International ESIA for an Integrated Renewable Energy Project

180MW Wind Power and Battery Energy Storage System, Tsogttsetsii soum, Mongolia

Chapter 4 Impact Assessment Methodology

PREPARED FOR

Net Zero Energy LLC
MCS and URECA

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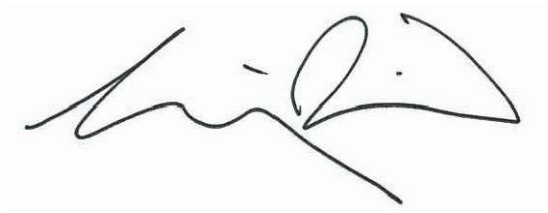
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ACRONYMS AND ABBREVIATIONS

Acronyms	Description
AADT	Annual Average Daily Traffic
[redacted]	[redacted]
AIS	Air Insulated Switchgear
ALARP	As Low As Reasonably Practicable
AoI	Area of Influence
APLIC	Avian Powerline Interaction Committee
BESS	Battery Energy Storage System
BMP	Biodiversity Management Plan

Acronyms	Description
BOD	biochemical oxygen demand
CAF	Central Asian Flyway
CAQMP	Construction Air Quality Management Plan
CCRA	Climate Change Risk Assessment
CD	Community Development
CH	Critical Habitat
CHA	Critical Habitat Assessment
CIA	Cumulative Impact Assessment
CIP	Climate Impact Platform
CITES	Convention on International Trade in Endangered Species
CLO	Community Liaison Officer
CMIP6	Coupled Model Intercomparison Project Phase 6
CMS	Conservation of Migratory Species of Wild Animals
CO	Carbon monoxide
COD	chemical oxygen demand
CR	critically endangered
CRM	Citizen's Representative Meeting
CRM	Collision Risk Model
CSMP	Cold Stress Management Plan
DEIA	Detailed Environmental Impact Assessment
DFID	International Development
DSF	Development Support Fund
E&S	Environmental and Social
EAAA	Ecologically Appropriate Area of Analysis
EAAF	East Asian-Australasian Flyway
EBRD	European Bank for Reconstruction and Development
EC	Electrical Conductivity
EEO	Extent of Occurrence
EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
EN	Endangered
EPC	Engineering Procurement and Construction
EPRP	Emergency Preparedness and Response Plan

Acronyms	Description
ERM	ERM-Hong Kong, Limited
ESA	European Space Agency
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environment and Social Management System
ETI	Ethical Trading Initiative
FERP	Flood Emergency Response Plan
FFDI	Arthur Forest Fire Danger Index
FGD	focus group discussion
FPIC	Free, Prior and Informed Consent
GBV	Gender-based violence
GCD	Global Climate Database
GHG	Green House Gas
GIIP	good international industry practice
GIS	Geographic Information System
GM	grievance mechanism
GPN	Good Practice Note
GRM	Grievance Redress Mechanism
HCO	Bicarbonate
HSEQ	Health, Safety, Environment, and Quality
HSMP	Heat Stress Management Plan
HSS	Health, Safety and Security
HSSE	Health, Safety, Security and Environment
HVAC	Heating, Ventilation, and Air Conditioning
IA	Impact Assessment
IAQM	Institute of Air Quality Management
IBA	Important Bird and Biodiversity Areas
IBAT	Integrated Biodiversity Assessment Tool
IFC	International Finance Corporation
ILO	International Labour Organisation
IMAR	Inner Mongolia Autonomous Region
IPA	Important Plant Areas
ISMP	Invasive Species Management Plan

Acronyms	Description
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Areas
KII	Key Informant Interview
LC	Least Concern
LiDAR	Light Detection and Ranging
LLC	Limited Liability Company
LO	Land Officer
LRP	Livelihood Restoration Plan
LRP	Livelihood Restoration Plan
LVIA	Landscape & Visual Impact Assessment
MCS	Mongolian Consulting Service
MECC	Ministry of Environment and Climate Change
MNS	Mongolian National Standard
MRIA	Mongolian Renewables Industries Association
MRL	Mongolian Red List
MSDS	Material Safety Data Sheet
MW	Mega Watt
MWEA	Mongolian Wind Energy Association
NASA	National Aeronautic Space Administration
NDC	Nationally Determined Contributions
NDC	National Dispatching Centre
NE	not evaluated
NGO	Non-governmental Organization
NH4+	Ammonium
NO2	Nitrogen dioxide
NO2-	Nitrite
NO3-	Nitrate
NOAA	Atmospheric Association
NPTG	National Power Transmission Grid Company
NPTG	National Power Transmission Grid Company
NREC	The National Renewable Energy Centre
NSR	Noise sensitive receiver
NT	Near threatened

Acronyms	Description
NZE	Net Zero Energy LLC
O&M	Operation and Maintenance
OHL	Overhead Transmission Line
OHS	Occupational Health and Safety
OT	Oyu Tolgoi
PA	protected area
PAD	project affected districts
PAPs	Project Affected Persons
PI, mg/L	Phosphate
PM	Particulate matter
POP	persistent organic pollutants
PPA	Power Purchase Agreement
PPE	Personal protective equipment
PS	Performance Standards
RAP	Resettlement Action Plan
RCIA	Rapid Cumulative Impact Assessment
RCS	Real Case Scenario
RILI	rainfall-induced landslide index
RoW	Right of Way
SCADA	Supervisory Control and Data Acquisition
SNH	Scottish Natural Heritage
SO	Social Officer
SO2	Sulphur dioxide
SO4	Sulphate
SPA	Strictly Protected Area
SRTM	Shuttle Radar Topography Mission
STE	Serrated Trailed Edge
TDS	Total Dissolved Solids
TIP	Trafficking in Persons
TL	Transmission Line
TNC	The Nature Conservancy
TOR	Terms of Reference
UNEP	United Nations Environmental Programme

Acronyms	Description
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States dollars
UV	Ultra-violet
VEC	Valued Environmental and Social Components
VP	Vantage Point
VU	Vulnerable
WBG	World Bank Group
WBGT	Wet Bulb Globe Temperature
WCS	Worst Case Scenario
WCS	Wildlife Conservation Society
WHO	World Health Organisation
WPF	Wind Power Farm
WPFW	West Pacific Flyway
WRI	World Resource Institute
WSDI	Warm spell duration index
WTG	Wind Turbine Generator
WWF	World Wide Fund for Nature

4. IMPACT ASSESSMENT METHODOLOGY

4.1 INTRODUCTION

This chapter presents the methodology used to prepare the ESIA, which follows the approach illustrated in ***Figure 4-1***. This ESIA has been undertaken following a systematic process that: evaluates the potential impacts the Project could have on aspects of the physical, biological, social/socio-economic, and cultural environment; identifies preliminary measures that the Project will take to avoid, minimise/reduce, mitigate, offset, or compensate for potential adverse impacts; and identifies measures to enhance potential positive impacts where possible.

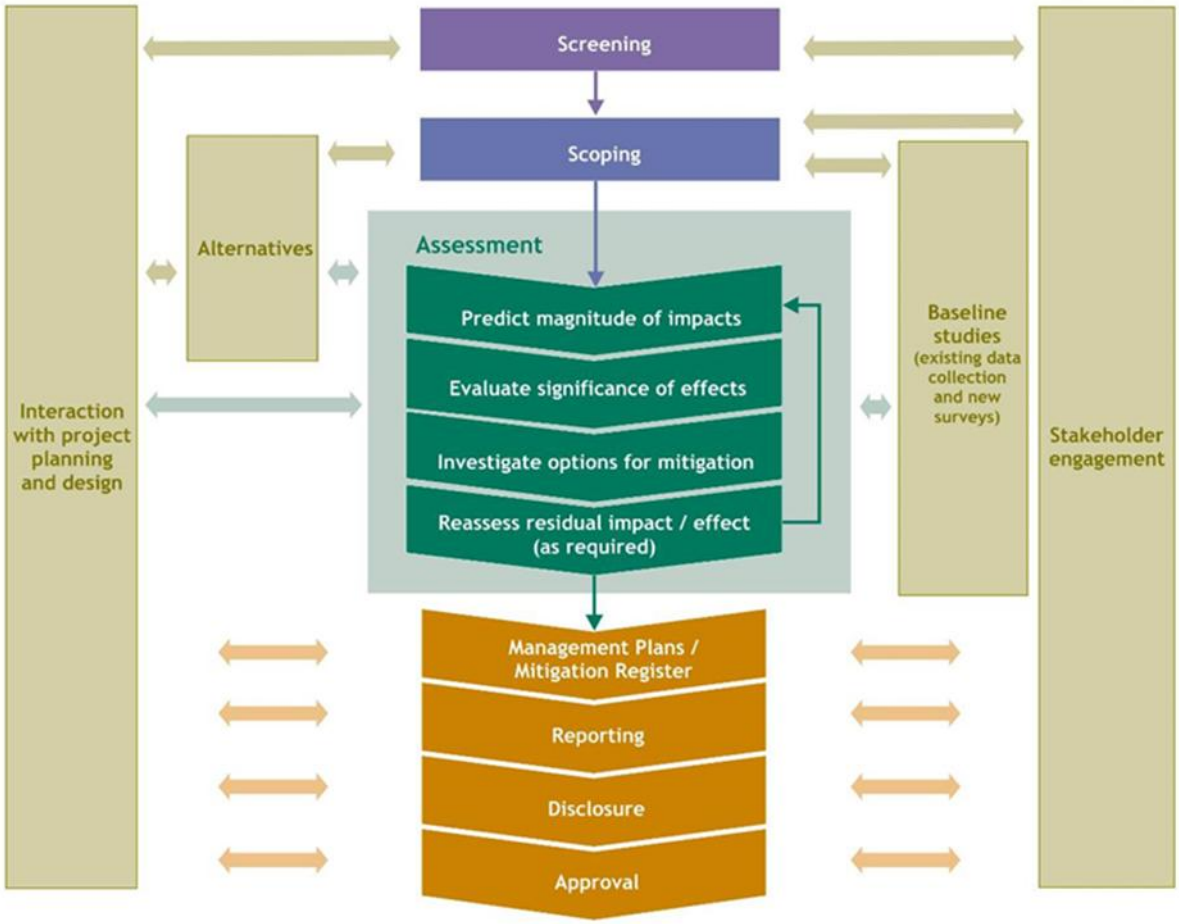


FIGURE 4-1: PROCESS OF PREPARING AN ESIA

This chapter also details the methodology used for the collection and analysis of primary and secondary data used in this report. Primary and secondary information from the Project Proponent, government sources, and other Project-related stakeholders have been collected to support the preparation of this report.

This ESIA Report and related ESMPs will be part of the Project ESMS. ESMPs will be implemented, and efficacy of mitigation measures will be monitored. Monitoring and review results will be reported to relevant parties. Under ***Figure 4-1***, reporting phase refers to monitoring and review as well as ongoing reporting.

4.2 SCREENING

At the initial stage of the ESIA, preliminary information was provided to aid in the determination of what legal and other requirements were applicable to the Project. This step was completed by utilizing a high-level description of the Project and its associated facilities.

4.3 SCOPING

Scoping has been undertaken to delineate the potential Area of Influence (AoI) for the Project (and thus the appropriate Project Study Area) and to identify potential interactions between the Project and resources/receptors in the Area of Influence (***Section 5.3.1***). The scoping process is also necessary in order to develop and select alternatives to proposed actions and in the identification of the issues which are considered in this ESIA.

The content of this ESIA report has been prepared according to the output from the scoping process, which is further detailed in ***Chapter 5***.

4.4 PROJECT DESCRIPTION

A Project description has been developed in order to set out the scope of this Project's features and activities, with a greater focus on the aspects which have the potential to impact the environment and social conditions. Details of the Project facilities' design characteristics, as well as planned and possible unplanned Project activities, are provided in ***Chapter 3*** of this ESIA report.

4.5 BASELINE CONDITIONS

To provide the context within which the potential environmental and social impacts of the Project can be assessed, a description of physical, biological, chemical, social, socio-economic, and cultural conditions that would be expected to prevail in the absence of the Project are presented. The Baseline includes information on all resources/receptors that were identified during scoping as having the potential to be significantly affected by the Project.

4.6 STAKEHOLDER ENGAGEMENT AND SOCIOECONOMIC DATA COLLECTION

An effective ESIA process requires engagement with relevant stakeholders throughout the key stages. This process assists in the understanding of the stakeholders' views; on the Project and in identifying issues that should be accounted for in the prediction and evaluation of potential impacts. The aim of this stage is to be able to fill in any identified data gaps which will be necessary when conducting a robust impact assessment.

4.7 IMPACT ASSESSMENT (IA)

Impact identification and assessment start with scoping and continue throughout the remainder of the ESIA process. The main ESIA steps are summarised below and comprise of:

- **Potential Impact Identification**: to determine what could potentially happen to resources/receptors as a consequence of the Project and its associated activities;
- **Impact Evaluation**: to evaluate the significance of the predicted impacts by considering their magnitude and likelihood of occurrence, and the sensitivity, value and/or importance of the affected resource/receptor;

- **Management and Mitigation Enhancement Measures**: to identify appropriate and justified measures to mitigate potential negative impacts and enhance potential positive impacts; and
- **Residual Impact Evaluation**: to evaluate the significance of potential impacts assuming effective implementation of mitigation and enhancement measures.

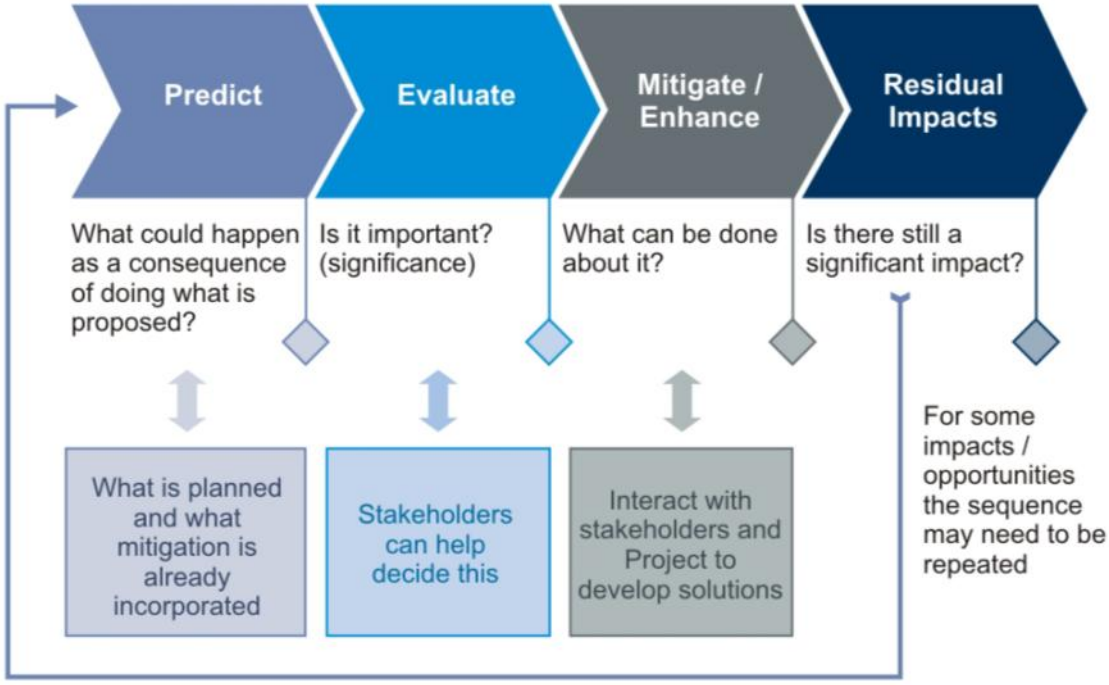


FIGURE 4-2: IMPACT ASSESSMENT PROCESS

4.7.1 IMPACT PREDICTION

Prediction of impacts is essentially an objective exercise to determine what is likely to happen to the environment and social aspects as a consequence of the Project and its associated activities. From the potentially significant interactions identified during the Scoping phase, the impacts to the various resources/receptors are elaborated and evaluated. The diverse range of potential impacts considered in the ESIA process typically results in a wide range of prediction methods being used, including quantitative, semi-quantitative and qualitative techniques.

4.7.2 IMPACT EVALUATION

Once the identification of potential impacts is completed, each potential impact is described in terms of its various relevant characteristics (e.g. type, scale, duration, frequency, extent). The terminology and designations used to describe impact characteristics are shown in ***Table 4-1***.

TABLE 4-1: IMPACT CHARACTERISTIC TERMINOLOGY

Characteristic	Definition	Designations
Type	A descriptor indicating the relationship of the potential impact to the Project (in terms of cause and effect).	Direct Indirect Induced
Extent	The "reach" of the potential impact (e.g., confined to a small area around the Project Site, projected for several kilometres, etc.).	Local Regional International

Characteristic	Definition	Designations
Duration	The time period over which a resource/receptor is potentially affected.	Temporary Short-term Long-term
Scale	The size of the potential impact (e.g., the size of the area with the potential to be damaged or impacted, the fraction of a resource that could potentially be lost or affected, etc.).	[no fixed designations; intended to be a numerical value or a qualitative description of "intensity"]
Frequency	A measure of the constancy or periodicity of the potential impact.	[no fixed designations; intended to be a numerical value or a qualitative description]

The definitions for the type designations are shown in ***Table 4-2***, for the other designations are resource/receptor-specific and are discussed in the resource/receptor-specific IA chapters presented later in this ESIA.

TABLE 4-2: IMPACT CHARACTERISTIC TERMINOLOGY

Type	Definition
Direct	Potential impacts that result from a direct interaction between the Project and a resource/receptor (e.g., between occupation of a plot of land and the habitats which are affected).
Indirect	Potential impacts that follow on from the direct interactions between the Project and its environment as a result of subsequent interactions within the environment (e.g. viability of a species population resulting from loss of part of a habitat as a result of the Project occupying a plot of land).
Induced	Potential impacts that result from other activities (which are not part of the Project) that happen as a consequence of the Project (e.g. influx of camp followers resulting from the importation of a large Project workforce).

The above characteristics and definitions apply to planned and unplanned events. An additional characteristic that pertains only to unplanned events is 'likelihood'. The likelihood of an unplanned event occurring is designated using a qualitative scale, as detailed in ***Table 4-3***.

TABLE 4-3: DEFINITIONS FOR LIKELIHOOD OF DESIGNATIONS

Type	Definition
Unlikely	The event is unlikely but may occur at some time during normal operating conditions.
Possible	The event is likely to occur at some time during normal operating conditions.
Likely	The event will occur during normal operating conditions (i.e., it is essentially inevitable).

Once impact characteristics are defined, the next step in the IA phase is to assign each potential impact a 'magnitude'. Magnitude is typically a function consisting of a combination (depending on the resource/receptor in question) of the following impact characteristics:

- Extent;
- Duration;
- Scale;
- Frequency; and
- Likelihood (for unplanned event).

Magnitude essentially describes the intensity of the change that is predicted to occur in the resource/receptor as a result of the potential impact. Magnitude designations are universally consistent, but the definitions for these designations vary depending on the resource/receptor. The universal magnitude designations are:

- Positive;
- Negligible;
- Small;
- Medium; and
- Large.

In the case of a potential positive impact, no magnitude designation (aside from 'positive') is assigned. It is considered sufficient for the purpose of the ESIA to indicate that the Project is expected to result in a potential positive impact, without characterising the exact degree of positive change likely to occur.

In the case of potential impacts resulting from unplanned events, the same resource/receptor-specific approach to concluding a magnitude designation is utilised. However, the 'likelihood' factor is considered, together with the other impact characteristics, when assigning a magnitude designation.

In addition to characterising the magnitude of impact, the other principal impact evaluation step is definition of the sensitivity/vulnerability/importance of the impacted resource/receptor. There are a range of factors to be taken into account when defining the sensitivity/ vulnerability/ importance of the resource/ receptor, which may be physical, biological, cultural or human. Other factors may also be considered, such as legal protection, government policy, stakeholder views and economic value. As in the case of magnitude, the sensitivity/ vulnerability/ importance designations themselves are universally consistent, but the definitions for these designations vary on a resource/receptor basis. The sensitivity/ vulnerability/ importance designations used herein for all resources/receptors are:

- Low;
- Medium; and
- High.

Once the magnitude of impact and sensitivity/vulnerability/importance of the resource/receptor have been characterised, the significance can be assigned to each impact. Impact significance is designated using the matrix shown in ***Table 4-4***.

TABLE 4-4: IMPACT SIGNIFICANCE

Magnitude of Impact	Sensitivity/ Vulnerability/Importance of Receptors / Resources		
	Low	**Medium**	**High**
Negligible	*Negligible*		
Small		*Minor*	
Medium		*Moderate*	
Large		*Major*	

The matrix applies universally to all resources/receptors, and all impacts to these resources/receptors, as the resource/receptor-specific considerations are factored into the assignment of magnitude and sensitivity/vulnerability/importance designations that enter into the matrix. The context for what the various impact significance ratings signify is presented in ***Table 4-5*** below.

It is important to note that impact prediction and evaluation take into account any embedded controls (i.e., physical or procedural controls that are already planned as part of the Project design, regardless of the results of the ESIA process). This helps avoid a situation where an impact is assigned a magnitude based on a hypothetical version of the Project that considers none of the embedded controls.

TABLE 4-5: IMPACT CHARACTERISTIC TERMINOLOGY

Degree of Significance	Description
Negligible	An impact of negligible significance is one where a resource/receptor (including people) is essentially not affected in any way by a particular activity or the predicted effect is deemed "imperceptible" or is indistinguishable from natural background variations.
Minor	An impact of minor significance is one where a resource/receptor is to experience a noticeable effect, but the impact magnitude is sufficiently small and/or the resource/receptor is of low sensitivity/vulnerability/importance; and In either case, the magnitude should be well within applicable standards.
Moderate	An impact of moderate significance has an impact magnitude that is within applicable standards, but falls somewhere in the range from a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit; Clearly, to design an activity so that the effects only just avoid breaking a law and/or cause an impact is not the best practice. The emphasis for moderate impacts is therefore on demonstrating that the impact has been reduced to a level that is As Low As Reasonably Practicable (ALARP); and This does not necessarily mean that impacts of moderate significance have to be reduced to minor, but that moderate impacts are being managed effectively and efficiently.

Degree of Significance	Description
Major	An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to majorly valued/sensitive resource/receptors; and An aim of ESIA is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long-term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e., ALARP).

4.7.3 IDENTIFICATION OF MITIGATION AND ENHANCEMENT MEASURES

One of the key objectives of an ESIA is to identify and define environmentally and socially acceptable, technically feasible and cost-effective mitigation measures. Once the significance of a given impact has been characterised using the above matrix (***Table 4.5***), the next step is to determine whether mitigation measures are necessary, and if so, what they should involve.

Mitigation measures are developed to reduce the significant negative impacts identified during the ESIA process to a point where they have no adverse effects, and to create or enhance positive impacts such as environmental and social benefits. In this context, the term "mitigation measures" includes operational controls as well as management actions. Where a significant impact is identified, a hierarchy of options for mitigation is explored, as summarised in ***Table 4.6***. It is important to note that avoiding at source through design or selection of appropriate equipment or work method should be the first consideration in the process of reducing impact significance.

The priority in mitigation is to first apply mitigation measures to the source of the potential impact (i.e., to avoid or reduce the magnitude of the potential impact from the associated Project activity). This is then followed by addressing the resultant effect to the resource/receptor via abatement or compensatory measures or offsets (i.e., to reduce the significance of the effect once all reasonably practicable mitigations are applied to reduce the impact magnitude).

TABLE 4-6: HIERARCHY OF OPTIONS FOR MITIGATION AND MANAGEMENT

Hierarchy	Description
Avoid at source; Reduce at source	Avoiding or reducing at source through the design of the Project e.g., avoiding by siting activity away from sensitive areas or reducing by restricting the working or changing the time of the activity.
Abate on Project Site	Add something to the design to abate the impact e.g., pollution control, equipment, traffic controls, perimeter screening and landscaping.
Abate at receptor	If an impact cannot be abated on-site, then control measures can be implemented off-site e.g., noise barriers to reduce noise impact at a nearby residence or fencing to prevent animals straying onto the Project site.
Repair or remedy	Some impacts involve unavoidable damage to a resource e.g., agricultural land and forestry due to creating access, work camps or materials storage areas; and these impacts can be addressed through repair, restoration, or reinstatement measures.

Hierarchy	Description
Compensate in kind; Compensate through other means	Where other mitigation approaches are not possible or fully effective, then compensation for loss, damage and disturbance might be appropriate e.g., planting to replace damaged vegetation, financial compensation for damaged crops or providing community facilities for loss of fisheries access, recreation, and amenity space.
Offset	Offsetting refers to the consideration of measures over and above rehabilitation to compensate for the residual negative effects on biodiversity, after every effort has been made to minimise and then rehabilitate impacts.

Additional mitigation measures should not be declared for impacts rated as not significant unless the associated activity is related to conformance with an 'end of pipe' applicable requirements. Furthermore, it is important to note that it is not an absolute necessity that all impacts be mitigated to a not significant level; rather the objective is to mitigate impacts to an As Low as Reasonably Practicable (ALARP) levels.

4.7.4 RESIDUAL IMPACT EVALUATION

Once mitigation and enhancement measures are declared, the next step in the ESIA process is to assign residual impact significance. This is essentially a repeat of the impact assessment steps discussed above, considering the implementation of the proposed mitigation and enhancement measures. In the context of the ESIA, residual impacts are those remaining after the effects of all reasonable mitigation measures have been taken into account. Where possible impacts are reduced to a level that residual impacts are considered 'not significant'; the objective of an ESIA is to identify means of reducing them to ALARP levels for the circumstances of the activity under consideration.

Reporting the significance of a residual impact in this report is based on the predicted magnitude of an impact, taking into consideration all the mitigation measures and the quality/importance/sensitivity of the receptor. Constraints arising from applicable regulations and standards are also taken into account in the evaluation of residual impacts and their acceptability.

4.7.5 MANAGEMENT, MONITORING AND AUDIT

The final stage of the ESIA process is defining the basic management and monitoring measures that are needed to identify whether: a) impacts or their associated Project components remain in conformance with applicable standards; and b) mitigation measures are effectively addressing impacts and compensatory measures and offsets are reducing effects to the extent predicted.

An Environmental and Social Management Plan (ESMP) which is a summary of all actions the Project Proponent has committed to executing, with respect to environmental/social/health and safety performance for the Project, is also included as part of this report. The ESMP includes mitigation measures, compensatory measures and offsets, and management and monitoring activities.

4.8 CUMULATIVE IMPACT

According to IFC (2013), "Cumulative impacts (CI) are those 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". Also, pursuant to the IFC (IFC, 2013), the assessment and management of cumulative impacts is necessary when the Project and other developments under consideration could contribute to generating cumulative impacts on valued environmental and social components.

In order to gain an understanding of the Project overall contribution to impacts, a cumulative impact assessment (CIA) was undertaken in ***Chapter 10***. Whilst total cumulative impacts due to multiple projects within a given area should be identified within government-led spatial planning efforts, the Project Proponent needs to determine the degree to which it is contributing to these overall cumulative impacts. In this regard, the objectives of the CIA are twofold:

- Determine if the cumulative impacts caused by the Project and other existing or predictable future projects would threaten the sustainability of valuable environmental component (VEC) in the area; and
- Develop mitigation measures to prevent unacceptable conditions of VECs. The measures could include additional mitigation measures for Project and also additional mitigation measures for other existing or predictable future projects in the area.

The ESIA and CIA are prepared based on similar logical framework, analytical process and tools. Unlike the ESIA that centres on the Project as a source of impacts, the CIA focuses on VECs under influence from different projects (***Figure 4-3***). In a CIA, the overall resulting condition of the VEC and its related viability are assessed.

This CIA closely follows the six (6) steps of the IFC Guidance (IFC, 2013), as shown in ***Figure 4-3***.

IFC Guidance takes into consideration the limitations that a private developer may face carrying out a CIA as part of an ESIA, or difficulties encountered in compiling such information. The limitations applicable to this CIA include:

- Incomplete information about other projects and activities (e.g., the information is not available in the public domain);
- Uncertainty with respect to the implementation of future projects; and
- Difficulty in establishing thresholds or limits of acceptable change for VECs, and therefore the significance of cumulative impacts.

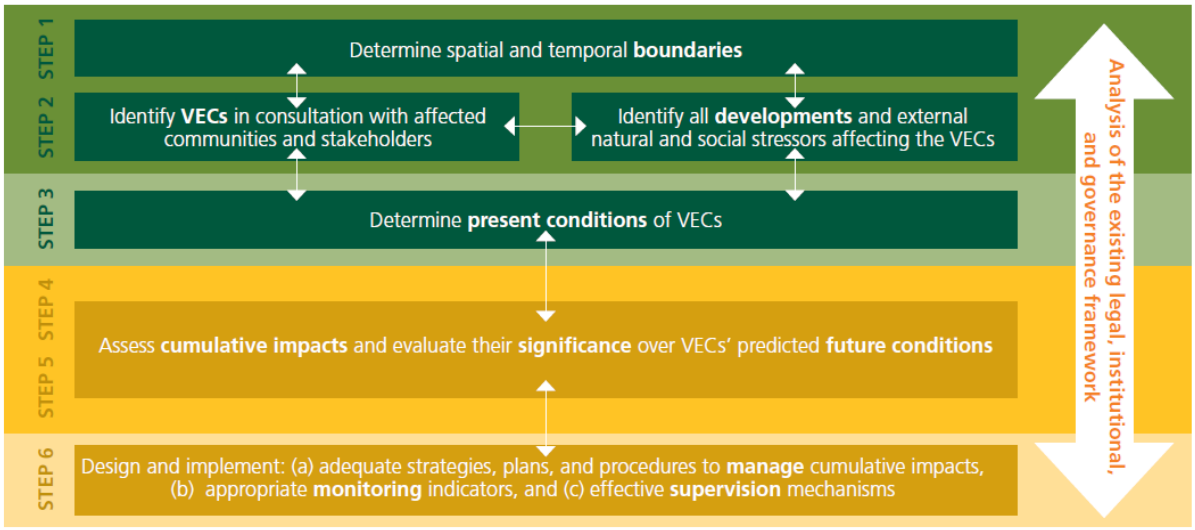


FIGURE 4-3: SIX-STEP APPROACH FOR CIA (IFC, 2013)

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Kazakhstan
Kenya
Malaysia
Mexico
Mozambique
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