NEOM نيوم

ENVIRONMENTAL PROCEDURE

Environmental & Social Risk & Opportunities Assessment for Development Projects

NEOM-NEV-PRC-602, Rev 01.00, June 2021

Document history

Revision Code	Description of changes	Purpose of issue	Date
Rev A	First Draft	Issued for Review	15.09.2020
Rev B	Addressing of internal comments	Issued for Review	15.04.2021
Rev 01.00	First Issue	Issued for implementation	17.06.2021

Document approval

	Prepared by	Reviewed by	Approved by
Name	Dr. Barry Shepherd	Peter Caron	Damien Trinder
Job Title	Manager Assessment and Monitoring	Manager Assessment and Approvals	(Acting) Chief Environmental Officer

Contents

List of Tables

NEOM aspires to be a global leader in environmental and sustainability performance, leading the transition to regenerative development and establishing a new blueprint for sustainable societies. NEOM is also firmly committed to attracting investors and development partners who can accelerate development that supports delivery of NEOM's sector strategies and overall vision. To achieve these dual goals, NEOM Environment Department has developed a Regenerative Development Management System that is an innovative set of procedures and standards to support, assess, approve, control and report on environmental aspects of all development activities. This procedure is a key element of that System.

1. Purpose

All NEOM developments must undergo a rigorous environmental and social assessment process. NEOM considers a risk-based approach to assessment to be the most appropriate method for assessing large and complex projects as this enables identification of potential impacts before they occur, as well as potential opportunities for environmentally net positive outcomes that might otherwise be missed.

The purpose of the NEOM Environmental and Social Risk Assessment Procedure (the Procedure) is to set out the method by which all NEOM Developments are to be assessed in relation to their potential environmental and social risks, and opportunities.

The Procedure is designed to meet or exceed the requirements of IFC *Performance Standard 1 - Assessment and Management of Environmental and Social Risks and Impacts* (2012) and generally aligns with *ISO 31000:2018 Handbook Risk Management Guidelines* and *Australian Standard/New Zealand Standard (AS/NZS) HB203: 2012 Managing Environment-Related Risk* (Standards Australia/Standards New Zealand, 2012).

2. Scope

The Procedure sets out the NEOM methodology for conducting Environmental and Social Risk and Opportunity Assessment to support the development of NEOM assessment documentation including Strategic Environmental Assessments (SEAs), Environmental and Social Impact Assessments (ESIAs) and Preliminary Environmental Reviews (PERs).

The Procedure is suitable for evaluating the risks and opportunities arising from development and operational activities (including unplanned non-emergency events), unplanned emergency events and proposed restoration, rehabilitation, offset and enhancement activities.

The Procedure is considered a mandatory operational control for the NEOM Environmental Management System (EMS) Standard which has been developed to be consistent with the requirements of *ISO 14001:2012 Environmental Management Systems*.

The Procedure is to be used by Proponents of NEOM Development Projects. Users of this document are strongly encouraged to review and be familiar with:

- *IFC Performance Standard 1 - Assessment and Management of Environmental and Social Risks and Impacts* (2012)
- *ISO 31000:2018 Handbook Risk Management Guidelines*
- *AS/NZS 203.2012 Managing Environment-Related Risk Standard.*

This Document is owned and controlled by the Director for Sustainable Development within the NEOM

Environment Department (NEV). It forms part of NEOM's regulatory guidance and is subject to revision and review on a regular basis in pursuit of continual improvement.

3. Definitions and Abbreviations

Table 1: Abbreviations

Abbreviation	Explanation
ALARP	As Low As Reasonably Practicable
AHARP	As High As Reasonably Practicable
AoI	Area of Influence
CESMP	Construction Environment & Social Management Plan
ENVID	Environmental [& Social] Hazard Identification
ESIA	Environmental & Social Impact Assessment
EUI	Energy Use Intensity
GRC	Gate Review and Approval Committee
IAP	Integrated Assessment Process
IDP	Integrated Development Plan
IFC	International Finance Corporation
KPI	Key Performance Indicator
NEV	NEOM Environment Department
O&M	Operation and Maintenance
PER	Preliminary Environmental Review
SEA	Strategic Environmental [& Social] Assessment
SITES	Sustainable Sites Initiative
SMART	Specific, Measurable, Attainable, Relevant, Time-bound

Table 2: Definitions

Term	Definition
Acceptability	Decision process applied at the end of risk and opportunity assessment, that determines whether a suite of predicted outcomes resulting from a development are demonstrated to have reached ALARP/AHARP ***and*** are consistent with, and meet NEOM's Environmental Vision, relevant legislation and international agreements, guidance, etc.
Activity	Planned actions undertaken during a development, construction or operation that may or may not be a driver for change on environmental or social Values.

Term	Definition
Additive Impact Assessment	Process that combines all impacts from a development on a single Value.
AHARP	Status reached when management or mitigation measures have reduced a predicted outcome to the highest level without incurring unreasonable costs for the gains that could be made. Demonstration of AHARP forms part of the acceptability of a predicted outcome.
ALARP	Status reached when management or mitigation measures have reduced a predicted outcome to the lowest level without incurring unreasonable costs for the gains that could be made. Demonstration of ALARP forms part of the acceptability of a predicted outcome.
Baseline	The status of an environmental or social Value, established through survey prior to any development happening at a given location.
Change	A measurable deviation between the baseline condition and after an effect happening. Can be positive or negative.
Consequence	The potential outcome (positive or negative) of an effect on an environmental or social Value prior to management measures being applied. Can be certain or uncertain depending on the level of risk.
Consequence Criteria	Series of sequential rules that determine the severity or significance of a predicted outcome.
Cumulative Impact Assessment	Process used to evaluate the combined predicted outcomes on an environmental or social Value from several unrelated developments.
Development	Planned construction or activity
Driver	Interaction between an activity and an environmental or social Value, with the potential to cause a change (directly or indirectly) from the baseline of the Value. Can lead to positive, neutral or negative effects. This is a neutral term inclusive of positive as well as negative change and thus includes risk and opportunity.
Effect	A deviation from the expected and can be positive or negative.
Environmental Consultant	Specialized **Environmental Consultant** selected from NEOM's Environmental Services Framework and engaged by the **Proponent** to independently review and advise the development process and develop and implement environmental and social risk management documentation and programs through to the end of Construction
Hazard	Substance, activity, structure or event that has the potential to do harm to environmental or social Values.
Iconic (Campus) Assets	Large scale complex development projects which are critical to broad social or community needs. Iconic Assets may include stadia, hospitals, universities, airports and train Stations. These assets may be subject to their own masterplan.
Infrastructure and Public Realm	Infrastructure and public realm networks that may serve and be part of a masterplan development or connecting multiple developments. Infrastructure projects may include infrastructure networks, power plants, desalination plants and other infrastructure facilities. Public Realm projects may include large scale landscaping and hardscaping projects (e.g. parks, public squares, pathways, and roadside landscaping)
Likelihood	The chances of a risk or opportunity happening.

Term	Definition
Management measure (also "Control")	Mechanism devised and applied to eliminate a hazard or reduce the level of risk of a hazard from causing harm. Can also be applied to increase the chances of an opportunity from being realized or succeeding. Management measures shall follow the management hierarchy (Figure 1).
Mitigation	A mechanism used to respond to an event that has occurred with the intent to reduce the negative outcomes or increase the positive outcomes.
Monitoring	Mechanism used to check how processes are operating and to make sure they are compliant with the standards set within the project. Process used to detect change from a baseline condition after a development to determine the trend and whether a predicted outcome was accurate.
Non-Standard Assets	Can include both temporary and permanent built structures that do not meet the definition of a Standard Asset. These may include but are not restricted to demountable buildings, tents, marquees, stages, lighting towers, generators, mobile tanks, viewing platforms or stands, and temporary access roads, transmission lines, supply pipelines power sub-stations, pump-houses, quarries and borrow pits.
Opportunity	The effect of uncertainty on an expected [positive] result (opposite of risk).
Planning Team	Project master-planners, Project Designers (including architects, urban designers and landscape designers), Engineering Consultants, **Environmental Consultant**s, Sustainability Consultants, Specialist Consultants, and Sub consultants who are responsible for the Planning Deliverables during Stages 1 & 2 of the Development
Predicted Outcomes	The combined consequence of a risk or opportunity for a given Value, after management measures have been accounted for.
Proponent (also referred to as the Development Team)	NEOM Regional CEOs, Sector Heads, Chief Officers, or Executive Directors, or otherwise Private developers (where available) and their **Environmental Consultant**, Specialist Consultants, and Sub consultants who are ultimately accountable for the Development.
Regenerative Development	A development that regenerates its natural, physical, social and economic capitals to a state beyond sustainability. The terminology implies a state of net positive impact at present and requires a holistic approach to nature, implementing systems thinking and true cost accounting i.e. ecosystems services accounting.
Regional Infrastructure Networks	Networks of standard and non-standard assets that serves the region such as regional storage facilities and tanks, regional power stations, material supply depots (e.g. quarries or waste transfer stations) connected by extensive linear infrastructure elements such as regional power transmission, water supply pipelines and roads.
Region-wide Programs	Region wide programs contain a collection of individual sites or clusters dedicated to the implementation or activation of economic sector strategies such as sports, strategic events and nature-based tourism, typically involving the installation of a combination of temporary buildings or non-standard assets and the presence of large numbers of visitors, guest or spectators
Risk	The effect of uncertainty on an expected [negative] result. The result is generally the outcome of a hazard against the likelihood.

Term	Definition
Risk Analysis	Process that overlays development activities with the baseline conditions to predict whether effects are likely, and the consequences of those effects.
Risk Evaluation	Process to compare the estimated risk (consequence) against criteria to determine the severity or significance of the risk.
Risk Rank	Process used to establish relative importance of risks to identify those that need further attention to ensure they are ALARP and acceptable.
Risk Tolerance	An aspect of risk assessment defining how tolerant a Value is to withstanding the predicted impact from an event occurring. In ISO 31000 refers to exposure of business and financial risk and is normally dealt with in environmental and social risk assessment through ***resilience*** of the Value to withstanding change.
Signature Assets	High-profile developments that will be indicative of what NEOM represents on the international stage. These Assets will fall within an SEA or masterplan area.
Standard Assets	All building types otherwise not considered Iconic or Signature; including but not limited to residential, commercial, hospitality, retail, healthcare, civic, and warehouse buildings
Sustainability Facilitator	A project facilitator assigned by the project team as the key integrator throughout the project development process and shall hold suitable qualification and experience in Sustainable Development.
Unplanned Activity	An activity that is not planned for, is generally undesirable and usually has a potentially negative effect. Normally occur as a result of an accident and includes oil spill, collision of fauna with a vehicle etc.
Value	Environmental or social phenomenon with perceived or inherent value as defined through legislation, guidance, treaties, social norms etc. Values span marine, terrestrial and atmospheric biomes, and include, as a small suite of examples: geologic features; individual plants or animals; species; genetic diversity; habitats; water quality; air quality; ecological processes; people; buildings; infrastructure, and business, etc.

4. Related NEOM Documents

The requirements contained in the following documents apply to the extent specified in this procedure.

Engineering Procedures

Document Code	Document Name
NEOM-EN-PRC-001	Procedure for Geotechnical Investigation
NEOM-EN-PRC-002	Procedure for Topographic Survey
NEOM-EN-PRC-011	Procedure for Site Specific Seismic Hazard Study
NEOM-EN-PRC-012	Procedure for Hydrological Study
NEOM-EN-PRC-013	Procedure for Traffic Study
NEOM-EN-PRC-017	Procedure for Innovative Ideas
NEOM-EN-PRC-020	Procedure for Asset Naming Conventions
NEOM-EN-PRC-021	Procedure for Gate Review and Approval
NEOM-EN-PRC-022	Procedure for Handing Over
NEOM-EN-PRC-028	Risk Management Procedure
NEOM-EN-PRC-029	NEOM Plan of Work

Regenerative Development Management System

Document Code	Document Name
NEOM-NEV-PRC-016	Procedure for Regenerative Development
NEOM-NEV-TGD-601	Technical Guidelines Document on Environmental & Social Assessment Reporting
NEOM-NEV-TGD-602	Environmental and Social Management Plan – Template and Guidelines

5. Procedure

The Risk and Opportunities assessment process is set out in Figure 1 and discussed thereafter.

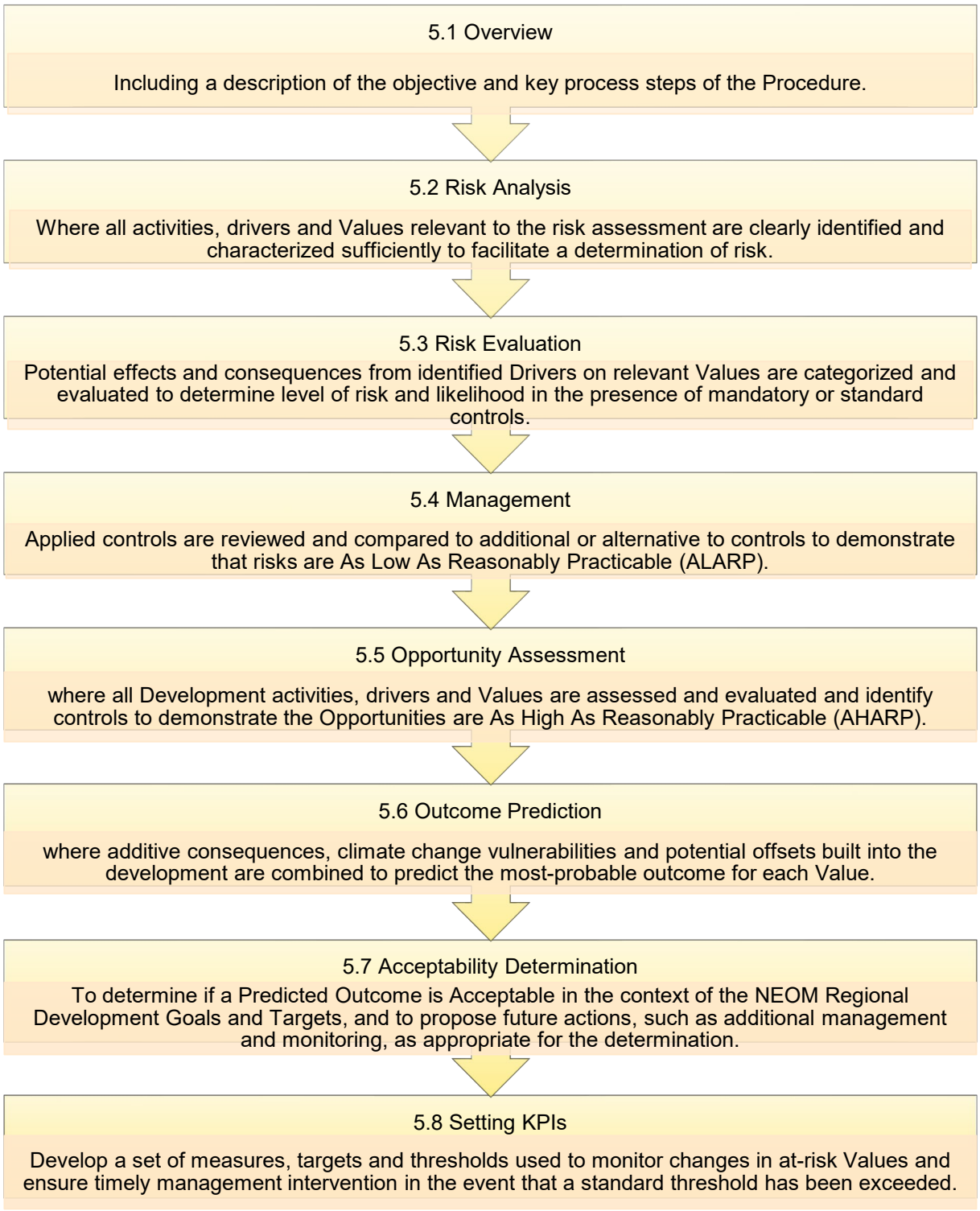

Figure 1. Risk and Opportunities assessment process flow diagram.

Note that Risk Tolerance is a component of the broader Risk Assessment process but is assessed from an environmental and social perspective by first identifying "resilience" in the Value being affected

and is included in the Evaluation of Risk, and then by establishing that the risks are ALARP and acceptable to NEOM.

5.1. Overview

The objective of environmental and social risk assessment is to identify the likelihood and consequences of effects to identified Values from all planned and unplanned activities associated with a development. On identification of the effects, control measures can be prioritized and applied to eliminate, control or mitigate primary risks to As Low As Reasonably Practicable (ALARP) and to determine if the subsequent residual risks are 'Acceptable'.

Consequences can be positive as well as negative, and therefore the risk assessment approach can also be used to determine where potential opportunities exist for positive effects. Furthermore, in the same way that management and mitigation can be applied to prevent a risk from resulting in a negative effect, management measures can also be applied to opportunities to increase the likelihood of a net benefit being achieved.

The environmental risk assessment process involves collation of technical and scientific data, including analyses and predictive modelling, in combination with consultations followed by one or more formal Environmental Hazard Identification (ENVID) workshops, formalization of the outcomes of the ENVID workshops in assessment documents such as SEAs or ESIAs, and subsequent monitoring and reporting.

5.2. Analysis

Prior to undertaking an assessment, detailed information about the proposed Development must be collated. This typically includes descriptions of relevant:

1. **Activities**, including narrative details and designs specifying the:
    a. Geographical area of the Development and its surrounding environmental context
    b. Key structural components, such as buildings and infrastructure, and associated operations
    c. Detailed descriptions on Execution Activities that are expected in construction and operation of the Development (as appropriate) which could interact with the surrounding environment, including operational characteristics such as personnel and machinery requirements, natural resources (water, materials), energy, location, timing and duration
2. **Drivers**, including details relating to development driven changes in environmental conditions associated with energy, i.e. noise, light, sound, movement, etc., including an understanding of their intensity, volume, frequency, and:
    a. Cumulative Area of Influence (AoI) for each Driver considering all expected relevant activities
    b. The set of relevant mandatory controls to mitigate risks associated with each Driver i.e. barriers to control physical movements, soundproofing to reduce generator noise, air filters to limit air emissions

3. **Values**, which occur in the Development Area and which may be potentially affected by Execution Activities. This should include an understanding of the:

    a. Type, number, distribution, trajectory (e.g. population, spatial extent) and in some cases demographics, of the Values in the Development Area

    b. The conservation or social significance of each Value

    c. Drivers of expected Development Activities that a Value may be sensitive

    d. Potential Effects that the expected Drivers could have on each Value.

The following sections expand on the specific information needs and requirements for undertaking an environmental and social risk assessment for NEOM Developments.

1.1.1 Activities

To fully understand the context and potential risks (and opportunities) of a Development, a high-level understanding of the proposal and its surrounding environment is required. This is typically provided through a combination of images and a detailed descriptive narrative for both construction and operation / occupation, referred to as the Project Description.

The concept drawings and other figures will contain the current design and layout that includes all of the key components, structures and operations of the proposed Development.

The General Layout should include the Development Area boundary, proposed conceptual layout, laydown area, and all existing buildings, roads, infrastructure, and natural areas that lie within or adjacent to the Development Area. It should, as a minimum, show topography, existing roads, buildings and other infrastructure, and major environmental features such as wadis, marine waters, and conservation priority areas.

Descriptive narratives should describe each key component, structure or operation with sufficient detail to enable a clear understanding of its purpose, reason for being located at the specified location (as shown in the General Layout), expected construction methods and materials, expected lifetime and any operational or maintenance activities. It should also include associated resource use requirements including sources of materials, energy consumption and waste / emissions generation.

The Project Description should also include detailed accounts of expected Execution Activities which include, but are not limited to, physical human or mechanical actions, the presence of temporary structures such as construction worker camps, laydown areas, roads and the transport and disposal of resources and wastes. Emergency events should also be described as an Execution Activity, even though these are unplanned, and development plans and designs are inherently intended to prevent their occurrence.

Information on Execution Activities is typically provided as a set of generic work method statements or emergency event scenarios that sets out their operational characteristics including:

- A general description of the work to be done including expected commencement and duration, for example the expected start date and duration for ground preparation
- A list and inventory of the types and numbers of machinery and labor, location, timing and duration, for example the number of bulldozers required for excavation work

- The frequency of repeated activities within the project area, for example the frequency of truck movements to deliver infill material
- The footprint, or total area that the activity will take place within (if less than the Development Area).

Information collecting during scoping inform, and should be expanded upon, in the relevant sections of the Scoping Report, ESIA and Environmental Management Plan(s).

1.1.2 Drivers

While the Project Description is important for contextualizing risks of a Development, information relating to associated Environmental Drivers is critical to ensure the risk assessment is accurate and appropriate.

Environmental Drivers that should be identified include but are not limited to:

- Physical presence and interaction
- Air, light and noise emissions, vibrations
- Effluents to rivers/wadis or the sea
- Land and seabed disturbance
- Surface-water flow alteration and sediment erosion
- Water turbidity and sedimentation
- Introduction of invasive species
- Hazardous material releases including oil spill.

In addition to describing them, it is important to determine the cumulative area over which each environmental Driver may have an influence. This is referred to as the AoI and is determined using a simple technical spatial analysis by combining information on the expected location of activities producing the Driver and the maximum distance from this area that the Driver will have an influence.

1.1.3 Values

Once the environmental Drivers of the Development have been determined, it is then necessary to collate all available information relating to the presence and distribution of plants, animals, humans and other Values within each of the respective AoIs.

Values may include, but are not limited to:

- populations of individual fauna and flora species and their habitats
- vegetation types, communities and natural ecosystems
- ecological functions and ecosystem services
- natural resources (e.g. air, water, soils) and natural capital
- human use of areas, conservation Values
- archeological and cultural heritage sites.

For each potentially effected Value, information that needs to be collected may include:

- general description of the Value including its function in the community or ecosystem and or its conservation and or other human Values
- the known or estimated number of individuals, their population demographics and geographical distribution within the Development footprint, the NEOM region, the Arabian Peninsula and globally, and conservation status regionally, nationally and globally (i.e. IUCN Red List)
- a description of how it is sensitive to Drivers of the Development including any specific information associated with the effect of the Driver and expected intensities, frequencies or durations.

5.3. Evaluation

Collated information on potentially affected Values is typically synthesized and then provided as a set of narrative descriptions, figures and maps. During scoping, the information needs for assessing risks to identified Values should be identified and then described in the Scoping Report. Once collated, information on each Value should then be compiled in the Existing Environment section of the ESIA. Finally, information relating to Value sensitivities, and associated standards for potential effects, e.g. noise limits, should be described in the Environmental Management Plan(s) and Environmental Monitoring Plan(s).

Evaluation is a sequential and iterative process which involves:

1. Reviewing the intensity and scale of identified Drivers in relation to the presence and condition of Values to determine what the consequence would be if management or mitigation are not put in place
2. Predicting the likelihood of that consequence occurring in the presence of mandatory or standard controls
3. This process involves identifying and discussing each individual risk to a Value from a single Driver and as such will likely result in multiple lines of evaluation for each Value.

Evaluation includes:

1. Determining the potential worst (or best case) credible consequence for each Driver-Value interaction, if no control measures are put in place, using the *NEOM Environmental and Social Consequence Criteria Matrix* (Appendix A)
2. Predicting the likelihood that the consequence will occur, using industry statistics and or expert opinion, and assuming mandatory and/or best practice control measures are applied (refer to relevant *NEOM Codes of Practice*)
3. Calculating the level of residual risk for the Driver-Value combination, accounting for the determined consequence and estimated likelihood, and using the *NEOM Risk and Opportunity Ranking Matrix* (Figure 2).

Evaluation should be conducted within an ENVID workshop. The objectives of the workshop are to present and discuss the environmental and social risks and, evaluate the likelihood and consequences

in the context of the development (siting, design, construction and operation) using the expertise and insight of all relevant project personnel. To be effective, ENVIDs should involve a multi-disciplinary team of experienced and suitable qualified personnel from the Proponents team, including its contractors and consultants as well as representation from the NEV.

An effective ENVID will be informed by:

- Previous experience from NEOM's activities and analogous NEOM projects/activities from locations around the world with similar conditions to those expected for the Activity being assessed
- Previous experience from NEOM personnel who manage relevant operations in the region
- Experienced contractor personnel who are familiar with the operations / activities under consideration
- Industry databases on the frequency of occurrence on unplanned events
- Sector/Stakeholder engagement inputs.

Depending on the size and complexity of the project, the ENVID workshops should include participants from a range of technical disciplines including designers, engineers, environmental scientists, construction managers, and in some cases emergency response personnel. The core team members should have sufficient breadth of knowledge, training and experience to assure that risks and controls are appropriately identified and assessed. All personnel should take time to become familiar with the project and workshop expectations, and to actively participate and contribute to the workshop. It is the responsibility of the Proponent to organise the workshop venue and facilitator with help from NEV.

1.1.4 Effects

Analyses of potential environmental effects should be undertaken by a team of specialists for each of the identified Values being affected, with the purpose of predicting potential changes to environmental quality, distribution, behaviour, population size and viability, ecosystem function and socio-economic Values.

Inputs to this analysis should include current, peer-reviewed and empirical technical information wherever available such as ecotoxicology reports, hydrodynamic, spill or noise modelling, and studies of ecological, physiological or behavioural sensitivities of relevant Values, with a focus on the driver mechanisms (cause and effect) such as toxicity, mobility, persistence, or bioaccumulation potential.

For risk assessment of incident investigation, Standard Assets and Non-building proposals that have no significant effects, outputs from this analysis should be reviewed internally within the Project team.

Risk assessments for large, complex or high risk developments and activities with the potential for significant environmental or social effect, will also be peer-reviewed by external, internationally recognised subject matter experts to verify that data used for determining potential environmental effects are appropriate. It is the responsibility of NEV to arrange external peer-review.

1.1.5 Consequence

Determining consequence relies on an understanding of range of physical, biological, chemical and geographical factors relevant to both the Driver and the Value in question, including but not limited to the:

- worst-case potential effect for each Driver-Value interaction
- distribution of the Value in relation to the relevant AoI, and specifically the proportion of the Values' range, habitat or community that may be affected
- nature of the receiving environment, including conservation significance, sensitivity or resilience of Values to the potential effect
- degree of change relative to pre-effect conditions, or to otherwise defined criteria of Acceptability.

The inclusion of so many variables in the prediction of likelihood increases the level of uncertainty and therefore participants should utilize all data and information available when predicting likelihood during a NEOM Risk Assessment. Evaluation of the uncertainty will help identify whether further studies, surveys or information are required.

Information sources that can support consequence determination include, but are not limited to:

- Expert Opinion – where scientific or industry experts determine the probability by consensus
- Scientific Literature – published peer-reviewed studies (e.g. journal papers) and associated data relating to the frequency of particular types of environmental incidents in a given industry
- Scientific Analysis – targeted experiments or analyses relating to a specific environmental effect associated with a particular activity and defined set of Values
- Predictive Modelling – where the use of predictive tools such as hydrodynamics or numerical models to project the potential of a Driver reaching threshold levels based on historical quantitative data and/or assumptions.

While much of the information that is used in the Consequence Determination can be quantified and/or qualitatively validated in terms of potential effects, the estimation still relies on a subjective analysis by participants in the risk assessment process. To support participants and ensure risk assessments are consistent between Developments, NEOM has developed a set of generic consequence criteria to be used as part of the risk assessment procedure. Generic consequence criteria have been developed for both environmental and social Values as shown in Table 3.

Table 3: General Consequence Criteria for Risks and Opportunities

Category	Definition
RISKS	
Incidental	Minimal or no detectable effects that do not require remediation
Minor	Medium-term, local or short-term widespread effects that can be easily managed, mitigated or remediated and unlikely to require compensation
Moderate	Long-term, local or medium-term, widespread effects that can be managed, mitigated or remediated or may be compensable

Category	Definition
Major	Permanent, local or persistent, widespread effects that may be managed are likely to be compensable
Severe	Permanent widespread or Persistent, regional effects that cannot be remediated but maybe compensable
Catastrophic	Permanent, significant and regional scale effects that cannot be remediated or compensated
OPPORTUNITIES	
Negligible	Minimal or no proposed improvement that are likely to lead to offsets
Marginal	Medium-term, local or short-term widespread benefits, that can easily be improved upon through up-scaling duration, scale or mechanism (e.g. contract)
Appreciable	Long-term, local or medium-term, widespread beneficial effects that may be improved by an increase in duration, scale or through medium term contract.
Material	Permanent, local or persistent, widespread beneficial effects that may be improved through scale or established long-term initiative
Substantive	Permanent widespread or persistent, regional beneficial effects with educational or long-term initiative leading towards cultural change
Transformative	Permanent, significant and regional-scale environmental benefits or cultural change that cannot be reasonably improved – no further action necessary

In addition to the general criteria listed in the Table 3, NEOM has developed a set of Value specific criteria to help ensure accurate and appropriate consequence determination and these are presented in the Consequence Criteria matrix in Appendix A.

Value specific criteria take into consideration a range of Value specific factors such as human value prioritization, conservation significance, and resilience. Value specific criteria are included in the NEOM ENVID workbook for the following potential Values:

- Climate
- Landform and Function (including hydrology, coastal processes)
- Resources (including water, minerals, soils and wastes)
- Environmental Quality (including air, water and soil)
- Biota (including behaviour, distribution and physiology of flora and fauna)
- Ecosystem Condition (including biodiversity and function)
- Ecosystem Services (including Provision, Regulating, Cultural and Supporting)
- People (including Wellbeing, Welfare, Equitable Access to resources and Culture)

- Places (including Microclimate)
- Prosperity (including industry, commerce and infrastructure).

NEOM will continue to develop appropriate Value specific criteria to ensure future risk assessments are current, appropriate and accurate in the context of NEOM's Environmental Vision.

Consequence Determinations are typically synthesised and then provided as a set of narrative descriptions, figures and maps in the Risk Assessment section of the ESIA. Finally, information relating to Value sensitivities, and associated standards for potential effects e.g. noise limits, should be described in the Environmental Management Plan and Environmental Monitoring Plan.

1.1.6 Likelihood

Prior to addressing the likelihood of a risk occurring, the controls and standards that are relevant to the Activity and are applied as standard through NEOM activities and developments, should be identified and listed. These will include, but are not be limited to:

- NEOM guidance documents, procedures, standards, contracts etc.
- KSA legislation, standards and guidelines
- Mandated international standards such as those from IFC, MARPOL, International Aviation Authority, etc.
- Discretionary standards such as the Dutch Soil Standards, ISO, etc.

Likelihood incorporates a number of temporal factors including:

- timing, duration, and frequency of an activity occurring
- the probability that a potentially sensitive Value will be present within the AoI and be affected
- the probability that an effect will occur if mandatory environmental controls are in place and working as designed.

The inclusion of so many variables in the prediction of Likelihood increases the level of uncertainty and therefore participants should utilize all data and information available when predicting likelihood during a NEOM Risk Assessment.

Information sources that can support Likelihood prediction include, but are not limited to:

- Expert Opinion – where scientific or industry experts determine the probability by consensus
- Industry Statistics – published data relating to the frequency of particular types of environmental incidents in a given industry
- Scientific Analysis – targeted experiments or analyses relating to a specific environmental effect associated with a particular Activity and defined set of Values
- Predictive Modelling – where the use of predictive tools such as hydrodynamics or numerical models to project the potential of a Driver reaching threshold levels based on historical quantitative data and/or assumptions.

For well-known and standard Activities and minor unplanned events, such as a small oil spill to ground from a vehicle, expert opinion and industry statistics are typically sufficient to determine likelihood. However, where an Activity is complex or large, such as a major oil spill from a ship to marine waters, likelihood must be informed by multiple and scientifically defensible techniques including scientific analyses and predictive modelling.

It should also be noted that in some cases multiple information sources and data may be available and should be consulted, however this can also lead to inconsistencies in probability estimates. In such circumstances the precautionary principle should be applied, and the most conservative (i.e. highest) probability prediction should be used.

Once all the data are collated and assessed, the probability of a potential environmental effect should be categorised using the NEOM Likelihood Categories and Criteria (Table 4). However, when categorising likelihood, the following must also be considered:

- For planned events where interaction between the Driver and Value is certain (e.g. earth works and ground disturbance) the likelihood will always be categorized as “Certain” (Score =1)
- For unplanned events, the probability of an event should be estimated using one or more of the techniques noted above
- Any reduction in likelihood of the defined consequence occurring due to the predicted effectiveness of planned control measures.

Table 4: Likelihood Categories and Criteria

Category	Probability (%)	Criteria
Remote	0-5	Rare or unheard of
Seldom	5-20	Has occurred once or twice within the industry
Occasional	20-50	Reasonable to expect that the consequences will not occur at this Development. Has occurred several times in the industry, but not in the Kingdom
Common	50-80	Exceptional conditions may allow consequences to occur within the Development lifetime, or has occurred within the Kingdom
Frequent	80-95	Conditions may allow the consequences to occur at the Development during its lifetime, or the event has occurred within NEOM
Certain	95-100	Consequences can reasonably be expected to occur in period of the Development

1.1.7 Ranking

Once consequence and likelihood rankings are determined, risks should be ranked using the NEOM Risk Matrix (Figure 2). This matrix uses consequence and likelihood to derive a unique scale for both risk and opportunity rankings as follows:

For Risks: ***Eliminate*** having the most serious impact potential, to ***Mitigate*** being the least serious.

For Opportunities: ***No Action*** having the least potential to improve, to ***Invest*** which has the greatest.

These reflect the risk and opportunities hierarchy to guide the prioritisation for controls and reflect Unacceptable impacts (Eliminate) and Regenerative Opportunities (Invest). All evaluated risks must be managed down to ***Mitigate*** through the application of additional controls, whereas the opportunities should be managed up to ***Invest*** where possible and are explained in the following:

- Risks scored ***Eliminate***: are **Intolerable** (i.e. catastrophic or severe impacts that are likely to occur or expected to occur on an occasional basis) and the associated risk must be eliminated or substituted with an inherently safer option
- Risks scored ***Substitute***: **Require Further Design or Planning** and the associated Activity must be revised through further engineering designs or identified risks must be managed using a specific management plan to mitigate potential risks. If no further reasonably practicable action can be taken, NEOM approval must be sought to proceed
- Risks Scored ***Engineer***: **Require Best Practice Controls** to proceed. This means that for the associated Activity, best practice operational controls must be applied for the Activity to be considered Tolerable
- Risks Scored ***Manage*** and ***Mitigate***: are considered **Tolerable** but may still need to have best practice applied to them to ensure they comply. The assessment of the associated activity can proceed subject to being ALARP and Acceptable.
- Opportunities Scored ***No Action*****:** are considered **AHARP** as they offer little opportunity for environmental improvement or the costs of improvement are prohibitively disproportionate to potential gains.
- Opportunities Scored ***Review*** and ***Plan***: **Require Further Design or Planning** and the associated Opportunity must be under constant appraisal to seek improvements or revised through further engineering designs, or managed using a specific management plan to assure the associated KPIs have the greatest potential of being met. The intent of ***Plan*** is to try and Achieve the rank of ***Design*** through further design or activity considerations before being considered AHARP.
- Opportunities scored ***Design***: are considered to offer important opportunities for the Development to achieve NEOM's goals and aspirations. However, further improvements should be sought to try and identify a means of achieving the rank "Invest"
- Opportunities Scored ***Invest*****:** offer the most important and far-reaching potential for NEOM to meet its environmental ambitions (i.e. Substantive or Transformative that have a high likelihood of realisation). Management Plans must be devised to ensure the Opportunity has the highest likelihood of being realised.

	RISKS						OPPORTUNITIES					
Consequence: / Likelihood:	Catastrophic	Severe	Major	Moderate	Minor	Incidental	Negligible	Marginal	Appreciable	Material	Substantive	Transformative
Certain	Eliminate	Eliminate	Eliminate	Substitute	Substitute	Engineer	Plan	Design	Design	Invest	Invest	Invest
Frequent	Eliminate	Eliminate	Substitute	Substitute	Engineer	Engineer	Plan	Plan	Design	Design	Invest	Invest
Common	Eliminate	Substitute	Substitute	Engineer	Engineer	Manage	Review	Plan	Plan	Design	Design	Invest
Occasional	Substitute	Substitute	Engineer	Engineer	Manage	Manage	Review	Review	Plan	Plan	Design	Design
Seldom	Substitute	Engineer	Engineer	Manage	Manage	Mitigate	No Action	Review	Review	Plan	Plan	Design
Remote	Engineer	Engineer	Manage	Manage	Mitigate	Mitigate	No Action	No Action	Review	Review	Plan	Plan

Figure 2: Risk / Opportunity Ranking Matrix

5.4. Management and Intervention

Management measures help avoid or reduce the likelihood of a risk occurring, and mitigation measures are applied in response to an effect happening with the aim of reducing the magnitude of the effect. The determination of ALARP relies on demonstrating, through reasoned and supported evidence, that implementation of further control measures to reduce risks, would require a grossly disproportionate level of technological or energetic effort in comparison to the environmental benefit gained.

NEOM's hierarchy of control (Figure 3) is used in the determination of ALARP (1-5) and AHARP (6-10) can be described as follows:

1. Eliminate or remove the hazard potential Catastrophic risks (No-action Alternative).
2. Substitute the Design or Methodology of an Activity with an inherently less-risky alternative
3. Engineer to lower risks through applying additional or international best-practice controls
4. Manage risks using standard procedural or administrative controls
5. Mitigate risks through provision of onsite monitoring and response capabilities.
6. No Action required: Activity is sustainable or presents a potential negligible opportunity
7. Review the activity to see if an opportunity may be achievable through management
8. Plan additional management actions to ensure opportunities are achieved
9. Design-in additional measures to increase the scale or magnitude of the opportunity
10. Invest in the opportunity in areas otherwise not considered under the development

Note: NEOM will only allow Offsets where the risks of an Activity are considered ALARP but otherwise not Acceptable in the context of the NEOM *Environmental Vision*. Offsets will be required to demonstrate a 3:1 positive net outcome as a minimum.

It is important to note, that while the inherent or initial level of risk may be tolerable, this does not mean that further reductions are automatically considered to not be reasonably-practicable. ALARP demonstration requires that the proponent provides evidence that no further benefit is possible without grossly disproportionate increase in complexity or effort.

To demonstrate residual risks are ALARP, the Proponent must prove that:

- The Lowest Risk Option has been selected (equivalent to Eliminate and/or Substitute)

AND:

- Applied a Design approach that is Inherently Safer than industry standard alternatives (Equivalent to Substitute and Minimize (Level 3.a).

Evidence for the selection of the lowest risk option should show that more than one reasonably practicable option for the proposed activity, including the no-action option, has been considered (e.g. for pipeline installation, options may include trenching, tunnelling or no pipeline) and, that the selected option represents the lowest relative inherent environmental risks to the other options considered.

To demonstrate that an Inherently safer design has been achieved for the Activity, Proponents must provide evidence that the design and planning of the selected activity option meets or exceeds an

international design standard and the highest level within the hierarchy of control (e.g. substitution, minimization and restoration) that is reasonably practicable.

If the Proponent cannot provide evidence that both the lowest risk option has been selected and an inherently safer design has been achieved, then the Activity cannot be demonstrated to be ALARP.

Where positive effects (opportunity) on an environmental or social Value have been identified for a development, the assessment and evaluation processes are generally similar to that followed for risk. Opportunity analysis requires the same input for analysis (Activity, Drivers and Values), evaluation (evaluation, effects, consequence, likelihood and ranking), management and monitoring. For this reason, the language throughout this Procedure and especially in the consequence criteria and risk ranking tables has been selected to be neutral.

However, opportunity assessment requires a different management hierarchy on which to determine the appropriate management measures and demonstrate AHARP. The opportunities hierarchy is shown in Figure 3.

To demonstrate AHARP, the selected controls should rise as high up the opportunity hierarchy as possible without grossly disproportionate increase in complexity or effort. Ideally, opportunities will be sought that match or exceed the combined predicted outcomes. If the risks exceed the opportunities, environmental or social offsets will be triggered. If opportunities exceed the risks, the excess can be declared as a net environmental benefit or net increase in biodiversity.

It is important to note, that all activities associated with the provision of opportunities must also be assessed for risk and included in the activities and drivers.

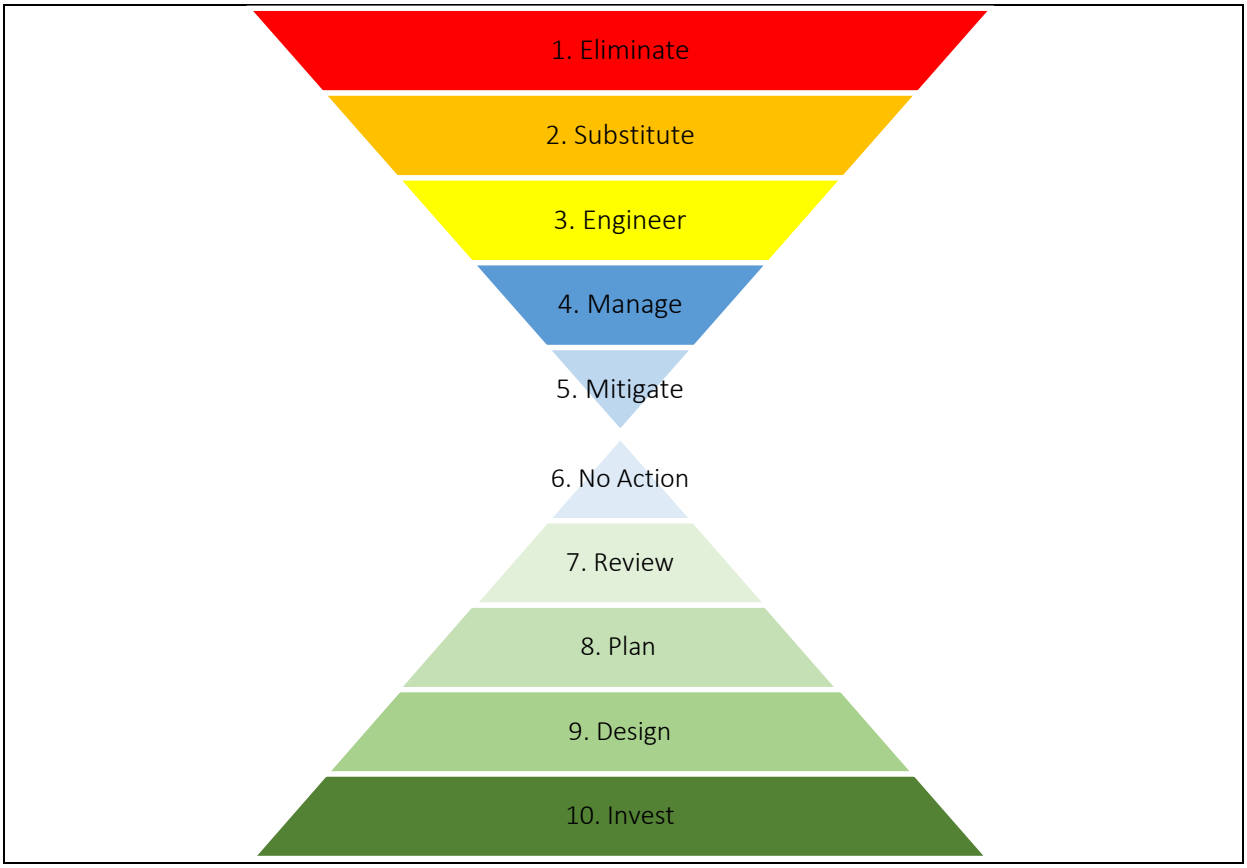

Figure 3: NEOM Hierarchy of Environmental and Social Risk & Opportunity Controls

5.5. Outcome Prediction

After completion of the risk evaluation and demonstration that all risks associated with individual Drivers are ALARP, an overall predicted outcome is required for each Value being assessed.

Predicted Outcomes should be described in terms of three key factors:

1. Significant Residual Risks
2. Additive Risks + Opportunities
3. Climate Change Vulnerability.

Residual risks are the results of the risk assessment on each of the Values.

Additive risk assessment is the combined effects of two or more drivers from a given development or activity on a single Value. Drivers can act on a Value in isolation e.g. the reduction of groundwater available for a sensitive flora species due to extraction, and additively e.g. reduction in groundwater ***and*** effects of dust emissions on photosynthetic activity. This process is to be included in the risk assessment for each Value. Additive assessment results in the predicted outcomes of the entire development on a given Value.

Certain Values are vulnerable to climate change (e.g. mangroves due to sea-level rise). On conclusion of the risk assessment based on the risks from the Development or Activity, the risks to the Value resulting from climate change will be assessed. This process will use available information about the

sensitivity of the Value and the levels of consequences due to climate change. If the resultant risks remain unacceptable, further management or mitigation measures, or offsets will need to be explored prior to acceptability being achieved.

5.6. Acceptability

In assessing the contribution of the Development towards NEOM's *Environmental Vision*, Proponents must demonstrate that the two overarching objectives of the *Vision* (all developments must be net positive for carbon emissions and net positive for biodiversity) will be achieved.

These two objectives require complex and comprehensive approaches, and so to assist planners and designers, the NEOM Regenerative Development Management System includes a set of Development Goals, Targets and Standards that should be applied to all developments and can be used in demonstrating Acceptability. Acceptability is determined using a simple equation of:

Risk Outcomes + Developmental Contribution (Opportunities)

compared with

NEOM's Environmental Vision objectives

Where the Predicted Outcome for a Value is determined to be Acceptable, that Outcome will be converted to an Outcome-based Condition and form part of the overall Environmental Accord for the Development.

Where the Predicted Outcome for a Value is determined to be Not Acceptable, the section should propose an appropriate and commensurate rehabilitation, Compensation or Offset Program. If the Rehabilitation, Compensation or Offset Program is considered Acceptable by NEOM Environment Department, it will be converted to an Outcome-based Condition and form part of the overall Environmental Accord for the Development.

It should be noted that Net Negative Outcomes may be considered Acceptable by the NEOM Environment Department, if it can be demonstrated that the cumulative effect of other developments across NEOM will ensure NEOM's Environmental Vision is still achievable AND that Rehabilitation, Compensation or Offsets Programs are not technically feasible or the cost of the program is grossly disproportionate to the nature and scale of the Outcome.

All performance objectives, targets and management measures will form part of the Accord, and will be monitored through the life of the project to track application and to assess efficacy.

5.7. Key Performance Indicators

KPIs and Interim Targets or Thresholds should be established for each Acceptable Outcome or otherwise proposed Rehabilitation, Compensation or Offset Program.

KPIs will be used in monitoring the potential changes to Values during Execution and should align to NEOM's Regenerative Development Standards where appropriate. Regardless, all KPIs must be SMART which is defined as:

- Specific: well defined and not open to wide interpretation
- Measurable: can be measured, and where possible, be in a quantitative manner

- Achievable: can be met, i.e. be realistic
- Relevant: relate to the potential environmental risks of the activity
- Time-based: include a time component (where relevant).

These will help identify the accuracy of the predicted outcomes to enable feedback to future risk assessments, and to validate that NEOM's *Environmental Vision* is being realised.

6. References

International Finance Corporation (2012). *IFC Performance Standard 1 - Assessment and Management of Environmental and Social Risks and Impacts*.

Standards Australia (2012). *Managing environment-related risk.* HB 203.2012

Standards Australia (2013). *Handbook Risk Management Guidelines – Companion to AS/NZS ISO 31000:2018.* SA/SNZ HB 436:2013

Appendix A: NEOM Environmental and Social Consequence Criteria

ENVIRONMENTAL OR SOCIAL VALUE SET			Consequence Definition	Incidental (6)	Minor (5)	Moderate (4)	Major (3)	Substantive (2)	Catastrophic or Transformative (1)
			Observable change that is outside the range of natural variability occurring over the following spatial and temporal scales (unless otherwise stated below)	Localized < 2 years	Localized, 2-10 years or Widespread, < 2 years	Localized, > 10 years or Widespread, 2-10 years	Widespread, > 10 years or Regional, < 10 years	Regional, > 10 years Or Landscape, < 10 years	Landscape, > 10 years
PLANET	CLIMATE & OCEAN	Atmospheric gases and oceanic chemistry	Total estimated GHG emissions (embodied and operational) of a Development or Activity with the potential to change > Surface climate conditions > Ocean chemistry (pH) > Sea Level Rise > Storm frequency and intensity				Is above levels required to meet the IPCC 1.0° C Target but below levels required to meet 1.5° C limit	Is above levels required to meet the IPCC 1.5° C but below levels required to meet the 2.0° C target	Is above net zero and equal to or above levels required to meet the IPCC 2.0° C limit
	LANDFORM AND GEOLOGY	Landform & Function	Alteration to landform with the potential to change geophysical processes e.g. hydrology, and visual aesthetics of landscape [Observable reduction in condition or integrity of coastal features with potential impacts on hydrodynamics or turbidity]	Alteration in geophysical processes with capacity to lead to short-term, localized environmental change	Alteration to geophysical processes with capacity to lead to long-term regional or short-term widespread environmental change	Alteration to geophysical processes with capacity to lead to permanent local or long-term widespread environmental change	Alteration to geophysical processes with capacity to lead to permanent widespread or long-term regional-scale environmental change	Alteration to geophysical processes with capacity to lead to permanent regional or long-term landscape-scale environmental change	Alteration in geophysical processes with capacity to lead to permanent landscape-scale environmental change
		Geology and Raw Materials	Quantifiable changes in the availability and security of a primary resource estimated using the EU CE framework for Raw Material Availability and Critical Raw Material Security	Localized < 2 years	Localized, 2-10 years or Widespread, < 2 years	Localized, > 10 years or Widespread, 2-10 years	Widespread, > 10 years or Regional, < 10 years	Regional, > 10 years Or Landscape, < 10 years	Landscape, > 10 years
	ENVIRONMENTAL QUALITY	Air Quality	Quantifiable changes in the condition of environmental media in relation to defined standards (NEOM or the greater of KSA, IFC, WHO, Dutch Soil Standards) that regulate human health e.g. ground water, air, soil, at the following spatial and temporal scales. Includes airborne and underwater noise	One exceedance within site boundary of Allowable Exceedances stated in Appendix A of PME Ambient Air Quality Standard	>1 but <20 exceedances within site boundary of Allowable Exceedances stated in Appendix A of PME Ambient Air Quality Standard	>1 but <20 exceedances of AQ standards per year within surrounding area of Allowable Exceedances stated in Appendix A of PME Ambient Air Quality Standard	Exceedances of AQ standards per year in surrounding area for ≥20 but <75 days Any detectable levels of atmospheric asbestos.	Exceedances of AQ standards per year in surrounding areas ≥75 but <150 days Levels of asbestos exceeding standards for period lower than standards permit	Continuous exceedances of AQ standards in surrounding area Levels of asbestos exceeding standards for period greater than standards permit
		Soil and Groundwater Quality		One localized (within site boundary) exceedance of standards	Localized but reversible exceedances of standards or widespread minor detection of exceedances	Localized and long-term or widespread but reversible exceedance of standards	Widespread and long-term or regional but reversible exceedance of standards	Regional and long-term or Landscape but reversible exceedance of standards	Permanent and irreversible exceedances of groundwater over regional or landscape
		Marine Water & Sediment Quality		One localized (within site boundary) exceedance of standards	Localized but reversible exceedances of standards or widespread minor detection of exceedances	Localized and long-term or widespread but reversible exceedance of standards	Widespread and long-term or regional but reversible exceedance of standards	Regional and long-term or oceanic but reversible exceedance of standards	Permanent and irreversible exceedances of groundwater over regional or oceanic scale

ENVIRONMENTAL OR SOCIAL VALUE SET			Consequence Definition		Incidental (6)	Minor (5)	Moderate (4)	Major (3)	Substantive (2)	Catastrophic or Transformative (1)
			Observable change that is outside the range of natural variability occurring over the following spatial and temporal scales (unless otherwise stated below)		Localized < 2 years	Localized, 2-10 years or Widespread, < 2 years	Localized, > 10 years or Widespread, 2-10 years	Widespread, > 10 years or Regional, < 10 years	Regional, > 10 years Or Landscape, < 10 years	Landscape, > 10 years
NATURE	BIODIVERSITY AND ECOSYSTEM FUNCTION	Behavior	Observable change to critical behaviors such as feeding, breeding (including nesting), resting and migration at the following spatial and temporal scales …		Localized, short-term	Localized, medium-term or Widespread, short-term	Localized, long-term or Widespread, medium-term			
		Physiology	Observable change in condition or annual reproductive potential in local populations, sub-populations or entire populations (depending on spatial scale of impact across …		<20% of the population	20-70% of the population	> 70% of the population			
		Abundance	Observable net change in population size for a single species – native and invasive species are to be addressed.	*Vulnerable**	Change of a minor portion (detectable but not statistically significant)	*1-2%*	*2-5%*	*5-10%*	*>10%*	Change to a population which may result in its local extinction or threaten the global population OR Successful reintroduction of a species native to the area but locally extinct
				*Sensitive**		*1-5%*	*5-10%*	*10-20%*	*>20%*	
				*Abundant**		*5-10%*	*10-20%*	*20-70%*	*>70%*	
		Biodiversity	Observable change in biodiversity or abundance of a functional guild with the potential to affect ecosystem function at the following spatial and temporal scales.		Localized < 2 years	Localized, 2-10 years or Widespread, < 2 years	Localized, > 10 years or Widespread, 2-10 years	Widespread, > 10 years or Regional, < 10 years	Regional, > 10 years Or Landscape, < 10 years	Landscape, > 10 years
		Ecological Units	Observable change in coverage, condition, connectivity or distribution of an ecological unit at the following spatial and temporal scales		Localized < 2 years	Localized, 2-10 years or Widespread, < 2 years	Localized, > 10 years or Widespread, 2-10 years	Widespread, > 10 years or Regional, < 10 years	Regional, > 10 years Or Landscape, < 10 years	Landscape, > 10 years
	ECOSYSTEM SERVICES	Provisioning	Quantifiable changes in the availability or Value of a natural resource or service used by people, measured in relation to its maximum sustainable yield, market price or other bio-economic parameters		Localized < 2 years	Localized, 2-10 years or Widespread, < 2 years	Localized, > 10 years or Widespread, 2-10 years	Widespread, > 10 years or Regional, < 10 years	Regional, > 10 years Or Landscape, < 10 years	Landscape, > 10 years
		Regulating	Quantifiable changes in selected regulating processes such as carbon capture (sabkhas), erosion control, flood control etc.		Localized < 2 years	Localized, 2-10 years or Widespread, < 2 years	Localized, > 10 years or Widespread, 2-10 years	Widespread, > 10 years or Regional, < 10 years	Regional, > 10 years Or Landscape, < 10 years	Landscape, > 10 years
		Supporting	Quantifiable changes in selected underlying ecological processes that support energy capture and nutrient cycling e.g. photosynthesis, decomposition, soil formation etc.		Localized < 2 years	Localized, 2-10 years or Widespread, < 2 years	Localized, > 10 years or Widespread, 2-10 years	Widespread, > 10 years or Regional, < 10 years	Regional, > 10 years Or Landscape, < 10 years	Landscape, > 10 years
		Bio-cultural	Quantifiable changes to the accessibility of natural areas and interactions that people have with wildlife, for research, educational, recreational and spiritual purposes.		Localized < 2 years	Localized, 2-10 years or Widespread, < 2 years	Localized, > 10 years or Widespread, 2-10 years	Widespread, > 10 years or Regional, < 10 years	Regional, > 10 years Or Landscape, < 10 years	Landscape, > 10 years

ENVIRONMENTAL OR SOCIAL VALUE SET			Consequence Definition	Incidental (6)	Minor (5)	Moderate (4)	Major (3)	Substantive (2)	Catastrophic or Transformative (1)
			Observable change that is outside the range of natural variability occurring over the following spatial and temporal scales (unless otherwise stated below)	Localized < 2 years	Localized, 2-10 years or Widespread, < 2 years	Localized, > 10 years or Widespread, 2-10 years	Widespread, > 10 years or Regional, < 10 years	Regional, > 10 years Or Landscape, < 10 years	Landscape, > 10 years
PEOPLE	PEOPLE AND COMMUNITIES	Community Safety	Observed number of fatalities, disabilities or non-permanent injuries (NPI) or acute health effects (AHE) requiring hospitalization in the workforce or resident population that are directly related to the Development or Activity	No Fatality No permanent disabilities No hospitalization No Evacuation necessary	No Fatality No permanent disabilities 1-5 NPI No AHE No Evacuation necessary	No Fatality No permanent disabilities 1-2 % NPI 1-2% AHE No Evacuation necessary	No Fatality 1 permanent disabilities >1-2 % NPI >1-2 % AHE Evacuation necessary	1 Fatality 2- 5 permanent disabilities 2-5 % NPI >2-5 % AHE Evacuation necessary	> 1 Fatality > 5 permanent disabilities 5-10% NPI > 5-10% AHE Evacuation necessary
		Community Health	Observed rate of chronic health effects requiring medical treatment in the workforce or resident population, or the WHO disability-adjusted life expectancy rate, that are directly related to the Development or Activity	No observable change	0-1% of the population	1-2%	2-5%	5-10%	10–15% *
		Education	Observable change to the rates of locally educated people and awareness of environmental issues.	Localized, short-term	Localized, medium-term or Widespread, short-term	Localized, long-term or Widespread, medium-term	Widespread, long-term or Regional, Short-Medium term	Regional, long-term Or Landscape, short-medium term	Landscape, Long-term
		Employment	Observable change to the rates of local employment in SME positions and involvement in innovative and creative roles.	Localized, short-term	Localized, medium-term or Widespread, short-term	Localized, long-term or Widespread, medium-term	Widespread, long-term or Regional, Short-Medium term	Regional, long-term Or Landscape, short-medium term	Landscape, Long-term
		Wellbeing	Observable change in the wellbeing of a resident population measured in relation to an internationally accepted standard such as the Indigo Wellbeing Index…	Indigo Wellbeing Index > 0.5	Indigo Wellbeing Index = 0.4 - 0.5	Indigo Wellbeing Index > 0.3 – 0.4	Indigo Wellbeing Index > 0.2 - 03	Indigo Wellbeing Index > 0.1 - 0.2	Indigo Wellbeing Index 0.1 or below
		Welfare	Observable change in the rate of Equal Opportunity metrics in relation to the KSA national average, or KSA Vision 2030 target, or the UN SDG targets (Voluntary National Review by KSA, 2018), as appropriate over the following spatial and temporal scales…	Localized, short-term	Localized, medium-term or Widespread, short-term	Localized, long-term or Widespread, medium-term	Widespread, long-term or Regional, Short-Medium term	Regional, long-term Or Landscape, short-medium term	Landscape, Long-term
		Cohesion	Observable changes in the level of social cohesion within a resident population as measured using a defined index or methodology such as the UNDP Social Cohesion Framework (*UNDP 2020*), over the following spatial and temporal scales…	Localized, short-term	Localized, medium-term or Widespread, short-term	Localized, long-term or Widespread, medium-term	Widespread, long-term or Regional, Short-Medium term	Regional, long-term Or Landscape, short-medium term	Landscape, Long-term

ENVIRONMENTAL OR SOCIAL VALUE SET			Consequence Definition	Incidental (6)	Minor (5)	Moderate (4)	Major (3)	Substantive (2)	Catastrophic or Transformative (1)
			Observable change that is outside the range of natural variability occurring over the following spatial and temporal scales (unless otherwise stated below)	Localized < 2 years	Localized, 2-10 years or Widespread, < 2 years	Localized, > 10 years or Widespread, 2-10 years	Widespread, > 10 years or Regional, < 10 years	Regional, > 10 years Or Landscape, < 10 years	Landscape, > 10 years
PEOPLE	LAND USE AND HERITAGE	Land Uses	Observable changes in the utilization or market value for areas important to social, cultural, recreational, conservation, production or religious activities, at the following spatial and temporal scales	Localized, short-term	Localized, medium-term or Widespread, short-term	Localized, long-term or Widespread, medium-term	Widespread, long-term or Regional, Short-Medium term	Regional, long-term Or Landscape, short-medium term	Landscape, Long-term
		Heritage and Archeology	Observable changes in condition or integrity of archeological sites	Short term impacts on minor sites but ability to record	Permanent change of minor site(s)	Permanent but minor change to moderate value site	Permanent and substantial change to moderate value site	Permanent but minor change to high value site	Permanent and substantial change to high value site
		Aesthetics	Observable changes to the aesthetic qualities of a location with the potential to alter the human-nature connection	Localized and short-term	Localized, medium-term or Widespread, short-term	Localized, medium-term or Widespread, short-term	Widespread, long-term or Regional, Short-Medium term	Regional, long-term Or Landscape, short-medium term	Landscape, Long-term
	BUILT ASSETS	Housing & Community Critical Infrastructure	Observable changes to the utilization or functionality of infrastructure that is vital for the continuity of existing communities, at the following spatial and temporal scales.	Localized, short-term	Localized, medium-term or Widespread, short-term	Localized, long-term or Widespread, medium-term	Widespread, long-term or Regional, Short-Medium term	Regional, long-term Or Landscape, short-medium term	Landscape, Long-term
		Connectivity	Observable changes in connectivity arising from alteration to mobility systems including pedestrian and motorized forms	Localized and short-term	Localized, medium-term or Widespread, short-term	Localized, medium-term or Widespread, short-term	Widespread, long-term or Regional, Short-Medium term	Regional, long-term Or Landscape, short-medium term	Landscape, Long-term
	INDUSTRY AND COMMERCE	Existing Business and Commerce	Observable changes in the utilization or market value for areas important to economic activities, at the following spatial and temporal scales.	Localized, short-term	Localized, medium-term or Widespread, short-term	Localized, long-term or Widespread, medium-term	Widespread, long-term or Regional, Short-Medium term	Regional, long-term Or Landscape, short-medium term	Landscape, Long-term
		Recovered Resources	Quantifiable rate of waste generation (by volume) in construction and operations (per capita thresholds based on World Bank Waste "What a Waste 2.0" Report, 2018).	< 5% material utilized during construction or operation is wasted Or 0.1-0.3 kg per person per day in the workforce or resident population	6-30% of material utilized during construction or operation is wasted Or 0.4-0.8 kg per person per day in the workforce or resident population	31-50% material utilized during construction or operation is wasted Or 0.9-2.0 kg per person per day in the workforce or resident population	51-80% material utilized during construction or operation is wasted Or 2.0-3.1 kg per person per day in the workforce or resident population	81-95% material utilized during construction or operation is wasted Or 3.2-4.5 kg per person per day in the workforce or resident population	>95% material utilized during construction or operation is wasted Or >4.5 kg per person per day in the workforce or resident population
		Wastes (energy, water, materials)	Quantifiable levels of waste utilization calculated as the Material reutilization score.	>95% of generated wastes are utilized	81-95% of generated wastes are utilized	51-80% of generated wastes are utilized	31-50% of generated wastes are utilized	6-30% of generated wastes are utilized	< 5% of generated wastes are utilized

Notes: The following table provides examples of potential sub-values or groups that may be subject to individual or collective risk assessment.

Environmental or Social Value	Examples
Climate & Oceans	Total GHG Emissions; Total Embodied Carbon ; Total Operating Carbon; Total Methane Emissions
Resources	Major minerals; Stone; Gravel; Sand
Landform & Function	Hydrology; Sedimentary Processes; Basin Drainage; Coastal Processes; Marine Hydrodynamics
Environmental Quality	Air Quality; Soil and Groundwater Quality; Marine Water & Sediment Quality
High Conservation Priority Species	E.G.: *Acacia* sp, *Lycium shawii*, *Vachellia tortilis*, *Maerua crassifolia*, *Hyphaene thebaica*, *Phoenix dactylifera*, Blandford's Fox, Arabian Wolf, Caracal, Spiny-tailed Lizard, Desert Monitor
Biodiversity	**Land** – Graminoids; Grasses; Shrubs; Trees; Herbivorous Mammals; Carnivorous Mammals (excl Bats); Bats; Reptiles; Wading Birds; Granivorous Birds; Insectivorous Birds; Predatory Birds; Parasites, Decomposers and Scavengers; **Marine** – Marine Primary Producers; Detritivores, Parasites and Decomposers; Planktivores; Piscivores; Apex Predators
Ecological Units	**Land**: Gravel Plains; Islands; Mountains; Rocky Outcrops / Cliffs; Sand sheets and Dunes; Wadis **Marine**: Bare sand (benthos); Coral; Deepwater (benthos); Macroalgae; Seagrass; Coastal: Dunes; Mangrove / Mangal; Mudflat; Rocky/Gravelly Beach; Sabkha; Saltmarsh; Sand/Shelley Beach
Nature Services	**Provisioning -** Agriculture; Horticulture; Commercial Fishing; Aquaculture **Regulating -** Air Quality (Human Health); Water Quality; Soil Quality; Carbon sequestration; Pollination; Flood/erosion control **Supporting -** Nutrient cycling; Atmospheric Oxygen; Soil Formation; Water cycling **Cultural -** Hunting/Recreational Fishing; Traditional Grazing; Camping/Hiking; Scenery/Vistas
Community Health	Fatalities; Permanent Injuries; Acute Health Effects; Chronic Health Effects
Wellbeing	Blood pressure; Blood glucose; obesity; depression; happiness; alcohol use; tobacco use; exercise; healthy life expectancy; healthcare spending
Welfare	Household Income; Education Level; Gender Equality; Equitable Housing; Employment
Culture	Community resilience; Community engagement; Emigration; Diversity
Land Use	Agricultural; Commercial; Conservation; Cultural; Recreational; Residential
Aesthetics	Visual Amenity
Heritage	Paleolithic; Neolithic; Bronze Age; Nabatean; Pre-Islamic; Islamic
Connectivity	Roads; Rail; Air corridors; Pathways; Migratory routes
Infrastructure	Power; Water / Wastewater; Telecommunications
Industry	Manufacturing; Tourism; Entertainment; Sport; Services
Recoverable Resources	Concrete; Steel; Hazardous Materials; Wood / Timber Products; Paper/Cardboard; Plastics (by type); E-waste; Organics; Heat (waste)