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Environmental management and climate change in mine action

Director
United Nations Mine Action Service (UNMAS)
1 United Nations Plaza
New York, NY 10017
USA

E-mail: mineaction@un.org
Telephone: +1 (212) 963 0691

Website: www.mineactionstandards.org

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1 United Nations Plaza
New York, NY 10017
USA

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Telephone: +1 (212) 963 0691

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Foreword

Management practices and operational procedures for mine action are constantly evolving. Improvements are made, and changes are required, to enhance safety and productivity. Changes may come from the introduction of new technology, in response to a new explosive ordnance (EO) threat, and from field experience and lessons learned in other mine action projects and programmes. This experience and lessons learned should be shared in a timely manner.

Technical Notes for Mine Action (TNMAs) provide a forum to share experience and lessons learned by collecting, collating and publishing technical information on important, topical themes, particularly those relating to safety and productivity. TNMAs complement the broader issues and principles addressed in International Mine Action Standards (IMAS).

The preparation of TNMAs follows a rapid production and approval process. They draw on practical experience and publicly available information. Over time, some TNMAs may be “promoted” to become full IMAS standards, while others may be withdrawn if no longer relevant or if superseded by more up-to-date information.

TNMAs are neither legal documents nor IMAS. There is no legal requirement to accept the advice provided in a TNMA. They are purely advisory and are designed solely to supplement technical knowledge or to provide further guidance on the application of IMAS. TNMAs are published on the IMAS website at www.mineactionstandards.org.

Introduction

Effective management of environmental aspects of mine action operations is important from the perspective of national authorities, mine action organizations, affected communities, donors and the wider global community. Protecting the environment and addressing climate change has an increased priority within national governments and international institutions. This is reflected in the increasingly rigorous demands related to environmental protection and climate change mitigation in the national legislation of many countries and international treaties, to which mine action operations are subject.

Mine action not only improves the safety and security of populations, but also presents opportunities for socio-economic development as its aim is to "reduce social, economic and environmental impact of mines, and EO including unexploded submunitions."[1] It is important to prevent and mitigate possible adverse impacts through appropriate environmental management. This takes into account the specific activities conducted by a mine action organization and the context in which operations are conducted, including the consideration of climate change.

The science around climate change is well established and human activity is the main cause of the temperature rise that has already occurred.[2] Climate change therefore affects mine action operations and the communities where they are conducted. Environmental management incorporates climate action, which means reducing greenhouse gas emissions[3] and strengthening resilience and adaptive capacity to climate-induced impacts. It is also important to note that the main and most effective way of reducing the direct impact of mine action operations on land is through the application of land release principles (as per IMAS 07.11, IMAS 08.10, IMAS 08.20 and IMAS 08.30) to minimize the number of square metres that are processed, without compromising the quality of the demining activities.

IMAS 07.13 provides a framework for national mine action authorities (NMAAs) to define appropriate measures. This Technical Note for Mine Action (TNMA) provides further guidance and a list of practical measures to be used by the NMAA, mine action centre and mine action organizations, to support the implementation of IMAS 07.13. IMAS 07.13 reflects the principles of ISO 14001:2015, *Environmental management systems*, and ISO 9001:2015, *Quality management systems*, but does not include a comprehensive management system as set out by these standards. Organizations seeking to enhance compliance with IMAS 07.13 are encouraged to consider conformity with ISO 14001 principles and accreditation. ISO 14001 is an internationally-agreed standard that sets out the requirements for an environmental management system, helping organizations improve their environmental performance through continual review.

National mine action standards need to be tailored to national conditions by developing mitigation measures for the impact of mine action operations on the environment and their contribution to climate action. The delivery of mine action, together with other humanitarian services, environmental recovery and climate resilience initiatives, can provide multiple benefits. Many conflict-affected countries are located in areas considered among the most susceptible to the effects of climate change, and are less well prepared to adapt to the impacts, with weaker capacity and fewer options available. It is important for NMAAs to ensure that opportunities are taken to embed environmental management and climate adaptation measures into the mine action sector management processes.

[1] IMAS 04.10:2023, 3.176.
[2] In 2013, the Intergovernmental Panel on Climate Change (IPCC) released its globally peer-reviewed Fifth Assessment Report, which concluded that *"climate change is real and human activities, largely the release of polluting gases from burning fossil fuel (coal, oil, gas), is the main cause*".
[3] Atmospheric gases, responsible for causing global warming and climate change. The major greenhouse gases are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_20).

Environmental management and climate change in mine action

1 Scope

This TNMA supports IMAS 07.13, which provides the minimum requirements for environmental management and climate change considerations in mine action operations.

This TNMA gives practical steps and guidance for the implementation of IMAS 07.13, including the provision of checklists. Checklists may encourage consistent working practices but need to remain flexible and tailored to local conditions.

NOTE: Using checklists has advantages but they need to be used in conjunction with supporting evidence and as a framework for follow-up actions (see IMAS 07.40:2016, B.5.4).

Environmental management and climate change is a wide-ranging topic. This TNMA sets out background information relevant to mine action, but also signposts to other guidance and good practice used across humanitarian organizations and other relevant agencies.

2 Normative references

There are no normative documents in this technical note.

A list of informative references is given in Annex A. Informative references do not form part of the provisions of this technical note but do provide information on the broader scope the topic.

3 Terms and definitions

A complete glossary of all the terms, definitions and abbreviations used in the International Mine Action Standards (IMAS) series is given in IMAS 04.10.

In the IMAS series, the words “shall”, “should” and “may” are used to indicate the intended degree of compliance:

- “shall” is used to indicate requirements, methods or specifications that are to be applied in order to conform to the standard. This term is not used in TNMAs, as their contents are purely advisory.
- “should” is used to indicate preferred requirements, methods or specifications; and
- “may” is used to indicate a possible method or course of action.

3.1
adverse impact
harmful or negative impact imposed

3.2
carbon sink
carbon store
anything that absorbs more carbon from the atmosphere than it releases

EXAMPLE: Plants, the ocean and soil.

3.3
climate
condition of the atmosphere at a particular location and usually defined as the average weather

3.4
climate action
efforts to reduce or prevent greenhouse gas emissions, and strengthen resilience and adaptive capacity to climate-induced impacts

3.5
climate change
long-term shifts in temperatures and weather patterns

3.6
climate change adaptation
process of adjusting to actual or expected effects of climate change, and making changes to live with its impacts

3.7
climate impact
impact due to climate change on lives, livelihoods, health and well-being, economic, social and cultural assets and investments, infrastructure, services provision, ecosystems and species

Note 1 to entry: In mine action, this may also mean impact on programming, working practices and the choice and deployment of certain equipment or clearance techniques.

3.8
climatic-impact driver
condition, event or trend related to climate variability which can exacerbate hazards for mine action operations

EXAMPLE: Climate-impact driver include increased summer temperatures, higher rainfall, flooding or the increased intensity of drought conditions.

3.9
climate change mitigation
efforts to reduce or prevent emission of greenhouse gases responsible for causing global warming and climate change

3.10
climate-related incident
extreme weather events which impact operations or adversely affect the local community

EXAMPLE: Flooding, landslides, landscape fires, heavy or unseasonal rainfall, extreme heat, dust storms.

3.11
climate resilience
capacity to cope with a climate event or trend in ways that essential function, identity and structure is maintained.

3.12
climate risk
potential for climate change to create adverse consequences for human or ecological systems

Note 1 to entry: A climate risk is a factor of probability of an impact occurring and the magnitude of its consequences.

3.13
ecosystem service
benefit – such as clean air, food, green spaces, medicines, raw materials, water – that people obtain from one or several ecosystems

3.14
environment
surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans and their interrelation

3.15
environmental aspect
element of an organization's activities or products or services that interacts or can interact with the environment

3.16
environmental baseline
environmental characteristics of an area before activities or project work takes place

3.17
environmental impact
change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects

3.18
environmental impact assessment
EIA
process of identifying, predicting, evaluating and mitigating the biophysical, social and other relevant environmental effects of mine action activities prior to taking decisions and making commitments

3.19
environmental incident

unplanned event which results in adverse impact to the environment, such as damage to sensitive natural habitats or wildlife, inappropriate waste management, fires, spill or pollution events and nuisance complaints.

3.20
environmental management
policies and procedures in place to address the adverse (negative) or beneficial (positive) effects of products, activities or services on the environment

3.21
environmental mitigation measure
action taken before, during and/or after mine action operations to lower adverse environmental impact

3.22
environmental management system
EMS
part of the management system used to manage its environmental aspects, fulfil compliance obligations and address risks and opportunities

3.23
environmental receptor

something that could be adversely affected by the impact or effect of an activity or climate-related event, for example, a person, living organism, ecosystem, property (including buildings, crops, and livestock), or water

3.24
environmental risk
combination of the likelihood or probability for an event to occur and the magnitude of the potential consequence (or severity) of the event occurring and harm to people or the environment

3.25
invasive species
animal, plant or other organism introduced by humans – intentionally or accidentally – into places outside of their natural range, negatively impacting native biodiversity, ecosystem services or human economy and well-being

3.26
nature-based solution
action to protect, sustainably manage or restore natural ecosystems, that addresses societal challenges, such as climate change, human health, food and water security and disaster risk reduction

EXAMPLE: Planting native species to reduce soil erosion and enhance biodiversity, or planting mangroves to improve coastal habitats and reduce flooding from tidal surges.

3.27
vulnerability
propensity or predisposition to be adversely affected

Note 1 to entry: Vulnerability encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

4 General requirements

The format of this TNMA follows the structure of IMAS 07.13 to provide reference material for each of its sections. In general, environmental management and climate change mitigation and adaptations are designed to reflect applicable legal, regulatory and normative requirements (for example, national law and applicable international conventions to which the host nation is a party).

5 Climate and environmental management considerations

5.1 Climate and environmental policy

5.1.1 General

A national or organizational mine action climate and environmental policy is important for establishing criteria for compliance with IMAS 07.13. IMAS 07.13 states that NMAAs and mine action organizations shall have a climate and environmental policy in place. This climate and environmental policy is also an opportunity to show compliance with national environmental regulations. It can be aligned with international environmental treaties and standards, as well as the United Nations Sustainable Development Goals, particularly those related to environmental sustainability.

When considering climate and environmental policy development, compliance with national and international environmental regulation is a minimum requirement for mine action. The local context and traditional knowledge, and information on community-level vulnerability and capacity, can also inform decisions on the action to be taken, and build communities' resilience to climate change.[4] Other elements to consider when developing a climate and environment policy are environmental impact assessment (EIA), relevant national legislation, elements required by donor contracts in their statement of works, environmental management plans (EMPs) and specific standard operating procedures (SOPs).

There is wide global variation on regulatory frameworks regarding EIA, with legal requirements often embedded into national planning and development policy.[5] Early consultation with relevant national authorities is required to determine whether the scale and nature of mine action activities are subject to EIA regulations and, if so, what level of detail for an assessment is required.

Environmental legislation is designed to enforce effective environmental management, but is not the sole driver. Environmental protection and the mitigation of adverse impacts aligns with the "do no harm" principle of humanitarian mine action and good practice. Contract and organizational management systems – including environmental policies, strong leadership, monitoring, quality assurance, risk management and training – can also promote and motivate increased environmental protection and mitigation. This is especially important in case of limited local governance or ownership of responsibility due to a fragile or conflict-affected setting.

The checklist in Annex B includes the policy topic areas for which national environmental legislation may apply to mine action activities, and confirmation should be sought with relevant national authorities.

[4] CARE, *Climate Vulnerability and Capacity Analysis Handbook*, CVCA Handbook, Version 2.0 (July 2019), https://careclimatechange.org/wp-content/uploads/2016/06/CARE-CVCA-Handbook-EN-v0.8-web.pdf.
[5] UN Environment, *Assessing Environmental Impacts – A Global Review of Legislation* (2018), https://wedocs.unep.org/bitstream/handle/20.500.11822/22691/Environmental_Impacts_Legislation.pdf?sequence=1&isAllowed=y.

5.1.2 Environmental management plan

An EMP can be used to set out environmental commitments and mitigation measures required to deliver the relevant climate and environment policy, together with any time frames and other restrictions to be considered. This should include operations in countries with less stringent or non-existing environmental legislation, with documentation retained to demonstrate compliance.

Table 1 – Example Environmental management plan structure

EMP content and structure	Description
Purpose of the EMP	Brief description of the purpose of the EMP
Programme	Description of location, timeframes and planned activities
Project and environmental objectives	Overview of the project objectives, and setting out environmental obligations
Environmental profile/data	Description of the environmental setting, climate change considerations and any supporting datasets
Roles and responsibilities	Roles and responsibilities involved in the delivery of the EMP, competencies and other external partnerships
Environmental commitments and actions	Clear and specific descriptions of commitments/actions, including locations, any assumptions made, relevant legislation, how action will be carried out, risk management, responsibility for actions, achievement criteria, date implemented, any monitoring required
Consents and permissions	Summary of any environmental consents/permissions required to deliver the EMP
EMP monitoring activities	Description of any ongoing or completion monitoring activities to be in place
Induction, training and toolbox talks	Brief description of induction, training and any toolbox talks required, and criteria for evaluation of training effectiveness
Environmental constraints map	Outlining key environmental features and areas to avoid, or where activities are to be controlled
Specific method statements or SOPs	Inclusion of method statements or SOPs required to complete specific tasks, activities or actions
Emergency procedures and incident reporting	Procedures for dealing with an environmental emergency event; and reporting of where environmental incidents or near-misses have occurred, and response provided

Environmental management and protection considerations can also be embedded into donor and contract requirements. The technical component of a contract – or Statement of Work –varies depending on the nature of the activity and location. It is where any specific environmental considerations can be included.[6,7]

An SOP on the environment in line with IMAS 07.13 and national mine action standards may also be used to highlight specific measures and legal obligations, and show that quality assurance/quality control procedures are in place as part of the framework for compliance.

Table 2 – Example standard operating procedure structure

SOP content and structure	Description
Purpose and scope of the SOP	Brief description of the purpose and scope of the SOP
Policy	Cross reference to organizational climate and environmental policy
Relevant environmental legislation	Overview of national environmental legislation and regulating authorities

[6] IMAS 07.20, *Guide for the development and management of mine action contracts*, https://www.mineactionstandards.org/standards/07-20/#:~:text=This%20standard%20establishes%20principles%20and,included%20in%20mine%20action%20contracts.
[7] GICHD, *A Guide to Contracting in Mine Action*. Second Edition (May 2012), https://www.gichd.com/fileadmin/GICHD-resources/rec-documents/Guide-to-Contracting-May2012.pdf.

Roles and responsibilities	Roles and responsibilities involved in the delivery of the SOP, competencies and other external partnerships
Establishing the environmental setting	Steps to establish and record the environmental setting and climate change considerations
Evaluating risks	Steps to identity climate issues and environmental aspects and impacts, and evaluate the associated risks
Operations – establishing compounds, temporary camps, work areas and access routes	Measures to be taken to avoid or minimize adverse environmental impacts, and to identify and implement compensation or enhancement opportunities
Operations – survey, clearance activities and stockpile destructions	Measures to be taken to avoid or minimize adverse environmental impacts, and to identify and implement compensation or enhancement opportunities
Operations – demobilization	Measures to be taken to avoid or minimize adverse environmental impacts, and to identify and implement compensation or enhancement opportunities
Operations – offices and accommodation	Measures to be taken to avoid or minimize adverse environmental impacts, and to identify and implement compensation or enhancement opportunities
Managing contractors or partners	Measures to be taken to ensure that subcontractors and partners follow SOP and environmental obligations
Emergency plans	Procedures for dealing with an environmental emergency event
Incident reporting	Incident and near-miss reporting procedures
Monitoring and reporting	Procedures for monitoring compliance, reporting outcomes and handover

5.2 Understanding the consequences for climate and environmental context and needs

Climate change, biodiversity loss and pollution are urgent global concerns.[8] Land contaminated with EO can include areas rich in biodiversity, or natural habitats and ecosystems that serve as important carbon sinks or stores. In other cases, communities affected by contamination are also dealing with environmental pressures caused by climate change, regional deforestation, land degradation, waste and pollution, biodiversity loss, water scarcity, over-exploitation of local resources or impacts on food.

Table 3 – Global and regional environmental/climate issues, and local needs linked with mine action

Global crises	Biodiversity loss	Climate change	Pollution
Regional issues	Regional deforestation	Over-exploitation of local resources	Impacts on areas rich in biodiversity
	Pressures from climate change	Water scarcity	Impacts on important carbon sinks
	Land degradation	Waste and pollution	Food security
Local needs	Support for sustainable livelihoods		Avoid unintended environmental impacts from land release
	Facilitate locally-led climate adaptation		Support access for biodiversity/conservation programmes
	Prevent and minimize harm from mine action activities		Support access for environmental remediation (for example, pollution clean-up)
	Promote sustainable land use practices		
	Avoid and reduce GHG emissions		

[8] UNEP, *The triple planetary crisis and public health*, Speech delivered by Inger Andersen and prepared for delivery at the Opening Ceremony of the G20 Health Ministers' Meeting (5 September 2021), https://www.unep.org/news-and-stories/speech/triple-planetary-crisis-and-public-health.

The clearance and removal of EO is critical for supporting sustainable livelihoods, but can cause adverse impacts on the environment, if not appropriately managed.[9] Mine action should be undertaken while preventing or minimizing harm to the environment. This includes steps to avoid or reduce greenhouse gas emissions that cause global warming and climate change. Following land release, mine action can also provide multiple benefits to communities by facilitating the implementation of locally-led climate adaptation initiatives, environmental remediation and access for biodiversity and conservation programmes. However, there can be unintended environmental consequences following land release through increased land access and, in some cases, increased unsustainable land use.

Chemical contamination of soil and water from the use and legacy of EO can also present risks to mine action organizations, the local community and the wider environment.[10] This includes EO which may corrode over time, leading to the release of explosive components – including metals and common explosives, such as TNT, RDX or HMX[11] – which can harm the environment, wildlife and people. Pollution may have also been caused from conflict damage to industrial sites, infrastructure and from the generation of debris,[12] and from previous land use practices. The risks to the environment from chemical contamination depend on several factors, including the nature and extent of pollutants present, the location and its environmental setting, and the routes by which people or the wider environment may be exposed to contaminants present (see Annex C).

Environmental management approaches – including the implementation of accredited environmental management systems (EMSs), such as ISO 14001:2015 – address adverse environmental impacts and support more environmentally responsible mine action programmes. The adoption of an accredited EMS may not be feasible, but environmental management principles can still be followed. Different measures and approaches may be put in place depending on the context, with engagement with the local community, experts and other stakeholders to inform decision-making and knowledge of the range of potential environmental impacts, as well as social impacts. Following the humanitarian "do no harm" principle, the mine action sector shall also collaborate with these stakeholders, and communicate the results.

Poor environmental protection puts pressure on the ecosystem services on which people depend.[13] Environmental protection should be balanced and viewed in consideration to other risks – including a threat to life or socio-economic factors – and linked to issues of concern of the impacted population. Improved environmental protection in the mine action sector can lead to improved socio-economic conditions at the local and national levels.

An overarching environmental best practice checklist is given in Annex B.

5.3 Identifying and evaluating climate and environmental aspects and impacts

5.3.1 General

Environmental screening and assessment should be well-defined, and carried out to evaluate the local environment, its sensitivity and to identify key environmental issues to be addressed. It involves systematically evaluating both adverse and beneficial outcomes, through identifying and evaluating potential risks and any uncertainties.

[9] Mine Action Review, *Mitigating the Environmental Impacts of Explosive Ordnance and Land Release* (October 2021), https://www.mineactionreview.org/documents-and-reports/mitigating-the-environmental-impacts-of-explosive-ordnance-and-land-release.
[10] GICHD, *Guide to explosive ordnance pollution of the environment* (December 2021), https://www.gichd.org/fileadmin/uploads/gichd/Publications/EO_Pollution_of_the_Environment_v17_web_01.pdf.
[11] NAVFAC EXWC, Technical Report Initiation Decision Report (IDR) [TR-NAVFAC-EXWC-EV-1906]. Analysis of the long-term fate of munitions constituents from unexploded and discarded munitions on terrestrial sites (2019), http://tinyurl.com/4se6f6y4.
[12] UN Environment, 2017. Perspective Series, Issue No. 24: Conflict pollution and the toxic remnants of war: a global problem that receives too little attention, available at https://www.unep.org/resources/perspective-series/issue-no-24-conflict-pollution-and-toxic-remnants-war-global-problem.
[13] Ecosystem services are the benefits provided to people and communities from ecosystems, such as nutrient cycling, pest regulation, pollination, raw materials, clean water and healthy soils for food production. Also see https://www.fao.org/ecosystem-services-biodiversity/en/.

Defining the scope and purpose of environmental assessment

- Who will be the main user of the environmental assessment results?
- What type of information will be most useful for informed decision-making?
- What policies and decisions will be informed by the environmental assessment?
- What is the time frame in which the assessment needs to take place? Rapid assessment or an assessment which is forward-looking and includes scenarios about the future?
- Will the assessment need to be repeated?
- What are the legislative or regulatory requirements?
- What level of certainty is required, and how will any uncertainty be communicated?
- How will cumulative and combined effects be considered?

All relevant stakeholders who may be affected by or have an interest in the outcome of the assessment should be identified at an early stage. Stakeholder engagement should be iterative, and is likely required at the onset, during and on completion of the assessment. Stakeholder and public engagement is required to gather local knowledge, address any concerns, present findings and communicate any further actions required. This can include important local and indigenous knowledge on local biodiversity and wildlife, native planting, presence of invasive species, climate trends and other environmental data.

The assessment should link with programme approval cycle, with the process tailored to the specific context and scale of the project, action or event being evaluated. Where environmental risks are identified:

- mitigation measures should then be developed and implemented to reduce risks to acceptable levels;
- residual risks should be recorded; and
- any issues should be logged.

EIAs, social impact assessments and risk assessments are common tools used to assess impacts and risks in various sectors, such as infrastructure development, natural resource management and public health. The ultimate goal is to make informed decisions that promote sustainable development, minimize negative impacts and enhance the well-being of communities and ecosystems.

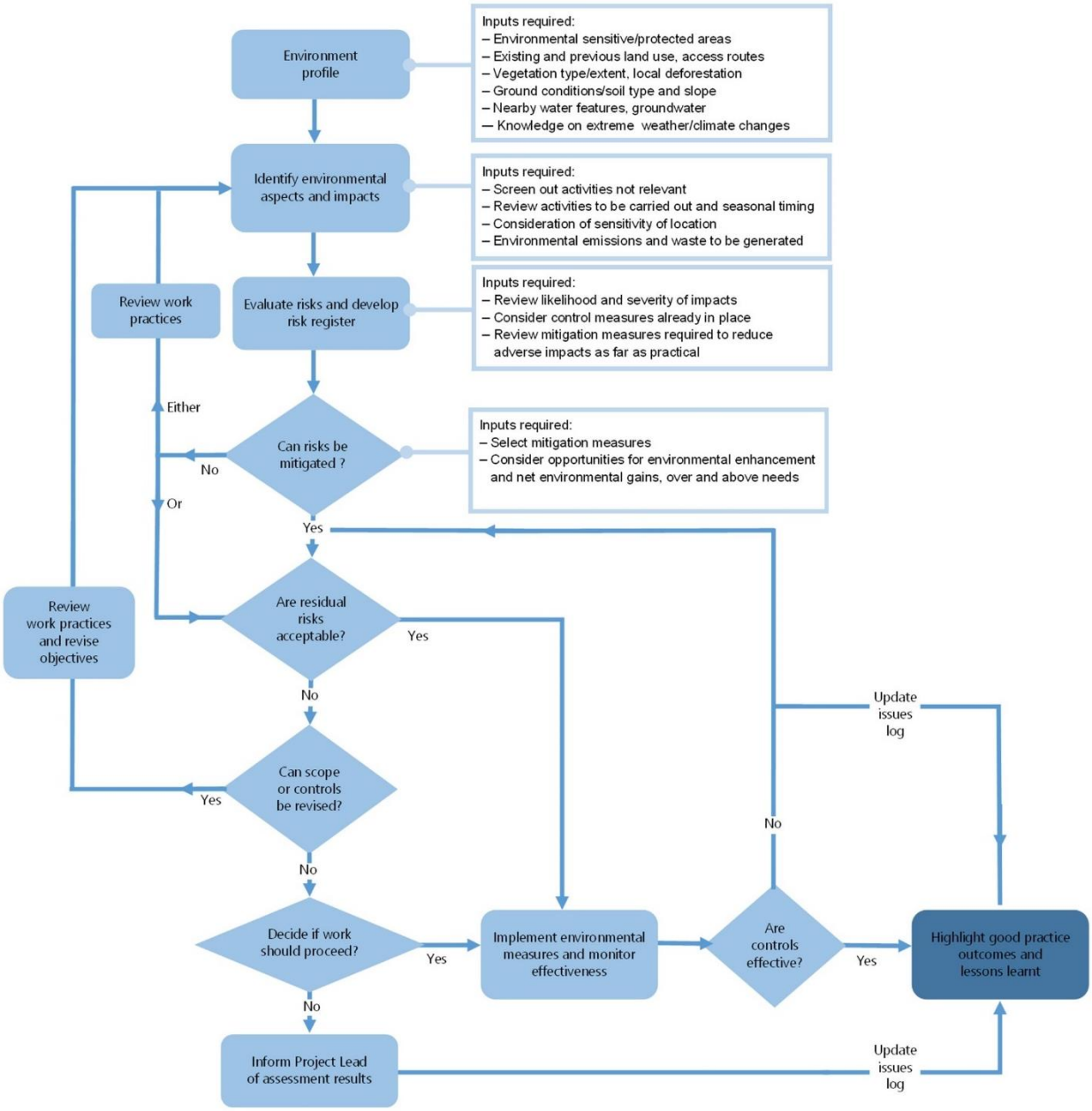

Figure 1 – Environmental assessment process

5.3.2 Environmental baseline (or profile) and sensitivity

An environmental baseline, or profile, refers to the environmental characteristics of an area before activities or project work takes place. In other words, it refers to the current state or condition of a specific area, ecosystem or environment before any significant changes or disturbances occur. It serves as a reference point against which future changes or impacts can be measured, and provides an understanding of the environmental setting and its sensitivity. The baseline typically included information about the physical, biological and chemical characteristics of an area.

Typical baseline environmental information required in a mine action context

Biodiversity and conservation status

- Is the area of operation located in or close to an environmentally sensitive, ecologically important or protected area (terrestrial or marine)?

- Are there any protected wildlife species in or near to the area of operation?
- Are there any other known conservation or ecological management activities in the area?
- Have any wildlife or conservation issues been raised through community engagement?

Climate patterns and trends

- Have there been changes in rainfall amounts in recent years?
- Have there been changes in rainfall patterns in recent years (for example, longer rainy seasons, longer dry seasons)?
- Has there been recent or more frequent surface or river flooding?
- Has there been recent or more frequent coastal flooding?
- Have there been recent or more frequent mud or landslides?
- Has there been an increase in landscape fires or burning?
- Has there been an increase in annual average temperatures?
- What have local communities observed?
- What are local coping strategies?
- How are local livelihoods likely to be affected?
- How are local ecosystems likely to be affected?
- Are there opportunities for introducing ecologically-based adaptation (EbA) initiatives?

Geology and soil composition, including soil stability, topography and erosion risk

- What is the soil type in the area of operation?
- What are the ground conditions in the area of operation?
- What is the local topography and terrain?
- What is the average slope/gradient of the area?

Habitat type, distribution and changes (for example, due to regional deforestation, landscape fires, urban growth)

- What is the prevailing vegetation cover?
- What is the secondary most common vegetation cover in the area?
- What is the vegetation density in the area of operation?
- What is the age/maturity of the vegetation?
- Has there been deforestation and development in recent decades?
- Are invasive species present which are problematic?

Historic and previous land uses, including likelihood of existing pollution or environmental degradation

- What is known about any previous or historic land use in the area?
- Is there a potential for sources of pollution to be present in or adjacent to the area?
- Is there any visual evidence of pollution on or adjacent to the area?

Human activities, cultural assets and current land use across the area

- What is the existing predominant land use?
- What is the distance to the nearest residential/populated areas?
- Are there any significant historical or cultural sites near to the area of operation?

Local water features and water quality

- Are surface water features in or near to the area of operation?
- What is the distance to the nearest water feature?
- What are the anticipated groundwater conditions in the area?
- Where does water drain from the area of operation?
- What is the main water source of the local population?

By establishing an environmental baseline, changes over time or the effects of specific activities can be assessed, and appropriate mitigation measures set to minimize adverse environmental impacts.

Geospatial and open-source data can be used to inform the environmental baseline, but should be supplemented by non-technical surveys, site visits, consultation with local and regional authorities and local community engagement. Periodic reviews are recommended due to ongoing updates and availability of open-source data.

Table 4 – Examples of open-source and other resources to help establish environmental baselines and the environmental sensitivity

Topic	Description
Data – various	Map layers available are through ARC-GIS[14], the UNEP World Environment Situation Room,[15] UNEP Strata,[16] and the UN Environment World Conservation Monitoring Centre,[17] may also be useful, dependent on the location (terrestrial or marine).
Data – various	Earthmap provides a wide range of useful datasets, including data on fires, precipitation/rainfall changes events, maximum temperatures events.[18]
Fire hotspots	FIRMS can be used to check fire incidents, including a timeline function which can indicate how long a fire has burned.[19]
Forests	Data on forest loss and gain, to understand regional context regarding deforestation or planting.[20]

[14] Web GIS Mapping Software | Create Web Maps with ArcGIS Online
[15] United Nations Environment Programme, *World Environment Situation Room, WESR Geospatial data and services* (2024), https://wesr.unep.org/article/wesr-geospatial-data-and-services.
[16] United Nations Environment Programme, *Strata* (2024), https://unepstrata.org/.
[17] United Nations Environment Programme, World Conservation Monitoring Resources, *Resources* (2024), https://resources.unep-wcmc.org/.
[18] Datasets can be accessed by navigating the toolbar. See https://earthmap.org/.
[19] NASA, "Fire Information Management Service", https://firms.modaps.eosdis.nasa.gov/map/#t:adv;m:advanced;d:2022-02-24;@31.2,49.3,6z.
[20] Global forest Watch, "Map", https://www.globalforestwatch.org/map/?mc_phishing_protection_id=28048-cd3d7q70s0ve2rt0tmg0.

Topic	Description
Human pressures	Combination of human footprint, water pressures and carbon storage of soils, to illustrate cumulative human pressures on the environment.[21]
Invasive species	The Global Invasive Species Database provides information about alien and invasive species that negatively impact biodiversity, from micro-organisms to animals and plants.[22]
Land use cover	Spatial information on different types of land cover – for example, forests, grasslands, croplands, lakes and wetlands. Also gives changes in land use from a 2015 base year.[23]
Landslides	NASA data set on reported landslide and mudslide events,[24] and MapX also gives geospatial data on other natural risks including an estimate of the global risk of landslides triggered by precipitations.[25]
Mangroves	Data on mangrove forest loss and gain, using baseline map for 2010, and changes between 1996 and2020.[26]
Protected and key biodiversity areas	The World Database on Protected Areas (WDPA) is a comprehensive global database on terrestrial and marine protected areas, and updated monthly.[27] WDPA can also be accessed through Protected Planet, which also gives country profiles and summaries.[28] The World Database of Key Biodiversity Areas (WDKBA) also maps areas important for targeted conservation, and can be used to guide the expansion of protected and conservation areas.[29] The WDKBA is updated twice a year.
Soils	FAO Soil Portal Hub, with links to global and regional soil maps and assessments.[30] Global mapping highlighting the relative rate of natural capital depletion of soil and sediments, measured through soil erosion, change in soil salinity and change in soil carbon.[31]
Surface water	Global mapping of surface water occurrence, including changes in surface water intensity from 1984–1999 and 2000–2021.[32]
Terrestrial habitat	The Global Map of Terrestrial Habitat Types gives the habitat as defined by the IUCN habitat classification system. [33]
Threatened species	Spatial data from the International Union for Conservation of Nature and Natural Resources (IUCN) on threatened species. [34] The spatial data covers IUCN Red List Threatened Species, to help identify key sites and habitats needing protection.[35] Also the National Red List, published from more than 76 countries/regions.[36]
Water levels	Hydroweb provides time-series data on water levels for large bodies of water using satellite altimetry.[37]

[21] United Nations Environment Programme, *Human Pressures on biodiversity, water and carbon* (2024), https://data-gis.unep-wcmc.org/portal/home/item.html?id=fabf96ab5e0c4becbd456ffc6f690113.
[22] IUCN, "Global Invasive Species Database", https://www.iucngisd.org/gisd.
[23] Copernicus, "Dynamic Land Cover", https://land.copernicus.eu/global/products/lc.
[24] NASA, "Landslide Viewer", https://maps.nccs.nasa.gov/arcgis/apps/webappviewer/index.html?id=824ea5864ec8423fb985b33ee6bc05b7.
[25] United Nations Environment Programme, "MapX", https://unepgrid.ch/en/mapx.
[26] United Nations Environment Programme, "Global Mangrove Watch", https://data-gis.unep-wcmc.org/portal/home/item.html?id=5e72c1881c524cd4bd0ca28a809514a2.
[27] United Nations Environment Programme, "World Database on Protected Areas", https://data-gis.unep-wcmc.org/portal/home/item.html?id=1919c32890074ce5a589a1a99b48994b.
[28] "Protected Planet", https://www.protectedplanet.net/en.
[29] Key Biodiversity Areas, "Map Search", https://www.keybiodiversityareas.org/sites/search.
[30] Food and Agriculture Organization, "FAO Soils Portal", https://www.fao.org/soils-portal/data-hub/en/.
[31] United Nations Environment Programme, "Global relative rate of natural capital depletion of soil and sediments", https://data-gis.unep-wcmc.org/portal/home/item.html?id=292675560c0b4706b7977014e04a9060
[32] European Commission, "Global Surface Water Explorer", https://global-surface-water.appspot.com/map?mc_phishing_protection_id=28048-cd3d7g70s0ve2rt0tmg0.
[33] United Nations Environment Programme, "Global Map of Terrestrial Habitat Types", https://data-gis.unep-wcmc.org/portal/home/item.html?id=79134b5187084c2499fc0b1b18e4c6d3.
[34] IUCN Red List, "Spatial Data Download", https://www.iucnredlist.org/resources/spatial-data-download.
[35] IUCN Red List, "How the Red List is Used", https://www.iucnredlist.org/about/uses.
[36] "The National Red List Project", https://www.nationalredlist.org/.
[37] LEGOS, "HydroWEB", https://www.legos.omp.eu/en/hydroweb-2/.

Table 5 – Supplementary sources to help establish environmental baselines and the environmental sensitivity

Source	Description
Non-technical surveys (NTS)	NTS to incorporate questions to establish environmental baseline. Also consult with national and local authorities, and other local civil society organizations or businesses, to supplement NTS questions, determine if any relevant climate or environmental studies have been conducted in the area (for example, in the last 3 years) and identify any transboundary issues (if working near international or regional borders).
Site visits and observations	Site visits and observations on the existing environment, and setting. This includes observations on the potential for pollution to be present (see Annex C). Pollution and chemical contamination in soil and water can present risks to mine action organizations, the local community and the wider environment.
Community engagement	Community engagement and questions around environmental issues and expectations, including knowledge on biodiversity and ecologically-sensitive habitats, location and use of water resources, land use and changes, access routes, cultural heritage, waste and pollution, air quality, farming practices and use of agrochemicals, and local concerns.

The baseline information is essential for making informed decisions, predicting potential impacts and designing effective mitigation or management strategies, together with any information about intended future use. Environmental sensitivity depends on the tolerance of the system and how it responds to change, stress or disturbance. For example, the sensitivity of a habitat may be based on the species present and likely respond to noise and ground-shock/vibrations from detonations, and vegetation clearance. Understanding both environmental baseline and its sensitivity is important in the assessment of the significance of an environmental impact.

Human activities, including the extent of regional deforestation, intense farming and overgrazing practices, the extent and frequency of landscape fires and increases in development and urban growth should be noted, since these can exacerbate the effects of climate change and other adverse environmental impacts in the area.

In relation to land and soils, note whether the area is already affected by erosion and whether mine action may cause this to increase, leading to soil compaction and further degradation. Information on land use practices can also help inform decisions on mitigation or enhancement options, such as options to subdivided fields and plant trees

5.3.3 Environmental aspects and impacts

The minimum environmental aspects of the mine action activities, inputs, products and services are given in IMAS 07.13 and include:

a) emissions to air, water and land;

b) use of raw materials and natural resources;

c) use of energy;

d) vegetation clearance, ground disturbance and construction;

e) noise and ground-shock/vibrations;

f) release of greenhouse gas emissions;

g) disturbance of pre-existing chemical contamination;

h) generation of waste; and

i) emergency events, which includes responses to extreme weather events due to climate change.

For each aspect, there is a potential environmental impact, which includes pollution of soil, water and air; nuisance and disruption to local people; disruption to wildlife and habitat; loss of soil fertility and function; soil erosion; altered landscapes (due to cratering and bombturbation[38]); damage to heritage; and an increased vulnerability to the effects of climate change.

Travel, energy and fuel use, and procurement are likely the key organizational environmental issues across mine action programmes. The key environmental impacts for mine action field activities themselves relate to soil, vegetation, wildlife and the release of chemicals into the environment. Environmental impacts following land release depend on the nature of land use and the outcome of any environmental enhancement initiatives put in place. In the absence of implementing enhancement opportunities, land use following land release may result in other adverse environmental impacts which are not mitigated.

Key environmental impacts from mine action field activities

Soil compaction, degradation and erosion – the use of mechanical demining machines and the detonation of EO can damage soils and cause compaction. Degraded soils lose their capacity to store water, nutrients and carbon, as well as the capability to support important soil microbes, which weakens its ability to support growing crops or the wider ecosystem. The exposure of top soils and removal of vegetation can affect the physical or chemical properties of soils and reduce its quality. Soil degradation includes loss of the nutrient-rich topsoil through erosion, loss of organic matter, salinization, acidification and loss of structural stability**.**

Vegetation and wildlife **–** some regions where mine action takes place see high rates of regional deforestation. Tree and vegetation cover loss can exacerbate the effects of climate change, with heavy rainfall on bare or sparsely vegetated slopes increasing the likelihood of flooding downgradient and causing soil erosion and slope instability. Clearing of vegetation during mine action can also cause adverse impacts, especially if this generates areas of bare ground which include ecologically important habitat. In some cases, vegetation clearance can be positive for example where this involves the removal of invasive species to improve conditions for native species. In contrast, it can remove cover which create shade for crops, people or animals.

The release of chemicals to the environment can take place from the detonation, demolition or corrosion of EO **–** Soil, surface water and underlying groundwater may be affected by detonations, demolitions or from EO components leaking over time. The range of contaminants is broad, including metals and common explosive residues (such as TNT and RDX) which are both toxic. TNT can slowly degrade to form DNT, which is more toxic than TNT itself. RDX leaches from soils more readily than TNT, degrades slowly and is highly persistent in the environment. Other munition compounds – such as lead, antimony, copper, mercury and zinc – can also accumulate in the environment, percolate through permeable soils and eventually reach underlying groundwater or surface water, if present. The risk depends on the nature of EO, soils, the environmental receptors present, exposure routes and other factors, such as moisture and temperature. If the area is readily accessed by people and used to grow crops, there is a higher risk for exposure to contaminants from the consumption of crops and ingestion or inhalation of soils. Where possible, as much information about the EO components and their environmental fate and behaviour should be incorporated into the risk assessment to support the selection of effective mitigation measures.

Indirect impacts following land release **–** this includes the unintended environmental consequences due to land use and increased access following land release. This may include unsustainable agricultural practices, deforestation, urbanization, illegal logging, resource extraction, poaching, hunting and illegal wildlife trade.

5.3.4 Managing environmental risks

The evaluation of risk associated with each environmental aspect and impact aligns with IMAS 07.14, where risk is the probability (or likelihood) of an impact occurring and the magnitude (or severity) of the consequences. Managing environmental risks involves a combination of strategies, policies and actions aimed at preventing, mitigating and adapting to potential risks to the environment.

[38] Bombturbation is a form of soil disruption caused by the use of EO (ranging from grenades to heavy artillery), which can cause severe damage to the physical soil structure.

To reduce risks, capacities and resilience also play a role. Capacities refer to the ability of individuals, communities and organizations to effectively plan for, respond to and recover from incidents. Capacities can be physical or structural (for example, putting silt fences or using straw bales to capture silty run-off) or policy-based and non-structural (for example, implementation of sustainable travel policy).

Increasing awareness across mine action and communities through campaigns, workshops and community outreach also contributes to empowering individuals to support more sustainable behaviours and better manage environmental risks

5.3.5 Climate change mitigation

Mine action also need to address climate change mitigation and take steps to avoid or reduce emissions of greenhouse gases that cause global warming and climate change by reviewing energy use and supply, transport and travel, waste, procurement and the supply chain. Practical measures which can be put in place depend on the region and mine action programme.

Measures to reduce organizational greenhouse gas emissions include:

- using accounting tools to manage and track progress;
- carrying out energy audits to identify energy efficiency opportunities and reduce demand;
- establishing travel and transport policies to reduce need and optimize efficiencies;
- switching to renewable clean energy alternatives, such as solar panels;
- considering “whole life” factors when selecting products or suppliers – cost, reliability, quality, energy efficiency/carbon footprint and disposal needs;
- implementing waste management systems and follow the waste hierarchy to avoid, reduce, reuse, recycle and dispose;
- optimizing the use of products or supplies made from recycled or recyclable materials, if possible;
- avoiding single-use plastics whenever possible;
- building awareness among staff.

Commitments to avoid or reduce greenhouse gas emissions should be monitored through the use of accounting tools, to manage and track progress. An example of an accounting tool made for humanitarian organizations is the Humanitarian Carbon Calculator, which is supported by guidance and training webinars.[39]

5.4 Planning and tasking of mine action operations

IMAS 07.13 states the importance of including environmental protection and climate action perspectives into planning and tasking of mine action operations (see checklist in Annex B).

Pre-existing pollution and chemical contamination in soil and water can present risks to mine action organizations, the local community and the wider environment (see Annex C).

As a minimum, the following actions should be taken to manage potential risks to mine action organizations, the local community and the wider environment from chemical and other contaminants which may be present:

- carrying out an NTS and task planning to consider the potential for chemical pollution to be present in or adjacent to the task area, with specific questions directed to the local community and local authority;

[39] Climate Charter, “Humanitarian Carbon Calculator”, https://www.climate-charter.org/humanitarian-carbon-calculator.

- implementing an information management system to include the potential for chemical pollution and control measures to be in place;
- performing site reconnaissance to include a visual inspection of ground conditions, including checks for the signs of environmental incidents and risk of environmental harm – see list of examples above;
- providing appropriate PPE for site staff;
- organizing site induction to inform all mine action staff of anticipated ground conditions;
- maintaining appropriate records, detailing the date, location, nature, cause and severity (where possible) of the environmental incident and reporting body;
- reporting incidents to the site owners and occupants/users and where possible, the local authorities or other actors.

The following measures may also be required, depending on the specific site conditions and nature of the suspected or confirmed contamination. This list is not exhaustive and specialist environmental support is necessary:

- stopping work in the event of unacceptable contaminated or site conditions, only proceeding once risks have been adequately assessed, appropriate control measures are in place and permission granted from relevant authorities to proceed;
- where applicable, obtaining consent from the relevant authority to proceed and subject to any operating conditions and safety requirements;
- updating health and safety file updates depending on the nature of any environmental incidents;
- providing additional PPE and welfare facilities – such as washing and changing facilities – for site staff;
- ensuring specialist environmental supervision and environmental monitoring during technical survey and clearance activities (see Annex D Environmental monitoring, sampling and surveys);
- organizing the excavation, containment, segregation and/or treatment of contaminated soils, water or waste;
- taking dust suppression measures during windy conditions;
- providing barriers or drainage systems to control the risk of contaminated run-off;
- establishing controls to restrict public site access;
- encouraging community engagement to inform the local community of any immediate and potential risk and control measures in place;
- maintain a register of liaison with authorities and other actors, including advice received.

Maintain appropriate records of any remedial responses taken or corrective action needed. This should include the reasons for taking action, what needs to be done, any start and finish dates, whether action is needed to comply with legislation and/or best practice, the consequences of not carrying the action and responsibility of parties involved.

5.5 Climate/environmental literacy, and multi-sectoral coordination

Staff competencies should be maintained, with regular refresher training and updates. Many environmental and climate action training, webinars and courses are available, covering a broad range of environmental and climate themes relevant to humanitarian organizations.

Mine action is multi-sectoral, requiring effective teamwork and coordination between stakeholders, including those external to the mine action sector. Effective coordination across a range of stakeholders can also help to improve environmental awareness, climate resilience, deliver and result in better environmental and climate action–related outcomes. Effective coordination can also help to:

- avoid gaps in the delivery of support;
- better direct resources;
- avoid duplicating efforts;
- increase and build capacities;
- share knowledge and data;
- improve outcomes for local communities and other beneficiaries; and
- demonstrate success, leading to the possibility of sustained funding.

Coordination is required across a range of stakeholders, including politicians; government environmental authorities; national mine action centres and national mine action authorities; international, national and local environmental non-governmental organizations; UN organizations; contractors and mine action organizations; academia and consultants; and the local and impacted population. This includes government authorities and supporting agencies involved in natural disaster and extreme weather early warning systems, disaster risk reduction, national adaptation plans, biodiversity and conservation strategies, sustainable agriculture, and environmental remediation and pollution control (see Annex E).

6 Consideration of climate risk

6.1 Climate change and mine action

Climate change refers to long-term shifts in temperatures and weather patterns, with human activity as the main cause of the temperature rise which has already occurred.[40] There is unequivocal evidence that the Earth is warming at an unprecedented rate,[41] with the effects of climate change already happening. Climate change presents additional challenges for mine action in how mine action operations are carried out, and how EO-contaminated areas and communities are affected.

The primary objective of mine action is to remove explosive hazards and reduce the risk for affected communities, but there is also a potential to support climate resilience and adaptation initiatives in EO-affected communities. People living in these communities are increasingly exposed to climate risks, with the compounding impacts of socio-economic factors, environmental degradation and conflict.[42]

It is critical to consider the local context and traditional knowledge. Information on community-level vulnerability and capacity can inform decisions on the action to be taken, and build communities' resilience to climate change.[43] Mine action can play a role in collecting this knowledge through community engagement and non-technical surveys.

[40] In 2013, the Intergovernmental Panel on Climate Change (IPCC) released its globally peer-reviewed Fifth Assessment Report, which concluded that climate change is real and human activities, largely the release of polluting gases from burning fossil fuel (coal, oil, gas), is the main cause. See https://www.ipcc.ch/assessment-report/ar5/.
[41] NASA, "Evidence", https://science.nasa.gov/climate-change/evidence/. "*There is unequivocal evidence that Earth is warming at an unprecedented rate. Human activity is the principal cause*".
[42] International Committee of the Red Cross and Norwegian Red Cross, Making adaptation work – Addressing the compounding impacts of climate change, environmental degradation and conflict in the Near and Middle East (2023), https://shop.icrc.org/download/ebook?sku=MAW/002-ebook.
[43] CARE, *Climate Vulnerability and Capacity Analysis Handbook,CVCA Handbook* (July 2019), https://careclimatechange.org/wp-content/uploads/2016/06/CARE-CVCA-Handbook-EN-v0.8-web.pdf.

6.2 Climate vulnerability

Conflict-affected countries are often the most vulnerable to climate change, and the mine action sector must adapt and remain capable of delivering effective and climate-resilient programmes, both in terms of how operations are delivered and how vulnerable communities can be supported.

The vulnerability and climate-risk profile for a country or region should be established and well understood for each mine action programme. Consultation with government and local agencies is essential.

Information from country-level climate profiles and climate projection data should also be supported by close dialogue with regional authorities, and community engagement.

Table 6 – Climate context

Primary considerations	Information and research tools
What extreme weather events are already affecting or likely to affect communities in the future?	Country profiles, historic and projected climate data
What are the observed changes in weather and seasonal patterns in recent decades, including rainfall and temperatures, etc.?	
What are the projected changes in weather and seasonal patterns?	
Have local communities or indigenous people noted weather or seasonal changes?	Community engagement and questions around changes relating to rainy/dry seasons, hot/cold seasons, holidays/festivals, planting and harvests, crop production and soil fertility, periods of scarce resources (for example food, water, fish, pasture), migration times of species, extreme weather events, pests and vermin, seasonal illness (people and livestock)

Country-level and scientific data used in conjunction with local knowledge and experience is important to identify:

- how climate change may be already impacting the region and local communities;
- how this may impact gender or social groups differently; and
- what local coping strategies may already be in place.

Mine action programmes should also be aware of the climate impacts facing communities, the uncertainties around them and, where possible, seek opportunities where mine action planning and operations can support local adaptation or mitigation strategies, as part of the land release process. In the absence of implementing enhancement opportunities, land use following land release may result in other adverse environmental impacts which are not mitigated (see Annex F).

6.3 Use of climate information

Information about past and recent trends, likely projections and potential impacts can help to manage climate risks. Climate information does contain uncertainties on future temperature rises, shifting rainfall patterns, sea level rise and how changes may interact with other variables.[44] When using climate information, some precautions are advised.[45]

- Conducting climate analysis which is too detailed or not suitably tailored for the decisions to be made can distract from effectively managing climate risks through improved planning or design.

- Using single, best-guess estimates of future conditions fails to consider a range of future scenarios, as well as uncertainties. Take account of the range of climate variability and extremes to ensure decisions are robust and consider a range of future conditions.

- Attributing observed impacts, trends or events to climate change based on anecdotal evidence alone can lead to ineffective management of other risks. Use a combination of information sources to define trends and impacts.

- Do not assume that the uncertainties around climate change means that there is no useful climate information.

6.4 Defining the scope

An assessment of how climate change may affect mine action operations is required, to ensure that:

- climate-related risks to operations and communities can be effectively managed;

- the operating capacity and the safety of field staff or communities is not compromised; and

- the prioritization and implementation of mine action programmes are scrutinized in relation to climate-related risks.

Climate risks refer to the potential for climate change to create adverse consequences for human or ecological systems. The risks that climate change within a country or geographical region may pose to programmes and specific tasks should be identified, and whether risks may arise from gradual changes in climate trends or more extreme weather-related events. In accordance with IMAS 07.14, risk is the probability (or likelihood) of an impact occurring and the magnitude (or severity) of the consequences.

Climate risk management integrates climate-related information into decision-making to decrease potential loss and damage. It also includes planning and implementing for a range of possible future climate scenarios, and building in the flexibility to adjust and adapt to a changing climate.

[44] USAID, *Primer: Using climate information for climate risk management* (2017), https://www.climatelinks.org/sites/default/files/asset/document/2017_USAID_Primer-Using-Climate-Info-for-CRM.pdf.
[45] Adapted from USAID, *Pitfalls to avoid when using climate information* (2017, p. 12), https://www.climatelinks.org/sites/default/files/asset/document/2017_USAID_Primer-Using-Climate-Info-for-CRM.pdf.

Checklist questions for consideration for mine action and climate change

1) Is the climate change profile for the region understood?

2) What are the current and projected climatic-impact drivers (for example increased average annual temperatures, higher rainfall, more intense drought conditions, increased flooding, extreme weather events..) which can exacerbate hazards?

3) How may these climatic-impact drivers and changes in climate patterns affect the mine action programme?

4) How may these climatic-impact drivers and changes in climate patterns affect local communities and the wider population?

5) May these climate impacts exacerbate other local tensions or conflict?

6) Are changes in land use patterns known and how this may affect planned and future mine action?

7) Has there been deforestation or development in recent decades, which may exacerbate the effects?

8) Have the local community been consulted on observed changes and impacts from weather, and seasonal patterns and extreme events?

9) Are there specific regions, groups (including gender), communities or economies particularly exposed to these climate impacts?

10) What local coping or adaptation plans are already in place, and are these likely to be effective for mine action activities?

11) What local coping or adaptation plans are already in place, and are these likely to be effective for communities?

12) What additional measures may be taken to avert, minimize or address the adverse effects of climate impacts?

13) Are there suspected or confirmed hazardous areas which should be prioritized due to climate risks?

14) Are revisions needed to mine action work plans, seasonal work patterns and choice of equipment?

15) What should be prioritized and is additional funding needed?

16) Are residual risks acceptable?

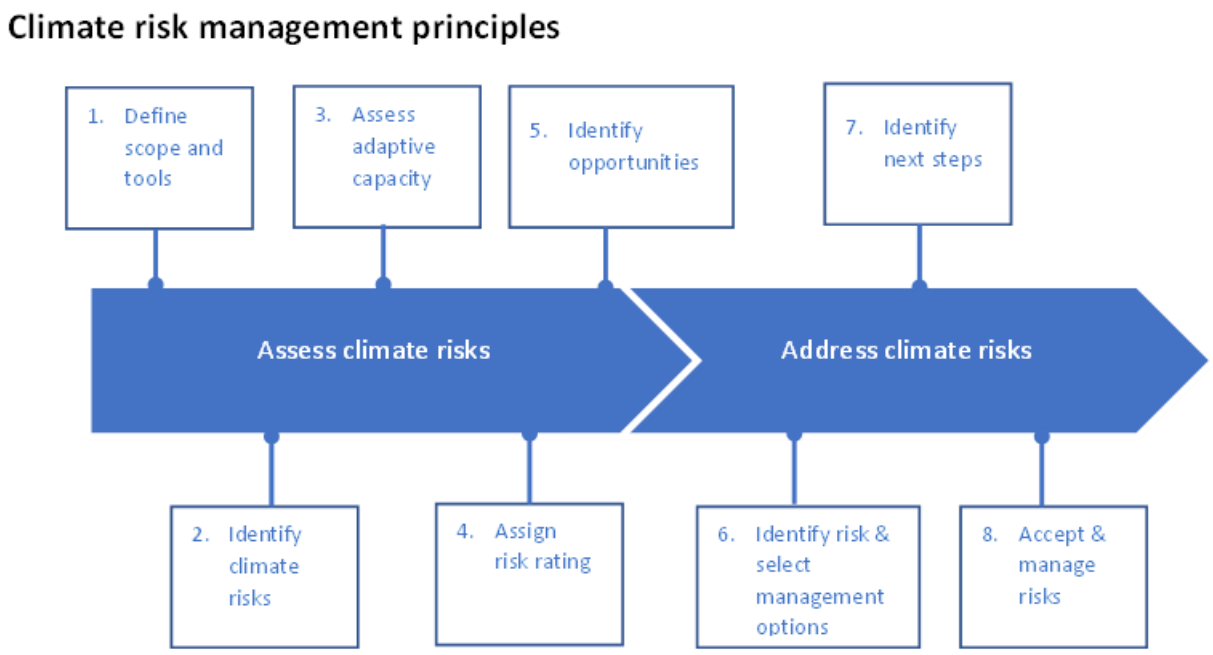

Figure 2 Climate risk management prinicples[46]

The interaction between climate and conflict sensitivity risks is complex, and beyond the scope of this TNMA. However, mine action programmes should be aware of this interrelationship, and of how the vulnerability of communities to climate change may adversely influence social, economic and political conditions.[47, 48]

6.5 Identifying climatic-impact drivers, climate impacts and risks

Climate-related impacts can affect lives, livelihoods, health, ecosystems and infrastructure. In mine action, this can impact programming, working practices and the choice and deployment of equipment and clearance techniques. Mine action programmes should review whether offices or field-based activities are vulnerable to climate-related impacts, such as flooding, increased risk of wildfires, extreme working temperatures, landslides or subsistence, dust storms, soil erosion, or failure of services (for example water or electricity). The potential risk of increased harm to any nearby receptors due to climate-related events should be reviewed, and opportunities identified to manage and reduce unacceptable risks.

A climatic-impact driver is a condition, event or trend related to climate variability, which can exacerbate hazards for mine action organizations. Examples of climatic-impact drivers include higher temperatures, prolonged or intense rainfall, droughts, storm surges and stronger winds. Given the potential impact, the risk to mine action operations should be evaluated and the findings integrated into prioritization, planning and decision-making. Examples of how climate-related impacts may affect mine action operations are given in Table 7.

[46] USAID Climatelinks, “Climate Risk Screening and Management Tools”, https://www.climatelinks.org/resources/climate-risk-screening-and-management-tools.
[47] Detges, Adrien; Adrian Foong,2023, 2023. Weathering Risk. Context matters – a review of the evidence of how social, economic and other variables influence the relationship between climate and security, published by adelphi. Available at https://weatheringrisk.org/sites/default/files/document/Context_Matters_Report.pdf.
[48] UNFCCC, 2022. Conflict and climate – how do they interact? 12 July 2022. Available at https://unfccc.int/news/conflict-and-climate#:~:text=And%20while%20conflict%20exacerbates%20the,desertification%20to%20rising%20sea%20levels

Table 7 – Examples of how climate-related impacts may affect mine action operations

Climate-related impact	Potential effect on mine action operations
Higher temperatures, dust storms and/or excessive rain	– Deterioration of EO condition and stability – Impact on durability/robustness of some equipment – Increased risk of heat-related illnesses – Shorter work shifts and more frequent breaks – Stand down, access constraints and delays to work plans – Unable to deploy mine detection dog teams or certain equipment
Increased risk of landscape fires	– Fires triggering EO detonations, and detonations causing fires – Increased risk to staff, equipment, firefighters and local people – Need for additional measures, such as use of fire breaks, provision of firefighting equipment, revised evacuation procedures – Stand down, access constraints and delays to work plans
Flooding and/or landslides causing potential for EOs to move	– Greater uncertainty over the location and orientation of EO – Need to areas to be re-surveyed and cleared – Potential for new or previously cleared areas to become contaminated – Stand down, access constraints and delays to work plans
Work areas prone to drought and desertification	– Increased pressure on local water resources – Need for additional measures to protect soils, prevent erosion and improve soil health – Exposure of previously submerged EO – Stand down, access constraints and delays to work plans
Increased risk of food-, water- and vector-borne diseases[49]	– Increased risk to staff, and local people – Need for additional precautionary measures, training, medical check-ups and treatment.

Climate tools and resources (see Annex F), including country climate risk profiles are available to support preliminary climate-risk assessments for mine action programmes and provide general climate trends. Climate and environmental information should be collected as early as possible and periodically reviewed at key stages of mine action programmes.

Table 8 – Stages in mine action programmes to collect and review climate and environmental data

Strategy planning and design[50]	– Check alignment with other natonal strategies, treaties, legislation and national climate and environmental issues
NTS and desktop assessment of open-source data **Community engagement and liaison**	– Check local and regionally specific datasets, including local and indigenous knowledge to inform environmental assessment and screening
Task planning and prioritisation	– Check datasets with seasonal considerations or need to prioritization areas due to higher climate change or environmental risks
Implementation	– Review and supplement data prior to implementation to ensure information is up-to-date

[49] World Health Organization, 2023. Climate change, 12 October 2023, available at https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health
[50] Climate Data for Action | Climate Watch | Emissions and Policies

Information from the affected population on how they experience changes in weather, local wildlife, livelihoods and related income and other climate and environmental patterns should also be considered when assessing the climate risks and planning for mine action operations, as well how gender and social groups may be affected differently.

6.6 Assessing adaptive capacity

Once climate impacts are identified, the adaptive capacity should be considered. This refers to the capacity of an individual, community, organization or nation's ability to plan and adapt to the impact of climate change. Since mine action organizations can be vulnerable – as well as the population in post-conflict and conflict-affected areas – mine action programmes should be aware of how they are affected, and ensure that their planning and operations support local mitigation or adaptation strategies, where possible.

In addition, drivers may be exacerbated by other local tensions or conflict and the vulnerability of specific groups (including gender-related) or communities should be considered. For example, women are more dependent on natural resources and, in many regions, are disproportionately responsibility for securing food and water. This means they can be more exposed to losses in income and climate change pressures on natural resources.[51],[52] Any local adaptation plans that are already in place or planned should be reviewed, and whether they are likely to be effective.

6.7 Evaluating, managing and communicating climate risk

The evaluation of risk associated with a climate impact aligns with IMAS 07.14, where risk is the probability (or likelihood) of an impact occurring and the magnitude (or severity) of the consequences**.** Mine action stakeholders should ensure that potential climate risks are communicated and appropriately acted on at the appropriate level.

Regular monitoring allows for further adaptive management and, if unexpected risks arise, adjustments can be made in real time to minimize ongoing risks to mine action programmes.

Table 9 – Communicating and acting on identified climate risks in mine action

Mine action stakeholder	Examples of communication and action to be taken
National authorities	– Reviewing and prioritizing survey and clearance in higher risk areas – Informing other relevant departments – Seeking advice on adaptation and disaster risk reduction – Linking with early warning systems – Providing information to the local community
Organizations	– Using the results to inform the operational approach and decision-making, as well as advising the local community – Adjusting EO risk education to incorporate any additional risk awareness due to climate change – Informing the mine action authorities – Align procedures with early warning systems – Seeking advice on adaptation and disaster risk reduction

6.8 Identifying opportunities and adaptative planning

Mine action stakeholders are required to take steps to adapt and improve the climate resilience of their organization and activities, as well as minimizing their own greenhouse gas emissions. Climate resilience refers to the capacity to cope with a climate event or trend in ways that essential function, identity and structure is

[51] UN Women, "Explainer: How gender inequality and climate change are interconnected" (28 February, 2022), https://www.unwomen.org/en/news-stories/explainer/2022/02/explainer-how-gender-inequality-and-climate-change-are-interconnected.
[52] Another example is the increased risk of gender-based sexual violence given the longer walks taken by women and girls to collect water.

maintained. In other words, it means having the capacity and ability to cope with the anticipated effects of climate change and recover efficiently from their impacts, in a timely manner.

Identifying opportunities to put in place adaptation planning requires an understanding of local adaptation plans already in place, their likely effectiveness and which additional measures may be taken to reduce or address the consequences of climate change. Prioritization and any additional funding needs should also be considered.

The climate resilience of communities can also be supported where mine action operates, and it can involve a range of solutions to enhance the long-term capacity of communities and support adaptation strategies. For communities, a single adaptation intervention is unlikely to achieve a long-term increase in resilience and should be considered as an iterative process in which adaptation approaches build on previous successes. Local ownership and collaboration with local partners are key.

Locally-led adaptation promotes bottom-up approaches to better facilitate local initiatives, allowing communities to drive the development of projects and decision-making, through guided support and sharing data.[53] Guidance is available on supporting communities in the planning of locally-led adaptation and resilience, and mine action should be encouraged to work collaboratively with partners to help deliver such adaptation initiatives.

Table 10 – Working collaboratively to help deliver adaptation and enhancement initiatives

Guidance to support communities in planning locally-led adaptation and resilience	It is critical that succession planning is built into initiatives for them to succeed and be sustained over time. For example, without aftercare in place, failure rates for planting schemes can be high. For finite mine action programmes and following land release, it is important that succession planning is in place through securing community buy-in, working with local partners and getting the support from local people to ensure long-term viability. For guidance, see BRACED Building Resilience and Adaptation to Climate Extremes and Disaster,[54] and CARE Climate Justice Centre – Locally-led Adaptation & Resilience portal.[55]
Online tools to support the planning of EbA	Ecosystem-based adaptation (EbA) is a nature-based solution, covering a wide range of ecosystem management activities, such as the sustainable management of forests, grasslands and wetlands, that increase the resilience and reduce the vulnerability of people and the environment to climate change. ALivE is a qualitative assessment tool, designed to help users understand and identify EbA options for community and ecosystem resilience[56].
Sharing and collecting information	It is also important that information which may be useful to others is collected and then shared. By doing so, this can encourage adoption of similar initiatives elsewhere, especially when the environmental, socio-economic and cultural benefits have been properly monitored and communicated. See interactive map detailing case studies examples implemented in some conflict-affected regions.[57]

6.9 Mitigation, compensation and enhancement

Mitigation refers to measures and strategies aimed at minimizing or reducing the negative environmental impacts of a project or activity. Examples of mitigation practices applicable to mine action are given in section 5.3.5. The list of examples given is not exhaustive, and regionally specific measures may also be relevant. Importantly, early identification and implementation of appropriate mitigation measures is necessary to avoid or reduce adverse impacts.

Compensation refers to actions where significant negative impacts cannot be avoided or mitigated, and compensatory measures may be appropriate. This involves habitat restoration, reforestation or wildlife conservation efforts that offset the harm caused by mine action operations. Compensation should be seen as a

[53] Carbon Brief, "How 'locally led' adaptation can help address climate change" (18 July 2023), https://www.carbonbrief.org/guest-post-how-locally-led-adaptation-can-help-address-climate-change/.
[54] See BRACED, http://www.braced.org/.
[55] See CARE, https://careclimatechange.org/what-we-do/adaptation/.
[56] See ALivE, "Adaptation, Livelihoods and Ecosystems Planning Tool", https://www.iisd.org/projects/alive-adaptation-livelihoods-and-ecosystems-planning-tool.
[57] See Ecosystem for Peace, "Nature-based Solutions for Peace and Security", https://solutions.ecosystemforpeace.org/.

last resort, when all other mitigation options have been exhausted. Some examples of compensation measures are given in Annex G.

Enhancement is an action which provides net benefits for the environment beyond the requirement to avoid, mitigate or compensate for any adverse environmental effects. In mine action, environmental enhancement may involve transforming cleared minefields into nature reserves, creating sustainable agricultural practices in cleared areas, or implementing water resource management programmes. The goal of enhancement is to leave the environment in a better condition than before the project or activity began. Some examples of enhancement measures are given in Annex G.

For both effective compensation and effective enhancement initiatives, meaningful consultation with local environmental experts, regulatory authorities, and community representatives is key.

It is important to tailor measures to the specific needs and conditions of the project and the environment in question. Collaboration with environmental experts, local authorities and community stakeholders is essential to ensure that enrichment measures are effective and sustainable. These measures not only protect the environment, but also contribute to the long-term well-being of both ecosystems and human communities. The suitability depends on several factors, such as climate, topography, soils, nearby habitats and landscape features, but is critically driven by local knowledge and specialist input.

7 Monitoring

A monitoring system is required to track progress, assess environmental outcomes and ensure that mitigation, compensation measures and improvement are effective. An environmental best practice checklist is given in Annex B.

Monitoring systems should be tailored to the specific project and environmental context. The frequency and type of any specific data collected varies depending on timelines, community and environmental setting.

Considerations for monitoring systems

At the onset, establish the environmental baseline. This serves as a reference point for evaluating changes over time.

- The use of environmental key performance indicators (KPIs) depends on the location and focus. KPIs may include mileage, energy use data, waste, air and water quality, biodiversity indicators, soil health and soil quality, improvements in staff or community awareness.

- Consider routine data collection at regular intervals throughout the duration of the programme, including sites and offices.

- Further environmental assessment and surveys may be required to periodically review specific tasks or locations. This should include both adverse and beneficial impacts.

- Check and update environmental legislation and compliance registers to ensure compliance with all relevant environmental laws and regulations, and that any necessary permits in place. Monitor and document adherence to these requirements.

- Consider the use remote sensing technology and geographic information systems to track changes in the environmental baseline, including land use, vegetation cover and other environmental parameters.

The records of all monitoring activities should be retained, with regular reporting generated to allow comparison to any established KPIs and targets (see TNMA 07.11/02). The data can then be used to make informed decisions about adjusting project activities, equipment needs, mitigation measures or compensation initiatives as needed. On completion and land release, there are also direct and indirect benefits from the reporting of environmental data as part of the handover documentation (see Annex H and TNMA 05.10/01).

Wherever possible, monitoring and performance should be shared with stakeholders, including local communities, environmental organizations and relevant authorities to share monitoring findings and address concerns or suggestions. In particular, post-completion monitoring is important to determine whether any long-term environmental effects are addressed and that compensation initiatives are successful.

A well-designed monitoring system helps ensure that environmental projects achieve their intended goals and decrease negative impacts. It provides stakeholders with valuable information for decision-making and accountability throughout the project's lifecycle and beyond (see also IMAS 07.40).

8 Review and improvements

Where funding timeframes allow, post-clearance assessments should take place at least six months to one year following the completion of field activities to review land use and to assess the outcome of environmental measures put in place. However, in some cases the outcomes may take much longer. Where land use or planting initiatives are incorporated, aftercare planning ensuring local community buy-in is needed.

Mine action organizations and contractors are expected to meet the performance criteria which are embedded into the funding award or contract, and to provide evidence of progress on their environmental commitments. In case of continued failure to meet the environmental obligations or make improvements, corrective action should be taken.

Donors should be informed of significant environmental incidents, or climate-related events that affect the delivery of the mine action programme or contract, as soon as possible. This includes any significant environmental damage caused due to negligence or disregard to operating procedures. Environmental or climate-related incidents/accidents should be reported (see Annex I) treated as nonconformities and investigated in accordance with IMAS 10.60. Mine action organizations and contractors also should be encouraged to raise any environmental concerns, feedback or improvement opportunities they have identified to donors. Where viable, donors may seek to explore and action environmental improvement opportunities identified.

Annex A
(informative)

References

[1] IMAS 04.10, *Glossary of mine action terms, definitions and abbreviations*

[2] IMAS 05.10/01, *Measurement and reporting of beneficiaries*

[3] IMAS 07.11, *Land release*

[4] IMAS 07.12, *Quality management in mine action*

[5] IMAS 07.13, *Environmental management and climate change in mine action*

[6] IMAS 07.14, *Risk management in mine action*

[7] IMAS 07.20, *Guide for the development and management of mine action contracts*

[8] IMAS 07.40, *Monitoring of mine action organizations*

[9] IMAS 07.50, *Management of human remains in mine action*

[10] IMAS 08.10, *Non-technical survey*

[11] IMAS 08.20, *Technical survey*

[12] IMAS 08.30, *Post-clearance documentation*

[13] TNMA 09.30/02, *Clearance of depleted uranium hazards*

[14] IMAS 09.50, *Mechanical land release*

[15] IMAS 10.60, *Investigation and reporting of accidents and incidents*

[16] IMAS 11.20, *Principles and procedures for open burning and open detonation operations*

[17] IMAS 14.10*, Guide for the evaluation of mine action interventions*

Annex B
(informative)

Environmental best practice checklist

	Yes	No	N/a
Policy and procedures			
Does your organization have a climate and environmental policy?			
Does your organization have a standard operating procedure (SOP) on climate and environmental management?			
Is your organization fully aware of the national, regional or local environmental legislation relevant for mine action? *This can include, but is not limited to, the following:* – Air quality – Climate – Contamination and soils – Conservation and protection of habitat, and endangered species – Environmental impact assessment (EIA) – Flood risk management – Historic or cultural protection – Invasive species – Noise and ground-shock/vibrations – Nuisance – Planning – Wastewater and waste – Water abstraction and use			
Are there any national, regional or local environmental policy or strategy relevant to planned or future mine action activities? *This can include, but is not limited to the following:* – Biodiversity and conservation – Climate adaptation – Disaster risk reduction and early warning systems – Environmental remediation and pollution control – Natural resource management – Sustainable agriculture – Urban and green recovery – Waste management			
Have stakeholder expectations and concerns on the environment been recorded and duly considered?			
Have any transboundary environmental issues been considered and addressed (for example, if close to international or regional borders)?			
Environmental profile			
Are the existing baseline environmental conditions for the region or for specific Task Areas known?			
Are additional open data sources or local consultation needed to the establish environmental baseline?			

	Yes	No	N/a
Are they any existing environmental reports, studies or surveys available which support understanding of the environmental baseline?			
Are any area-specific environmental monitoring, sampling or surveys required to inform the assessment of the environmental baseline?			
Regional and local trends			
Are changes in land use patterns known? How may this affect planned and future mine action?			
Is the climate change profile for the region understood?			
Are current and projected climatic-impact drivers known and changes in climate patterns? How may these affect planned and future mine action?			
Are current and projected climatic-impact drivers known and changes in climate patterns? How may these affect local communities and the wider population?			
May these climate impacts exacerbate other local tensions or conflict?			
Are changes in land use patterns known? How may this affect planned and future mine action?			
Has there been deforestation or development in recent decades, which may exacerbate the effects of climate change?			
Has the local community been consulted on observed changes and impacts from weather and seasonal patterns and extreme events?			
Are local climate coping strategies in place and likely to be effective for mine action activities?			
Are local climate coping strategies in place and likely to be effective for communities?			
Are there specific regions, groups (including gender), communities or economies particularly exposed to these climate impacts?			
Are additional measures needed to avert, minimize or address the adverse effects of climate impacts?			
Are there suspected or confirmed hazardous areas which should be prioritized due to climate risks?			
Are revisions needed to mine action work plans, seasonal work patterns and choice of equipment?			
Are residual climate risks acceptable?			
Operations – establishing compounds, temporary camps, work areas and access routes			
Have areas been selected in close consultation with local community and engagement with local leaders, with preference for existing access roads and sites?			
Have agriculturally productive, culturally or environmentally sensitive areas been avoided as far as possible, for establishing access routes and compounds?			
Are there measures in place to avoid nuisance to the local community?			
Are there measures in place to ensure safe and environmentally acceptable disposal or treatment of human waste?			
Are there measures in place to reduce volumes generated, and ensure safe and environmentally acceptable treatment and disposal of wastewaters?			
Are there measures in place to reduce volumes generated, and ensure safe and environmentally acceptable storage, treatment and disposal of solid waste?			
Are measures in place to control insects and rodents?			
Is there appropriate drainage of the site?			
Has the clearance of vegetation been avoided or minimized?			
Are there measures in place to protect areas of retained trees and vegetation?			
Are there measures in place to protect soils and avoid soil degradation and erosion?			

	Yes	No	N/a
Have any vegetation clearance activities been planned to avoid disturbance to breeding or nesting animals?			
Are there measures in place to control noisy activities and reduce noise, where possible?			
Are there measures in place to avoid the release of fuel or hazardous chemicals to soil, water or air?			
Have obstructing or blocking water courses been avoided?			
Are residual environmental risks acceptable?			
Operations – survey, clearance activities and stockpile destructions			
Have seasonal and climate considerations been incorporated into the task planning?			
Are there measures in place to minimize impacts to agriculturally productive, cultural or environmentally sensitive areas?			
Are there measures in place to avoid nuisance to the local community?			
Are there measures in place to reduce volumes generated, and ensure safe and environmentally acceptable storage, treatment and disposal of all waste generated from activities?			
Are there measures in place to minimize the clearance of vegetation and protect retained areas?			
Are there measures in place to protect soils and avoid soil degradation and erosion?			
Have any clearance activities been planned to avoid disturbance to breeding or nesting animals?			
Has the location of any central demolition site been selected in minimize the impact on local people and the environment?			
Are there measures in place to control noisy activities and reduce noise and ground-shocks/ vibrations, where possible?			
Are there measures in place to avoid the release of fuel and hazardous chemicals to soil, water or air?			
Have obstructing or blocking water courses been avoided?			
Are residual environmental risks acceptable?			
Operations – demobilization			
Have all temporary support facilities and infrastructure been removed?			
Have areas of latrines, wastewater soak-away pits, or disposal areas been suitably restored, infilled and the surface stabilized, where appropriate?			
Have any temporary road, parking areas, temporary culverts and buried water lines been removed and areas restored?			
Is drainage re-established across the site suitable?			
Are all other areas of disturbed areas suitably restored to their original condition or improved?			
Have waste materials been removed for treatment or disposal, as appropriate?			
Are residual environmental risks acceptable?			
Operations – offices and accommodation			
Is a travel policy in place? Are travel mileage and vehicle use monitored?			
Have alternative low emission and ultra-low emission vehicles been considered and adopted, where appropriate?			
Are there measures in place to reduce and monitor energy use?			
Have renewable energy alternatives been considered and adopted, where appropriate?			
Are there measures in place to reduce and monitor water use?			
Are there measures in place to reduce emissions to air and improve air quality, including indoors?			

	Yes	No	N/a
Are there measures in place to reduce the use of consumables (including paper and single use plastics), and implement sustainable procurement criteria with suppliers where possible?			
Are there measures in place to implement sustainable procurement criteria with suppliers, where possible?			
Are there measures in place to reduce volumes of waste generated, improve rates of recycling, reuse and recovery, and monitor progress?			
Are there measures in place to control noisy activities and reduce noise, where possible?			
Are there measures in place to reduce emissions from the use of chemicals and switch to alternatives with a low environmental footprint, where possible?			
Are residual environmental risks acceptable?			
Compensation and environmental enhancement measures			
Have any opportunities for environmental compensation been identified, where adverse impacts cannot be avoided?			
Have any opportunities for environmental enhancement been identified which can provide net benefits for the environment beyond the requirement to avoid, mitigate or compensate for any adverse environmental effects?			
Have any opportunities been identified which can support the climate resilience of local communities?			
Emergency planning			
Are early warning systems in place to alert mine action operations and communities of natural disasters or extreme weather events?			
Are procedures in place to respond to an environmental emergency event, such as a flooding event, landscape fire, landslide, major spill or pollution?			
Incident reporting			
Are incident reporting procedures in place for environmental incidents and near-misses during mine action activities?			
Monitoring and reporting			
Are procedures in place to monitor environmental performance and compliance of mine action activities?			
Are procedures in place to report relevant and useful environmental data or information on climate resilience, and outcomes to stakeholders and interested third parties?			

Annex C
(informative)

Environmental site observations and evidence of pollution

C.1 Background

Pollution and chemical contamination in soil and water can present risks to mine action organizations, the local community and the wider environment. Visual observations and inspections are important to:

- support the collection of data on site conditions;
- develop an understanding of potential risks; and
- inform decisions on any precautions or mitigation measures needed.

As well as consulting the local community, landowners and the authorities, visual observations and inspections of task areas and adjoining land should be carried out to assess the potential for pollution or contaminated soil or water to be present. This should be carried out as part of non-technical surveys and task planning.

There are several ways in which soil and water may become contaminated, including industrial, military, agricultural and waste management practices. In addition to contaminants from EO themselves and the remnants of EO, the use of explosive weapons can cause pollution, especially in urban settings where damage to industrial sites, infrastructure, fuel storage facilities, commercial properties and fires may have caused the contamination of underlying soils and water. The debris generated – including from residential properties – may also contain hazardous materials, such as asbestos.[58]

Past and current land use practices may also have led to the contamination of soils and water. It is important to have control measures in place to minimize the risk of harm to people and the environment. It is also recommended to seek specialist advice.

The effect of conflict-related pollution on civilians is particularly under-researched, despite the risk of significant and long-term exposure. This is a barrier to identifying local need and remediation of polluted areas.

C.2 Types of observations and incidents

Soil and water contamination is not always obvious. However, there may be clear evidence or other indicators. Examples of types of site observations and incidents to note include the following:

- signs of physical damage to infrastructure or utilities;
- signs of cratering, bombturbation and physical compaction of soils;
- buried drums, tanks, pipework or containers;
- evidence of leaks or spills of fuel or chemicals from tanks, containers or pipework;
- soil or water with discolouration or odour;
- non-natural materials and wastes, including stockpiled waste and debris at ground level or buried/partially buried;

[58] For guidance related to asbestos, including safety protocols, and best practices related to debris and handling asbestos-containing materials see https://sheltercluster.org/ukraine/documents/ukraine-asbestos-resources

- evidence of dead fish or signs of fish gasping for air within water bodies;
- other evidence of contamination, for example iridescent sheens (like oil or diesel) on soil or water;
- dead or sick livestock or wildlife;
- fire damaged infrastructure or natural assets;
- damage to natural habitat, including vegetation dieback and signs of vegetation distress.

C.3 Consultation and local interviews

Consultation and interviews with people who may have knowledge about previous activities or sources of pollution may also be useful to enhance knowledge about suspected contamination. Anecdotal evidence, however, should be used with caution.

It is recommended to seek specialist advice where contamination sources are suspected or confirmed.

Historical mapping, and historic aerial photography or satellite images may also help identify potential sources of contamination from previous land use practices, together with consultation with regulatory authorities.

C.4 Records and reporting

Any evidence of soil or water pollution should be recorded within the information management system. Observations on ground conditions and potential sources of pollution or chemical contamination may also be provided to other actors and can support the prioritization of higher risk sites for investigation and remediation. Collaboration and the provision of elementary environmental data and incident reporting by mine action organizations can be a useful additional resource to other organizations.

Additional occupational health and safety provisions may also be required where there is a risk of harm to mine action organizations or local people from the presence of debris, chemical pollution, radiological or biological hazards.

Refer to Annex I for details of the information to be recorded. If there is contamination or if the risk exist of an environmental incident causing an immediate threat to people or the environment, this should be reported immediately to whoever is in control of the area – and, where possible, the local authorities – so that any essential urgent action can be taken.

Annex D
(informative)

Environmental monitoring, sampling and surveys

Environmental monitoring, surveys and the collection of environmental samples may be required under certain circumstances to assess site conditions, or to establish the nature and extent of chemical contamination present. This may also include:

- ecological and habitat surveys, for sites where a significant ecological or wildlife value is anticipated, including endangered or sensitive one;

- air, sediment, soil or water quality monitoring, for example to assess the water quality in rivers, lakes and groundwater sources for signs of contamination, soil contamination or the effectiveness of soil stabilization and erosion control measures.

Environmental monitoring, surveys and sampling may also be required to validate assumptions made as part of initial assessments or screening, and can provide additional information to inform a risk assessment and support the selection and design of mitigation measures which may be required.

Environmental monitoring, surveys and sampling should only be carried out by trained and technically competent persons. It is recommended to seek specialist technical support to assist in the design and implementation of any environmental sampling or survey requirements, and in the interpretation of the results.

Key considerations include:

- scope and objectives of the monitoring, surveys or sampling;

- sampling strategy and medium – for example, air, soil, water, crops/produce, ecology;

- selecting sample locations and nearby environmental receptors;

- sampling or survey methodology;

- competencies and selection of staff;

- site constraints, access and safety considerations;

- selection and use of survey and portable field equipment;

- selection criteria for testing laboratories or subconsultants, including accreditation and certification;

- field notes and record keeping;

- sample storage, transport and handling;

- turnaround times for sample analysis;

- limitations and dealing with uncertainties;

- assessment criteria framework and reporting requirements.

Annex E
(informative)

Coordination across government authorities and supporting agencies

Theme	Description and links with mine action
Biodiversity and conservation strategies	National or regional strategies to protect nature and reverse the degradation of ecosystems, including safeguards for protected and endangered species, and their habitats. These should align with mine action strategies, noting the need for EO risk education for impacted areas, and safeguards to ensure that mine action programmes operating within or close to ecologically important areas do not adversely affect conservation objectives.
Disaster risk reduction plans	National and local disaster risk reduction plans to reduce disaster and climate risks.[59] Contingency plans for disasters within areas contaminated by EO should include clear procedures for emergency response, evacuation and the safeguarding of affected communities.
Early warning systems	Early warning systems help communities prepare for natural disasters and hazardous climate-related events. These should be designed to alert mine action authorities and their agencies to provide timely notice to implement appropriate responses.
Environmental remediation and pollution control	These are varied and may include land use management practices to control exposure risks from pre-existing soil or water contamination, clean-up and restoration, such as waste removal and recovery, soil improvement or treatment, restorative planting or removal of invasive species. These should align with mine action strategies, identifying potential remediation needs within areas also impacted by EO.
National adaptation plans (NAPs)	These are designed to reduce a country's vulnerability to the impacts of climate change by building adaptive capacity and resilience.[60] In mine action, climate adaptation and resilience planning should be integrated into land release and post-clearance land use.
Nationally determined contributions (NDCs)	These are national climate action plans which set out a country's commitment to address climate change and reduce their greenhouse gas emissions.[61] Mine action authorities and mine action strategies should be align with NDC commitments.
Natural resource management (NRM)	This covers the sustainable management and use of natural resources, including land, water, air, forests, fisheries, minerals and natural habitats. NRM should align with mine action strategies, ensuring that mine action programmes support and do not adversely affect NRM objectives.
Sustainable and climate-smart agriculture (CSA)	This includes agricultural practices which aim to sustain and improve agricultural productivity while protecting ecosystems, adapting and building resilience to climate change; and reducing and/or removing greenhouse gas emissions, where possible. Mine action programmes support and align with sustainable and CSA objectives, where relevant.
Urban and green recovery, and waste management	This covers urban and green recovery, including debris and waste management, sustainable reconstruction, and post-conflict "building back better" initiatives. Mine action programmes support and align with recovery and waste management objectives, where relevant.

[59] The Sendai Framework for Disaster Risk Reduction 2015–2030 was adopted in 2015, outlining targets and action to prevent new and reduce existing disaster risks. See https://bit.ly/46YIjXA.
[60] NAPs submitted by developed countries to the UNFCCC can be viewed at https://unfccc.int/topics/resilience/workstreams/national-adaptation-plans/overview.
[61] NDCs submitted to the UNFCCC can be viewed at https://unfccc.int/NDCREG.

Annex F
(informative)

Resources to help establish climate-risk profiles for mine action programmes[62]

	Resource	Description
Regional	IPPC Atlas[63]	The IPPC Working Group I interactive atlas can be used to review observed and projected climate change information on a regional basis.
	UK Met Office[64]	Top-level regional overview of potential climate change risks, key issues and complexities.
National	ND-Gain index score[65]	This summarizes a country's exposure, sensitivity and capacity and readiness to adapt to the negative effects of climate change. A higher index score is better, indicating that a country is likely to be more resilient.
	ND-GAIN country profiles[64]	These provide further detail on vulnerabilities related to food, water, health, ecosystem services, human habitat and infrastructure.
	ClimateSERV[66]	Provides historic and near-real-time data on climate and vegetation, to help understand how agriculture and water availability is being affected.
	GFDRR/World Bank Group[67]	*ThinkHazard!* provides a country overview of potential climate hazards, highlighting how these may change in the future as a result of climate change.
	National Oceanic and Atmospheric Administration[68]	Interactive map providing information on historic tropical cyclones/hurricanes.
	Red Cross Red Crescent[69]	Climate factsheets for some countries, detailing regional climate change projections.
	United Nations Framework on Climate Change (UNFCCC)[70]	National Communication submissions by Non-Annex H Parties, including information on specific needs and concerns due to the adverse effects of climate change.
	USAID[71]	Country climate risk profiles and data are available via the Climatelinks Portal.
	World Bank Group[72]	Country climate profiles are available via the Climate Change Knowledge Portal, providing a high-level assessment of physical climate risks by country.
	World Health Organization[73]	Profiles summarizing the climate hazards and health risks facing each country.
Local	National and regional authorities	National and local government representatives working on climate adaptation and mitigation.
	Academia	Regional and local universities/institutes to build on higher-level national climate data and knowledge.
	Communities, local partners and local civil society organizations	Local engagement to collate community experience on climate trends and impacts, and used in conjunction with scientific knowledge and national data.

[62] USAID, *Primer: Using Climate Information for Climate Risk Management* (2017), https://www.climatelinks.org/sites/default/files/asset/document/2017_USAID_Primer-Using-Climate-Info-for-CRM.pdf
[63] IPCC Working Group I, "Interactive Atlas", https://tinyurl.com/2wvbwk93.
[64] Met Office, "Climate risk reports", https://www.metoffice.gov.uk/services/government/international-development/climate-risk-reports.
[65] Notre Dame Global Adaptation Initiative, "Rankings", https://gain.nd.edu/our-work/country-index/rankings/.
[66] ClimateSERV, "ClimateSERV 2.0. Data and tools for sustainable development", https://climateserv.servirglobal.net/.
[67] ThinkHazard!, https://thinkhazard.org/en/.
[68] Historical hurricane tracks, https://coast.noaa.gov/hurricanes/#map=4/32/-80.
[69] Red Cross Red Crescent Climate Centre, "Country climate fact sheets", https://www.climatecentre.org/publications/#Country%20Climate%20Factsheets.
[70] UNFCC, "National Communication submissions from Non-Annex I Parties", https://unfccc.int/non-annex-I-NCs.
[71] USAID Climatelinks, "Climate Risk Screening and Management Tools", https://www.climatelinks.org/climate-risk-management/regional-sector-country-risk-profiles.
[72] World Bank Group, "Climate Risk Country Profiles", https://climateknowledgeportal.worldbank.org/country-profiles.
[73] World Health Organization, "Health and Climate Change Country Profiles", https://www.who.int/teams/environment-climate-change-and-health/climate-change-and-health/evidence-monitoring/country-profiles.

Annex G
(informative)

Examples of compensation and enhancement measures opportunities

G.1 Compensation

Compensation is often seen as a way to achieve a neutral or beneficial environmental impact by restoring or improving the environment in response to any damage or loss. Examples include:

- applying soil stabilization methods, such as revegetation and erosion control mats, in areas where soil disturbance is a concern;
- being prepared to adjust compensation initiatives as necessary based on project monitoring and feedback from environmental experts and stakeholders;
- dedicating portions of the project site as permanent conservation areas or green spaces;
- developing educational programmes for project staff, local communities and schools to raise awareness about environmental issues;
- ensuring these areas are preserved in their natural state, allowing for the regeneration of native vegetation and wildlife;
- establishing or contributing to protected areas, wildlife reserves or ecological corridors to safeguard habitats and species;
- funding infrastructure projects that directly benefit the environment, such as waste treatment facilities, pollution control systems and green transportation options;
- identifying and protecting areas with high biodiversity value both within and outside the project site;
- implementing erosion control measures, such as terracing, riparian buffers and bioengineering techniques, to prevent soil erosion;
- implementing wetland enhancement initiatives, such as water level management and the removal of invasive species;
- investing in water resource management projects, such as riverbank stabilization, watershed protection and water quality improvement;
- planting native trees and vegetation in areas adjacent to the project site to restore or enhance forest cover;
- promoting and supporting sustainable farming practices that reduce soil erosion, chemical use and water pollution;
- restoring and protecting wetlands that may have been impacted by the project.

G.2 Enhancement

Enhancement is an action which provides net benefits for the environment beyond the requirement to avoid, mitigate or compensate for any adverse environmental effects. Opportunities for environmental enhancement are varied and should be explored as early as possible. This may include opportunities to address climate change or historic environmental impacts caused by conflict or land use practices, such as loss, decline and removal of natural habitat or pollution. Examples include:

- conducting soil assessments and implement soil improvement techniques to enhance soil quality.
- better managing existing ecological features, including the removal of invasive species or planting and replacement with native species;
- introducing more sustainable farming practices and climate-smart agriculture;
- providing new ecological features or habitat which results in a net-gain in biodiversity;
- removing waste or debris;
- conserving and protecting wildlife.

Enhancement objectives may be specific (for example, for a designated area) or more wide-ranging, with the outcome affecting the wider community or regional environment. Consultation with local stakeholders and authorities is essential to identify opportunities for enhancement that would help deliver local priorities or contribute to partnership projects in the local area. In the absence of implementing enhancement opportunities, land use following land release may result in other adverse environmental impacts which are not mitigated.

Environmental enhancement opportunities on rural and agricultural land depends on the farming system and local context, but may include:

- creating nesting sites and wildlife corridors to facilitate the movement and breeding of native species;
- creating flower-rich pollinator habitats – for example, on field margins or by grassland restoration;
- creating seed-rich bird habitat – for example, on field margins and by leaving overwinter stubbles;
- developing ecotourism initiatives that allow visitors to appreciate the enhanced environment;
- developing land use plans that balance human needs with environmental protection;
- engaging in community outreach to promote environmental stewardship and involve local communities in conservation efforts;
- identifying and controlling invasive plant and animal species that can negatively impact the local ecosystem;
- promoting responsible water resource management, such as rainwater harvesting and water recycling;
- promoting sustainable agricultural and forestry practices that conserve soil and water resources and reduce the use of harmful chemicals;
- planting trees and creating woodland;
- protecting water resources – for example, by use of buffer strips and planting of cover crops. Buffer strips (for example, of perennial grasses) can help to reduce run-off or pollutants such as pesticides, fertilizers or sediment from fields into nearby watercourses. Cover crops can also help reduce pollutant run-off and soil erosion;
- restoring wetland. These can provide important habitats for wild flowers, insects, waders, wildfowl and aquatic species, as well as helping to store carbon and reduce the risk of downstream flooding and soil erosion.

The suitability depends on several factors – such as climate, topography, soils, nearby habitats and landscape features – but is critically driven by local knowledge and specialist input.

Planting native tree species can make a positive contribution to the environment.[74] In spite of the benefits, it is important that the right tree is planted in the right place. Just because trees may be capable of growing on land, they may not always be the right option.

Table C.1 – Guidelines principles

Do	Do not
Do consult with the local community – make sure you understand local needs and local environmental conditions. Where possible, this should also include consulting arboriculturalists, ecologists or forestry specialists with local knowledge.	Do not plant invasive or non-native species.
Do plant productive trees – trees can provide multiple benefits. Fruit trees for example can provide a food crop, as well as attracting pollinating insects. Broadleaf trees can intercept rainfall and provide valuable shade or shelter for livestock.	Do not plant trees in the wrong soil or ground conditions – trees typically need well aerated, moist and uncompacted soil.
Do consider the root system of the tree – trees with aggressive root systems can create problems, damaging infrastructure and building foundations. If near property, check whether the root system is likely to cause future problems.	Do not plant thirsty trees in dry climates – all trees require sufficient water. When planting in dry climates, consider the tree species, watering or irrigation options. Keep in mind that large-scale tree planting schemes can lower groundwater tables under some circumstances.
Do plant trees as part of an ecosystem with other native plant species. This creates a more diverse habit and avoids monocultural planting.	Do not plant trees on peatland, ancient or semi-natural grasslands or other non-wooded and highly biodiverse habitats. Keep in mind that the “ideal” ecosystem for a given place may not include trees at all.
Do plant trees which address social, as well as environmental needs – this requires meaningful engagement with the local community to ensure their needs are understood and met.	Do not neglect newly planted trees – it is important to build in an aftercare plan for tree planting initiatives, ensuring that the community takes on responsibility for looking after them.
Do plant trees that are able to cope with current pressures (such as pests) as well as future climate change expected at the planting site. Trees can live for decades or centuries, so it is important to choose a future-proof species/provenance.	Do not plant trees in areas where they are at risk of vandalism or have a low chance of survival, unless these risks can be mitigated.
Do plant trees which attract local wildlife – even on a small scale, this can help support biodiversity by providing food and shelter.	Do not plant trees in a way that displaces agriculture or other high-impact land uses elsewhere – ensure that the tree planting scheme does not harm the environment outside of the project site.
Do use local tree nurseries to source samplings, where possible.	
Do make sure you are aware of the laws and regulations that govern tree planting at the site. For instance, you may need permission to carry out large reforestation projects, or carry out environmental impact assessments.	

[74] Trees can provide crucial habitat for birds, insects and other wildlife, provide food crops, give shelter for livestock, help stabilize soil and slopes, reduce run-off and the risk of flooding, improve air quality and help tackle climate change by absorbing carbon dioxide from the atmosphere.

Annex H
(informative)

Handover reporting and use of environmental data

There are direct and indirect benefits from the reporting of environmental data, assessment and action.

The land release and handover documentation should contain environmental reporting, the results of any climate or environmental assessments, and details on any mitigation action taken or environmental enhancement implemented. This may then be able to:

- demonstrate compliance and meeting of ”duty of care” obligations for the mine action organizations;
- highlight competencies and credentials;
- allow baseline environmental information to be provided to landowners and inform future land use considerations;
- support the identification of residual environmental or climate risks associated with the area;
- demonstrate potential environmental enhancement opportunities and highlight recommendations on land use practices;
- set out any land management or aftercare requirements to maintain any planting scheme or environmental initiatives implemented as part of any mine action activities;
- inform and support mine action authorities regarding the environmental issues and any residual risks;
- identify points of contact for relevant authorities, the UN or non-governmental organizations;
- enable the sharing of environmental datasets with collaboration partners, and minimize duplication of community outreach and data collection;
- support awareness-raising across local and wider communities;
- support improved climate and environmental outcomes for local communities and contribute to good community cohesion through collaborative ventures;
- increase potential for donor interest and future funding opportunities.

Annex I
(informative)

Environmental incident reporting and non-compliance

Consistent reporting about environmental incidents, events or undesired circumstance helps to understand how and why something happened, and what may be put in place to prevent it happening or minimize the impact in case it happens again.

This includes responses to extreme weather and climate-related events, which may have impacted mine action site-based activities.

An environmental incident includes any situation which has caused harm or has the potential to cause harm to people, property (including crops and livestock) or the wider environment (that is, air, water, soil, habitat or wildlife).

Incident reporting should also include near-misses and non-compliance with environmental policy.

All environmental incidents and near-misses should be reported, which impact and relate directly to the mine action activities, external factors (such as a wildfire, flooding event or a pollution incident), and the communities where mine action activities take place.

Environmental incidents which may not relate directly to a mine action activity may be important to include, since:

- the cause and extent of the incident or non-compliance may need investigating;
- preventive or corrective action may need to be taken;
- authorities, landowners, occupants/users and the local community may need notifying; and
- the mine action activities themselves may need to be ruled out.

Events that may be reported include:

- damage to a structure or asset which may result in a loss or leak of fuel, chemicals or hazardous material to soil, water or air;
- a spill or pollution event;
- nuisance (for example, litter, odour) or noise, ground-shocks and vibrations;
- illegal or uncontrolled waste disposal and tipping;
- pre-existing soil contamination;
- damage to ecologically important habitat and protected areas, including illegal logging;
- damage to cultural assets;
- flooding event from surface water run-off, groundwater, inland or coastal waters;
- landscape or localized fire;
- landslides, subsidence or soil erosion;
- collapsed or badly damaged riverbanks;

- unusual changes in flowrates in rivers or streams;
- dead or gasping fish;
- injury or death to wildlife, including illegal trapping and killing;
- presence of invasive species;
- inspection or contact from the regulatory authorities;
- complaint from a local landowner, community leader, civil society group or member of the public;
- non-compliance with an organization's environmental policy or standard operating procedure on environmental management.

An incident or near-miss report should include the following information:

- date, time and location;
- involved parties;
- person(s) witnessing or reporting the incident or near-miss;
- nature of the event (incident or near-miss), description and root cause, including weather events;
- extent and severity of the incident – estimate the area impacted and its severity. Is it localized or widespread? Is it at depth or near surface? What are the volumes and hazardous nature of materials or pollutants involved?;
- detail on what has been impacted – air, urban land, rural land, natural habitat, sewer/drain network, inland waters, coastal waters;
- detail on any visual or olfactory signs of contamination (colouration, odours, sheens);
- any corrective or preventive action to be taken;
- contact details of reporting party – in case any follow-up questions are needed;
- photographs – to show evidence of the nature and extent of the incident;
- detail on external parties who have been notified – for example, landowner, occupants/users, community leaders, authorities;
- follow-up and completion status.

Amendment record

Management of IMAS amendments

The IMAS series of standards are subject to formal review on a five-yearly basis. However, this does not preclude amendments being made within these five-year periods for reasons of operational safety and efficiency or for editorial purposes.

As amendments are made to this IMAS they are given a number. The date and general details of the amendment shown in the table below. The amendment is also shown on the cover page of the IMAS by the inclusion under the edition date of the phrase "*incorporating amendment #*."

As the formal reviews of each IMAS are completed, new editions may be issued. In this case, amendments up to the date of the new edition are incorporated into the new edition and the amendment record table cleared. Recording of amendments then starts again until a further review is carried out.

The most recently amended IMAS are posted on the IMAS website at www.mineactionstandards.org.

Number	Date	Amendment details