative. Definitions of these terms are provided in Table 4.4.

The methodology for an impact assessment is to systematically consider whether each project feature or activity will have an impact on each aspect of the baseline. This can be considered as a matrix approach, with activities as rows and aspects of the baseline as columns, and impacts may be summarised in this way in the ESIA report, as in the example in Figure 4.2. Every impact may not fit into this approach, as some may result from a number of project activities, but it is useful to use this approach to check that all potential impacts have been identified and assessed.

4.6.2 Methodologies for assessing the significance of impacts

Assessing the *significance* of each identified potential impact of the project is fundamental to an ESIA. Impacts that are concluded to be Not Significant (NS) do not require any management. Impacts that are Significant (S) must be avoided, minimised, mitigated or compensated, so that the residual impact is Not Significant.

The significance of each impact is determined by categorising the Magnitude of the impact and the Sensitivity of the receptor, as shown in Figure 4.3.

Negligible and Minor impacts are Not Significant, and Moderate and Major impacts are Significant. The matrix and definitions of the Negligible, Low, Medium and High categories of Magnitude and

Table 4.4 Definitions of types of impacts

Type of Impact	Definition
Negative	An impact that is considered to be an adverse change from the baseline or introduces a new undesirable factor.
Positive	An impact that is considered to be an improvement on the baseline conditions or introduces a positive change.
Direct impact	Impacts that result from a direct interaction between a planned project activity and the receiving environment/receptors (e.g. the loss of vegetation and habitat as a result of site clearing, or between an effluent discharge and receiving water quality).
Indirect impact	Impacts that result from other activities that happen as a consequence of the project.
Induced impact	Induced impacts are a type of indirect impact, and result from activities that occur in response to the changes brought by a new development (e.g. increased forest loss due to in-migration using improved access from the construction of the project access road). They may also be referred to as secondary impacts.
Cumulative impact	The combined effects of the project and other existing or planned future developments or natural processes on the same resources and/or receptors; these effects are additive or interactive in nature.

Sensitivity may vary according to the consulting firm conducting the ESIA. Some generic definitions are provided in Table 4.5. Some firms have their own systems for determining sensitivity according to each aspect, in some cases by linking it to the value of the receptor (for example, a species that is critically endangered has high sensitivity). Magnitude may be based on a further series of criteria, as shown in Table 4.6.

In many jurisdictions, the regulatory authorities may prescribe what factors must be considered in assessing significance, and provide a precise methodology for assessing significance. Regardless of which precise methodology of assigning significance is used, the determination of significance should be based on clear criteria that are presented clearly to stakeholders, and it should take into account both the physical facts of an impact and the values of stakeholders related to the affected environmental component. It is important that the baseline data collection and analysis provides the information necessary to assess the criteria used to determine significance.

In assessing significance, it is also important to apply the precautionary principle. The classic definition of the precautionary approach comes from the 1992 Rio Declaration on Environment and Development, which states that "Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation" (UNEP 1992). In impact assessment, the precautionary principle requires planning for measures to manage an impact, even if the impact is not certain.

Further reading:

- IAIA (2016). *Fastips 14: Assessing Significance in Impact Assessment of Projects.*
- IAIA (2018). *Fastips No. 17: Induced Impacts.*
- Science for Environment Policy (2017). *The Precautionary Principle: decision making under uncertainty. Future Brief 18.* Produced for the European Commission DG Environment by the Science Communication Unit, UWE, Bristol. Available at: http://ec.europa.eu/science-environment-policy

Figure 4.2 Example of a summary table of impacts related to project activities and aspects of the baseline (Ngonye Falls hydroelectric scheme, Zambia) *Note: S=Significant; NS=Not Significant*

	Environmental / Social Aspects														
	Greenhouse Gas Emissions	Climate Change Resilience	Air Quality	Noise and Vibration	Geology and Soils	Water Quality & Sedimentation	Hydrology	Aquatic Biodiversity	Terrestrial Biodiversity	Livelihoods and Access	Community Health and Safety	Loss or Damage to Land and Structures	Occupational Health and Safety	Cultural Heritage	Landscape and Visual Amenity
Permanent Project Features															
Permanent acquisition and conversion of land									NS	S		S		S	
Power canal, forebay and power plant									NS	S	S	S		S	S
Headworks (weir, embankments and barrage)					NS		S	S	NS	S	S			S	S
A 5 km 220 kV interconnector line									NS	NS	NS	NS			NS
Permanent headpond	NS	NS			NS	NS	S	S	NS	S	S	S		S	S
Construction Phase Activities															
Temporary acquisition of land									S	S		S			
Site preparation and clearing of land			S	NS	NS	NS			S		S		S	NS	S
Mobilisation and employment of 3,100 people						S		S	S	S	S		S		S
Heavy construction activities throughout the site	NS		S	S	S	S			NS	S	S		S	S	S
Instream construction activities				NS	S	S		S	NS	S	S		S		S
Water abstraction (from river) for construction								NS							
Temporary diversion of flows/ reduced flows to downstream reaches						NS	S	S		S	NS			NS	
Construction traffic movements – internal and external	NS		S	NS	NS				NS		S		S		
Procurement of materials and services for construction	NS									S			S		

Bulk storage of materials on site			NS		S	S		S			S		S		
Waste generation (hazardous and non-hazardous)					S	S		S			S		S		
Lighting of contractor work areas									NS						NS
Demobilisation of employees										S	S				
Dismantling of construction buildings and plant			S	NS		S			NS		S		S		
Operations and Maintenance (O&M) Phase															
Reduction in flows downstream of the headworks		NS				S	S	S	S	S				S	S
Floodplain inundation around the headpond and upstream		NS					S		S	S	S	S		NS	
Weir/barrage operations and maintenance						S	S	S					S		
Power plant operations and maintenance				NS	NS	S	NS	S	S				S		
Power plant shut downs – managed and unmanaged							S	S			S		S		NS
Use of water (operators, camp/centre)						NS	NS								
Traffic movements	NS		NS	NS							NS				
Employment of 100 people								NS	S	S	NS		S		
Generation of electricity		NS								S					

Figure 4.3 Significance Ranking Matrix

		Sensitivity			
		Negligible	Low	Medium	High
Magnitude	Negligible	**Negligible** Not significant	**Negligible** Not significant	**Negligible** Not significant	**Negligible** Not significant
	Low	**Negligible** Not significant	**Minor** Not significant	**Minor** Not significant	**Moderate** Significant
	Medium	**Negligible** Not significant	**Minor** Not significant	**Moderate** Significant	**Major** Significant
	High	**Minor** Not significant	**Moderate** Significant	**Major** Significant	**Major** Significant

Table 4.5 Definitions of negligible, low, medium and high Magnitude and Sensitivity

	Magnitude	Sensitivity
Negligible	No perceptible change to the specific condition assessed.	Receptor (human, physical or ecological) with good capacity to absorb proposed changes and good opportunities for mitigation.
Low	Detectable but minor change to the specific condition assessed; well within accepted standards and limits.	Receptor (human or ecological) with some capacity to absorb proposed changes or moderate opportunities for mitigation.
Medium	Detectable change to the specific conditions assessed, resulting in non-fundamental temporary or permanent change; within accepted standards and limits.	Vulnerable receptor (human or ecological) with limited capacity to absorb proposed changes or limited opportunities for mitigation.
High	Fundamental change to the specific conditions assessed, resulting in long-term or permanent change; typically widespread in nature, and requiring significant intervention to return to baseline; exceeds accepted standards and limits.	Vulnerable receptor (human or ecological) with little or no capacity to absorb proposed changes or minimal opportunities for mitigation.

Table 4.6 Criteria used to determine Magnitude

Criteria	Description	Designations
Intensity	The intensity or severity of the impact.	• Negligible • Low • Moderate • High
Extent	The reach or spatial (geographical) extent.	• On-site • Local • Regional • National
Scale	Scale of the impact (as a relative measure); e.g. the size and proportion of a group or system affected, or the scale of effects in the context of the study area.	• Low • Medium • High • A measured value
Duration	The time period over which a resource or receptor is affected. Permanent impacts would be considered irreversible.	• Temporary • Short-term • Medium-term • Long-term • Permanent
Frequency	A measure of the constancy or periodicity of the impact.	• Low/occasional • Medium • High • A measured value
Likelihood	Likelihood of the impact occurring (i.e. this expresses the uncertainty or confidence limits of the occurrence of scale of the impact, or the probability of an accident or unplanned event occurring)	• Highly Unlikely • Unlikely • Likely • Highly Likely • Definite

Box 4.11 Avoid, minimise, mitigate and compensate

The mitigation hierarchy refers to a sequential process, through which potential impacts are first entirely avoided, for example, through selecting an alternative project option without these impacts, or adjusting the design (e.g. the height of the dam) to avoid these impacts. If it is not feasible to entirely avoid some potential impacts, the next priority is to minimise them, through redesign or management measures. Only after options to avoid and minimise the impact have been exhausted should mitigation be considered. Options for mitigation should be exhausted before compensation is considered. If the remaining impact after mitigation (i.e. the residual impact) is significant, then compensation should be provided.

	Environmental example: potential loss of the habitat of a critically endangered bird species	Social example: potential safety risks for a number of downstream fishing villages, due to peaking generation
1. Avoid the activity that creates the impact	If the habitat occurs within the footprint of the reservoir, find an alternative project that does not affect this type of habitat.	Find an alternative project for peaking generation, with no downstream population.
2. Minimise the activity	If no alternative project can be found, redesign the project to reduce the area of the habitat that will be lost, e.g. by adjusting the dam location or reservoir full supply level.	Restrict peaking generation to a fixed period each day, e.g. evening, and restrict the rate at which flows can be increased or decreased.
3. Mitigate the impact	Increase the ability of the remaining habitat to support the endangered bird species, e.g. by enriching with its preferred food species.	Warning signage and sirens to warn river users of increases in flow.
4. Compensate for the impact	Protect this type of habitat elsewhere, or recreate it elsewhere, to achieve a net gain in the bird species that offsets the loss due to the project.	If the remaining safety risk prevents fishing on the river, provision of replacement livelihood assets and transitional allowance.

4.6.3 The mitigation hierarchy

If a particular potential impact of the project is considered to be significant through the above methodology, the next step is to determine which measures can be taken to avoid, minimise and mitigate the impact, and if necessary, compensate for it. The aim is to first entirely avoid, or then to minimise, or then to mitigate, or then to compensate for the impact, so that any remaining residual impact is not significant. Box 4.10 describes the mitigation hierarchy and presents environmental and social examples.

4.6.4 Residual impacts: the conceptual approach of reducing all to not-significant

Residual impacts are defined as those impacts that remain following the implementation of these measures. The impact assessment process should seek to iteratively consider the likely effectiveness of the measures in reducing the magnitude of the impact, and identify additional or alternative measures, so that the residual impact is not significant. This process is depicted in Figure 4.4.

The residual impact can be determined for each aspect or VEC that was presented in the baseline description. This compares the pre-project baseline

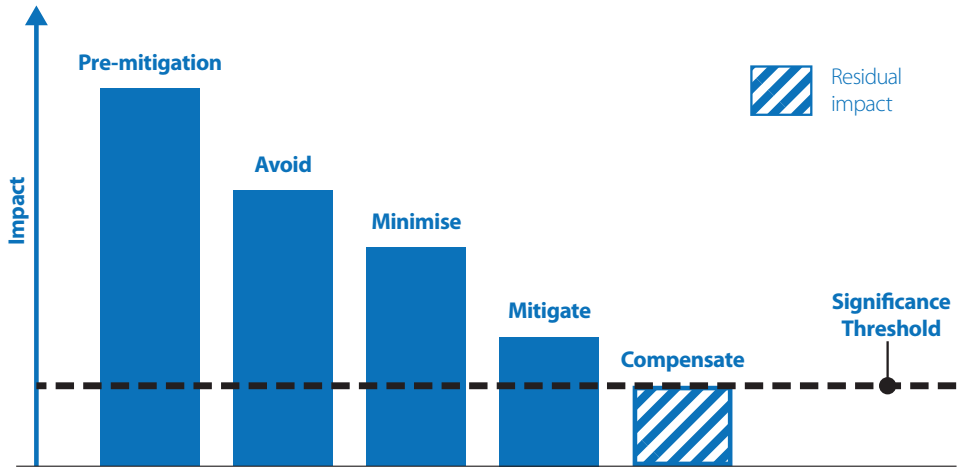


Figure 4.4 Applying the mitigation hierarchy until residual impacts are not significant

and post-project conditions (with mitigation measures in place), and helps the reader to understand how much the baseline environment is likely to change with the implementation of the project.

4.6.5 Design measures to be integrated into project designs and feasibility

Avoidance, minimisation and some mitigation measures may be design measures that are integrated into the engineering designs of the project. This requires the close cooperation of engineering consultants (or the engineering staff of the developer) and ESIA consultants (or the environmental staff of the developer); or it requires that proposed design measures are clearly communicated to design engineers. For this reason, it is often the case that the developer appoints the consulting firm that is conducting pre-feasibility and feasibility studies to conduct environmental and social screening, and the ESIA.

Examples of these design measures include: dam height, spillway height and intake levels (determining reservoir levels); length of dewatered reaches; siting of the dam and power house; downstream regulating dams; energy dissipation structures in the tailrace; sediment bypass tunnels and channels; bottom outlets for sediment management; fish passes and ramps; micro-siting of specific components such as access roads; fish screens, and turbine design to minimise entrainment of aquatic biota. There may also be a requirement for design measures to minimise construction stage impacts: for example, layout of the construction stage facilities, and the drainage design of the construction site.

The need for adaptive management (see Section 4.14.6) may require design measures in some cases, such as for adapting minimum environmental flows. It is important to anticipate the need for such adaptive management measures early in project development, so that the project is designed to accommodate them.

It is good practice to describe the process of design modifications in the analysis of alternatives in the ESIA. This will help to demonstrate that the mitigation hierarchy has been adopted in project planning.

Any measure that a construction contractor is required to construct in order to manage impacts should be integrated into designs so that they may be fully costed, even if the impacts are felt in later stages.

The interaction of design and avoidance/minimisation of environmental and social impacts is an iterative process that commences during the earliest stages of project development, and

Figure 4.5 Example of a summary ESMP matrix with clear mitigation measures (Tina River Hydropower Development Project - TRHDP, Solomon Islands)

Project Activity/ Action and Its Effect(s)	Mitigation		Monitoring and Reporting	Budget
	Mitigation Measure(s)	Responsibility / Timing		
Measures to Protect the Natural Environment During, or as a Result of:				
1. Reservoir Preparation, Filling, and Operation				
GHG emissions; suspended solids on aquatic life; river pollution on aquatic life; temporary diminished water quality; reservoir water quality	• Prepare Reservoir Preparation Plan • Clear trees >10cm dbh and strip loose soil and rocks from reservoir area during dry season prior to inundation • Use of herbicides will not be permitted • (see also Vegetation Management Plan) • (see also Sediment and Erosion Management Plan)	• BOOT Contractor to prepare plan / pre-construction • BOOT Contractor to implement with support from local Community labourers in last dry season of construction phase; and operation phase	• TRHDP PO to Audit BOOT Contractor; • BOOT Contractor E&S Subconsultant to monitor and report on pre-construction completion of plans, and construction phase implementation	• Included in BOOT Contractor's USD 2.0M ESMP budget
Surface hydrology; reduced flows on aquatic life; water users	• Maintain minimum E-flow of 1.0m^3/s in bypassed section of river	• BOOT Contractor / late construction phase; and operations phase	• TRHDP PO to Audit BOOT Contractor; • BOOT Contractor E&S Subconsultant to monitor and report / operations phase	
Reduced overnight flows on surface hydrology, aquatic life, and water users	• Maintain minimum of 3.4m^3/s flow downstream of powerhouse at night	• BOOT Contractor / operations phase	• TRHDP PO to Audit BOOT Contractor; • BOOT Contractor E&S Subconsultant to monitor and report / late construction phase; and operations phase	
Reduced sediment transport, with changes to aquatic life; reduced gravel extraction; reservoir sedimentation	• Periodic flushing of sediments from reservoir, or drawing down of reservoir to excavate/ dredge sediments	• BOOT Contractor / operations phase	• TRHDP PO to Audit BOOT Contractor; BOOT Contractor E&S Subconsultant to monitor and report in construction phase implementation	

2. Hydro Facility Operation				
Reduced flows between dam and power station; indirect impacts on fauna; direct impacts on aquatic fauna; water users	• Prepare Environmental Flows Management Plan • Maintain minimum E-flow of 1.0 m^3/s in bypassed section of river	• BOOT Contractor to prepare plan / pre-construction • BOOT Contractor to implement in operation phase	• TRHDP PO to Audit BOOT Contractor • BOOT Contractor E&S Subconsultant to monitor and report on pre-construction completion of plans, and construction phase implementation	• Included in BOOT Contractor's USD 2.0M ESMP budget
3. Barrier to Fish Passage and Fish Entrainment				
Dam as barrier to upstream fish migration	• Prepare Fish Passage Plan • Implement trap and haul fish passage system	• BOOT Contractor to prepare plan / pre-construction • BOOT Contractor to implement onwards from commissioning stage of late construction phase	• TRHDP PO to Audit BOOT Contractor; • BOOT Contractor E&S Subconsultant to monitor and report on pre-construction completion of plans, and construction phase implementation	• Included in BOOT Contractor's USD 2.0M ESMP budget
Dam as barrier to downstream fish migration; entrainment of fish into power intakes	• Spill water over spillway early wet season; install fish exclusion screens	• BOOT Contractor / operations phase	• TRHDP PO to Audit BOOT Contractor; • BOOT Contractor E&S Subconsultant to monitor and report / operations phase	

continues through the scoping stage of the ESIA and the impact assessment. The process links in with consultation and stakeholder input, regarding the significance of impacts and the suitability of proposed avoidance and minimisation measures.

4.6.6 Identifying mitigation measures

It is necessary to identify mitigation measures for all significant impacts. All measures identified should be sufficiently specific, and should include the timing, proposed responsibility for implementation, and costs of the measures. Defining each impact with sufficient precision is helpful in identifying clear, well-scoped mitigation measures. It is important to avoid measures which are meaningless, and simply repeat the receptor or impact, e.g. 'erosion management measures'. Figure 4.5 provides an example of well-defined mitigation measures in an ESMP of a project in the Solomon Islands.

4.6.7 Positive impacts and benefits

The impact assessment process can also be used to identify the potential positive impacts of a project, specify the measures that can be taken to enhance these positive effects, or propose mechanisms to provide additional benefits. The identification and delivery of opportunities to have a positive impact runs through the HSAP in its proven best practice criteria for each topic.

However, it is very important to ensure that the EIA or ESIA does not present only the potential positive impacts of the proposed project, with a limited

assessment of the adverse impacts. This has been a widespread weakness regarding the assessment of social impacts. The benefits of the project, in terms of its objectives in power generation or, for example, flood control, should be confined to the Project Rationale section.

The process of environmental and social assessment, for new and older hydropower projects, can be used to:

- identify and quantify the potential positive impacts, and assess how they might be enhanced through additional measures;
- obtain affected stakeholders' views on potential benefits, and how to enhance them (for example, how to improve the prospects of employment of local women during construction); and
- develop proposals for benefit-sharing mechanisms.

4.7 Incorporating gender, legacy issues and human rights

4.7.1 Gender and social inclusion

The ESIA, and ongoing environmental and social assessment and management, should both:

i. ensure that consultation is conducted inclusively of women and of vulnerable groups; and

i. clearly identify the differentiated impacts of the project on women and girls, and on vulnerable groups, and devise management measures accordingly.

Box 4.12 sets out some ways in which hydropower projects may have greater adverse impacts on women. ESIA reports frequently include a section on gender and a section on vulnerable groups in the baseline or possibly the impact assessment chapters. However, these are rarely a satisfactory analysis of the position of women or vulnerable groups in the local context, or of the differential impacts they will experience as a result of the project's development.

Vulnerable groups that are often identified include: women-headed households (for example, widows and single mothers); people with disabilities; and the elderly. Vulnerable groups include those who may be distinct in some way from mainstream society, for whom the project should find tailored means of engagement, and should assess impacts differentially. Depending on the context of the project, they may include:

- ethnic minorities;
- caste or religious minorities;
- landless people, or those without formal land titles;
- people who practice a distinct livelihood, such as pastoralism;
- lesbian, gay, bisexual and transgender (LGBT) people;
- internally displaced persons or refugees; and
- those with limited education or who are illiterate.

In some contexts, Indigenous Peoples may be a vulnerable minority, and in others the entire local community may consist of an Indigenous People.

Specialist expertise on gender and social inclusion will be necessary, and greater attention should be given to:

- identifying all vulnerable groups, estimating their numbers, and identifying how they might experience different project impacts or greater impacts as a result of their vulnerability;
- assessment of impacts, and specific measures to address and monitor differential impacts;
- ensuring that all management plans, e.g. resettlement plans, take the needs of women and vulnerable groups into account and do not inadvertently have adverse effects on these groups.

Box 4.12 How might hydropower development have greater adverse impacts on women than men?

- The presence of the construction workforce (or any other project employees) exposes women and girls in the community to sexual harassment and the risk of sexual exploitation.
- Men in the local community who become employed on the project increase their economic power further above that of local women.
- Women are excluded from employment opportunities, due to sexist assumptions or because they are less likely to have the necessary skills or construction industry experience than men.
- Some male employees and men who in-migrate to the area stimulate the emergence of a sex industry and use alcohol and drugs, resulting in greater risks of gender-based violence and harassment (GBVH), and the sexual exploitation and abuse (SEA) of women and girls.
- Women in the workforce are subject to sexual harassment, an absence of sufficient accommodation and sanitation facilities, or inferior facilities, and personal protective equipment that is oversized or ill-fitting.
- Women often have greater traditional roles in the farming of vegetables on small riverside or floodplain plots, which are most likely to be lost (upstream) or negatively affected by altered flows (downstream).
- Women are often engaged in and most dependent on the gathering of communal natural resources – through fishing, gathering small aquatic animals for food (e.g. snails), or collecting aquatic herbs, and reeds, lianas and other non-timber forest products – that are lost due to hydropower development, and they are often overlooked in compensation packages.
- Compensation for displacement, including replacement land for customarily owned land, is typically given to the male 'head of household' on the assumption that he will continue to provide for the household. At best, this ignores individual family circumstances, and may be unjust (for example, if the household's property was originally in the wife's family). while in the worst cases it results in the misuse of the compensation and the break-up of the family.
- Women-headed households (for example, by widows or single mothers) may be especially vulnerable to project impacts, as they are most dependent on natural resources or may be unable to take up employment.

There is increasing recognition that a diverse workforce, with a diversity of perspectives, is good for business. This is also true for hydropower development, whether in bringing a diversity of community views into ESIA, or in establishing a diverse construction workforce.

Further reading:

- IIED (2018). *Gender considerations in the restoration of livelihoods: resettlement from hydropower.*
- IFC Hydro Advisory Programme, Powered By Women Initiative: https://www.ifc.org/wps/wcm/connect/industry_ext_content/ifc_external_corporate_site/hydro+advisory/resources/powered+by+women
- It's not just men, maths and hard hats. *International Water Power and Dam Construction,* May 2019.
- CDC, EBRD, IFC (2020). *Addressing Gender-Based Violence and Harassment: Emerging Good Practice for the Private Sector.* Prepared by Social Development Direct.
- Frost, S. and Alidina, R. K. (2019). *Building an Inclusive Organization: Leveraging the Power of a Diverse Workforce.*
- Fauconnier, I., Jenniskens, A., Perry, P., Fanaian, S., Sen, S., Sinha, V. and Witmer, L. (2018). *Women as change-makers in the governance of shared waters.* Gland, Switzerland: IUCN, viii, 50 pp.
- IAIA (2011, updated 2018). *Key Citation Series: Gender and Gender Impact Assessment.*
- Women for Water Partnership https://www.womenforwater.org/publications-wfwp.html

4.7.2 Legacy issues

Legacy issues are the impacts of previous projects that have been unmitigated or not compensated, or long-standing issues with a present (existing) project, or pre-existing issues in the present location of a new project.

The ESIA should identify the legacy issues of previous developments, to determine whether they mean that impacts on affected people will be more severe, and how mitigation and compensation measures may need to be strengthened. Legacy issues are typically social impacts, due to:

- historical disempowerment and relocation programmes, such as for Indigenous Peoples;
- physical or economic displacement by a previous development or an abandoned project, for which compensation was not provided;
- ineffective livelihood restoration programmes of previous developments;
- mistrust in the local community for developers of hydropower or other projects, due to their limited implementation of commitments, or a limited response to unexpected impacts;
- failure to live up to promises and commitments by previous projects, such as the provision of employment opportunities and electricity supplies;
- poorly managed social change in the local area that resulted from previous projects, due to an influx of in-migrants, sexual exploitation and abuse, and environmental degradation; and
- mismanaged or abusive communications between previous developers and communities.

It is useful to explicitly identify these issues, so that the developer can determine whether and how they plan to overcome them.

The identification of legacy issues from the development of an operating project should be a key part of reviewing and updating the environmental and social management of operating

projects. This is discussed in more depth in Section 4.14.9.

4.7.3 Human rights

Human rights are the basic rights and freedoms to which all humans are entitled, encompassing civil, political, economic, social and cultural rights. They are enshrined in international agreements such as the Universal Declaration of Human Rights, 1948.

Concern with multinational companies' abuses of human rights led to a six-year initiative that culminated in 2011 with the publication of the UN's *Guiding Principles for Business and Human Rights*, known as the 'Ruggie Principles' (after Harvard professor John Ruggie, the UN Special Representative for Business and Human Rights). The identification of human rights, how a project's development may affect them, and the measures necessary to protect them, have been subject to increasing focus in ESIA, but still are rarely explicitly addressed.

Key opportunities to improve the focus on human rights in ESIA are:

- Ensure that human rights are identified in the legal and regulatory review, including conventions ratified by the country (e.g. ILO conventions), constitutional rights and other national human rights law, and cases in which defendants have had their rights upheld against developers.
- Plan and deliver consultation so that it respects the human rights of participants, including disadvantaged groups, and gathers their views on how their rights may be affected.
- Put stronger emphasis on impacts on people and their human rights in the impact assessment, and identify risks for human rights.
- Rigorously identify measures to avoid and mitigate negative impacts on people, manage risks for human rights, and monitor these impacts and risks.

Further reading:

- Shankleman, J. (2017). *Can an IFC compliant ESIA also meet human rights standards?* https://www.linkedin.com/pulse/can-ifc-compliant-esia-also-meet-human-rights-jill-shankleman
- UN OHCHR (2011). *Guiding Principles on Business and Human Rights: Implementing the United Nations 'Protect, Respect and Remedy' Framework*. https://www.ohchr.org/documents/publications/guidingprinciplesbusinesshr_en.pdf

4.8 Assessing air quality, noise and wastes

Emissions into the air, noise, and waste generation are issues that will be of most significance during the construction of the project (reflecting this, there is an HSAP topic: I-18 Waste, Noise and Air Quality, only in the Implementation Stage tool). In addition, there will continue to be more minor air, noise and waste issues that require ongoing management during operations.

4.8.1 Air quality and noise

It is often the case that the air is uncontaminated and air quality is high at the site of new hydropower developments. The baseline assessment should either confirm this and identify the assumed baseline of contaminants to be zero, or conduct measurements to ascertain actual levels of contaminants. Typical contaminants to be measured and subsequently monitored are: particulate matter (PM10 and PM2.5); sulphur dioxide (SO2); nitrogen oxides (NO and NO2); carbon monoxide (CO); and volatile organic compounds (VOCs).

Similar principles apply to noise, with measurements of ambient noise in decibels (dB).

It may be necessary to identify the location of receptors that are sensitive to air emissions and noise – for example, the nearest residential housing – and establish a baseline there, with subsequent monitoring.

Box 4.13 Examples of measures for the avoidance, minimisation and mitigation of air quality and noise impacts

Fugitive dust

- Planning land clearing, removal of topsoil and excess materials, and the location of haul roads, tips and stockpiles, with due consideration to prevailing wind direction and sensitive receptors
- Immediate rehabilitation of sites, including landscaping and revegetation
- Compacting and periodically grading and maintaining roads
- Dust suppression techniques on unpaved roads and material stockpiles
- Materials-handling to avoid and reduce multiple transfer points
- Drop heights to be minimised during material transfer activities
- Speed limits on-site and on access roads, to minimise dust generation
- Materials to be covered with tarpaulin, to prevent dust emissions during transport to/from and within site
- No open burning of waste materials shall be permitted

Vehicles and generators

- Manufacturer-recommended engine maintenance programmes
- Regular vehicle inspections
- Driver training to reduce fuel consumption, e.g. measured acceleration and no idling
- Operate equipment and vehicles to minimise exhaust emissions
- Generators of a modern design, and well maintained
- Locate generators and the height of their exhaust pipes to enable dispersion of pollutants
- Location of any hot-mix, crushing, batching or similar plants more than a fixed distance (for example 500 m) from any sensitive receptor
- All plants maintained in conformity with the manufacturer's specifications, instructions and manuals

Noise

- Restrict the most noisy activities to daytime working hours;
- Plan activities in consultation with neighbouring communities, to identify when noisy activities are most tolerable
- Inform neighbouring communities in advance of increased-noise events
- Minimise project-related traffic through community areas and follow predefined routes
- All plant and machinery to use silencers; in no case operate machinery or vehicles with defective or missing silencers, mufflers or exhaust pipes
- Keep blasting activities to the minimum necessary
- Controlled blasting techniques (such as muffle blasting) to prevent fly-rock, and to minimise ground vibrations and dust generation
- Temporary acoustic barriers and deflectors around sensitive receptors or noisy activities such as blasting
- Notices of blasting operations posted on site and in neighbouring communities, with timings
- Warning signals prior to blasting

Quantitative modelling may be necessary to predict the dispersion of air contaminants from a discharge point (or points) to the receptor, or from the source of noise to the receptor (dispersion models).

Measures to be taken to manage air emissions and noise are relatively standard. Box 4.12 sets out a number of potential management measures. The construction contractor will be responsible for ensuring that all necessary measures are taken to meet international and national guidelines and thresholds.

Further reading:

- IHA (2018). *Hydropower Sustainability Guidelines on Good International Industry Practice, Chapter on Waste, Noise and Air Quality.*
- World Bank Group (2007). *Environmental, Health, and Safety Guidelines: General EHS Guidelines,* sections 1.1 Air Emissions and Ambient Air Quality, and 1.7 Noise.
- DiGiovanni, F. and Miguel Coutinho, M. (2017). *Guiding Principles for Air Quality Assessment Components of Environmental Impact Assessments.* IAIA.

4.8.2 Waste management: reduce, reuse, recycle

Effective waste management requires planning, and the ESIA should initially:

- identify the types of wastes that will be generated by construction, including hazardous wastes and spoil;
- identify the volumes of each waste that will be produced, and in some cases, generation rates;
- establish regulatory requirements for waste management, including licensing requirements, requirements for spoil management, and landfill regulations; and

Box 4.14 Waste management during construction of the Chaglla project, Peru

During the construction of the 456 MW Chaglla project in Peru, the construction contractor installed waste separation and collection facilities across the site (with collection bins made from recycled chemicals drums), and established a comprehensive Waste Management Centre.

Waste was separated before being transported to the centre for storage. Metals, plastics, cardboard and tyres were sold for recycling, oil drums were cleaned and sold for recycling, and wood was donated to the local community or chipped for composting.

Large-scale bio-activated composting was employed to treat organic waste from the site kitchens, and the resulting product used in site rehabilitation. A contractor was used to dispose of batteries and electronic waste, as required by the local authorities.

Construction spoil was crushed and shaped into terraces for revegetation, or reused in construction of the dam.

All of these measures, with compression of residual solid waste, reduced the number of truck trips per week to Peru's landfill (near Lima) to one or two.

The Contractor compiled monthly reports on the amounts (in kg) of waste produced in recyclable and non-recyclable categories, its source, and destination, with charts on waste volumes produced to date through construction. These categories included oil-contaminated cloth, fluorescent lights, hospital waste, domestic waste, metals, wood, paper / cardboard, plastics, waste oils, and hazardous waste.

- identify waste management services, including reuse and recycling services, hazardous waste management services, and disposal options.

Based on an analysis of wastes, the ESIA should then identify a strategy for waste management, based on the waste management hierarchy of reducing the quantity of waste generated, reusing wastes, recycling and recovery, and then (only then) disposal. It is important to identify measures to avoid and minimise hazards associated with all wastes during storage and transport, and where and how wastes are to be disposed of to meet regulatory requirements and avoid unmanaged disposal.

The Project ESMP typically includes a Waste Management Plan, and related plans such as a Spoil Management Plan and Hazardous Materials Management Plan. A 'waste recycling centre' that is part of the construction site is a widely used approach to gather and sort wastes prior to reuse or transport off-site for recycling or disposal (see Box 4.14). In some isolated locations, developers establish their own sanitary landfill facilities to dispose of solid wastes; it is important that these meet regulatory requirements, but they also offer an opportunity to benefit local settlements if they are built with sufficient capacity for the disposal of their wastes.

Key performance indicators in waste management include, for example: volumes and percentage of waste, categorised by type, disposed of at the on-site landfill and not reused, recycled or reclaimed; volumes and percentage of waste, categorised by type, reused, recycled or reclaimed; number of non-compliances concerning separation of wastes; number of non-compliances concerning mixing of hazardous waste with non-hazardous; and number of reports of any illegal dumping of wastes.

Further reading:

- IHA (2018). *Hydropower Sustainability Guidelines on Good International Industry Practice,* Chapter on Waste, Noise and Air Quality.

- UNEP and ISWA (2015). *Global Waste Management Outlook*. https://wedocs.unep.org/bitstream/handle/20.500.11822/9672/-Global_Waste_Management_Outlook-2015Global_Waste_Management_Outlook.pdf.pdf?sequence=3&amp%3BisAllowed=

- World Bank Group (2007). *Environmental, Health, and Safety Guidelines: General EHS Guidelines,* sections 1.5 Hazardous Materials Management, and 1.6 Waste Management.

- World Bank pages on solid wastes management: https://www.worldbank.org/en/topic/urbandevelopment/brief/solid-waste-management

4.9 Taking account of third parties and primary suppliers

4.9.1 Roles of third parties such as the government environmental regulator

It is important to gain an understanding at an early stage, regarding the role of government agencies in the assessment and management of environmental and social impacts. Different agencies at different local, regional and national levels of government may have specific roles, depending on the size of the project.

In all jurisdictions, the environmental regulator will at least play a role in approving the ESIA report, in the process of issuing a permit or licence for the project. It also may be required to approve the scoping report and Terms of Reference for the ESIA. In many jurisdictions, it will be the responsibility of the regulator to arrange public hearings or other forms of stakeholder consultation, so that the consultation process is perceived to be independent of the developer. In some locations, it will be necessary to obtain government permissions for any interactions, including surveys, with affected communities. For example, consultation with affected communities will be mediated by state authorities in some regions, and consultation with Indigenous Peoples must be conducted using federal-approved consultants in Brazil.

Box 4.15 Assessing supply chain risks on the Baleh Hydropower Project (1285 MW), Sarawak, Malaysia

Sarawak Energy Berhad (SEB) conducted a major supply chain risk assessment with the main objective of identifying the areas where possible or unexpected events might occur within the supply chain. The assessment identified supply interactions consisting of consultancies, manufacturers, contractors, and vendors of goods and services. It categorised suppliers into three categories, as follows:

- **High Value.** A significant value (monetary) of supply with a lengthy total response time, due to its complex engineer-to-order process. This was caused by a complex manufacturing process, which involved multiple numbers of raw material suppliers, sub-manufacturing of the components, and global transportation across various regulatory environments.
- **High Quantity.** Supplies that were identified as high quantity would require early material planning (including the production process). This gave an initial outlook on the timeline, extent of material supply, and resources that were required for procurement. Due to its high-volume nature, the process of managing inventory was also considered to ensure continuity of the supply chain.
- **Complexities.** Items with limited supply, or from inexperienced suppliers or vendors, low supplier's capacity, and local regulatory conformance and commitment issues.

The identified major supply chain issues, i.e. those categorised as a high risk to the project, were incorporated into the project's risk register and evaluated with Sarawak Energy's subject-matter experts and the contractors. Mitigation measures were identified, and the risks (including environmental and social risks) would be monitored regularly. This would be done by: updating the procurement expediting plan with environmental and social risks; updating the emergency response plan which addresses environmental emergencies such as pollution of waterways and spillage of hazardous materials; and monitoring local content participation.

4.9.2 ESIA reports to meet regulatory and additional requirements

In many countries, a range of aspects of the ESIA requirements may be set out in legislation, ranging from the methodology for assessing significance, to the required structure of the ESIA report, and the number of days for its public disclosure. Investors and lenders may have requirements for the ESIA content and process that differ from or are additional to the regulatory ESIA requirements.

For this reason, it is important to anticipate lenders' and investors' requirements early in the ESIA process, to determine how their additional requirements may be accommodated in the regulatory ESIA process. In some cases, when an investor or lender becomes involved at a later stage, it is possible to prepare an additional or supplementary impact assessment, or supplementary studies addressing their requirements.

4.9.3 How to assess and manage impacts associated with primary suppliers?

Primary suppliers are defined in the HSAP as first-tier suppliers who are providing goods or materials essential for the project. An example may be a quarry or a cement supplier. These suppliers often have significant impacts, especially through weak labour conditions and the absence of basic environmental management.

This is a difficult and challenging area, because even for a large project with significant demand for cement, aggregate and steel during construction, the suppliers of these materials may not be known

at the time of the ESIA, or the suppliers may be in other countries and very distant from the developer.

The developer should seek to systematically and progressively map and prioritise the suppliers and sources of their most significant materials, and identify the key risks in the supply chain – especially the risks of using an unpermitted or illegal supplier, forced labour and child labour, unmanaged displacement of communities, and extraction of resources from protected areas and waterways.

This process may begin during the ESIA, but continue through construction, with progressive updates. Effectiveness in addressing the impacts of primary suppliers will depend on the alternatives available to the construction contractor and the leverage that they and the developer have over the supplier. Where they do have this leverage, they can collaborate with the primary suppliers to propose mitigation measures.

Further reading:

- IFC (2012). *Guidance Note 2 – Labor and Working Conditions,* paragraphs GN93 to GN97.
- CDC/EBRD/DFID/IFC (2018). *Managing Risks Associated with Modern Slavery: A Good Practice Note for the Private Sector* (Ergon Associates and Ethical Trading Initiative).

4.10 Preparing Environmental and Social Management Plans (ESMPs)

4.10.1 Linking mitigation measures to the ESMP(s)

During the preparation of a hydropower project, the impact assessment process will identify the avoidance, minimisation, mitigation and compensation measures necessary to reduce residual impacts to non-significant residual impacts. With details on their timing, and responsibilities and costs for implementation, these measures will be compiled into a coherent Environmental and Social Management Plan (ESMP), or a series of plans for implementation. The ESMP(s) will be the backbone of the permitting conditions, and possibly the conditions agreed with investors and lenders. A permit or licence for the project may refer directly to

Figure 4.6 Development of the ESIA into the ESMP and the ESMS

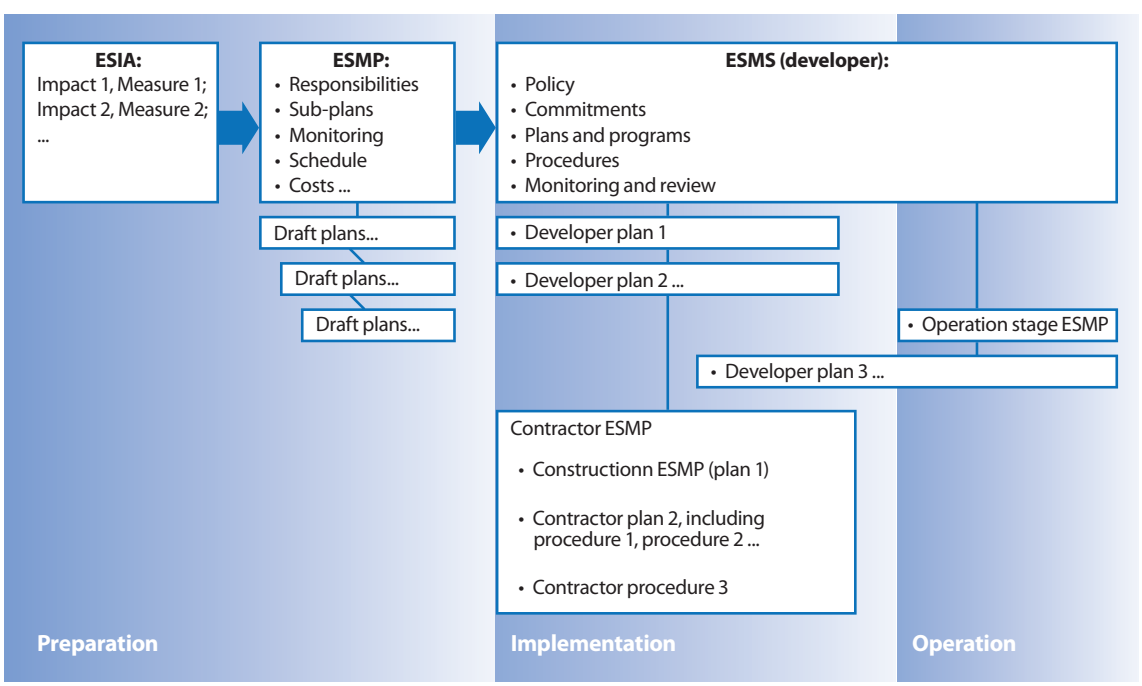


Table 4.7 Contents of an ESMP

Main section	Details
1. Introduction	• Overview of the ESMP • A summary description of the project • A summary table of the significant impacts of the project • Objectives of the ESMP • Structure of the ESMP
2. Developer policy and commitments	• A statement of the environmental and social standards that the developer has committed to, and which the ESMP will meet
3. Legal and policy requirements	• Describing how each legal requirement and commitment to international standards will be met through ESMP implementation
4. Organisational roles and responsibilities	• How roles and responsibilities are divided between the developer, its contractors, the owner's engineer, and other third parties such as government agencies • Personnel (positions and number) necessary for ESMP implementation, and their responsibilities
5. Plans to be implemented	• This may be divided into two sections, for the contractor and the developer • Measures to be implemented, assigned to the responsible party, and with details of timing, cost, and associated monitoring requirements • Identification of design measures to be integrated into engineering designs • Descriptions of how the measures will be implemented through management systems and/or work method statements • Details of each sub-plan and its timing • Plans to be put in place prior to construction mobilisation • Construction stage plans • Developer's plans for implementation through preparation, implementation and operation (e.g. RAP)
6. Monitoring and reporting	• Responsibilities for supervision, reporting, and adaptive management • Reporting frequency and content • Supervisory role of the regulator or other third parties • Planned surveys and methodologies for monitoring substantive issues
7. Implementation schedule and costs	• Plans for implementation during preparation, construction and operation

Table 4.8 Indicative list of ESMP plans for a hydropower project

Implemented throughout Pre-construction, Construction, and Operation Phases	Construction Phase	Operations Phase only
Responsibility: developer	**Responsibility: contractors**	**Responsibility: operator**
• Resettlement Action Plan • Stakeholder Engagement Plan • Grievance Response Mechanism • Project Code of Conduct • Human Resources Management Plans • Gender Action Plan • Local Employment Plan • Occupational Health and Safety Plan • Biodiversity Action Plan • Water Quality Monitoring • Cultural Heritage Management Plan • Community Development Plan • Benefit-sharing Mechanism or Plan • Dam Safety Plans (Quality Assurance, Instrumentation and Monitoring Plan)	• Contractor Environmental and Health and Safety Management Systems • Emergency Response Plan • Human Resources Plan • Local Employment Plan • Worker Accommodation Management Plan • Influx Management Plan • Supply Chain Management • Air Quality and Noise Management Plan • Instream Works Management Plan • Erosion and Sediment Control Plan • Water Resources Management Plan • Hazardous Materials Handling and Waste Plan • Spill Response Procedure • Quarries and Borrow Areas Management Plan • Waste Management Plan • Spoil Management Plan • Construction Traffic Management Plan • Community Health, Safety and Security Plan • Biodiversity Management Plan • Chance Finds Procedure	**Operator's HSES Management Systems, including:** • Traffic management • Spill response • Emergency response • Community health, safety and security • Waste management • Noise thresholds • Lighting controls **E-Flows Management Plan** **Dam Safety Plans:** • Emergency Preparedness and Response Plan • Operations and Maintenance Plan

the ESMP(s), or copy measures from them into the permit or licence.

The ESMP for a small project with limited impacts may be integrated into the ESIA document, but most hydropower projects develop a stand-alone ESMP document, as a distinct volume of the ESIA/ESMP documents.

As the project moves towards implementation, the plans within the ESMP are developed into specialist action plans and management plans that address specific impacts or issues. These would at least include a Construction Stage ESMP, which would be prepared by the main construction contractor. A fully detailed Operation Stage ESMP may be prepared later, during construction, in advance of operations.

Figure 4.6 shows how the measures set out initially in the impact assessment evolve into ESMP plans, which further develop into the plans, programmes and procedures to be implemented through the developer's and contractors' environmental and social management systems (ESMSs).

There is no simple 'off-the-peg' model of how the ESMP should develop into and relate to specific sub-plans and the developer's and contractors' ESMSs. The correct approach will vary depending on the specific issues of the project, and contracting arrangements of each project. The point is that the measures that were identified as necessary for the management of impacts must develop into operable plans, which are implemented through a systematic approach.

4.10.2 Contents of an ESMP document and a sub-plan

Environmental and social management plans (ESMPs) not only describe the range of measures to avoid, minimise, mitigate and compensate impacts, and to enhance positive benefits; they also describe the organisational structures and responsibilities necessary to implement the measures, and how their effectiveness will be monitored. The typical contents of a stand-alone ESMP document are provided in Table 4.7, and an example of a sub-plan for a specific aspect is shown in Figure 4.7. There may be separate ESMPs for Construction (C-ESMP) and Operation (ESMP-O) stages.

While every project has unique circumstances which determine, for example, numbers of resettlement-related staff or whether they use an owner's engineer for HSE supervision, general organisational structures tend to consist of: board-level direction; a management level; and an operational level of HSE engineers, and more specialised environmental and social officers. Figure 4.8 provides indicative organisational structures for environmental and social management in the construction and operation stages.

4.10.3 Range and focus of ESMPs

The range of measures to be implemented are commonly presented in a series of sub-plans or associated plans. Some of these may be significant plans in their own right, such as the Occupational Health and Safety Plan, Resettlement Action Plan (RAP), Biodiversity Action Plan (BAP) and Stakeholder Engagement Plan (SEP), and their content will be determined by the aspect that they address. Other plans may follow a consistent structure, including but not limited to: objectives; standards to be met (e.g. water quality standards in effluent); measures to be taken; corrective actions in the event of non-compliance; reporting; key performance indicators; and monitoring. Table 4.8 describes an indicative list of sub-plans for a hydropower project, and Figure 4.7 presents an example of a sub-plan. In practice, the number and combination of plans is determined by the scale and nature of the proposed hydropower project and its impacts. It is important to combine measures into a coherent set of plans, rather than have a separate plan, with unnecessary documentation, for every aspect or every management measure.

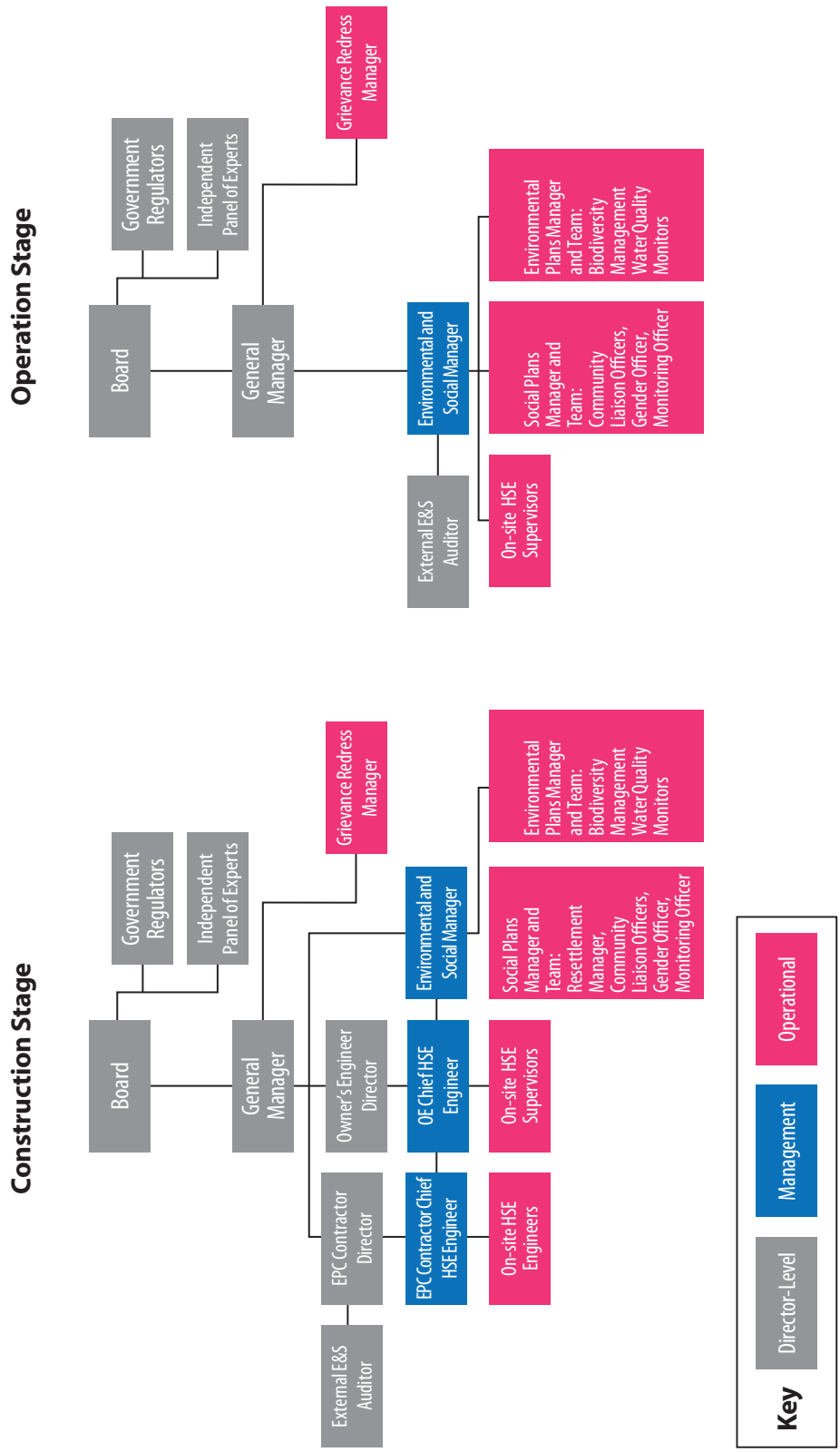
4.10.4 Construction stage ESMP (C-ESMP) for contractor implementation

In the vast majority of cases, the developer will appoint a construction contractor to design and build the entire project (an engineering, procurement and construction contractor, i.e. EPC Contractor). This contractor should be tasked with

Figure 4.7 Example of a sub-plan: Traffic Management Plan, Kariba dam rehabilitation project, Zambia

Objective	To minimise impacts associated with traffic generated by the Project and transport of abnormal loads to the Project Area.
Timeframe	Construction (ie rehabilitation activities associated with the Plunge Pool and Spillway).
Aspect (Project Activity)	Vehicles and traffic associated with the Project and the interaction of these with surrounding communities.
Responsibility	All contractors
Performance Criteria	• No traffic-related incidents and minimal complaints • Minimise impacts on road pavements
Mitigation Measures	• Development and implementation of a traffic management strategy for transport of rehabilitation work materials and equipment to the site, including abnormal loads. • Clear signs and signals will be installed on-site and along access and haul roads to guide traffic movement and increase traffic safety. • Vehicles will observe site traffic regulations (ie speed limits). Vehicles must adhere to speed limits on site, and not exceed 30 km/hr on site. • The transport of oversize loads will be restricted to non-peak periods where possible and deliveries will be restricted to periods of least risk to other road users where possible. • Necessary approvals for the transport of oversized loads will be obtained from the relevant authorities prior to transporting the loads. • All vehicles transporting goods to the Project Area (both local and foreign vehicles) will need to obtain the appropriate licenses and have certificate of fitness. • Rail will be used, where feasible, to transport Project components from the port to the site.
Monitoring and Auditing	• The number of incidents or complaints received in relation to project traffic will be monitored. • Potential transport network shortcomings will b reported to the relevant authorities and appropriate action taken in agreement with those authorities. • Road conditions will be monitored on a regular basis. • Transport companies will be audited to ensure compliance with Traffic Management Plan.
Reporting and Corrective Action	• Records of all monitoring and auditing activities will be kept, with results reported to the ZRA at agreed intervals. • Recommendations and corrective actions arising from audits will be recorded. • All activities that deviate fro normal operating conditions will be reported and corrective action initiated to prevent a recurrence of the incident. • The occurrence of any traffic incidents or complaints will be notified to the EHS Manager and reported to ZRA. • All traffic incidents involving Project personnel will be thoroughly investigated. • All incidents including near-misses and deaths need to be reported through the incident reporting system within 24-hours of the incident occurring. • In the event of a complaint/incident or failure to comply with requirements, relevant corrective action will be taken.

Figure 4.8 Indicative Organograms for Construction and Operation Stage Environmental and Social Management



developing the ESMP and the measures therein, into their own construction-stage ESMP as a first step, prior to construction mobilisation, and should be required to implement it through and as part of their ESMS. If the developer is contracting a number of separate contractors, they should each be tasked with a construction ESMP for the components they are constructing. Even in cases where a state-owned developer is constructing the project, their construction department must be tasked with implementing a C-ESMP and ESMS.

4.10.5 The role of third parties in ESMP implementation

The role of any third parties, other than the developer and the contractor(s), should be identified clearly in the ESMP(s). Examples of these include the roles of:

- the owner's engineer in approving Contractor ESMPs and plans, and in inspections, supervision and reporting (see 4.14.1);
- government environmental regulators or their agents, in conducting inspections and auditing compliance with licence conditions;
- other government regulators tasked with supervising adherence to legal requirements, such as labour agencies with regard to working conditions, and water resource agencies on surface water quality checks;
- independent panels of experts in reviewing performance against ESMP requirements and international standards; and
- the various consultants and specialist experts tasked by the developer to undertake the implementation of specific plans or monitoring of specific aspects.

Environmental and social objectives and targets are included in job descriptions and performance reviews.

4.11 Budgeting

4.11.1 Costing the ESMP(s)

It is essential to fully budget for environmental and social measures. If they are not included in both the developer's and the construction contractors' budgets, then the various proposed measures will likely not be implemented. Because fully costed environmental and social measures can be high, they may have implications for the viability of the project, or the tariff that the developer will seek in its power purchase agreements with the offtaker.

The 'polluter pays' principle requires that no costs of the project's environmental and social management should be externalised to other agencies, such as the government or the public. A good example of this is externalising some or all of the costs of a biodiversity offset to the national parks authority. The developer should be accountable for all of its avoidance, minimisation, mitigation and compensation actions, and cover their costs accordingly.

The developer should integrate its environmental and social costs into its financial models, including: the developer's costs during project development and construction; a construction contractor cost that fully takes account of the environmental and social requirements of the contractor(s); and the ongoing environmental and social costs incurred by operations.

Contractors are responsible for integrating environmental and social costs into their tender prices, but it is important to avoid a situation where the contractor has under-budgeted for these measures. This underlines the importance of ensuring the ESIA process and feasibility design are well aligned; that the procurement process provides full disclosure of the required environmental and social measures to bidders; and that the pre-qualification or tender process excludes contractors that cannot demonstrate a track record in taking environmental and social measures fully into account.

The developer's costs should be estimated in the same manner as with any other budgeting, by specifying the necessary staff and staff costs, material items (including cars, monitoring

equipment, etc.), and unit costs, annually over the life of the project.

4.11.2 Contingency

It is highly likely that there will be unanticipated environmental and social costs, due to the difficulty of estimating them precisely, as well as unanticipated environmental and social impacts. Cost overruns in hydropower have been considerable on some high-profile projects, partly due to higher-than-expected environmental and social costs.

A contingency for environmental and social measures is often included in budgets for environmental and social plans, to cater for these unanticipated costs. Depending on the scale of the budget for these plans, contingencies are often between 5 and 15 per cent.

4.12 Incorporating ES issues into pre-qualification and tendering

4.12.1 Incorporating environmental and social capacity in pre-qualification

The pre-qualification stage of contracting, when potential contractors are shortlisted, can be used to exclude potential contractors with no track record or willingness to address environmental and social issues. This is especially important in pre-qualifying an EPC Contractor or the main construction contractor, but similar principles can be applied to the procurement of contractors throughout the project life cycle.

Environmental and social criteria in pre-qualification must be integrated into the full set of technical and financial criteria to be used. They may consist of mandatory requirements (i.e. those used for pass/fail), as well as items that will be scored. Interested potential contractors should be asked to provide documentary evidence of the mandatory requirements, and statements related to the items that will be scored. These can be requested using a questionnaire format, used equally for all potential contractors.

Mandatory requirements can include, for example:

- Application of environmental and social management systems to a certified international standard.
- No previous violations of environmental regulations and permits.
- Occupational health and safety management systems.
- Actual safety performance (rates of incidents and fatalities lower than an identified benchmark).
- Documented human resources policies, codes of conduct, and grievance mechanisms.

The items that will be scored may be included alongside technical capacity and qualifications, covering:

- A statement of experience and capacity in the management of environmental and social issues.
- Number and qualifications of ESHS personnel.
- Experience in managing human resources issues, including training and promoting local employment, the management of Gender-based Violence, and grievance mechanisms.
- How they manage environmental and social issues of sub-contractors and in their supply chain.

The number of documents and level of detail that should be requested for pre-qualification should be commensurate with the contract. Most detail is required when pre-qualifying the EPC Contractor; less detail is required in a system of pre-qualifying contractors during operations.

To ensure the above, it is essential that the developer's most senior environmental and social personnel are fully involved in pre-qualification. They should contribute environmental and social criteria to the pre-qualification process, document

Box 4.16 Contents of the HSES Requirements in the Technical Specifications of an EPC Contract
Adapted from on an example provided by the developers of the Seli Hydropower Project (143 MW) in Sierra Leone.

1. Applicable Policies and Standards
1.1 Government Legal Requirements
1.2 International Performance Standards including Hydropower Sustainability Tools
1.3 Developer's Company Policies
1.4 Contractor Policy and Commitments

2. HSES Management System
2.1 Establishment of Health and Safety, Environmental and Social (HSES) Management Systems
2.2 Certification
2.3 HSES Plans, Procedures and Practices
2.4 HSES Permits
2.6 Design Considerations
2.7 Community Relations and Grievance Mechanisms
2.8 Human Resources
2.9 Associated Facilities
2.10 Sub-contractors
2.11 Supply Chain Management
2.12 Mobilisation
2.13 Temporary Land Requirements and Restrictions
2.14 Site Rehabilitation and Demobilisation

3. Occupational Health and Safety
[referring to a separate OHS Management Plan if available]

4. Construction Environmental and Social Management and Plan (C-ESMP)
[subsections on each sub-plan, referring to ESMP or C-ESMP]

5. Organisational Capacity and Personnel
5.1 Organisational Capacity
5.2 Personnel
5.3 Induction and Training

6 Monitoring, Supervision and Reporting
6.1 Contractor ESHS Monitoring Plans
6.2 Sub-contractors
6.3 Objectives, KPIs, Measurable Acceptance Criteria, and Targets
6.4 Inspections and Supervision
6.5 Communication of Major Incidents
6.6 Powers to Stop Work
6.7 Adaptive Management
6.5 Reporting (Report Contents and Frequency)

7 Incentives and Penalties
7.1 Incentives for Exceptional ESHS Performance
7.2 Deductions for Remedial Works
7.3 Employee Recognition and Rewards
7.4 Disciplinary Procedures

the responses and attachments of the responding contractors clearly, and ensure that the developer's evaluation of responses objectively evaluates and documents the responses.

Further reading:

- IFC (2017). *Good Practice Note: Managing Contractors' Environmental and Social Performance.*

4.12.2 Incorporating environmental and social requirements into tender documents and contracts

Similar principles of integrating environmental and social requirements apply to the full tendering process, including the definition of mandatory and scored criteria, the full involvement of the developer's environmental and social personnel in the process, and documentation of evaluation results.

A Request-for-Proposals (RFP) package (tender package or bid package) should clearly include the environmental and social (and OHS) requirements that the contractor will be required to follow. For the main construction stage contractor or EPC Contractor, these should consist of at least:

- an environmental and social (often 'HSES' – health, safety, environmental and social) specification, integrated into the Technical Specifications document that will be referred to in the main body of the contract and attached to it;
- the project ESIA and ESMP, including C-ESMP, in which the contractor's responsibilities are clearly established; and
- the developer's environmental and social policy and other relevant policies, and industry standards and guidelines that the developer is committed to.

The HSES specifications that are part of the Technical Specifications should include the standards to be met, requirements for management systems, details of reporting and supervision, the specific design and management measures to be implemented, and requirements for monitoring. The specifications may refer to the ESMP or C-ESMP if it is sufficiently detailed, and should avoid duplication which may introduce ambiguity into the requirements. The aim is to ensure a legally robust contractual arrangement to ensure that the developer can hold the contractor accountable for the required environmental and social performance. Box 4.14 presents a potential table of contents for the HSES requirements.

It can be useful to refer to the Hydropower Sustainability Tools (HGIIP, HSAP and HESG) as standards and guidelines to be followed in the HSES specifications, and to require tenderers to describe how they will meet these standards as part of their tenders.

The evaluation criteria, including environmental and social criteria, should be established before the RFP is requested, and included in the tender package so that tenderers can clearly see how environmental, social, and health and safety aspects of their proposal will be evaluated, alongside all of the other criteria.

The design measures for ES issues, as described in Section 4.6.5, must be fully reflected in the technical drawings that are part of the tender package.

For smaller contracts, the developer/operator should develop a standard set of HSES requirements to be attached to all bid packages and contracts, which includes details of the standards and measures required in all specific environmental and social aspects, and does not refer to the details of the ESMP.

Tenderers should be asked to provide, as a minimum:

- Their ES or sustainability policies, and the applicable standards they will apply.
- A description of their ESMS and how it will be applied.
- A statement confirming that they have read and understood the standards and requirements in the specification and ESMP, and that the measures are fully reflected in their price.

- A description of how they will implement the plans set out in the specification.
- Confirmation that they will be responsible for the ES performance of their subcontractors and suppliers, and a description of their systems for vetting and managing subcontractors.
- The positions and numbers of personnel to be mobilised for the management of ES issues, with descriptions of their previous experience and CVs.
- Their proposals for supervision and reporting, if different from those set out in the specification.
- Examples of past ES performance on similar hydropower projects, and evidence of performance against ES targets on similar projects.

All ES design and management measures should be fully reflected in the BOQ (Bill of Quantities) in their tender, and attached to the contract.

Further reading:

- IFC (2017). *Good Practice Note: Managing Contractors' Environmental and Social Performance.*

4.12.3 The role of the owner's engineer in environmental and social management

Developers, especially those with limited in-house engineering capacity, typically appoint an owner's engineer (OE) or employer's engineer to provide them with engineering advice through preparation and implementation. They are normally a consulting engineering firm that can provide a sufficient number and range of staff for supervision. The OE is often the same firm that provided pre-feasibility or feasibility studies.

The OE has an important role to play in ES management: during an EPC Contractor's detailed design of the project, the OE is responsible for reviewing designs, including those required for ES management and the standards they will meet; they may also be tasked with providing ES (and OHS) supervision through construction. It is therefore necessary to build these requirements specifically into the scope of work of the OE, OE personnel requirements, the tender process for the OE, and their ongoing reporting.

A key role of the OE is to ensure that ES measures are fully integrated with the technical, financial and legal aspects of project development, and that the scheme is optimised. It is important to move away from ESIA being retrofitted to sub-optimal projects developed by OEs without consideration of the ES issues. This is discussed further in Sections 4.1.6 and 4.6.5.

4.13 Establishing environmental and social management systems

4.13.1 Establishing the owner's ESMS, including environmental and social policy

Systematic or methodological approaches to the management of environmental and social impacts and issues or risks have been increasingly recognised as important for effective environmental and social management. In Performance Standard 1, IFC defines an effective Environmental and Social Management System (ESMS) as: "a dynamic and continuous process initiated and supported by management, that involves engagement between the client, its workers, local communities directly affected by the project (the Affected Communities) and, where appropriate, other stakeholders." It should be appropriate to the nature and scale of the project, and apply a 'plan, do, check, and act' process of continuous improvement. The concept of continuous improvement, through which measures are implemented, monitored, and adapted to continuously improve their effectiveness, underlies ESMSs.

An ESMS would develop the measures proposed in the ESIA and ESMP, and implement them in a systematic and methodological way. The plans identified in Table 4.8 would become plans, programmes or procedures that are implemented through these management systems. An ESMS normally encompasses:

Figure 4.9 Devoll HPP, Albania (Statkraft): procedures used by the developer (owner) during the construction stage, addressing quality, legal, HSE, human resources, and environmental and social requirements

Doc No	Document title
DHP-PCQ-R-01	DHP Handbook Construction Phase
–	Banja HPP Project Handbook
–	Banja HPP Quality Plan
DHP-PCQ-R-02	Moglicë HPP Project Handbook
DHP-PCQ-R-03	Risk Management Procedure
DHP-PCQ-R-04	DHP WBS
DHP-PCQ-R-05	Instruction for Adrega Usage
DHP-PCQ-R-06	Document Management Procedure
DHP-PCQ-R-07	Replacement Roads Handbook
DHP-PCQ-R-08	Overall QMS Audit Plan
DHP-PCQ-R-09	Non-Conformance Management Procedure
DHP-PCQ-R-10	IPC check & approval procedure
DHP-PCQ-R-12	Performance security protocols
DHP-PCQ-R-11	As-built & archiving procedure
DHP-PCQ-R-13	QMS Audit Schedue
DHP-PCQ-R-14	Asset handover to GoA agencies
DHP-LEG-R-01	License and permit process
DHP-LEG-R-02	Expropriation process
DHP-HSE-R-01	HSE Program
DHP-HSE-R-03	Working at Height
DHP-HSE-R-04	Excavation
DHP-HSE-R-05	Substance misuse at work
DHP-HSE-R-06	Moglicë HPP Risk Assessment – External Activities
DHP-HSE-R-07	Moglicë HPP Risk Assessment – Underground Activities
DHP-HSE-R-08	Cranes and Lifting Operations, lifting equipment and lifting accessories
DHP-HSE-R-13	Notification and Investigation of HSE Incidents

DHP-HSE-R-14	Fire Prevention and Protection
DHP-HSE-R-16	Permit to Work
DHP-HSE-R-17	Working near and over water
DHP-HSE-R-18	HSE in business travel
DHP-HRA-R-02	Employee Relations Termination Procedure
DHP-HRA-R-03	Moglicë Facilities Usage Requirement
DHP-HRA-R-04	Asset Management Procedure
DHP-HRA-R-05	Keys and access cards usage procedure
DHP-HRA-R-10	Instruction for visitors to Albania
DHP-ESM-R-01	ESM Plan (master plan)
DHP-ESM-R-03	Environmental and Social impact assessment
DHP-ESM-R-04,05,06	Annual implementation plan
DHP-ESM-R-02	Strategic environmental assessment
–	Reservoir clearance
DHP-ESM-R-07	2016 Annual implementation plan.
DHP-ESM-R-08	Structure Assistance Strategy
DHP-ESM-R-09	Reservoir Impoundment communication plan
DHP-ESM-R-11	Community evacuation and relocation plan, Lower Zgjupe 2016

- policy – the company's policy commitments, often board-approved;
- identification of environmental and social aspects, using the ESIA-identified risks and impacts;
- management programmes, i.e. the plans identified in the ESMP;
- organisational capacity and competency;
- emergency preparedness and response;
- stakeholder engagement; and
- monitoring and review.

Further reading:

- CDC, *Environmental and Social Management Systems* (Company-level).
- IAIA (2012, updated 2018). *Key Citations: Environmental Management Systems.*
- IFC (2012). *Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts.*
- IFC (2015). *Environmental and Social Management System Implementation Handbook: General.*

- IFC (2014). *Environmental and Social Management System Implementation Handbook: Construction.*

4.13.2 Contractor's ESMS

Contractors may apply the environmental and social management measures that they are required to fulfil through their own ESMS, and these may be linked to wider corporate systems. The implementation of ESMPs and ESMS during construction will evolve into the implementation of the operation-stage ESMP and the operator's ESMS, which will continue to be updated and adapted through operations in the long term.

4.13.3 Certification of management systems, such as ISO-14001

Environmental management systems may be certified to the international standard ISO-14001 (now ISO 14001:2015) on Environmental Management Systems. Occupational health and safety systems may be certified to ISO 45001 on Occupational Health and Safety (or its equivalent, OHSAS 18001, i.e. Occupational Health and Safety Assessment Series). Both may be integrated into wider quality management systems, which may be certified to ISO 9001 on Quality Management Systems.

Further reading:

- ISO 14001 (2015). Environmental Management Systems.
- https://www.iso.org/iso-14001-environmental-management.html
- SA 8000 (2004). Social management system.
- https://sa-intl.org/programs/sa8000/

4.13.4 What are processes and procedures?

A process is any activity or set of activities that use resources to transform inputs into outputs (i.e. *what* needs to be done, and why). Therefore, the various plans and programmes described above should be used to manage ES issues are processes. A procedure is a specified way to carry out an activity or a process (i.e. *how* the process needs to be done). These terms are used in quality management across all industries, and are defined in the ISO 9000 series of standards on quality management. A work instruction or a work method statement may provide yet further detail on how to carry out the procedure, as a step-by-step guide.

The aim is that certain activities are carried out to meet a specified level of quality, including environmental quality. Some processes and procedures may be entirely focused on an ES issue: for example, a procedure for handling a grievance raised by a community member. Other procedures and work instructions concern the wider construction or operation of a project, but ES requirements (and OHS) can be integrated into them.

Documenting each procedure provides a greater level of control, and some system of version control and review can be used to make improvements to the procedure. Figure 4.8 provides an example of a list of procedures from a construction-stage project.

4.14 Improving performance through effective monitoring and reporting

4.14.1 Inspections and reporting

During construction, the EPC contractor or the main construction contractor are required to conduct regular inspections and reporting. The developer, or the OE on the developer's behalf, will conduct further inspections and supervision, and will prepare reports on ES progress, incidents, etc. These are normally combined with OHS inspections, supervision and reporting.

Table 4.9 KPI Examples for Air Quality and Noise, distinguishing parameters, indicators and targets

Parameter	Indicator	Target	Timing / Frequency
Air Quality			
Particulate matter (PM_{10})	Example: PM_{10} (average over 24 hour) at geo-referenced position in Village X	Does not exceed WHO Guideline of 50 g/m^3	Weekly on a working day
Particulate matter ($PM_{2.5}$)	Example: $PM_{2.5}$ (average over 24 hour) at geo-referenced position in Village X	Does not exceed WHO Guideline of 25 g/m^3	Weekly on a working day
Noise			
Daytime decibels	Example: Daytime dBA (One Hour L_{Aeq}) at geo-referenced position in Village X	Does not exceed 55 dBA	Spot checks 7 am to 10 pm, at least twice weekly
Night-time decibels	Example: Night-time dBA (One Hour L_{Aeq}) at geo-referenced position in Village X	Does not exceed 45 dBA	Spot checks after 10 pm, at least once weekly

Inspections may be as frequent as daily at the main construction sites, conducted by the contractor's EHS personnel, with weekly supervision inspections by the developer's or OE's personnel. Some inspections may be conducted jointly, and it is useful to conduct weekly meetings between the contractor and the developer, on-site at each site.

During operations, the developer should continue with the measurement and reporting on KPIs, inspections, and regular reporting, though the focus of these will be on operation-stage impacts and ongoing impacts of the project's development.

4.14.2 Incident and Non-compliance Reports, and Register of Non-compliances

Most developers and operators will use a form to record the occurrence of each incident or non-compliance. This will be a basic form, reporting breaches of the ESMP or ESMS requirements or applicable standards, or any accidents, incidents and near misses. It should be used to communicate these non-compliances: during construction, to the contractor's site manager and EHS personnel immediately for action and investigation, and to the developer and owner's engineer's EHS personnel; and during operations, to the operator's site manager and EHS personnel.

A Register of Non-compliance Reports (NCRs) is used to record all incidents and non-compliances; and specifically, whether they have been corrected, and if any lessons or remedial measures are to be taken. This will be in Excel form, with columns for the following, and red/green colouring to highlight open/closed non-compliances: date; incident or non-compliance; actions taken to address the non-compliance; whether the item is resolved/closed (green) or unresolved/open (red); target date for closure; and management system or procedural improvements to prevent the reoccurrence.

4.14.3 Key Performance Indicators (KPIs)

The EPC contractor or the main construction contractor should be contractually required to conduct monitoring and reporting of KPIs related to the impacts of its activities, from prior to the start of the construction. Responsibility for monitoring is likely to be allocated by the contractor to its EHS unit, under the direction of an HSE manager. Monitoring should begin during contractor mobilisation, then continue through the main

construction phase, and through demobilisation, site closure and rehabilitation. The contractor's monitoring of performance should include performance by all sub-contractors.

The developer should measure KPIs in an additional range of aspects, or according to similar parameters as those used by the contractor, but across a wider geographical scope.

KPIs can be defined for all aspects of ES performance, from specific measured parameters, such as the water quality of effluent discharges from on-site facilities, to data on activities and materials, such as the number of training events, and volumes of wastes recycled. Measuring KPIs can be used to confirm that activities on-site are not resulting in impacts, and to show conformance with ESMP requirements. They measure progress or performance against pre-defined goals or targets, and can be quantitative or qualitative.

Applying a conceptual framework can help to identify and define KPIs. A simple framework is to distinguish between indicators of process and effectiveness or outcomes:

- Process – indicators of what the contractor or developer is doing to manage impacts (for example, the actual frequency of dust suppression with water along roads in Village X).
- Effectiveness or outcomes – indicators of the status of the environmental or social receptor that is at risk (for example, indicators of air quality in Village X).

In some cases, for complex aspects, it may be useful to define a results chain or theory of change to identify indicators. The Pressure-State-Response framework is widely used in environmental policy and planning, and can be applied on a project scale for specific impacts:

- Pressure – indicators of the source of the impact (for example, population increase in Village X due to influx of camp-followers).
- State – indicators of the status of the receptor (for example, area affected by unmanaged waste disposal in Village X).
- Response – indicators of the measures being taken to mitigate the impact (for example, percentage of sub-contractors applying the rule of no recruitment 'at-the-gate').

KPIs should be defined clearly so that they can be repeated to produce comparable results, and it is useful to distinguish between the parameters that are measured, indicators, and targets. They should also be part of a monitoring programme: that links indicators to the baseline measurements gathered during project preparation; defines sampling and measurement methodologies and standards; identifies responsibilities, timing and frequency; and determines costs for the measurement of parameters and compilation of the indicators. Table 4.9 presents air quality, noise and waste management parameters, and provides examples of potential corresponding indicators and targets.

Detailed 'how-to' guidance on the parameters and KPIs to be used in specific areas, such as erosion and sedimentation, and biodiversity and invasive species, is set out in separate How-to Guides.

Further reading:

- IFC GPN on Hydropower, Section 2. Performance Indicators and Monitoring
- Morrison-Saunders, A., Marshall, R. and Arts, J. (2007). *EIA Follow-Up – International Best Practice Principles. Special Publication Series No. 6. Fargo,* USA: International Association for Impact Assessment.
- World Bank Group (2007). *Environmental, Health, and Safety Guidelines: General EHS Guidelines,* sections 1.1 Air Emissions and Ambient Air Quality, and 1.7 Noise.
- World Bank Group (2007). *Environmental, Health, and Safety Guidelines: General EHS Guidelines,* sections 1.5 Hazardous Materials Management, and 1.6 Waste Management.

Table 4.10 Construction stage reporting

Report	Prepared by	Content and frequency
Weekly Site Inspection Reports	Contractor	Checklist format, completed on a weekly basis for each working site, based on daily site walk-overs, to be discussed at weekly on-site meetings between the contractor, OE and developer's EHS managers.
Monthly ES Reports	Contractor	Including, but not limited to: • Progress in implementing C-ESMP and ESMS; • Summary of key ES issues arising in the month; • ESHS staffing, including new hires and departures, and confirmation of current staff and positions; • EHS training including dates, number of trainees, and topics; • Summary and table of incidents and near misses, including: remedial and preventive actions required, implemented, and outstanding; and non-compliance incidents with permits and national law, project commitments, or other ES requirements; • List of inspections and audits, with key findings; • Results of Key Performance Indicator monitoring; • Summary of stakeholder engagement activities; • Summary and table of grievances raised by community members, and complaints raised by any external body; raised, resolved and outstanding; • Summary of compliance with permits and consents; and • Priority actions in the following month. In practice, reporting would also include labour-related information, including numbers of personnel, safety indicators, and grievances raised by employees.
Quarterly ES Reports	Contractor	Same content as the monthly report, and replacing every third monthly report. Includes information for the full preceding quarter.
Internal audit reports	Contractor	Undertaken at least biannually to audit the conformance of procedures and practices on-site with the ESMP and contract.
Annual audit reports	Independent auditor	Annually for the duration of the construction period; audit of ESMS with an international standard such as ISO-14001.
Monthly and quarterly ES reports	Developer	Including, but not limited to: • Progress in implementing the developer's responsibilities under the ESMP (e.g. on resettlement, biodiversity); • Key ES issues arising; • Data on Key Performance Indicators; • Information from the contractor's report, as described above; and • Summary of compliance with licence conditions.
Annual ES Report and Plan	Developer	Compiling information from monthly and quarterly reports, and replacing every fourth quarterly report. Also includes results of audits, including regulator's audits. In addition, includes planning and budgeting of the subsequent year's ES activities.

4.14.4 Reporting on ESMP implementation and commitments

The most regular inspections should be reported using a simple checklist-style report form, while monthly, quarterly and annual reports will provide full details. The contractor should be required to deliver monthly reports using a structure agreed with the developer, and equivalent quarterly reports, and possibly annual reports. The developer should hold at least monthly meetings with the contractor to discuss the content of the report and all aspects of ES performance.

The developer will also conduct monitoring of KPIs related to the plans and issues under its responsibility, and compile monthly, quarterly and annual reports, continuing through construction and operations. These reports may be legally required, and submitted to the environmental regulator, or a specific form of report may be agreed for submission to the regulator. The type, content and frequency of construction-stage reports is summarised in Table 4.10.

4.14.5 Reporting to regulators

Regulators may require reports to be submitted at specific intervals, and to address specific content – for example, reporting against each of the licence conditions. This may require a separate report to be compiled for the regulator, and formally filed.

4.14.6 Adaptive management

The purpose of monitoring is to provide data on whether the measures being taken are in place and are effective, or to identify emerging impacts and opportunities. If monitoring shows they are not in place or effective, or that there are emerging issues, the measures may need to be amended, adjusted, reinforced or added to. This process of adapting ES management in response to information on its effectiveness is referred to as 'adaptive management'. For example, an environmental flow provision may need to be adjusted if it is not mitigating impacts on aquatic biota as expected.

This example of adjusting the environmental flows underscores the importance of recognising the potential need for adaptive management early in the project's development. This is to ensure that the infrastructure of the project, generation operations, or its finances, allow for such adjustment and do not prevent it.

Adaptive management is especially important in hydropower due to the uncertainty regarding the probability or significance of some predicted impacts, the likely occurrence of unexpected impacts, a changing external environment, and evolving stakeholder interests. ES management should not be fixed, with the contractor or developer narrowly following the requirements of the ESMP, ESMS or licence. Rather, ES management should be adjusted and continuously improved through implementation and over the life of the project (see Section 4.14.9), in response to performance, emerging risks, and opportunities.

Monitoring programmes, indicators and targets should also be adaptively managed to respond to the effectiveness of the programme, and to monitor results. They may be adjusted to respond to unforeseen incidents, unexpected impacts, and the evolving requirements of stakeholders.

4.14.7 Auditing

Auditing is a formal, on-site evaluation against a defined set of criteria. The contractor's and the developer's ESMSs can be audited against the requirements of an international standard – usually ISO-14001 for environmental management systems, and against the commitments and measures set out in the ESMS.

Conducting internal audits is important for checking that the ESMS requirements are being followed, and the developer should require the EPC contractor to conduct internal audits on a regular (at least biannual) basis, in order to assess conformance of on-site activities with its ESMS. An annual external audit, conducted by qualified external auditors, provides an independent audit, to audit conformance with the ESMS and ISO-14001 requirements. An external audit is essential for certification to these international standards.

Further reading:

- ISO 19011 (2018). *Guidelines for auditing management systems*. https://www.iso.org/standard/70017.html

4.14.8 Management review

Management review is a formal part of ESMS, through which senior management are engaged in checking ESMS implementation and reaffirming senior management's commitment. The purpose of management review is to routinely involve senior management in evaluating the development and implementation of the ESMS. An audit to certify conformance with international standards would look for evidence of this management review. The review's deliberations and conclusions should be recorded in written form as a controlled document in the ESMS.

The review should occur at least annually; it consists of the provision of key information on ESMS implementation and performance to senior management, and meetings to review this information and reach conclusions on improvements to be made.

Key items for review include: progress on the ESMP plans and sub-plans; compliance with regulations; numbers and sources of non-compliances; performance in relation to ESMS requirements; performance against KPIs; adjustments and improvements to be made; priority actions for the next three, six and 12 months; and approval of resources needed for continuing implementation.

Further reading:

- IFC (2015). *Environmental and Social Management System Implementation Handbook: General.* Section 9, Monitoring and Review (Conducting an Effective Management Review).

4.14.9 Periodic reviews of environmental and social performance

The management of ES issues and impacts of older projects can be informed by regular, new reviews to assess performance. This is especially useful for projects that have been operating for some years, and those that were not subject to an ESIA at the time of development, or had an ESIA with some limitations. It provides an opportunity to identify and address legacy issues.

The purpose of a periodic review is to reassess the operational impacts of the project, re-engage with affected or interested stakeholders, and to determine adjustments to management measures or new and additional management measures. It is particularly useful for large projects with landscape-level impacts, and can be conducted for portfolios of projects (for example, two or more projects in a cascade). It may be conducted periodically, for example every five years, or as frequently as annually.

Activities may include:

- Specialist studies on a number of key issues arising: for example, legacy impacts of unmanaged resettlement at the time of project development, the emergence of invasive species in the reservoir, etc;
- Stakeholder engagement events to identify the main interests and concerns of stakeholders;
- Benchmarking of performance against an international standard such as the HSAP;
- Assessment of impacts and benefits, using similar approaches as described in Section 4.5;
- Public disclosure and public hearings on the findings;
- Publication of the final recommendations of the review; and
- Agreement with regulators on additions and adjustments to ES management.

A periodic review also allows for the identification of ways in which the project could provide further enhancements to positive impacts, or benefits to stakeholder communities.

In most jurisdictions, a periodic review would be voluntary and not a legal requirement. This provides an opportunity for more flexibility in the approaches used for the review.

Further reading:

- Hydro Tasmania Water Management Reviews: https://www.hydro.com.au/environment/environmental-management/water-management https://www.hydro.com.au/environment/environmental-management/cataract-gorge
- Itaipu Cultivando Agua Boa ('Cultivating Good Water' – a watershed management programme) https://www.itaipu.gov.br/meioambiente/cultivando-agua-boa

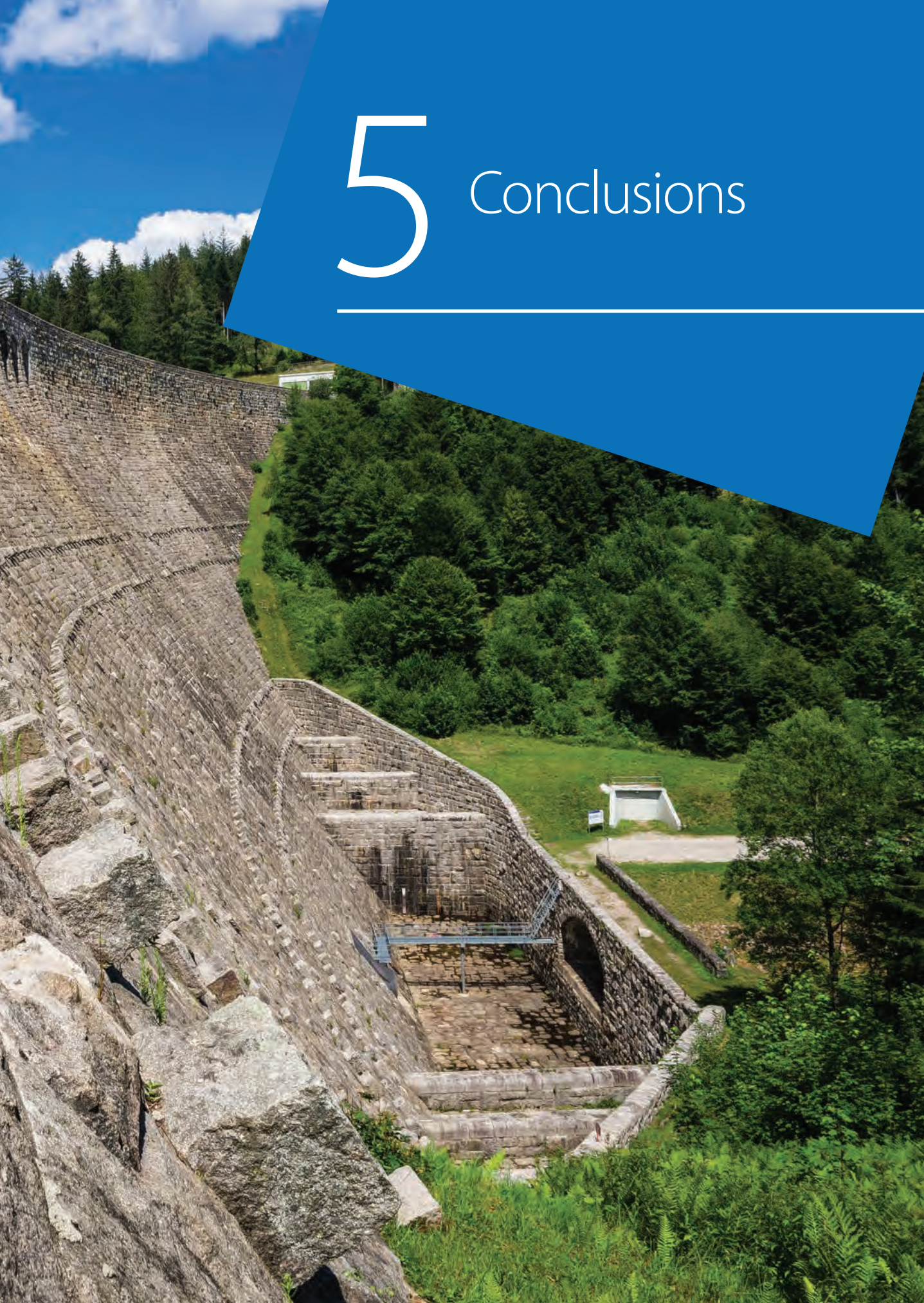
4.15 Engaging with stakeholders throughout the project cycle

Stakeholder engagement for environmental and social assessment does not cease with the ESIA and the permitting of the project. Planned ongoing engagement should be set out in a Stakeholder Engagement Plan (SEP), initially for the implementation stage and ultimately for operations.

Even an old operation-stage project should conduct stakeholder analysis, and develop and implement a SEP. Similar methods and approaches for stakeholder engagement can be used during later stages as during preparation. Specific opportunities for and examples of ongoing engagement are:

- Stakeholder involvement in project monitoring, including participatory monitoring;
- Public disclosure of quarterly and annual reports, if necessary with specific reports tailored for specific audiences;
- Ongoing consultation events to discuss impacts during construction, and then, possibly less frequently, during operations; and
- Periodic reviews of environmental and social performance, aiming to elicit emerging concerns, issues and opportunities, and adjust operational procedures if necessary (as discussed in Section 4.14.9).

5 Conclusions



Conclusions

This How-to Guide is the first global guide on hydropower that focuses on how to assess and manage environmental and social issues and impacts in order to meet international good practice, from project concept to operation.

The guide maps out the key steps in environmental and social assessment and management at each stage of the project development cycle. The process of environmental and social impact assessment (ESIA) provides the foundation for the identification of risks and impacts of a project, and their ongoing avoidance, minimisation and mitigation through the project's life.

However, even the best ESIA in the world cannot ensure effective management of environmental and social issues if the project has significant unavoidable impacts, or if proposed mitigation measures are not implemented. The guide therefore provides how-to guidance on strategic planning to avoid the most damaging projects, on environmental and social management plans and systems, and on ongoing monitoring and review.

Nam Theun 2 project aeration weir in Lao PDR
Photo Credit: Doug Smith

Hydropower that is not environmentally and socially responsible is not sustainable. Applying this How-to Guide, from upstream planning to downstream implementation and operation, will enable planners, developers and operators to avoid, minimise and mitigate environmental and social risks, and ensure that hydropower is able to contribute to the low-carbon future.

Annex 1
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Annex 2

Project examples

From assessments using the Hydropower Sustainability Assessment Protocol

	Assessment	Management	Stakeholder Engagement	Compliance
Hvammur 82 MW Preparation stage Iceland	• Assessments of project environmental and social impacts were undertaken for two alternatives, the Núpur Power Plant and the two-plant scheme of Hvammur and Holt Power Plants, beginning with a scoping of environmental and social impacts of two alternative project-schemes, prior to an EIA, and a Project Planning Report.	• Mitigation measures set out in the EIA report and the Project Planning Report. • Environmental Management Plan prepared to conform to the EIA, and built into contractors' tender documents. • Procedure for handing over management from the construction to operation phase, addressing 20 significant environmental factors.	• Four open public meetings held during the scoping phase, four during the EIA itself, and three after the EIA. • Ongoing engagement through direct contact, a website for the scheme, and a Communications and Stakeholder Engagement Plan.	

	Assessment	Management	Stakeholder Engagement	Compliance
Kabeli A 38 MW Preparation stage Nepal	• IEE (Initial Environmental Examination) report for regulators, an EIA, including an EMP in line with lender's requirements, and an SIA. • Additional studies conducted to examine areas of uncertainty in the EIA and SIA, and EIA/SIA, then updated. • Rapid Cumulative Impact Assessment (RCIA) included in the EIA.	• EMP included in EIA, outlining key plans such as constructing a fish passage, infrastructure for cremation sites, and minimum downstream flows, as well as EMP requirements for the contractor. • A separate Social Action Plan, including Resettlement Compensation and Livelihood Assistance Plan, Indigenous and Vulnerable Community Development Plan, Resettlement Policy Framework, Gender Action Plan, Public Consultation and Participation Strategy, and benefit-sharing.	• Four public consultations, one at site, two at the district level, and one at the national level. • A 'Kabeli-A Cooperation Concern Committee' (KACCC) to facilitate grievance management.	
Keeyask, 695 MW Preparation stage Canada	• Provincial-level process for demonstrating the need for the Keeyask project and evaluating alternative options: Need-For-and-Alternatives-To (NFAT) assessment. • Separate EIAs of the Keeyask Infrastructure Project (KIP; access road and preparatory works), Keeyask Generation Project (KGP), and Keeyask Transmission Project (KTP). • Keeyask Cree Nations (KCN) undertook and disclosed their own parallel assessments, based on Aboriginal Traditional Knowledge (ATK).	• For all components, a series of plans including Environmental Protection Plans (EPPs), Environmental Management Plans, and Environmental Monitoring Plans. • Emphasis on impacts designated as important (Valued Environmental Components, or VECs) in the EIAs or raised by the KCN in their parallel EIAs. • Manitoba Hydro maintains an Environmental Management System certified to the ISO 14001 standard, and the Keeyask project is included within this.	• Assessments, consultations and negotiations in the formation of the Keeyask partnership. • Public comments on assessment reports, public hearings to be conducted by the Clean Environment Commission on the assessment reports, Crown Consultation with First Nations required under the Constitution, and consultation under the NFAT review.	

	Assessment	Management	Stakeholder Engagement	Compliance
Semla IV 3.5 MW Preparation stage Sweden	• Short EIA, meeting Swedish regulations, and focused on the immediate, local impacts of the project.	• The project will use the wider company's environmental management system, certified against ISO 14001. • An action plan is proposed for the entire river, including measures to address eutrophication, acidification, heavy metal and chemical contamination, environmental flows, and migration barriers.	• Consultation meetings and negotiations were held with directly-affected stakeholders, groups of invited local stakeholders at the power plant, and individual stakeholders. • A regulatory 'Land and Environment Court' was convened.	• The project will use the developer's 'Prevent' incident reporting system for environmental, health, safety and reputational issues.
Chaglla 456 MW Implementation stage Peru	• Financers' gap analysis of EIA and EMP led to a series of additional specialist studies. • Separate EIA for transmission line and sub-station. • Both prepared by Ministry-registered specialists. • Monitoring and reporting using parent company's standard environmental and social performance indicators system.	• EMP prepared as part of the EIA, approved by environment and energy ministries. • EMP updated in 2013 to incorporate the results of the gap analysis and transmission line plans: becoming the Environmental, Social, Health and Safety Management Plan (ESHSMP) • Developer's Sustainability Team established for implementation of the ESHSMP and EIA requirements, and supervision of contractors' environmental and social compliance. • Range of procedures ('sustainability procedures') for the implementation of the ESHSMP.	• Ongoing meetings with directly-affected communities. • Circulation of a monthly community bulletin. • An 'Ethics Line' phoneline. • Community-level offices.	• Quarterly and annual on-site monitoring by investors and their environmental/social monitors. • Regulator's annual environmental on-site inspections at short notice

	Assessment	Management	Stakeholder Engagement	Compliance
Devoll 72 & 184 MW Implementation stage Albania	• ESIA for three projects (Devoll consisted of two of these), and separate ESIAs of replacement roads. • ESIA Feasibility Study as an input to the project's feasibility study. • Prior to the ESIA, a Strategic Environmental Assessment presented a preliminary scoping of potential impacts. • Project monthly and quarterly reports on the main events and next steps in ESM, reporting against Annual Implementation Plan commitments and Key Indicators of Success. • ESM Monitoring Framework, including monitoring policy, and specification of all items to be monitored, including monitoring objective, methodology, indicators, frequency and reporting. This includes activities, outcomes, compliance with legal and developer commitments, and key indicators of success.	• Environmental and Social Management Plan (EMAP), made public in October 2013, consisted of a number of plans addressing social issues and environmental issues. • Policies, plans and procedures are embedded in the project's quality assurance system, concerning project control and quality (PCQ), HSE, and ESM, and categorised as requirements (R), or supporting documents (S). • Daily HSE inspections, and occasional environmental audits, focusing on known deficiencies, using a developer's team of 11 HSE inspectors. • Specification for the contractor's HSE programme, the project EMAP, risk assessment procedures, and the Project Supplier Code of Conduct appended to the main contractor's contract. • Risk review meetings on a monthly, quarterly, and ad hoc basis.	• Public hearings for the main ESIA. • Staffed Public information Centres in two locations. • Roundtable meetings with local stakeholders; and ongoing discussions with municipalities and village heads.	• HSE site manager compiles a sheet of non-compliances for following-up with the contractor. • Annual Implementation Plans comprehensively review ESM activities, with a description of the status of planned activities and performance analysis in each programme areas (community liaison, environment, water quality, etc.).

	Assessment	Management	Stakeholder Engagement	Compliance
Jirau 3,750 MW Implementation stage Brazil	• basin and mapping of stakeholders for the Madeira River Complex (including Santo Antonio, below), several years in advance of development. • EIA in three parts: 8 volume baseline report; impacts analysis (with 118 potential adverse and beneficial impacts that are analysed according to scope, reversibility, duration, and importance); mitigation measures and analysis of the with-project and without-project situations. • Separate EIA process and licensing for the associated 94 km transmission line.	• A total of 34 environmental and social programs, ranging from wildlife and fish rescue, to deforestation of the reservoir area, degraded area restoration, heritage protection, and resettlement planning and social compensation. • Examples of specific measures include: solid waste management and the construction of a sanitary landfill; construction of a wastewater treatment plant; water treatment plants on left and right banks. • Contractor's EMS implemented through their Operating Manual. Each task is subject to Task Environmental Analysis, and Daily Briefings include environmental aspects. • A total of 105 Contractor employees are engaged entirely on environmental management on site, consisting of nine teams. • GIS-based Environmental Management System.	• A Sustainability Forum, to promote dialogue between the community and stakeholders during construction and operations, with representatives from regulators, government, local communities, the developer and technical teams. It has an overarching Sustainability Committee and ten Working Groups to encourage dialogue on specific issues. • A telephone hotline for the public, to call for information and to raise queries.	

	Assessment	Management	Stakeholder Engagement	Compliance
Reventazón 306 MW Implementation stage Costa Rica	• Developer prepared an ESIA, and lender's commissioned an Environmental and Social Management Report. • Additional studies and reports including on a construction management plan, water quality, sediments, biodiversity corridors and offsets, cumulative effects, and GHG emissions. • The Project Environmental Monitoring Unit provided an internal independent monitoring function.	• Construction ESMP and more than 10 Environmental and Social Management Plans (including construction methods, schedules, equipment, labour management, etc.) for each infrastructural component of the project. • A project-level environmental and social team (the Environmental Management Unit) with its own budget, staff, vehicles, etc. • A separate and independent supervision unit (the Environmental Monitoring Unit). • A range of issue-specific plans such as the Social Management Plan and Biodiversity Management Plan. • An innovative Adaptive Management Plan was adopted to respond to unpredictable downstream effects.	• 52 workshops and meetings with communities as part of ESIA preparation. • A community relations office in one of the neighbouring communities. • Community liaison officers, community meetings and public presentations during construction. • A visitors' programme for the project's construction site. • A protocol agreement was signed between ICE and all 15 affected communities, formalising the developer's commitment to comply with the EMP. • Ongoing engagement has been guided by a Communities Engagement Plan.	• Environmental Monitoring Unit conducted regular inspections to ensure compliance with all commitments, reported breaches or issues, and issued monthly reports. • An Independent Environmental and Social Monitoring Consultant (IESMC) monitored compliance with conditions established in the Project Environmental and Social Action Plan agreed with financers

	Assessment	Management	Stakeholder Engagement	Compliance
Romanche-Gavet 94 MW Implementation stage France	• ESIA was structured around the requirements of the regulator. • Separate studies conducted for the decommissioning of several smaller plants that were to be replaced. • A series of additional specialist studies on fish pass design for Clavaux, bankside vegetation restoration, impacts of decommissioning on geomorphology, and an inventory of the local bat population. • Separate ESIAs for improved connections to existing roads, and the transmission lines.	• An environmental assurance plan (EAP) for all commitments. • Environmental commitments were integrated into the overall Project Execution Plan, agreed with the authorities. • An Environmental Management System (EMS) which is part of the overall electronic project management system. • Lead contractors had a separate environmental management plan which set out how they were to meet their contractual requirements.	• ESIA made public during the public inquiry, which was part of the concession process. • Public meetings twice a year for residents of the valley to discuss the project with the developer and other stakeholders. • A project office (Maison Romanche Energie) is open to the public one morning and one afternoon every week. • Viewing platforms to view the construction sites, open to the public and visitors.	• The Environmental Monitoring Plan describes the processes used by the project to monitor the management of environmental impacts. • QSSE (Quality, Security, Safety, Environment) visit sheet to record findings of weekly inspections of contractor construction sites. • Occasional environmental and social monitoring checks by the regional regulator throughout all stages of the project.

	Assessment	Management	Stakeholder Engagement	Compliance
Santo Antônio 3568 MW Implementation stage Brazil	• EIA, followed by a series of complementary studies. • The original EIA looked at both the Madeira River projects, Jirau and Santo Antônio, allowing assessment of the cumulative impacts.	• 28 environmental and social programmes, the key ones being: Environmental Management Programme; Environmental Programme for Project Construction; and Environmental Compensation Programme. • Environmental Management Programme set up as a GIS-based system with data loading via e-mail and a standardised spreadsheet. • Each contractor has their own management system, and all the main members of the Construction Consortium were certified in accordance with ISO 9001, ISO 14001 and OHS 18001. • Joint initiatives of Jirau and Santo Antônio on cumulative issues, e.g. fish passage and sediments.	• EIA was first publicly disclosed as part of the regulatory public hearing. • Social Communications Programme, with over 160 public meetings and 94 workshops held between 2008 and 2012 with affected communities, and 78 workshops held with governmental institutions. • Monthly newsletter. • Public hearings whenever major changes are being made. • A visitors' programme, which resulted in more than 6 000 people visiting the project by 2015.	• Programmes of ongoing investigations, monitoring and analyses. • Compliance monitoring by the federal regulator; additional monitoring by various other government agencies, and by lenders' consultants.

	Assessment	Management	Stakeholder Engagement	Compliance
Blanda 150 MW Operation stage Iceland	• Developed in 1993 prior to ESIA requirements, but in 2004, Landsvírkjun commissioned a retrospective environmental and social impact assessment of operations. • Additional 2006 study on social impacts. • Inspections of all issues through a Quality Management System certified to ISO 9001. • Extensive programme of environmental monitoring, including with a range of specialist partners.	• Environmental control system incorporated into ISO 9001 Quality Management System, including ISO 14001 requirements.	• Regular meetings with stakeholders. • Project communication plan. • Periodic public meetings and briefings to respond to questions and identify new opportunities. • Reservoir water levels (of interest to many stakeholders) made available on the website and updated daily.	• Laws and regulations regarding environmental and safety issues reviewed twice annually and regularly updated on the intranet. • Non-compliances are logged in the Quality Management System and summarised in the annual environmental report.
Jostedal 288 MW Operation stage Norway	• An annual mapping of environmental aspects for the regional group of hydropower projects. • Annual dam safety inspections, which include environmental issues.	• Environmental management system covering all Statkraft operations, including a series of procedures and governing documents, stored in a 360 document management system.		• Monthly report which includes environmental issues and reports regarding KPIs on serious and less serious environmental incidents. • 'Emendo' improvement and non-conformity system: used to register observations, incidents, improvement proposals, and permissions to deviate from commitments.

	Assessment	Management	Stakeholder Engagement	Compliance
Kárahnjúkar 690 MW Operation stage Iceland	• Comprehensive Environmental Impact Assessment (EIA), followed by the regulatory process that stipulated 29 conditions. • Environmental inspections and monitoring are ongoing, in accordance with a comprehensive plan which details what to monitor and with what frequency. • Additional monitoring programmes implemented by senior external professionals from organisations such as the Icelandic Institute of Natural History.	• Integrated comprehensive management system with its focal areas of: corporate governance, the value chain, the environment, society, health and safety, and knowledge dissemination. These focal areas are supported by policy documents. • An environmental management and quality-control system outlined in a suite of documents, including policies, planning, legal requirements, objectives, targets and programmes, resources, roles and responsibilities, requirements for training, documentation, operational control, and monitoring needs. • Landsvírkjun is certified in accordance with ISO 9001, 14001 and 27001, as well as OHSAS 18001.	• A Project Community and Environment Manager. • Regular meetings with municipalities, angling societies, the tourism operators, the Soil Conservation Service, and individual farmers. • Water flows and levels at several stations in the river system and reservoirs are publicly disclosed on websites.	• Regulatory requirements are recorded in the environmental management system and followed up in accordance with the procedures in place. • Regional and local agencies supervise the project's compliance. • Occasional audits of all requirements including ISO 14011.
Teesta-V 510 MW Operation stage India	• Central-Level Monitoring Committee composed of experts from different government departments, NGOs, and the operator, to evaluate all requirements of the Environmental Clearance and identify any additional environmental safeguards.	• Environmental Management System, certified to ISO-14011, underpinned by the operator's Corporate Environment Policy 2016. • Central-Level Monitoring Committee introduced additional requirements during operations for the management of waterborne diseases, wildlife, fisheries, and landslides.	• Project-Level Monitoring Committees for a Teesta-V Catchment Area Treatment Plan, and the Resettlement and Rehabilitation Plan involving external stakeholders.	• Six-monthly reports on the status of all requirements under the Environmental Clearance, published on the regulator and operator's websites • Annual reports and annual inspections by state environmental authorities

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