GICHD

MINE ACTION AND THE RESILIENCE OF COMMUNITIES TO CLIMATE CHANGE

Cover page:

Top: Impact of land release on Ta Lao village, Quang Tri province, Vietnam, is depicted by this composite picture where clearance, on the left (2022), gave place to the banana cultivation proposed by the Women's Union of Quang Tri, on the right (2023). © PeaceTrees Vietnam (left) © GICHD (right).

Bottom: In Navobod, Tajikistan, less than a kilometer from the Panj River and the border with Afghanistan, land release allowed the access and maintenance of the Panj River drainage canals, creating conditions for sustainable agricultural use of 60 ha of land, on the right (2022). This land had been flooded for more than 10 years, as the dark patches on the left evidence (2014). © Daniel Perkins

ACKNOWLEDGEMENTS

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Mine Action and the Resilience of Communities to Climate Change, GICHD, December 2023.

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EXECUTIVE SUMMARY

Climate resilience – the ability or capacities of populations to cope with and respond to climate change-related hazards – has gained increased attention in recent years, including in the mine action sector. The present study examines the links between mine action and climate resilience, takes stock of current practices and proposes solutions.

Climate change-related events such as heatwaves, heavy precipitation, droughts and tropical cyclones drive human displacements, have a negative effect on human health and contribute to the increase of hunger and poor nutrition in areas where vulnerable populations already struggle to grow or find sufficient food. Due to their relative levels of vulnerability, communities affected by the presence of explosive ordnance are not exempt from the effects of climate change. In fact, 60 per cent of the 20 countries ranked most vulnerable to climate change are contaminated by explosive ordnance.

The present study assesses the integration of climate resilience considerations within mine action policies, strategies, standards and planning processes, encompassing facets like priority-setting and task allocation. The study draws on instances from various contexts to illustrate the extent to which climate resilience aspects are included in the mine action decision-making process. The study also documents existing contributions to climate resilience at the community level and identifies ways to better promote climate resilience in the future.

Evidence collected from eight mine action programmes, 20 communities visited and 110 people met as part of this study confirms the interrelation between mine action and climate resilience. The findings stem from a research process which combined desk research, field visits in Colombia, Kosovo, Somaliland, Tajikistan and Vietnam, and online engagements with stakeholders working on Palau, Yemen and Zimbabwe.

Case studies indicate that, while the primary objective of mine action is explosive hazard removal and risk reduction, climate resilience outcomes that benefit local communities often arise. Although the connections between mine action and climate resilience may not always be immediately apparent and mine action's contribution to climate resilience may sometimes be unintentional, the study confirms that the sector plays a role in facilitating greater climate resilience at the community level. Using examples from various mine action programmes, the study illustrates the enabling role of mine action in supporting initiatives that have empowered communities to better navigate the challenges arising from the changing climate.

The study also suggests that while good practice exists, current efforts to promote climate resilience should be intensely reinforced. The study offers a series of recommendations centred around better understanding, addressing and reporting on climate resilience issues within the context of mine action. By embracing these recommendations, stakeholders can navigate the challenges posed by a changing climate and contribute to the broader endeavour of forging a sustainable and resilient future.

INTRODUCTION

This study was made possible through support provided by the Office of Weapons Removal and Abatement in the US State Department's Bureau of Political-Military Affairs (PM/WRA), to gain a better understanding of the connections between mine action and climate resilience. The study is intended to inform, reflect, and propose solutions to better serve communities that are increasingly affected by the effects of climate change in explosive ordnance-affected settings.

STUDY AIMS, METHODOLOGY AND STRUCTURE

The present study investigates the interconnections between mine action and climate resilience. The study assesses the integration of climate resilience considerations within mine action policies and planning processes, encompassing facets like priority-setting and task allocation. This examination draws on instances from various contexts to illustrate the extent to which climate resilience is embraced and included in the decision-making process.

Secondly, the study documents existing contributions to climate resilience and identifies ways to better promote climate resilience in the future. In doing so, the study tries to identify how mine action operations contribute, either intentionally or unintentionally, to the resilience of communities to climate change.

To develop the study, the GICHD conducted desk research, online engagements and field visits in Colombia, Kosovo, Somaliland, Tajikistan and Vietnam. Furthermore, the study consulted with mine action organisations working on Palau, Yemen, and Zimbabwe to complement the findings related to mine action and climate resilience.

The GICHD consulted with a total of 27 institutions, including government agencies, national mine action organisations, international organisations and non-mine action civil society organisations. The study team visited 20 communities beneficiaries of mine action, conducted more than 40 interviews and met with over 110 people.

The study consists of a background chapter, which delves into the concept of climate resilience and its significance within the context of mine action.

The subsequent findings chapter highlights how mine action contributes to climate resilience. The chapter is structured along three areas: a) understanding climate resilience within national mine action contexts, b) addressing climate resilience in the context of mine action and c) monitoring and reporting on climate resilience in mine action.

The recommendations chapter, structured along the same categorisation as the findings chapter, provides specific suggestions and rationale based on the findings and analysis presented in the preceding chapters of the study.

The study contains several case studies for further reading, which are presented in Annex I, showcasing specific examples from field visits and desk research. Annex II provides a table of good practices observed during the study and opportunities to strengthen resilience at the community level. The methodology used in the study is detailed in Annex III. Lastly, a glossary of terms related to climate change, as well as a list of acronyms is presented, ensuring clarity and precision in understanding terminology used throughout the study.

BACKGROUND

Eco-tourism guide from San-Luis, along the main road from the city of Medellín to the capital Bogotá in Colombia. Eco-tourism in formerly explosive ordnance contaminated areas represent a sustainable source of income, contributing to community resilience. ©GICHD

WHAT IS CLIMATE RESILIENCE?

Climate change is already affecting every region across the globe. It has warmed the atmosphere, ocean and land, increasing the risk of irreversible losses in all ecosystems and the ecosystem services on which people depend. Severe heatwaves, heavy precipitation, droughts and tropical cyclones have intensified as a result of climate change, exposing millions of people to higher food and water insecurity and driving human displacements.

Vulnerability to climate change is greater in locations with fragile institutions, governance challenges, limited access to basic services and resources, violent conflict and elevated levels of climate-sensitive livelihoods (for example, smallholder farmers, pastoralists, fishing communities). Climate change intensifies existing vulnerability and inequality, with adverse impacts on most vulnerable groups, including women and children in low-income households, indigenous or other minority groups.[1]

Combined with other existing physical, social, economic and environmental vulnerabilities, climate change undermines these communities' ability to cope and adapt. **The ability or capacity of populations to cope with and respond to climate change-related hazards is called climate resilience.**[2] At the local level, communities' resilience to climate change is context-specific and multidimensional. For some communities, climate resilience may be facilitated by having greater access to basic services that guarantee their water and food security. For others, climate resilience may be strengthened when roads and infrastructure guarantee their safety and mobility. In other contexts, climate resilience may be promoted when communities gain knowledge and skills that allow them to better sustain their livelihoods.

To better appreciate the concept of climate resilience and understand how it relates to mine action, this study uses six themes originating from the Intergovernmental Panel on Climate Change (IPCC)[3]'s Climate Resilient Development solutions framework. The six themes are described in Box 1 and used throughout the study to illustrate mine action's contribution to climate resilience.

Box 1: IPCC's Climate Resilient Development solutions framework

Climate resilient development (CRD) is described by the IPCC as the process of implementing greenhouse gas (GHG) mitigation and adaptation options to support sustainable development for all.[4] In its latest Synthesis Report and based on the CRD solutions framework, the IPCC presents six themes that are core to climate resilience. They are a useful reference to understand what the different aspects of climate resilience are and how they relate to mine action contexts.

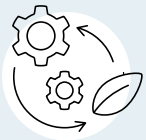
Society, livelihoods and economy.
Satisfying communities' basic needs is a fundamental aspect of climate resilience. Initiatives that improve communities' abilities to sustain their livelihoods and reduce poverty are therefore critical. Societal change and transformation that embrace climate-resilient development have the potential to accelerate climate resilience, especially through greater climate literacy and information provided through community approaches, including those that are informed by local knowledge.

Land, ocean, food and water.
Climate resilience is strengthened through sustainably sourced agriculture and forest products; agroforestry; farm and landscape diversification; urban agriculture; conservation, improved management and restoration of forests and ecosystems (especially high-carbon ecosystems, such as peatlands, wetlands, rangelands, mangroves and forests); protection and restoration of inland water sources and coastal ecosystems, as well as ecosystem-based management in fisheries and aquaculture.

Settlements and infrastructures are an integral part of climate resilience, both in urban and rural settings. Integrating climate change considerations in the design and planning of settlements (low-emissions construction materials, efficient building envelopes, green/blue infrastructure) and in transportation systems (energy-efficient transport modes) also enhances climate resilience.

Health and nutrition.
Access to potable water and healthcare systems (including psychosocial care) are key aspects of climate resilience. Actions that reduce the spread of diseases and improve nutrition also contribute to climate resilience.

Energy access and security are important aspects of climate resilience. The diversification of energy generation sources – from wind, solar or small-scale hydroelectric installations – and improvements in energy efficiency can increase energy reliability and reduce vulnerability to climate change.



Industries' reductions in GHG emission form part of efforts to increase climate resilience. Greater energy efficiency, electrification, materials' circularity, improved efficiency of water usage and transition to low- and zero-GHG emitting fuels are initiatives that create further climate resilience.

The IPPC further notes that, for climate resilient development to be achieved, **gender and diversity** must be explicitly addressed.[5] Individual and collective actions for climate resilience also require inclusive governance; diverse knowledge and values; finance and innovation; integration across sectors and time scales; ecosystem stewardship; synergies between climate and development actions; and behavioural change supported by policy, infrastructure and socio-cultural factors.[6]

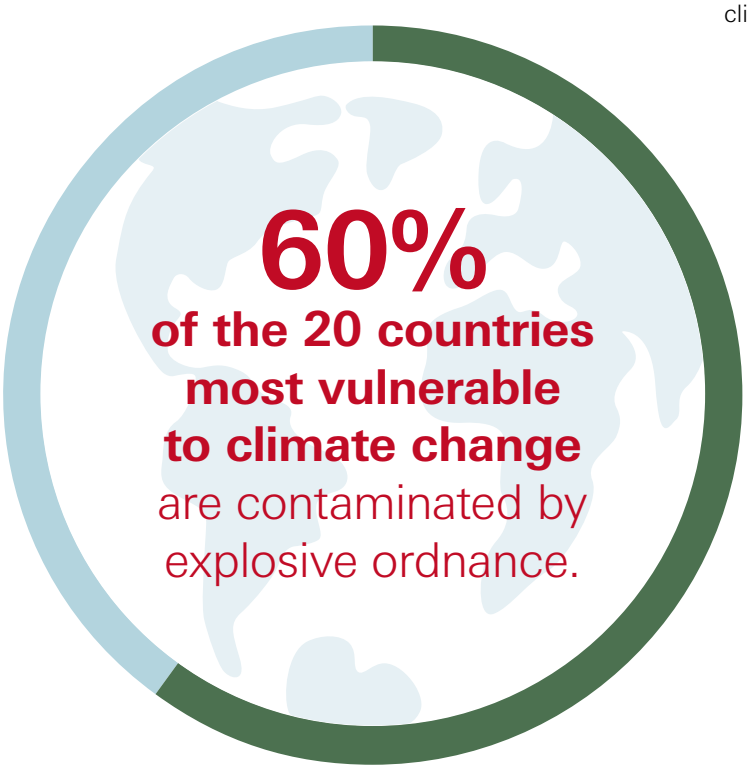
WHY IS CLIMATE RESILIENCE IMPORTANT FOR MINE ACTION?

By acknowledging the enabling role of mine action at the community level in facilitating access to basic services, roads and infrastructure as well as education, health and livelihoods, it is possible to establish links between mine action and climate resilience, which will be further developed in the present study.

Mine action operates in countries and territories that are affected by climate change and serves communities that might be particularly exposed to climate change's impacts, due to their relative levels of vulnerability. A total of **60 per cent of the 20 countries most vulnerable to climate change are contaminated by explosive ordnance**.[7] Climate-induced migration or relocation can drive communities to move into explosive ordnance contaminated areas. Climate-related events, such as flooding, have been reported to have shifted explosive ordnance from uncleared to cleared areas (for example, in Ukraine,[8] Bosnia and Herzegovina[9] and Libya[10]). Events such as forest fires can also make explosive ordnance to be initiated (for example, forest fires in Greece[11]).

Furthermore, the mine action sector itself already is, and will continue to be, increasingly impacted by the effects of climate change. Climate change-related events, such as heatwaves, tropical cyclones, dust storms or heavy rainfall, have a tangible impact on the conduct of mine action operations. Increasing temperatures can create heat stress and have severe consequences on the well-being of deminers and other mine action staff. Climate-related events such as flooding can pose significant challenges in accessing remote areas contaminated by explosive ordnance (for example, floods in South Sudan[12]) and responding to emergencies.

As every sector, mine action also directly contributes to global warming, and thus climate change, by emitting GHG in the atmosphere during operations. Moreover, during clearance operations, mine action teams may remove and cut vegetation or trees to allow detectors to get close enough to the ground in order to detect and remove explosive ordnance. In doing so, they may cause soil compaction, increase the risk of erosion or degrade the quality of the soil or disturb ecosystems, taking away existing environmental protection to climate-related hazards and removing carbon sinks (that is, capturing carbon dioxide from the atmosphere). This exacerbates climate change and reduces climate resilience.



There is a growing body of observations and evidence on the environmental impacts of mine action operations,[13] and the role of land release in potentially reducing some of those impacts. Additionally, acknowledging the need to address climate change and recognising its close links with environmental management, International Mine Action Standard (IMAS) 07.13 on Environmental Management in Mine Action[14] is under review at the time of writing this study. The revised IMAS chapter will contain climate change considerations, including on climate change mitigation and adaptation.

Given the close links between climate change and environment, the two terms are often used interchangeably. Although they contribute to each other – environmental protection is a key aspect of climate resilience – they also differ (see Box 2 on the difference between environment and climate change).

Box 2: What is the difference between environment and climate change?

The term environment refers to the "surroundings in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans and their interrelationships".[15] These include biodiversity, ecosystems, climate or other characteristics.

Climate change refers to long-term changes in the average weather patterns that have come to define the Earth's local, regional and global climates. These changes have a broad range of observed effects that are often associated with the term.[16] The causes of climate change have been clearly established by the IPCC: most human activities, principally through emissions of greenhouse gases, have unequivocally caused global warming, causing climate change.[17]

In short, the environment encompasses a broader spectrum of characteristics of the natural world, while climate change specifically refers to the long-term shifts in global or regional climate patterns driven by factors such as GHG.

FINDINGS

Marking for mine and explosive ordnance hazardous areas in Colombia. Despite efforts to clear and release land, markings such as this one are still too many and impacting the ability of communities to strive. ©Christian Cardona / OAS

MINE ACTION'S CONTRIBUTIONS TO CLIMATE RESILIENCE

Evidence collected from 27 institutions consulted and 20 communities visited as part of this study confirms that mine action positively contributes to climate resilience. This chapter examines those different contributions and consists of three sections[18] which analyse: a) mine action stakeholders' **understanding** of climate resilience in mine action contexts, b) the extent to which climate resilience is currently **addressed** in mine action, and c) the **monitoring and reporting** mechanisms related to climate resilience.

UNDERSTANDING CLIMATE RESILIENCE IN NATIONAL MINE ACTION CONTEXTS

Climate literacy and awareness

Many stakeholders interviewed during this study were aware of certain climate threats present in their regions, and most of them had experienced climate change impacts firsthand. The concept of climate change was generally known by communities, mine action authorities and mine action organisations (MAOs), though people's awareness was often limited to climate change events and impacts. Very few individuals met were familiar with the causes of climate change and ways to mitigate it.

In all field visits, interviewees often used the terms climate change and environment interchangeably. While the two terms are linked, their meanings differ (see Box 2). Much attention is given to environmental conservation and protection by the mine action sector, but there is less understanding of what climate resilience entails.

Despite this general awareness, the study shows that there is often **a lack of comprehensive understanding of climate change impacts at the local level where operations are conducted,** which can lead to inadequate planning and responses in mine action programmes. There is also limited understanding among mine action stakeholders of the interplay between mine action and climate change, which can result in missed opportunities to advance climate resilience.

The adverse impacts of climate change will continue to intensify and affect all sectors, according to IPCC's projections. The need to strengthen climate resilience and implement climate adaptation measures will likely become more apparent and be included as an essential component of sustainable development strategies across sectors, coupled with climate change mitigation measures. Mine action, which predominantly focuses on explosive ordnance clearance and related activities, also recognises its role in contributing to climate resilience.

However, **low levels of climate literacy and limited capacities within mine action authorities and MAOs to address the issue can hinder effective integration of climate change considerations** into mine action programmes. Promoting climate resilience and adaptation (as well as addressing climate mitigation) requires specialised skills that may not be present within the sector at the moment. In that view, some MAOs have started developing institutional capacities on environment and climate change through the creation of specific staff positions. Moreover, some MAOs have started partnering with specialised organisations focusing on environmental awareness, as highlighted during the Somaliland case study with The HALO Trust and its partner Candlelight (see Annex I, Somaliland case study).

Climate data accessibility and integration

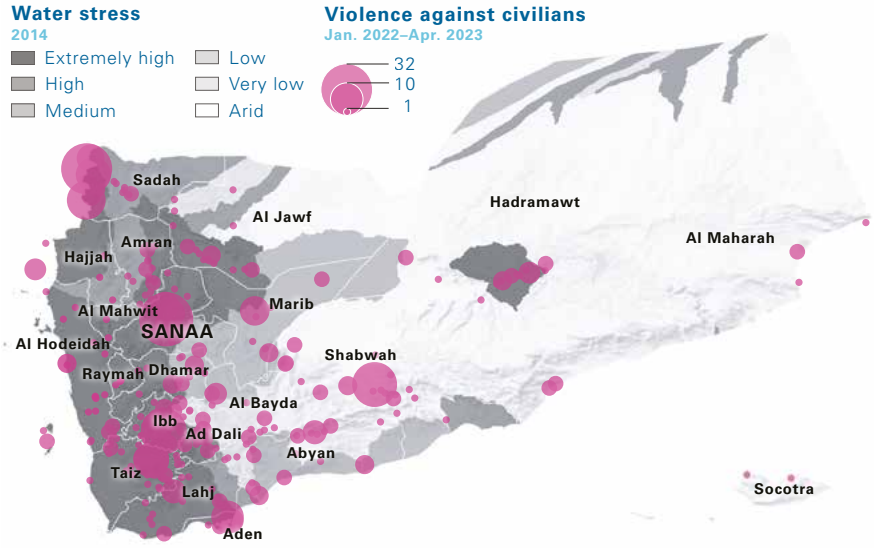
The study enquired about the existence of geographical information system databases that include environmental aspects, specifically relating to climate change events such as flooding or droughts. The study confirmed that open-source climate change-related spatial datasets exist, which depict areas susceptible to climate impacts. However, **while datasets on climate risks are readily accessible for certain regions of the world, such datasets are not currently available worldwide, or might not be openly accessible to the mine action sector yet.**

Moreover, the study noted that the mine action sector does not generally engage in a structured manner with agencies responsible for the collection and presentation of data that may assist environmental and climate change assessments. These may include Ministries of Environment, UN support missions or UN agencies. The only noticeable example of accessibility and integration of mine action and environmental data is in Palau. There, the Information Management System for Mine Action (IMSMA) data will be integrated with and accessed through the Palau Land and Resource Information System (PALARIS), an open-access system which stores environmental datasets to be used for evaluating and analysing environmental conditions and trends to support environmental planning, forecasting, monitoring and reporting requirements.[19]

Integrating environmental and climate change data into mine action information management would present many benefits. It would allow mine action authorities and organisations to assess specific threats and identify areas that are most susceptible to climate events. By overlaying explosive ordnance contamination with climate-related data, it would for instance be possible to assess explosive ordnance-contaminated areas susceptible to flooding and drought.

By overcoming challenges related to data accessibility, compatibility, resource constraints, expertise and interpretation, the mine action sector can harness the power of climate change information to make informed decisions, enhance operational effectiveness and contribute to global efforts to mitigate climate change impacts.

Water stress and conflict in Yemen



Note: Violence against civilians refers to the number of violent incidents committed by armed actors against civilians.

Source: Armed Conflict Location & Event Data Project, 'Data export tool', accessed 15 May 2023; and World Resources Institute, 'Aqueduct 3.0', accessed 15 May 2023.

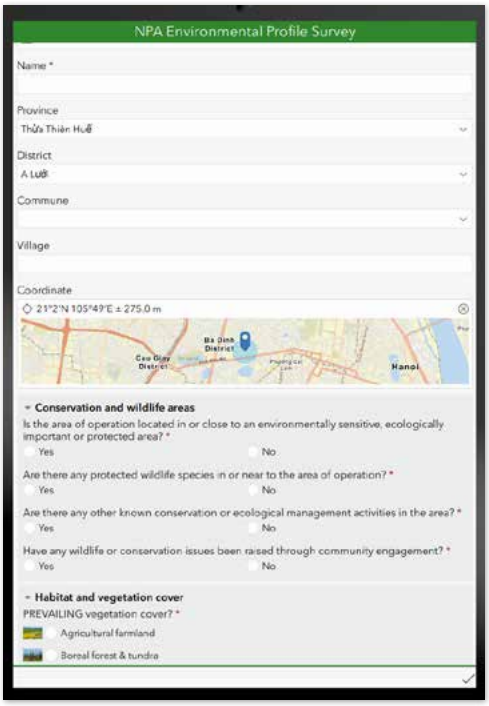
Map overlaying conflict and water stress data from Yemen. Such data overlays provide an example of how climate data accessibility and integration can support decision making. (adapted from Climate, Peace and Security Fact Sheet, Norwegian Institute of International Affairs (NUPI) and the Stockholm International Peace Research Institute (SIPRI), June 2023)

Climate risks assessment

The consultations conducted during this study questioned the environmental and social impact assessments undertaken during the priority-setting and tasking processes. It was observed that various impact assessment systems are used across the sector. However, assessments relating to the environment and climate change impacts are currently inconsistent and carried out on an ad hoc basis.

The study confirmed that **mine action authorities and organisations do not consult climate vulnerability or risk information in order to assess climate risks at the local level**. Rather, mine action stakeholders rely on the communities' perception of risks, and information gathered during non-technical surveys (NTS) and community liaison activities, to plan operations.

It should be noted that some MAOs begin to proactively integrate environmental and climate change-related questions into the survey process. A prominent example of this is the 'total mine action survey' being implemented in Vietnam by the Norwegian People's Aid (NPA), which explicitly includes questions about the environment and climate change impacts.



NPAs Green Field Tool: Together with NPA's Head Office, NPA Vietnam collects environmental baselines and identifies potential contamination and climate trends ©Norwegian People's Aid

MAOs also consider annual weather patterns in planning, such as in Kosovo where operations are suspended between November and March due to the snow season. In Yemen, mine action operations may be impacted by the windy season which occurs in July prior to the Indian Ocean southwest monsoon, preventing clearance work in some areas.

ADDRESSING CLIMATE RESILIENCE IN MINE ACTION

Coordination between climate change and mine action authorities

The study confirmed that mine action and climate change authorities often function within separate institutional frameworks with distinct hierarchies and decision-making processes. All mine action authorities consulted have little to no mechanisms in place when it comes to coordinating and collaborating with climate change authorities.

Often housed within a specific government ministry, mine action authorities liaise with most relevant ministries on issues related to mine action's environmental impacts, for instance when environmental incidents occur during mine action operations (for example, leakage of hazardous substances in camp sites or fires sparked by explosive ordnance disposal). However, mine action authorities reported that, while decisions related to climate change mitigation and adaptation might be taken at the governmental level within relevant ministries, limited information-sharing and inter-ministerial consultation occurs.

Policies, strategies, standards and procedures

The study examined whether the mine action authorities consulted as part of this study had aligned policies, strategies, standards or procedures with specific laws and/or national strategies or plans on climate change.

Some stakeholders knew about the existence of climate change adaptation plans or strategies seeking to reduce GHG in their respective contexts. Some of the assessed climate change strategies do include specific references to climate resilience, such as in Colombia and Palau.

Yet, at present, mine action authorities have generally not participated in the development of adaptation plans or climate change strategies. This suggests that collaboration between relevant mine action and climate change authorities could be strengthened and synergies further explored.

Some mine action programmes have included specific climate change considerations into mine action policies, strategies, standards or procedures. Colombia has a specific decree on environmental considerations in mine action (Decree 1195 of 2017), which outlines mitigation and correction measures that must be applied by MAOs when undertaking demining in national parks and other areas of ecological value. While not specifically linked to climate change, this does contribute to environmental conservation, which is a key aspect of climate resilience.

Regarding mine action strategies, Colombia has also included environmental considerations in its National Mine Action Strategic Plan 2020–2025. In Vietnam, VNMAC plans to align its procedures with the Vietnamese Government's Decision 896, which approved the National Climate Change Strategy in 2022. The implementation of this law will not be written into VNMAC's procedures until the next issue of Program 504 for the period 2026–2030.

In Kosovo, KMAC intends to make specific reference to existing climate change strategies in its next mine action strategy expected to enter into force in 2024.

Out of all the mine action authorities consulted, only Kosovo adopted a mine action standard on Environmental Management in 2023, in the spirit of IMAS 07.13: Environmental management in mine action, which does not include specific references to climate change. In Palau, the Government's Environmental Quality Protection Board has issued two specific authorisation forms related on unexploded ordnance (UXO) clearance and open burning.[20]

To summarise, it can be noted that a **number of mine action authorities have integrated environmental protection aspects in their relevant mine action strategies, standards or procedures**. While some measures might positively contribute to climate resilience, more synergies could be developed with relevant climate change authorities. This study confirms observations made by mine action and environmental policy practitioners that incorporating climate change and risk management into national mine action strategies as well as updating or developing a new IMAS to address climate change risks specifically[21] may help solve this challenge.

Priority-setting and tasking

Priority-setting in mine action is defined as the set of decisions and processes involved in determining which tasks or activities to undertake in which sequence.[22]

The high-level and macro decision-making linked to priority-setting is commonly referred to as 'big P' prioritisation. It encompasses strategic requirements, often aligning mine action goals with other strategic programmes and national goals. 'Big P' priority-setting allows to identify the areas within a country which require immediate attention, and to allocate resources accordingly.

Subsequently, once resources are distributed, relevant stakeholders determine which actions should take precedence over others. This involves decisions around prioritising tasks related to survey and clearance, or selecting parts of wider contaminated areas to be released first – this is known as 'small p' prioritisation.

Historically, the prioritisation of hazardous areas has often been focused on the reduction of immediate risks and promotion of short-term development goals, linked to short-term funding agreements. While this approach yielded short- and medium-term gains, it sometimes unintentionally overlooked the long-term consequences of neglecting sustainable development outcomes and, eventually, climate resilience.

The pursuit of efficiency metrics in some mine action programmes has the potential to both neglect and compromise effectiveness, particularly in addressing longer-term climate resilience issues. For instance, prioritising the use of key performance indicators that only measure outputs limits meaningful priority-setting (that is, cost per square meter of land released/cleared, square meters of land released/cleared per item of explosive ordnance found, square meters cleared per day per asset, etc.). In fact, focusing on efficiency solely can compromise effectiveness and, thus, the potential impact of mine action on community climate resilience. Priority-setting is therefore a critical tool to ensure the effectiveness of mine action operations.

This study revealed that **many mine action authorities and centres do not consider climate change in their priority-setting and tasking policies, processes and procedures**. While due attention is given to specific environmental aspects in line with relevant legislation and technical norms, it is common to all mine action authorities that climate change factors are often not considered. Two exceptions have been observed in Colombia and Kosovo, though.

Colombia is a positive exception when it comes to integrating climate resilience aspects into the priority-setting framework. Over 55 per cent of the total weighting in the Colombian point-based priority setting system is, directly or indirectly, linked to strengthening community resilience. Criteria used in the systems include immediate land use potential, absence of alternatives, likelihood of returning populations, and development prospects. However, it should be noted that these criteria are only applied at the task level, after the NTS has been completed. In other words, it is used at the 'small P' level. Elevating and using such systems at the 'big P' level could greatly and positively impact how the entire land release cycle and other mine action activities enhance community climate resilience. Indeed, it would foster balanced and sustainable economic growth, offer alternatives, restore resources and support long-term and sustainable developmental initiatives.

Another positive example is Kosovo's priority-setting system that has criteria centred on risk reduction, development, environmental protection and poverty reduction. Notably, climate change is a dedicated criterion in the matrix. If an area is proven to positively impact climate change resilience, it immediately receives the highest priority for clearance, showcasing a commendable alignment between mine action and climate resilience.

Climate change, often regarded as a distant concern, has gradually become a global crisis with far-reaching implications. It has become evident that neglecting environmental and climate considerations undermines the very foundations of sustainable development. The lesson learnt from this historical perspective is that effective prioritisation must embrace a holistic approach (one that integrates risk reduction, sustainable development, climate resilience and environmental preservation), ensuring balanced and enduring progress that protects both present and future generations.

Community-based climate resilience

This study establishes direct and indirect links between mine action and climate resilience at the community level, where demining has been conducted. Mine action is not typically carried out with the intention to specifically benefit community resilience to climate change at the local level. Nonetheless, despite their negative direct environmental impact, mine action operations can often **facilitate community-led initiatives which, due to their nature and the environments in which they are conducted, may support communities to adapt against the effects of climate change**.

Case study examples from Colombia, Kosovo, Tajikistan, Somaliland and Vietnam confirmed that mine action plays an enabling role in facilitating aspects of climate resilience such as livelihoods, sustainable land and water use, infrastructure access and renewable energy production. It is worth noting that, in certain communities visited by the GICHD for the present study, the connections between mine action and climate resilience were not immediately apparent when discussing with community members. While taken individually, climate resilience aspects may not inherently lead to enhanced resilience to climate change, when considered collectively, they could.

Box 3 features a selection of community-based climate resilience examples collected during the study. Additional stories of community-based climate resilience are available in relevant case studies to be found in Annex I and summarised in Annex II.

Box 3 – Examples of community-based climate resilience

Society, livelihoods and economies

Satisfying communities' basic needs is a fundamental aspect of climate resilience. By being able to sustain their livelihoods, communities are better equipped to cope and adapt to shocks, including climate-related hazards. In many communities visited as part of this study, mine action's enabling role in allowing communities to sustain their livelihoods post-land release was evident.

Food security exists when people have physical and economic access to sufficient nutritious food to meet dietary needs for an active and healthy life. Worldwide, access to a consistent and reliable source of food is fundamentally important to prevent forced internal and cross-border displacement. Climate change threatens agricultural production in all regions of the world, whether as a result of drought, flooding, disease, degradation of soil or species shift. Countries whose populations are heavily reliant on an agricultural sector exposed to multiple climate impacts risk high levels of displacement.

In Colombia, the demining of a farm homestead visited as part of the study in El Carmen de Bolívar confirmed mine action's role in supporting communities meeting their basic needs. In the small village of Sierra Venado, a family that had to flee during the armed conflict was able to return and use its land following demining operations. The farmers were able to cultivate their crops again and rebuild their homesteads. They installed a rainwater harvesting system from the roof of the house into holding tanks, to avoid relying on water sources located farther down the valley. Although not directly intended, humanitarian demining activities have resulted in greater community resilience for the family and their village, by supporting them in rebuilding their lives, recreating their means to livelihoods and establishing sustainable water-harvesting practices.

The Phong Dien District in Hue Province, Vietnam is another example where mine action has improved the food security of the local communities. The district is heavily reliant on agriculture, and highly susceptible to two climate change effects, namely flooding and heatwaves, both of which villagers consider are occurring more frequently and are becoming more severe. Mine action operations have directly contributed to increasing small-scale agricultural and forestry production at the individual and village level. This, in turn, has led to greater community sustainability and reduced reliance on imported food, including rice from areas of Vietnam that already experience climate-related stress on production.

While subtropical climates are expected to be particularly impacted by heatwaves as well as severe storms resulting in flooding and landslides, the effects of climate change may be more subtle elsewhere and take longer to be truly noticeable. Climate change impacts at higher latitudes and altitudes may include a reduction in snow and rainfall, and the modification of their pattern. Rising global temperatures are expected to accelerate snow and glacier melt resulting in flooding, mudslides and landslides, such as in Tajikistan. The village of Navobod was visited during the present study. It is located about 1 kilometre from the Panj River, which demarcates much of Tajikistan's southern border with Afghanistan. Prior to mine action operations, heavy precipitation and flooding significantly impacted crop production and the socio-economic activities of the community. In the village, mine action facilitated the establishment of drainage canals, which allowed the community to return land to cultivation and pasture, thereby securing food resources and ultimately strengthening their resilience to climate change.

In Navobod, Tajikistan, less than a kilometer from the Panj River and the border with Afghanistan, land release allowed the access and maintenance of the Panj River drainage canals, creating conditions for sustainable agricultural use of 60 ha of land, on the right (2022). This land had been flooded for more than 10 years, as the dark patches on the left evidence (2014). © Daniel Perkins

Land, ocean, food and water

Mine action is inherently linked to land and other features of the environment, including water sources. The sustainable use of land and water creates greater resilience to climate change. Nature-based solutions and practices such as agroforestry; farm and landscape diversification; conservation, improved management and restoration of forests and ecosystems (especially high-carbon ecosystems, such as peatlands, wetlands, rangelands, mangroves and forests) are known to actively contribute to climate resilience (see Figure 1).

Mine action benefits communities and their climate resilience by ensuring safe access to ecosystem services. These services include natural resources, goods and systems that sustain life (see Figure 2). They support nutrient cycles, soil formation, farming, forestry and water purification, while also regulating climate and disease.

Ecosystem services are most evident when people directly rely on them daily, like water sources, crops, and cooking materials. Losing ecosystems and their services, especially in regions where people heavily depend on them, has lasting impacts on local communities, particularly Indigenous Peoples. Enhancing ecosystem services provides nature-based solutions that bolster community adaptation and resilience to climate change.

All of the visited sites have shown varying degrees of interconnection between mine action and climate resilience and land, ocean, food and water. A clear example of this was illustrated in Vietnam where mine action operators released coastal land that is now used for low-intensity agriculture (cattle rough grazing) combined with forestry. While the primary purpose of clearance was to save lives through removing the risks from explosive ordnance, mine action in this instance increased the community's socio-economic base through the provision of grazing and land for timber production. This initiative also allows for carbon sequestration and provides safe access to land that has become of cultural and heritage importance to the community (that is, the adjacent cemetery). These three outcomes benefit communities through socio-economic diversification, utilising marginal land of limited economic value, and helping to develop further community ties with the land.

Figure 1: Nature-based solutions, International Union for the Conservation of Nature

Figure 2: Ecosystem services ©Fermi Research Alliance, LLC

In Colombia, the benefits brought to communities through the unlocking of aspects of ecosystem services were apparent in many instances, including tourism, sustainable agriculture, and other community development projects. On one area of land in La Ermita, released land has strengthened climate resilience through creating habitat that will regulate flooding, benefit biodiversity and sequester carbon. While mine action projects in La Ermita were not implemented with intended climate change benefits, outcomes from mine action have included community-wide diversification and adaptation of livelihoods, which help to strengthen community resilience to the effects of climate change in the long term.

In another case study, in Kosovo, land release operations carried out in Bjeshkët e Nemuna National Park have resulted in the release of 355,502 square metres to date, permitting access to popular walking and horse-riding trails, the reestablishment of access to woodlands for non-commercial plant foraging, hunting, and the collection of spring water that the population of Peja has traditionally always utilised. Releasing the park from explosive ordnance reinforces the role of forests as a natural climate-buffer for regulating rainfall and flooding. The increased access to forests and its benefits are therefore considered to contribute to strengthening the resilience of communities to climate change in the long term.

In early 2023, APOPO initiated a syntropic agroforestry project in Zimbabwe on land that had been previously contaminated by landmines, building on previous experience using syntropic agroforestry in East Africa. Syntropic agroforestry is a process which replicates and accentuates the natural process of ecological succession, giving each plant species ideal conditions for growth. Soil structure is maintained restoring natural nutrient and carbon cycles which benefits the long-term viability and productivity of the soil.

Syntropic farming may result in significant carbon uptake and sequestration in soils, while also creating the necessary plant and soil structure required to naturally regulate rainfall, store moisture and control floodwater. It can also purify groundwater and spring water. While this project is still being implemented at the time of writing this study, it should result in meaningful assistance to strengthen community resilience to climate change in the long run.

APOPO's syntropic farming initiatives, like this one in Morogoro, Uganda, promote that soil structure is maintained, restoring natural nutrient and carbon cycles, which benefits the long-term viability and productivity of the soil, following land release © APOPO

Health and nutrition

Access to potable water is a key aspect of climate resilience. Climate change events can lead to communities being quickly moved, disrupting access to water sources. Climate impacts can often strike suddenly and unexpectedly resulting in the loss of property and lives.

This was the case in Vietnamese village Tan Hiep (Quang Tri Province), where mine action facilitated the rapid relocation of 62 households, in response to extensive damage caused by ground collapse due to heavy rainfall eroding underlying rock formations. Land release activities enabled the swift relocation of an entire community, permitting minimal disruption to livelihoods and continued access to markets, health clinics and schools. Following land release, the Vietnamese Government installed an aqueduct from the local irrigation impoundment to transfer water to the new rice paddies established in the site of the former, forested battle area.

Similarly, in Somaliland, access to water was highlighted by community members in Sayla Bari as the biggest challenge to their food security. There, mine action has supported community resilience by opening up roads, notably facilitating the delivery of water to villagers, something which was not possible before land release operations were conducted. Mine action also enabled the rehabilitation of traditional water reservoirs, called berkards, which are a vital infrastructure for rural communities heavily impacted by persistent drought conditions.

Energy

The diversification of energy generation sources – from wind, solar or small-scale hydroelectric installations – and improvements in energy efficiency can increase energy reliability and reduce vulnerability to climate change. In the village of Bajgora in Kosovo, mine action operations have cleared roads and pathways that were previously contaminated with cluster munition remnants, facilitating the installation of wind turbines. While the wind turbines are not bringing direct benefits to the Bajgora community as the energy is exported to the cities, they present an interesting low-carbon economic opportunity for the region. Demining in Bajgora has also opened access to woodlands and enabled the installation of water pipelines. The outcomes of mine action have therefore improved water and food security in the region, opened new transportation routes, fostered renewable energy initiatives and boosted income diversification.

MONITORING AND REPORTING ON CLIMATE RESILIENCE

Post-land release impact assessment

The study explored the inclusion of environmental or climate change-related data into pre- and post-clearance impact surveys. Data collected by MAOs during such surveys is often defined by contractual agreements with donors.

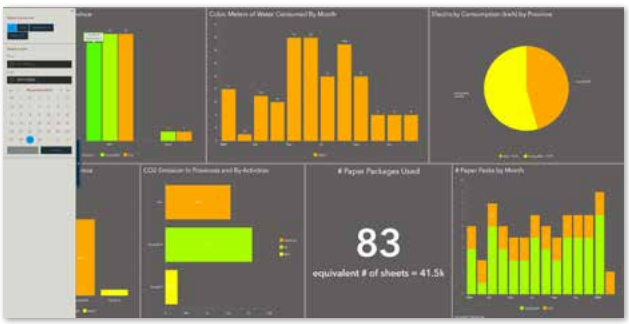
Notably, a promising trend is emerging as some **MAOs begin to proactively infuse environmental and climate change factors into these surveys**. This is the case in Vietnam where a 'total mine action survey' is being implemented, which explicitly integrates questions about the environment and climate change impacts.

Additionally, MAOs operating in Tajikistan are strategically aligning their priorities by focusing on evaluating community impact and resilience, particularly within the socio-economic dimension. This demonstrates an awareness of the interconnectedness of environmental, social and economic aspects, ensuring that post-land release efforts are not just restricted to explosive ordnance but also contribute to broader community well-being. Such integrative approaches show promise in drawing valuable lessons from the field, allowing for continuous improvement and a holistic perspective in mine action practices.

Carbon accountability

Measuring and monitoring GHG emissions is a process known as carbon accounting. GHG emissions are measured by defining Scope 1, 2 and 3 emissions.[23] At the national level, carbon accounting is the responsibility of relevant ministries in charge of climate change mitigation and adaptation, in line with their respective obligations under the Paris Agreement.

Most MAOs consulted as part of the study either are in the process of measuring their GHG emissions and voluntarily reporting on their carbon accounting or have already done so. Many MAOs have committed to reducing their GHG emissions as part of the Climate and Environment Charter for Humanitarian Organizations[24] of the ICRC and IFRC, which provides useful guidance on carbon accounting for humanitarian actors. As global efforts to combat climate change intensify, the mine action sector's commitment to sustainability and carbon reduction not only aligns with broader environmental goals but also demonstrates its dedication to a more resilient and responsible future.



NPA Vietnam Emission Monitoring dashboard: NPA Vietnam developed a system to collect data on emissions from vehicles, flights, energy use, water use and paper use ©Norwegian People's Aid

Climate-related key performance indicators (KPIs)

There is little, if any, evidence of consistent data being collected when it comes to climate related KPIs. None of the mine action authorities or MAOs consulted reported collecting data related to climate resilience.

RECOMMENDATIONS

Impact of land release on Ta Lao village, Quang Tri province, Vietnam, where clearance gave place to the banana cultivation proposed by the Women's Union of Quang Tri (2023). ©GICHD

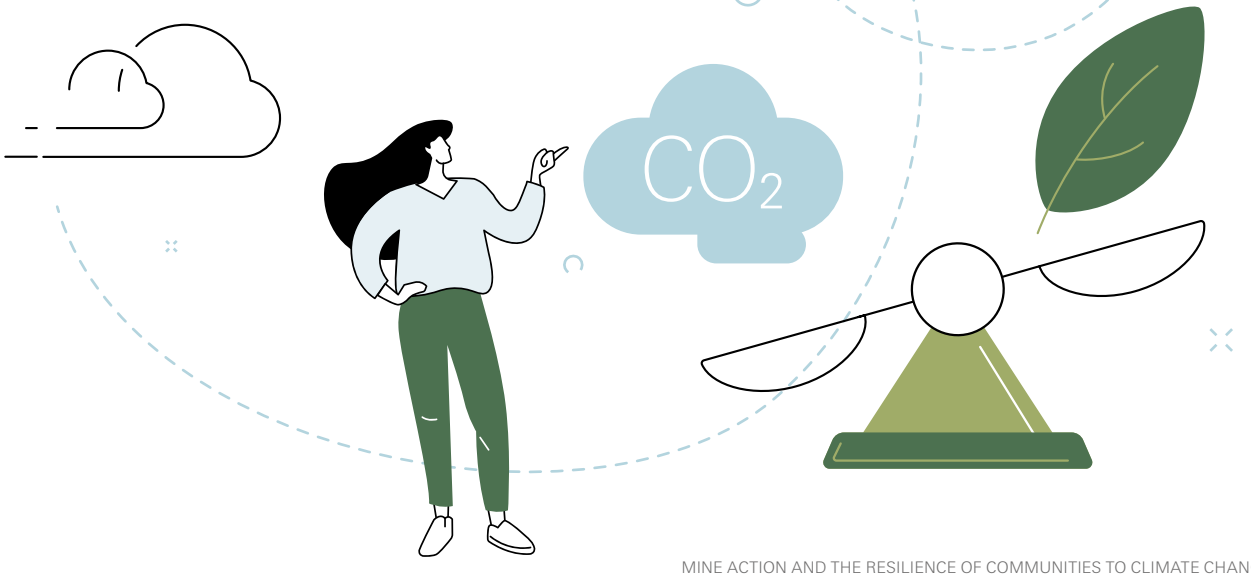
This chapter presents a series of recommendations centred around better understanding, addressing and reporting on climate resilience issues within the context of mine action. The recommendations are directed to all mine action stakeholders, including mine action authorities, organisations, donors and partners.

In its latest report, the IPCC emphasizes that there is a rapidly closing window of opportunity to secure a liveable and sustainable future for all. The need to take urgent near-term integrated climate action cannot be overstated. The mine action sector has a critical role to play in contributing to climate resilient development, particularly for vulnerable communities already affected by the presence and risks from explosive ordnance.

"The choices and actions implemented in this decade will have impacts now and for thousands of years",

according to the IPCC[25]

We trust that mine action stakeholders will embrace these recommendations as fast as possible, to contribute to the broader endeavour of forging a sustainable and resilient future.



FOCUS 1
BETTER UNDERSTAND CLIMATE RESILIENCE IN MINE ACTION CONTEXTS

1.1 Promote climate literacy and awareness

Action: Develop initiatives for mine action stakeholders to acquire knowledge and skills to communicate effectively on climate change and climate resilience. This could be explored through comprehensive and targeted capacity enhancement that empowers mine action stakeholders with the knowledge and skills needed to understand challenges related to climate resilience and start addressing them, working closely with climate change experts.

Rationale: Enhanced knowledge and awareness foster informed decision-making and facilitate collaborative efforts to address climate-related vulnerability in mine action activities. Enhancing capacity boosts the effectiveness of post-land release efforts and ultimately ensures that communities are better equipped to manage climate-related risks.

1.2 Enhance tools and capacities for climate risks assessments

Actions:

- Develop or obtain access to socio-economic, land use, resource, environmental and climate vulnerability spatial data that can be overlaid with explosive ordnance baseline data.
- Develop technical capability and resources as well as agreement and collaboration with the organisations responsible for gathering data.
- Maintain and update the databases.

Rationale: Climate data integration equips mine action authorities and MAOs with critical insights into climate-related risks, enabling targeted and effective operations. Incorporating climate vulnerability data reinforces the accuracy and efficacy of mine action planning, enabling proactive climate-related decision-making.

1.3 Conduct climate risks assessments

Action: Conduct climate risk assessments that identify environmental aspects and impacts, and assess the likelihood and severity of these impacts, especially in areas vulnerable to climate change. Risk assessments should consider the vulnerabilities of relevant groups, including women and children in low-income households. Climate risk assessments could be complemented with an analysis of climate resilience aspects at the local level, building on inclusive and participatory community-liaison engagement with communities. Such assessments could be conducted in collaboration with environmental and/or climate change agencies at the governmental level (Ministry of Environment) or relevant non-governmental agencies (national or international organisations, the UN).

Rationale: Understanding the precise nature of climate-related hazards enables mine action programmes to reduce risks and to develop targeted strategies for climate resilience. Climate risk assessments enable proactive and strategic mine action efforts that consider climate vulnerabilities and prioritise areas with the greatest need.

FOCUS 2
COMPREHENSIVELY ADDRESS CLIMATE RESILIENCE IN MINE ACTION

2.1 Enhance coordination between climate change and mine action authorities

Actions:

- Advocate for the involvement of relevant climate change authorities in key mine action decision-making processes, such as strategic planning and priority-setting, in the spirit of inclusivity and cross-ministerial collaboration and coordination. Given the long-term nature of predicted climate change impacts, the involvement of climate change authorities is critical during both proactive and reactive clearance (that is, following the application of the principle of all reasonable effort, with a focus on residual risks).
- Advocate for the involvement of mine action authorities in relevant environmental and climate change policy discussions and plans (for example, by incorporating mine action needs and risks into National Adaptation Plans).

Rationale: Mine action and climate change authorities often function within separate institutional frameworks, often resulting in limited inter-ministerial coordination and collaboration. Increased involvement of climate change authorities in mine action decision-making processes – and conversely, of mine action authorities in climate change policy discussions – may facilitate the exchange of information, data and expertise, and contribute to raising awareness about the interlinkages between mine action and climate resilience. Such collaboration may expand the capacity of mine action authorities to integrate climate change considerations into all policies and systems, encouraging informed decision-making.

2.2 Align mine action policies, strategies, standards and procedures with climate change frameworks

Actions:

- Update and enhance mine action policies, strategies, standards and procedures in line with existing climate change-related legislation and/or in climate adaptation plans.
- Align those with the latest version of IMAS 07.13, which should explicitly incorporate climate change considerations and sustainability practices.
- Incorporate specific reference to climate resilience in mine action strategies and include strategic objectives and/or outcomes on climate resilience, as relevant.
- Update national mine action standards (NMAS) to incorporate contextual information on climate change.

Rationale: Explicitly incorporating climate change factors within policies, strategies, standards and procedures provides a structured framework to align mine action efforts with broader climate resilience goals. Systematic integration ensures that mine action activities continually adapt to rapidly evolving climate priorities. It also enables the sector to effectively address emerging climate-related challenges. Integrating climate change into the IMAS and NMAS guarantees that climate resilience becomes an integral part of mine action processes and activities (for example, the current revision of IMAS 07.13: Environmental management in mine action will contain climate change considerations).

2.3 Integrate climate change and climate resilience in priority-setting and tasking

Action: Incorporate climate change-related data and climate resilience considerations into priority-setting methodology and tasking processes, to enable mine action authorities to identify and give priority to areas vulnerable to climate events.

Rationale: Including climate change considerations (criteria and indicators) in priority-setting systems and tasking processes ensures that mine action resources are allocated strategically to address climate-related risks, thus safeguarding communities and strengthening climate resilience.

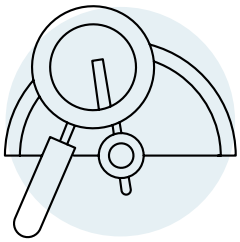
2.4 Promote climate resilience at the local level

Actions:

- Support mine action projects that facilitate climate resilience, including nature-based solutions at the community level (specific examples are provided in Annex II).
- Adapt funding strategies to emphasise climate change resilience within mine action projects through the integration of expected climate resilience outcomes in project proposals, in line with mine action strategies that include specific climate resilience objectives and/or outcomes.

Rationale: Mine action positively contributes to climate resilience by facilitating key aspects of resilience. Strengthening existing good practice and projects that facilitate climate resilience is a tangible way of further promoting climate resilience at the local level. Aligning funding with climate resilience objectives reinforces the sector's capacity to address the long-term impacts of climate change on affected communities.

Understanding climate resilience in mine action contexts: coordination and alignment require engagement and consultation of local communities in round tables. ©GICHD



FOCUS 3
IMPROVE MONITORING AND REPORTING ON CLIMATE RESILIENCE

3.1 Include climate resilience aspects in post-land release impact assessments

Action: Include climate resilience data requirements in pre- and post-clearance impact surveys. Alternatively, link existing criteria with climate resilience themes to monitor and demonstrate contributions to climate resilience. Link such contributions to climate resilience outcomes of mine action projects.

Rationale: Collecting data from communities and understanding how they interact with the environment after land release may be an interesting indicator of climate resilience in the short- to medium-term.

3.2 Improve carbon accountability

Action: Measure and report on carbon emissions associated with mine action operations while prioritising efforts to minimise emissions and seek carbon offsetting opportunities, by adopting environmental policies and associated work plans. Guidance to improve carbon accountability for humanitarian organisations is available through the Climate and Environment Charter for Humanitarian Organizations of the ICRC and IFRC, and the upcoming Inter Agency Standing Committee Guidelines on environmental responsibility in humanitarian operations.

Rationale: Addressing carbon accountability demonstrates the sector's commitment to reducing its environmental impact and contributes to broader climate mitigation goals.

3.3 Develop climate-related key performance indicators (KPIs)

Action: Develop KPIs to measure the impacts and actions related to climate change adaptation and mitigation within the mine action sector. The upcoming revision of IMAS 14.10: Guide for the evaluation of mine action interventions and current revision of IMAS 07.13: Environmental management in mine action (including the upcoming accompanying Technical Note) could constitute interesting avenues to address KPIs and minimum data requirements. Some of the KPI reporting may address:

- Area (in hectares) of land release in climate vulnerable areas.
- Area (in hectares) of land release facilitating climate risk mitigation measures (for example, measures that reduce the severity of climate events) or GHG emissions mitigation.
- Number of people (disaggregated by sex and age) to whom mine action has directly and intentionally provided assistance in order to prevent their displacement as a consequence of deteriorating climate conditions.
- Other KPIs may include aspects related to climate resilience, such as sustainable livelihoods or efficient water and sanitation systems, which might also be impacted by climate conditions and facilitated by mine action.

Rationale: Climate-related KPIs provide a quantitative basis for tracking the sector's progress in integrating climate resilience and sustainability into its operations, offering a clear assessment of its effectiveness. By addressing challenges related to measurement complexity, data availability, collaboration, scope and target setting, the sector can create meaningful indicators that drive informed decision-making and demonstrate impact.

ANNEX I

Case studies

View of the Samana River Valley from the Birds Hermitage Nature Reserve in Antioquia, Colombia. This Reserve is yet another example of Eco-tourism services made possible after land release, fostering community resilience. ©GICHD

COLOMBIA

Overview

Colombia is located in the northwest corner of South America. Climatically diverse, the country is highly vulnerable to extreme weather events, especially in the Caribbean and Andean regions. Over the last 20 years, Colombia has recorded an average rise in temperature of more than 1°C and experienced severe fluctuations in rainfall patterns.[26] Water provision is heavily reliant on glacier melt, which are projected to continue receding under rising temperatures. The country is also vulnerable to inter-annual rainfall variability influenced by two phenomena: El Niño, which brings droughts and warmer weather, and La Niña, which is associated with floods and cooler weather.

The key sectors of Colombia's economy, such as housing, transport, energy, agriculture and health, are particularly vulnerable to the effects of climate change.[27] The economically important coffee industry is already impacted due to its high vulnerability to rising temperatures and hydrologic events, which are projected to increase with climate change.

Known as the country with the second highest level of biodiversity in the world[28] and with national natural parks widely distributed throughout its territory, Colombia has a wide range of ecosystems, such as paramos (grassland), mangroves, wetlands, coral reefs, glaciers, oceans and tropical forests. However, Colombia's rich environment is under pressure linked to deforestation, mining, illegal logging, erosion, overgrazing and increasingly severe competition over natural resources. These pose a significant threat to Colombia's ecological balance, not only impacting the functioning of ecosystems but also disrupting interactions among species.[29]

After more than 50 years of internal armed conflict, the country continues to suffer from the widespread presence of explosive ordnance. Between 1990 and 30 June 2023, 12,363 casualties were recorded,[30] with a peak between 2005 and 2007.[31] As of June 2023, 491 municipalities have been declared free from suspicion of mines, and 102 municipalities are still in intervention. A total of 12.8 million square metres of land has been released, and 8,876 devices have been destroyed. It is estimated that about 30 per cent of the 1,122 municipalities are still contaminated by explosive ordnance.

The departments with the highest levels of explosive ordnance contamination also exhibit a high presence of illicit crops and mining. About half (48 per cent) of the coca crop cultivation is concentrated in territories with special regulations, such as indigenous reserves, afro-descendant communities' territories, national natural parks and environmentally protected areas. According to the Office of the High Commissioner for Peace (OACP) Comprehensive Action against Antipersonnel Mines programme (AICMA), the 199 municipalities considered as highly affected by explosive ordnance concentrate 91.19 per cent of the registered coca crops plantations. These municipalities also accounted for 75.6 per cent of explosive ordnance-related accidents that occurred between 1990 and 2015.[32]

In Colombia, the indiscriminate laying of anti-personnel (AP) mines was intended to stop state security forces from advancing. These mines were also used by different illegal armed groups as a method of warfare, with the intention of exerting control over the populations and territories of interest. Mines were placed close to roads, riverbanks, mountain ridges and infrastructure commonly used by the military to prevent access to strategic routes, access roads, drug laboratories and plantations of illicit crops.[33]

Of improvised nature, the AP mines used in Colombia were placed in low density, and are therefore hard to detect for the most part. The severe topography of Colombia, including mountains, and the high rainfall experienced in most areas creates further barriers to land release operations. The combination of these factors renders the identification of suspected areas and subsequent land release operations difficult and expensive. Colombia has the highest cost per square metre of land released and the highest cost per item of explosive ordnance found.[34]

Legislative framework on climate change

The first law on environmental protection was promulgated in 1959.[35] The Constitution of 1991, as amended in 2015, provides the basis for environmental protection and conservation in Colombia. Article 79 outlines the State's duty to protect the diversity and integrity of the environment, to conserve the areas of special ecological importance, and to foster education for the achievement of these ends.

Colombia is a State Party to the UNFCCC and a signatory to the Paris Agreement and the Kyoto Protocol. Colombia prepared its first Nationally Determined Contributions (NDC) report in 2018 and published a reviewed NDC version in 2020.[36] Colombia is one of the 48 UNFCCC State Parties that has submitted a National Adaptation Plan to climate change.[37] Climate change mitigation and adaptation are recognised as national priorities. As such, the Government of Colombia has adopted a comprehensive legislative framework and public policy regulatory instruments to implement its commitments, under the coordination of the Ministry of Environment and Sustainable Development.

The Climate Change Law[38] and Climate Action Law[39] address climate change management and carbon neutrality, respectively. Specifically, the Climate Action Law establishes minimum goals and measures to achieve carbon neutrality, climate resilience and low carbon development in the short, medium and long terms. Colombia's Long Term Climate Strategy E2050 is a state policy instrument that seeks to "define socio-economic development objectives and realistic long-term goals for reducing greenhouse gas emissions in order to strengthen Colombia's climate resilience".[40] According to the Ministry of Environment and Sustainable Development, the planning instruments for climate action have been consolidated and implemented at all levels of the Government. This has been reflected in the inclusion of climate change into formal planning instruments and through the formulation of Comprehensive Climate Change Management Plans at the sectoral and territorial levels.[41]

The 2022–2026 National Development Plan (NDP), entitled "Colombia World Power of Life", was adopted in May 2023 by the Colombian Parliament.[42] It addresses a broad range of topics, including environment and climate change as well as mine action. Among other actions, the NDP makes provision for the creation of a Fund for Sustainability and Climate Resilience.[43]

Climate change and the national mine action programme

OACP is the national mine action authority (NMAA) in Colombia and through AICMA, it coordinates all mine action activities in Colombia. Chaired by the Vice-Minister of Defence, the Inter-institutional Humanitarian Demining Instance is the body in charge of the prioritisation and tasking process of demining activities. In practice, it decides which zones are prioritised for demining tasks and assigns MAOs to those tasks.

Humanitarian demining operations in Colombia are undertaken by seven accredited humanitarian MAOs. Two organisations are part of the state capacity, namely the Colombian Army's Humanitarian Demining Brigade (BREDH) and the Demining and Amphibious Engineers Battalion of the Navy (BDIAN). The five remaining organisations are civilian, namely the Colombian Campaign to Ban Landmines (CCBL), the Danish Refugee Council (DRC), the The HALO Trust, Humanity and Inclusion, and HUMANICEMOS DH. In addition, the Organization of American States (OAS–AICMA) oversees the quality management systems of land release operations, and UNMAS provides strategic and capacity enhancement support to the sector.

To determine which new geographical zones to prioritise for humanitarian demining operations, the following factors are considered in Colombia:

- contamination records;
- proximity to populated areas;
- existence of development plans;
- government policies (land restitution and return);
- security situation.

One area of particular importance in the Colombian mine action programme is the use of a priority-setting system geared towards strengthening community resilience, ultimately contributing to climate resilience. This approach is an exception in the mine action sector, as many countries use other criteria, such as risk and threat reduction, to drive task selection and prioritisation. In this regard, the Colombian Technical Norm (the Colombian NMAS) on non-technical survey (NTS), Annex A to NTC6470 (*Matriz de Afectación*), allocates 20 points out of the maximum 35 available to priority criteria and indicators that have direct or indirect link to community resilience.

The four criteria outlined below, each with a total score of five, reflect the highest level of importance and urgency, underlining the critical role they play in shaping land release decisions. They are directly linked with the topic of climate resilience for **society, livelihoods and economy**.

Land use potential in economic activities. In this indicator, five points are allocated if the community expects immediate intervention and land use on clearance. The immediate intervention and use of land on clearance, as anticipated by the community, signifies a direct connection between land release and economic activities. Enabling prompt access to cleared land empowers the community to engage in agricultural, commercial or developmental endeavours that can drive economic growth. By prioritising areas with high land use potential, the land release process directly contributes to the diversification of economic activities, ultimately boosting the community's capacity to adapt to changing climate conditions.

Presence of alternatives for blockages. Five points are allocated if the affected community has no alternatives for the mined area. The absence of viable alternatives to the mined area underscores the importance of releasing these lands. When communities lack options due to blockages, demining becomes an essential step in expanding available spaces for various activities. In such cases, land release provides a means to create new avenues for economic activities, housing and infrastructure development. These expanded opportunities enhance the community's capacity to withstand climate-related challenges by providing more adaptive spaces.

Types of blockages. Five points are allocated if the area holds communal, religious or cultural significance (for example, schools, water sources, sacred sites). The cultural, religious and communal significance of the blocked areas magnifies their importance for the community's overall resilience. Clearing land with such significance not only restores valuable communal resources but also reinstates vital cultural practices and access to resources like water sources. The restoration of these critical elements contributes to the community's overall well-being and reinforces its ability to respond to climate variations while maintaining important cultural ties.

Development projects and returnees. Five points are attributed if the affected community is awaiting demining for development projects or projects of interest to national/international entities, or if local authority requires demining. The community's anticipation of demining for development projects aligns with a forward-looking approach to climate resilience. Such projects can include infrastructure improvements, sustainable resource management, and disaster preparedness initiatives. Additionally, the involvement of national or international entities, and local authorities underscores the collaborative nature of these efforts, demonstrating a holistic commitment to enhancing the community's adaptive capacity.

Such substantial weighting can have profound impact on the process of land release if applied at the right level, contributing significantly to the advancement of community climate resilience.

However, while integrating climate resilience issues into a priority-setting system is a good approach, this system is used at the municipality level and only after NTS has been conducted. As such, it is not driving the tasking but, rather, the order in which the tasks that have already been planned for completion are cleared.

Applying similar matrices at the strategic level, and not only at the operational or site levels, will achieve a greater impact in terms of how the climate resilience risks are addressed by mine action in the longer term. Incorporating these high-scoring criteria into the tasking of land release decisions will increase the commitment to strengthening community climate resilience. By addressing economic activities, alternative options and sustainable developmental potential, land release contributes to the strengthening of a community's ability to navigate and respond effectively to the challenges posed by a changing climate. The prioritisation of areas based on these criteria not only enables immediate positive impact but also lays the groundwork for sustained climate resilience within the community.

Environmental considerations are addressed in the legal frameworks to which MAOs must adhere and specific environmental-related policies, procedures and tools regulate mine action:

- Colombia's National Mine Action Strategic Plan 2020–2025 recognises that the mission of AICMA should be reducing the social, economic and environmental impacts of explosive ordinance. Although the Strategic Plan recognises the country's diverse climate, among others, as a strength making agriculture one of the cornerstones of the Colombian economy, the weather and climate conditions are also identified as a risk for the successful implementation of the Plan since it notably impacts the efficiency of demining operations in the field.[44]
- Decree 1195 of July 2017[45] addresses environmental considerations in mine action. It confirms and builds on several preceding laws and decrees defining the environmental conditions under which demining activities must take place. The decree reiterates the guarantee to the right to life, mobility and the use and exploitation of land to all Colombians without leaving anyone behind. The decree outlines mitigation and correction measures that must be applied by MAOs when undertaking demining in national parks and other areas of ecological value.
- The principles of Decree 1195 are mainstreamed in the Colombian Technical Norms for AICMA (NTC-AICMA, as per the Spanish acronym), Colombia's NMASs. Annexes to NTC-AICMA 6483 on tasking include specific references to environmental considerations.[46]
- The national IMSMA database includes a layer which records the Unique National Registry of Protected Areas. Data and information on national, regional and local protected areas, including natural parks and reserves, are readily available to all mine action stakeholders.
- MAOs have specific standard operating procedures (SOPs) on environmental management, based on Decree 1195 and NTC-AICMA's requirements. Most MAOs' SOPs on environmental management include, among others, requirements for an analysis of the environmental impact of contamination, environmental mitigation measures for camp management, marking and vegetation clearance requirements.

The Birds Hermitage Nature Reserve, Colombia ©GICHD

Case study examples

Impacted communities and individuals interviewed as part of the case study gave verbal expression to the high value that they assign to the conservation and protection of the environment. Communities interviewed are acutely aware of the threat of changes in climatic patterns in Colombia. They have experienced climate change impacts first-hand, in the form of more frequent floods, droughts, damage to roads and other infrastructure and changes in crop growing patterns.

Despite this environmental awareness and knowledge, climate resilience remains a less clear topic. Although they are familiar with the term, it is a new concept and little time has yet been spent on addressing the implementation of relevant policies and practices. The deficiency in understanding climate resilience was best expressed by some of the MAOs that indicated that, although they are aware of the concept, they need guidance in its implementation and monitoring.

Nonetheless, this case study highlights that mine action activities have positively contributed to climate resilience. Although not always intentionally, mine action activities contribute to greater resilience at the community level. Interviews with all MAOs and meetings with communities in Antioquia, Huila and Bolívar have provided evidence of those positive links.

While three examples were selected for this case study, many others exist. Among other examples, MAOs mentioned experiences of voluntary reforestation schemes post-land release operations in national parks and indigenous reserves which facilitated access to preserved land, operations that have re-opened access to water sources, and operations that have facilitated dialogue between communities who did not interact together before mine action was carried out.[47] Overall, the case study examples illustrate that mine action reduces communities' feelings of fear, which contributes to rejuvenating an area despite existing structural challenges and specific socio-economic conditions. All these instances illustrate further that mine action has an enabling role and contributes to greater resilience to shocks and difficult events, including relating to climate change.

CASE STUDY 1
ECOTOURISM AND SUSTAINABLE DEVELOPMENT INITIATIVES IN SAN LUIS, ANTIOQUIA

The San Luis municipality is located at about 135 km from Medellín, the departmental capital of Antioquia. It is crossed by the Dormilón river, which flows into the Samaná river. Similar to other areas in the Andean region, San Luis faces climate extremes more frequently. Heatwaves and abnormal dry climatic conditions during some periods of the year contrast with heavy rains and flash flooding during other periods. Given San Luis' geographical position along the main road from Medellín to the capital city of Bogotá, landslides and road blockages often create significant delays in the transportation system of the region.

Antioquia is the department with the highest number of landmine victims.[48] During the conflict, illegal armed groups occupied San Luis and used landmines indiscriminately and extensively. Many families had to flee and abandon their land for a long time and could only return once the municipality had been declared free from suspicion of landmines, in 2022.

Before humanitarian demining took place, San Luis was regarded as an unsafe area to live and work. Due to this poor image, the municipality did not attract new investments or initiate new developments. The BRDEH conducted land release operations in the municipality, which was eventually declared as having all known suspected areas cleared in July 2022. Since then, 194 families have returned and there is increasing interest by investors in retail, tourism and housing-related developments.

Due to the unique location of San Luis, with a rich environment and proximity to the city of Medellín, the municipal area now enjoys significant tourism development opportunities which could not be undertaken when it was contaminated by mines. The demining of the area has opened new development and investment opportunities and the implementation of sustainable development projects such as the Birds Hermitage. Following the release of their land, one family founded the Ermita de las Aves (Birds Hermitage) Nature Reserve, which consists of 54 hectares of land dedicated to birdwatching and other ecotourist activities such as cocoa trails hiking or camping.

Led by women from the family, this multigenerational initiative is based on sustainable development principles and seeks to offer a healthy environment to attract both national and international tourists. Future plans include projects to grow sustainable food using permaculture techniques, provide training in rural practices (including the use of wood and other vulnerable natural resources found in the area) and educate youth in commerce and associated skills to prepare them for employment. The group of women works closely with the San Luis Community Tourism Network and has already benefitted from assistance provided by the Ministries of Tourism and the Environment in planning, strategic development, marketing, and tour guiding.

The demining of the municipality also led to other initiatives, including the creation of the Forest of Reconciliation and Peace (*Bosque de la Reconciliación y la Paz*), in which 17,000 trees and native species were planted. The Forest of Reconciliation and Peace was created in memory of the victims of landmines in San Luis. Other Forests of Peace exist in municipalities neighbouring San Luis, all of which were supported by the BRDEH and the Government of Colombia as part of a strategy to rebuild ecosystems, protect water sources, promote sustainable tourism and acknowledge the victims of the armed conflict in Colombia.[49]

The demining of the municipal area has reportedly changed the image of the municipality which led to new optimism among the people and a rejuvenation of the economy, through the creation of livelihood opportunities, sustainable use of nature resources, and sustainable cultural heritage initiatives.

A community map of The Birds Hermitage Nature Reserve (top) and the Forest of Reconciliation and Peace commemorative plaque (bottom) testify the new optimism of the community after land release and the return to sustainable use. ©GICHD

CASE STUDY 2
AGRICULTURAL DIVERSIFICATION IN ALGECIRAS, HUILA

Algeciras is a municipality within the Huila Department about 60 km south of the departmental capital of Neiva. Huila is a fertile agricultural region within the Magdalena Valley where commercial agriculture flourishes. Most of the population of Huila is settled in the Magdalena Valley due to the commercial agricultural economy, oil exploitation and the availability of roads and infrastructure along the valley plain.

Algeciras is located on the west of the Magdalena Valley towards the Andes and is considered to be the agricultural basket of Huila. Coffee, avocados and bananas are the main agricultural crops produced in the municipality. Warmer climatic conditions have led to changes in farming practices, including coffee plantations which are increasingly planted at higher altitudes on the mountain slopes than before, or replaced by avocado plantations. Heavy rains and flooding are more frequent and extreme. Landslides and road blockages make access to the town of Algeciras and agricultural markets difficult, and farmers increasingly more reliant on intermediaries.

Being close to the border with the Caquetá Department, Algeciras was often crossed by illegal armed groups along the high mountain ridges during the conflict. The presence of the armed groups gave rise to several conflicts resulting in mines being installed along the high mountain routes. Local communities were subjected to violence to such an extent that many families left the municipal area during that time. While some have already returned since the municipality was declared free from suspicion of mines in October 2021, more displaced persons and families continue to return as of May 2023.

The demining of the municipality was undertaken by the Colombian Campaign to Ban Landmines (CCBL) during 2020 and 2021. As part of their actions, and in coordination with the municipality, the CCBL adopted an integrated community development approach. In this regard, it appointed a trained local community member as community development officer, who supported beneficiaries in parallel to the land release operations[50] with agricultural advice, especially for farmers seeking to change their cultivation to other crops. After the end of land release operations, the community development officer continued as a volunteer to assist the people returning to the area and to help farmers re-establish their farms. Being a coffee farmer himself, the volunteer continues to give sound agricultural advice to the returning farmers.

One of the beneficiaries of this project was a farmer, whose homestead was visited as part of the case study. This farmer lost all he had during the armed conflict and initially left the area. He later returned to earn a living despite the harsh conditions on the farm, which is located at a high altitude and very difficult to access from Algeciras, though only located five kilometres away from the town.

The farm is subjected to climate change events such as heavy rainfall, resulting in recurring floods and higher temperatures at the bottom of the valley. The main access road to the farm for vehicles was washed away in a flood the week before the visit to the farm took place. The higher temperatures are affecting the coffee crops, which must now be planted higher on the mountain slopes to avoid the heat of the valley. Many of the farmers in the area are therefore changing over from coffee to avocado production, which is a hardier crop and can sustain climate fluctuations better than coffee.

Local farmers are often main beneficiaries of direct outcomes of mine action efforts. In the picture a local farmer guiding a visit to his homestead post-land release. ©GICHD

This case study is an example of where demining activities can result in greater climate resilience for communities. The farmers supported by the CCBL project are not only aware of the changes taking place but also able to respond positively to the changes, thanks to the advice they received during and after land release. This example illustrates the effectiveness of community development approaches when it comes to climate resilience,[51] and the outreach opportunities which MAO have with climate vulnerable communities.

CASE STUDY 3
FARM RE-ESTABLISHMENT IN EL CARMEN DE BOLÍVAR, BOLÍVAR

Sierra Venado is located 24 km away from El Carmen de Bolívar, the capital district of the Bolívar Department, near Cerro Cansona at an altitude of 700 metres. The climate conditions in the area are harsh due to increasing temperatures in summer and frequent flash rainstorms and floods. The changing climate conditions affect farms significantly. Farmers must harvest later in the season and diversify crops such as coffee, bananas and avocados to counter these changing conditions.

El Carmen de Bolívar was one of the municipalities with the highest levels of violence in Colombia during the armed conflict with the Revolutionary Armed Forces of Colombia, People's Army (FARC-EP as per the Spanish acronym), resulting in more than 70,000 people being displaced and leaving the region, plagued by landmines and other explosive ordnance.[52] Until humanitarian demining took place in 2016–2017, the area was known as the "Mountain of Fear", and no one ventured onto the mountain footpaths and roads.

The case study included the visit of a farm in Sierra Venado, whose land was cleared by the BDIAN. The family had left the farm during the conflict and settled in the city, where living conditions were so harsh that they decided to return to their home in spite of the ongoing conflict. One of the family members who survived an anti-vehicle (AV) mine blast went to Venezuela but also later returned to the farm. The farm homestead, roads and pathways throughout the area were mined and the family could not live in the house nor attend to the crops. They lived in temporary shelters in the bushes on the farm, living off what nature could provide.

The farm homestead and its surroundings were mined and about six mines were destroyed by the BDIAN within 30 metres of the farmhouse. The demining allowed farmers to cultivate their crops again and rebuild their homesteads. The BDIAN reportedly went beyond demining operations and helped the family with the rebuilding of the farm. The family installed a rainwater harvesting system from the roof of the house into holding tanks, not to be reliant on water sources located farther down the valley.

Despite difficult living conditions, the family and other community members reported that the demining of the area brought safety and new optimism, making the community want to start the rebuilding process. Although not directly intended, humanitarian demining activities have contributed to greater community resilience for the family and their village, by supporting them rebuilding their lives, recreating the means to livelihoods and establishing sustainable water harvesting practices.

In Sierra Venado, Bolívar, Colombia, demining allowed farmers to cultivate their crops again and rebuild their homesteads. In the picture, a farmer in his plantation (left), one of the mines found in the farm (middle) and the farmhouse' water harvesting system (right) (2023) ©GICHD

View of the city of Peja from the Bjeshkët e Nemuna National Park, in Kosovo. Promotion of development and environmental protection is one of the three criteria used by KMAC for priority setting. ©GICHD

KOSOVO

Overview

Kosovo experiences a continental climate with both Mediterranean and Alpine influences. It faces several climate vulnerabilities relating to water, including flooding, changes in the seasonality of rainfall, reduction in precipitation, a shift from snow to rainfall, altered and lower river flows, reduced groundwater and soil moisture deficit. It is predicted that Kosovo will be water stressed by 2050.[53]

Kosovo is also prone to severe drought and heat stress.[54] Climate events have a greater impact than in the past and are contributing to increased socio-economic hardship, higher incidence of poverty (among 45 per cent of the population) as well as strains to the health, social welfare and employment sectors.[55]

At the end of 2022, Kosovo recorded 9.9 square kilometres of cluster munition remnants contamination across 41 confirmed hazardous areas, 25 confirmed mined areas covering 0.59 square kilometres, and 4 mixed areas covering 0.4 square kilometres. Explosive ordnance are recorded in all districts, with greatest known contamination in the north, west and southwest, respectively in Mitrovica, Peja and Gjakova.[56]

Legislative framework on climate change

In 2013, Kosovo's Ministry of Environment and Spatial Planning issued a Climate Change Strategy for the period 2014–2024 and, in 2018, a revised Climate Change Strategy was published for the period 2019–2028.[57] The strategies establish policies for reducing greenhouse gas emissions and adaptation to climate change. The current Climate Change Strategy is in line with the Government Program of the Republic of Kosovo 2017–2021, the National Development Strategy 2016–2021 and the EU Green Deal.[58]

The Government of the Republic of Kosovo is in the process of drafting a Law on Climate Change. In accordance with the Climate Change Strategy, the Kosovo Emergency Management Agency, within the Ministry of Interior, is responsible for maintaining an emergency management database and Ministry of Environment and Spatial Planning for maintaining a database relating to the Kosovo Spatial Plan.

In addition to geographic, demographic, poverty, land and environmental data analyses, the Kosovo Spatial Plan includes sector reports and data on the following sectors in Kosovo: education, habitation, agriculture, forests, rural areas, energy, health, transportation infrastructure, hydrology, trade, industry, culture, information technology and tourism. In addition to these two databases, the Situation Centre within the Office of the Prime Minister also collates national data. As noted by the Climate Change Strategy, the national databases managed by Ministry of Environment and Spatial Planning, Kosovo Emergency Management Agency and Situation Centre are neither developed collaboratively nor linked.

The Climate Change Strategy notes that, at the community level, municipalities possess little to no risk assessment capacity, and that Kosovo Emergency Management Agency does not yet have climate change vulnerability data for Kosovo.

Climate change and the mine action programme

The Kosovo Mine Action Centre (KMAC) holds the responsibility of overseeing the survey and clearance of explosive ordnance across Kosovo. Additionally, KMAC oversees coordinating activities, such as quality management, risk education, public information dissemination and victim assistance. The role and duties of KMAC, operating under the authority of the Ministry of Defence, were officially established and institutionalised by Kosovo's 2012 Law on Humanitarian Demining. Three MAOs are active in Kosovo, namely the humanitarian demining unit of the Kosovo Security Forces, The HALO Trust and NPA.

In 2023, KMAC issued an NMAS on environmental management in mine action, which is based primarily on IMAS 07.13 and aims to ensure that measures to protect the environment are incorporated into the planning and execution of mine action in accordance with applicable national and international legislation. With the exception of introducing plant species that can adapt to climate change during the initial establishment in a designated area, the NMAS does not explicitly account for the effects of climate change.

During the formulation of Kosovo's Climate Change Strategy in 2018, no consultations took place with KMAC and other departments or representatives of the Ministry of Defence. Nevertheless, KMAC intends to incorporate pertinent mentions of climate change and the country's climate-related laws in its upcoming mine action strategy, slated for creation in late 2023. This will encompass the incorporation of the Law on Climate Change once it has been officially enacted.

KMAC operates and establishes priorities through a structured priority-setting system based on three primary criteria: a) risk reduction, b) promotion of development and environmental protection and c) poverty reduction. Within the "promotion of development and environmental protection" criterion, an indicator is employed whereby, if a hazardous area contributes to climate change impacts, it is assigned the highest priority level (Priority 1) for clearance. This represents a noteworthy instance where a priority-setting criterion within a mine action programme is directly associated with climate change, which is commendable. Further elaboration on the methodology used to measure this criterion could boost the effectiveness of the priority-setting implementation.

In addition to the direct indicator on climate change, KMAC also uses a criterion which is centred around poverty reduction and community well-being. It assesses whether the hazardous area is blocking assets that are essential for households, as well as safe usage of crop land, grazing land and forests. It considers both individual and community impacts on livelihoods. This criterion is effective for addressing poverty reduction and ensuring that the essential needs of households and communities are considered. Overall, the criteria cover a range of factors that contribute to community resilience to climate change, including poverty reduction. KMAC consults regularly with municipalities affected by the presence of explosive ordnance and adapts its priorities when requested by the municipalities. It should be noted that municipalities set their own priorities according to existing municipal development plans, which may include initiatives related to climate mitigation, such as renewable energy development projects. Municipalities may have representative departments responsible for the implementation of the Climate Change Strategy, which would feed into the municipal development plans.

MAOs active in Kosovo do not currently have climate change policies and procedures specifically for Kosovo. Project planning and execution currently follow IMAS-based SOPs, which do not yet include climate change considerations. As of 2024, all operators (Kosovo Armed Forces, The HALO Trust and NPA) will be requested to have an SOP on environmental management in line with the new NMAS.

Case study examples

The case studies below show some evidence of the positive contributions of mine action to climate resilience in Kosovo. While the case studies reveal that the current focus lies more on the economic challenges rather than on the impacts of climate change, the intersection of mine action and climate resilience emphasises the need to consider environmental factors for sustainable development amidst changing conditions. Mine action has contributed to increased access to natural resources, agricultural production and socio-economic development, all of which foster economic opportunities and strengthening climate resilience. Additionally, land release initiatives in various villages have led to restored access to crucial resources such as pastures, forests and water sources. These efforts have contributed to increased security in terms of water, food, transportation and energy.

CASE STUDY 1
NATURAL RESOURCES ACCESS AND INCREASED BUSINESS OPPORTUNITIES IN THE BJESHKËT E NEMUNA NATIONAL PARK

In 1999, NATO air strikes to the west of the town of Peja resulted in the explosive ordnance contamination of wooded hillsides on the edge of Bjeshkët e Nemuna National Park. The park is popular for hiking and provides ecosystem services[59] to farmers, tourists and the wider population in the form of seasonal forage and grazing for livestock. The adventure tourism industry also relies on unhindered, safe access to the park. In terms of climate conditions, Peja and the surrounding area are susceptible to flash flooding. It is increasingly hotter in summer and the winters are milder, with little snow.

Humanitarian demining conducted in the national park has resulted in the release of 355,502 square metres of land to date and has permitted popular hiking and horse-riding trails to be reopened. It also re-established access to woodlands for non-commercial plant foraging, hunting and the collection of spring water that the population of Peja has always utilised.

In Peja, mine action is seen as a facilitator for local communities to reach the national park and its advantages such as spring water, flora and fauna. This also leads to the growth of business opportunities in proximity to the park or related to it. Making the park secure also has the effect of supporting the role of forests as a natural climate buffer, regulating rainfall and preventing flooding. Increased access to the forests and their benefits ultimately contributes to strengthening the long-term resilience of communities against climate change. Moreover, by clearing the national park of mines, safe entry points have been established for Kosovo's authorities to counter illegal poaching and logging activities.

Team leaders discussing aspects of environmental impacts of explosive ordnance disposal in the Bjeshkët e Nemuna National Park, Peja, Kosovo, in 2023. ©GICHD

CASE STUDY 2
LIVESTOCK FARMING AND RENEWABLE ENERGY IN MITROVICA

In the municipality of Mitrovica, mine action operations have been ongoing since the end of the war. The region has faced significant waves of migration due to economic challenges stemming from the war and subsequent closure of major industries. These circumstances have greatly undermined the overall socio-economic viability of various services in the area. This mountainous region is presently experiencing milder winters compared to the past, with reduced snowfall, and notably hotter summers. There is a potential risk of drought during the months of July and August.

The village of Barë, which was among the targets of the 1999 NATO air strikes, saw the completion of its mine action operations in 2018. The land release efforts have enabled villagers to access pastures for livestock grazing, and forests for collecting firewood. This has led to increased livestock production and the safe gathering of hay for winter feed. These improvements, coupled with municipal projects that surfaced roads and provided electricity, have assured the long-term sustainability of the village and the surrounding farms.

In the adjacent village of Bajgora, mine action operations have cleared roads and pathways, facilitating the development of renewable energy sources such as wind turbines. While the wind turbines are not bringing direct benefits to the Bajgora community as the energy will be exported to the cities, they present an interesting low-carbon economic opportunity for the region. This has also opened access to woodlands and enabled the installation of water pipelines. The outcomes of mine action include enhanced water and food security, improved transportation routes, renewable energy initiatives and income diversification.

Currently, the impacts of climate change in this mountainous area are not of significant concern since the economic challenges arising from industrial closures take precedence. Although the benefits of mine action related to climate change resilience are incidental, they hold importance for the community's long-term sustainability as the effects of climate change become more evident.

Bajgora is a village of the Mitrovica municipality, where mine action operations have been undergoing since the end of the war. Land release has created conditions for the development of renewable energy sources such as wind turbines. ©GICHD

Investigation and uncovering of an naval mine washed up on shore in Peleliu, Palao. The region saw intense naval battles during World War II, which explosive remnants of war still impact likelihoods today, namely safe hunting, fishing and agricultural cultivation. ©Todd Essicks / Clear Ground Demining

PALAU

Overview

Palau is a microstate located in the equatorial Western Pacific Ocean. The archipelago consists of 340 islands and a population of about 18,000, most of whom are located in the south of the main island of Babeldaob. While the interior of the islands lies above the areas immediately at risk of rising sea level, the population is concentrated on the coasts, earning their livelihoods from urban areas, the coast and the ocean.

Palau is highly vulnerable to the effects of climate change, which are already visible and likely to increase in the future according to existing projections. These include increasing air temperatures, coral reef bleaching and loss, stronger storms and typhoons, sea level rise, changing rainfall patterns, more extreme rainfalls and flooding, and risks to freshwater resources, including due to salinity intrusion.[60] Palau's rich ecosystems (it has the highest levels of marine and terrestrial biodiversity in Micronesia)[61] are under threat due to climate change, which is also predicted to affect human safety and health, infrastructure and food security.

During World War II, Palau was used as a base for Japan's invasion of the Philippines in 1941. It was also the scene of intense fighting, with the Battles of Peleliu and Angaur in 1944. The legacy of World War II remains evident today, as Palau is still contaminated by UXO and abandoned explosive ordnance on land in all 16 states and in the sea.[62, 63] Explosive ordnance can be found, for instance, in abandoned shipwrecks or in protected marine zones, making operations challenging.

So far, 20,000 UXO items have been safely removed and disarmed by the National Safety Office and NPA. Despite ongoing efforts, the Palauan population continues to be exposed to explosive ordnance while hunting, fishing, collecting shellfish and attending to agricultural cultivation.[64]

Legislative framework on climate change

The Government of Palau is a State Party to the UNFCCC and has ratified the Kyoto Protocol and Paris Agreement. The Government submitted its latest Nationally Determined Contributions report to the UNFCCC in 2015.[65] Palau's 2015 Climate Change Policy[66] was developed to meet the country's obligations under the UNFCCC and other regional and international agreements.

The Climate Change Policy, which was informed by input from communities, civil society and other stakeholders, establishes Palau's National Appropriate Mitigation Actions and National Adaptation Plan as well as the institutional and policy frameworks for climate change mitigation, adaptation, risk reduction and management.

Long before the adoption of the country's Climate Change Policy, and in recognition of the nation's vulnerability to climate change, the Government of the Palau included climate change considerations in relevant ministries' policies and plans. Climate change has historically been included as a key topic of national disaster risk management plans and frameworks, as well as in the 2020 Palau National Master Development Plan developed in 1996.[67]

Nowadays, climate change is addressed by the Ministry of Agriculture, Fisheries and the Environment. As per the Ministry's latest strategic plan "People, Palau, and Prosperity 2021–2024", climate resilience is an underlying topic in the plan's vision for "sustainable food production and wise stewardship of our marine and terrestrial resources [which] enhances the well-being and economic livelihoods of all".[68]

Climate change and the national mine action programme

The Government's UXO Committee is composed of governors and ministers and acts as the steering group for mine action in the absence of an NMAA. The UXO Committee may meet on a yearly basis and is supported by the UXO Safety Office, which acts as liaison between government departments and NPA, the only humanitarian mine action organisation present in Palau. The UXO Safety Office responds to enquiries as and when they arise.

The prioritisation of mine action tasks is based on needs for infrastructure, as well as marine environment conservation, to a certain extent. Climate change challenges are not specifically considered in the prioritisation process at the moment. However, due to the nature of the projects for which mine action is required (which may include road access, coastal defences, housing development and other land uses), mine action ultimately assists the population's resilience to climate events (that is, unintentional benefits relating to mitigating the effects of climate events arise from mine action).

NPA responds to task orders by submitting the necessary in-country documentation, including specific forms for UXO clearance and open burning emitted by the Palau Environmental Quality Protection Board.[69] NPA is currently working on the IMSMA database. IMSMA data will be integrated with and accessed through the PALARIS, an open-access system which stores environmental datasets to be used for evaluating and analysing environmental conditions and trends to support environmental planning, forecasting, monitoring and reporting requirements.[70] Similarly, spatial data for all government ministries and agencies will be accessed in due course via PALARIS, which will assist stakeholders in effectively sharing climate-related data to enable cross-sectoral coordination.

As part of its environmental awareness efforts in Sayla Bari, Somaliland, The HALO Trust's partner, Candelight, established beehives to promote alternative sources of livelihood, with a view to enhancing community resilience. During the visit in 2023, beehives could be seed under the shade of the trees behind the fenced area on the right-hand side of the picture. ©GICHD

SOMALILAND

Overview

Somalia is considered as one of the most vulnerable countries to climate change in the world.[71] Some of the effects of climate change in the Horn of Africa region include increasing temperatures, changes in precipitation patterns, water availability and the occurrence of extreme weather events. Somaliland's topography is characterized by mountainous terrain, and much of the territory depends on shallow and increasingly saline groundwater resources.[72]

As of 2023, the rainy season in Somaliland has failed for the sixth consecutive year, causing significant damage to livelihoods. The unreliability and unpredictability of rainfall has led to the loss of crop production and changes in the breeding of livestock, making populations more reliant on markets' variability. In turn, this has often resulted in financial debt for communities. The unpredictability of rainfall also increases the risk of flooding, as demonstrated by the catastrophic 2023 floods, which led to the loss of lives due to drowning.

Climate impacts in Somaliland have historically been a cause for nomadic pastoralism. The current severity of climate events and their resulting impacts on resources, in particular reduced available land for grazing, cause unprecedented levels of internally displaced persons and small-scale conflicts over resources between different groups.

As they face more pressing and immediately life-threatening concerns daily, climate change is not the main concern of local populations. However, its effects have significant consequences for populations and reinforce existing vulnerabilities.

The three decades of war across Somalia and with neighbouring states, particularly Ethiopia, have resulted in both AP and AV mines laid to protect military bases or form barriers. The country is also littered with explosive remnants of war (ERW).[73] As of 2019, an estimated 6.71 square kilometres of confirmed hazardous areas exist, spread across ten districts.[74] Explosive ordnance contamination continues to threaten life among the primarily nomadic pastoralist communities, heavily reliant on agriculture and land for livestock grazing.

Legislative framework on climate change

Party to the UNFCCC, the Federal Republic of Somalia published its first National Communication in 2018,[75] including information from the Somaliland Government. Somaliland's Ministry of Environment and Climate Change recently drafted a National Climate Change Policy, which is awaiting approval by the Cabinet of the Government of Somaliland. The policy, which complies with the Paris Agreement and is aligned with the Kyoto Protocol, addresses adaptation plans and mitigation measures.

Consultations addressing the impacts of climate change on Somaliland were conducted in 2022. The consultations brought together government officials, international partners, environmental and climate academics, among others, and provided a platform to raise awareness about climate change, discuss the impact of the changing climate and consider possible solutions. The Ministry of Environment and Climate Change produced guidance on environmental and social impact assessments which provide standard operational guidelines, with the aim of integrating environmental concerns into policy and project planning processes at the earliest possible planning and design stages.

The Republic of Somaliland recently developed its third National Development Plan (NDP) for the period of 2023–2027, which includes a chapter on environmental considerations.

Climate change and the mine action programme

Mine action is coordinated by the Mine Clearance Information and Coordination Authority (MCICA), Somaliland's mine action authority, formerly known as the Somaliland Mine Action Centre. MCICA is housed within the Ministry of Defence (MoD).

The HALO Trust is the only MAO operating in Somaliland and works under the guidance of the MCICA. The HALO Trust Community Outreach Risk Education teams also deliver explosive ordnance risk education. In 2021, The HALO Trust established a partnership with Candlelight, a local NGO which engages in environmental awareness programmes and has supported communities in best making use of formerly contaminated areas.

While officials in the MoD are aware of climate change and its impacts on the environment and are developing relations with the Ministry of Environment and Climate Change, there is no formal consideration of climate change in their work in relation to mine action.

The current IMSMA database, managed by MCICA, does not include environmental or climate vulnerability data for Somaliland.[76]

Case study examples

There is evidence of the positive contributions of mine action to climate resilience in Somaliland. Generally speaking, Somaliland communities experience difficult climate events and live in harsh conditions. They adapt to changing conditions by planting more crops during productive seasons and storing food in their underground during more difficult times. When low harvests affect families, those are supported by the community.

The visited communities confirmed that land release operations have contributed to increased access to roads and improved agricultural production, water access and trade, thus enabling socio-economic diversification. All of these aspects contribute to strengthening these communities' resilience to climate change.

While communities met during the case study widely perceive mine action as positive, they also highlighted some of the harmful impacts of mine action operations on the environment, especially regarding land degradation and biodiversity destruction. Examples were shared on soil erosion, damages to water wells and berkards, which are water reservoirs used in arid areas to collect water during the wet season for use in the dry season.

CASE STUDY 1
SMALL SCALE AGRICULTURAL AND SOCIO-ECONOMIC DIVERSIFICATION IN CARO-YANBO

Caro-Yanbo village, located 29 kilometres away from Hargeisa, was established by internally displaced persons and refugees returning from Ethiopia. The 500 families living in the village are heavily reliant on agriculture, and therefore highly susceptible to climate change effects like drought, floods, strong winds and heatwaves. The communities met during the visit reckon that these events occur more frequently and becoming more severe than in the past.

Caro-Yanbo was a strategic location and the crossing point for civilians fleeing to Ethiopia. Hence, mines were used in order to prevent ambushes and to stop civilians from crossing towards Ethiopia.

Due to the high casualty rates in Caro-Yanbo, the village was colloquially named Markhato, which translates to "where accidents occur" in the Somali language. Between November 2005 and September 2012, The HALO Trust cleared 3 AP mines, 6 AV mines and 12 UXO items in an area of about 273,782 square metres. The released land was a two-kilometre-wide strip either side of the tarmac road.

The primary activity for the community's socio-economic base is agriculture and pastoralism. Grazing land for livestock production and for farming is therefore critical. Although the main purpose of clearance was to save lives through the reduction of risks from explosive ordnance, mine action has also increased safe access to agricultural land, opening opportunities for growing fruits, khat and vegetables. The road has also improved access to markets, with traders travelling with greater ease to other markets to buy goods, and also provided access to buyers coming to engage in trade with the community. Because of the high level of traffic, women from Caro-Yanbo have set up kiosks selling their farm production, including fruits and khat.

The cleared road is also used for delivering water to communities, something which was not possible before land release operations. Access to water was highlighted by the community as the biggest challenge to their food security. While some families have access to individual water reservoirs, or berkards, these are often too expensive and most community members rely on a community berkard that was rehabilitated by the German Agency for International Cooperation in 2006. Farmers also use rainwater to fill hanging bottles to water younger fruit plants until they are robust enough and capable of withstanding droughts.

In addition to the existing community bonds and climate resilience, the Caro-Yanbo case study demonstrates that land release operations have positively contributed to strengthening community resilience. By re-opening the road and expanding crops production, land release operations have enabled communities to generate income to cope with uncertain climate conditions.

Land release of a two-kilometre-wide strip either side of the Caro-Yanbo tarmac road, in Somaliland, led to the increase of traffic, bolstering access to markets and the setting up of kiosks where locally farmed fruits and vegetables are sold in 2023. ©GICHD

CASE STUDY 2
IMPROVED WATER ACCESS IN SAYLA BARI

Community berkards constitute important water capture and storage structures, ensuring water availability in local communities. In Sayla Bari, Somaliland, mine action played a crucial role in facilitating the delivery of water to communities through the clearance of roads. This continues to be of critical importance in 2023, after six years of drought in the region. ©GICHD

The village of Sayla Bari used to be a military camp site of the Somali National Army during the war, initially set up close to the Ethiopian border. Upon request by the Ethiopian government, the camp was moved 25 kilometres inside Somaliland and is now located about 60 kilometres from Hargeisa. Both AP and AT mines were laid along the perimeter of the camp to deter the Somali National Movement that was operating from within Ethiopia. Initial clearance was undertaken in 1992 by a British commercial demining company and was continued by The HALO Trust between July 2016 and February 2019, when land release was completed.

As with other communities in Somaliland, the main economic activity in Sayla Bari is farming and nomadic pastoralism. The 500 families living in the village have experienced the effects of climate change, especially lower water availability due to the constant drought of the last six years.

The communities met reported that mine clearance had improved land access, making larger pieces of land available for cultivation. The clearance of roads in Sayla Bari has also improved transportation, facilitating the delivery of water to communities. In addition, and as access improved, the village saw an increase in the presence of international organisations providing education, health and water support to the community. While no international organisations were present before land release operations were completed in 2019, the World Food Program, World Vision and UNICEF are now operating in the community.

Mine action operations in Sayla Bari have resulted in increased safety for livestock, limiting losses previously caused by mine accidents. Releasing land has also reportedly supported community safety, improved road access and reduced displacement, thereby strengthening community bonds and ultimately resilience.

CASE STUDY 3
ENVIRONMENTAL AWARENESS IN SAYLA BARI

In addition to organic community development taking place in the community, which positively contributes to climate resilience, the Sayla Bari village is currently supported by The HALO Trust and its partner Candlelight, which started engaging with the community that has used the previously contaminated land since 2021. As activities of this project promoting environmental mitigation are relatively recent, the full extent of their benefits is not yet clear. However, some interesting facts and lessons learnt have already been identified.

Communities living in post-land release areas may be hesitant to use the land due to the stigma associated with prior contamination. Land that is clearly marked as safe using different coloured stones that are meant to symbolise safety, can be a constant reminder for some that the land was previously mined and unsafe. Thus, as part of community engagement post-land release, Candlelight has engaged with the community for continuous interventions to restore land use and build confidence and trust, with the ultimate goal of promoting climate risk mitigation.[77] Communities were provided with support and materials for construction, fostering local ownership.

The project includes training communities to employ innovative climate risk mitigation techniques, including digging soil bunds to catch rainwater for regreening cleared land, reseeding cleared land with native grass to reduce soil degradation, planting multipurpose trees for shade and animal fodder, and establishing a school and community nurseries. Acknowledging that the idea of rejuvenating and rehabilitating land by leaving land fallow and protected from grazing might not seem relevant or important to the communities, especially the nomadic pastoralists, Candlelight initiated its project with capacity strengthening on climate change and environmental mitigation, notably by raising awareness on the benefits of such activities in the long run.

Beyond the rehabilitation of land, the project included other components such as apiary activities (beekeeping) as an alternative source of livelihood, with a view of enhancing community resilience. The project also included training and supplies for honey production to support eco-friendly economic diversification. A tree nursery is also being built, with 2,000 trees planted. Through this initiative, community members are trained to build and maintain both beehives and the tree nursery, in an effort to promote local ownership and the sustainability of these activities. There are still areas in Salya Bari where mine clearance has taken place that require regreening. Both Candlelight and the communities agree that there is a need for further education on matters environment and rehabilitation for the project to have impact.

Seedling nursery maintained in 2023 by local communities trained by Candlelight in Sayla Bari, Somaliland. Effective engagement with communities to build trust in post land release settings is a key lesson learned of the Candlelight project. ©GICHD

Crop field in the Rasht Valley, in 2023, located on previously mine-contaminated land. Agricultural land use post land release supports food security for remote villagers. ©GICHD

TAJIKISTAN

Overview

The Republic of Tajikistan is a landlocked country located in Central Asia. Due to a combination of political, geographic and social factors, Tajikistan is recognised as vulnerable to climate change impacts. Aridity, extreme and significant temperatures variability are predominant characteristics of Tajikistan's climate. It is predicted that temperatures in Tajikistan will more regularly surpass 40°C, which could trigger the expansion of arid land for some areas, potentially affecting agricultural yields.[78]

Tajikistan's numerous glaciers, located primarily in the country's eastern regions, serve an important function by retaining water, controlling flows and regulating the climate. Glaciers, snowmelt and permafrost are also important sources of water used to irrigate agriculture, supply industrial and domestic needs. Approximately 95 per cent of all national electricity is generated by hydro stations.

The potential melt of the country's mountain glaciers is likely to reduce the regularity of waterflows and may result in the drying of some watersheds, ultimately aggravating drought conditions in the summer. This, combined with the decreasing snowfall, contributes to increasing food insecurity. Consequently, upland areas that were previously inaccessible due to the climate may become increasingly used, some of which remain contaminated by explosive ordnance. Simultaneous flooding issues and associated hazards such as landslides and mudslides are expected to intensify, impacting lives and livelihoods.

Mountains occupy about 93 per cent of the national terrain. It is also where most minefields and battle areas dating from the 1992–1997 civil war are located. The country has an estimated 8,201,658 square metres of AP mine contamination, consisting in 6,946,658 square metres of confirmed hazardous areas, 1,255,000 square metres of suspected hazardous areas, as well as an additional 4,617,696 square metres of confirmed hazardous areas consisting of battle areas, according to 2022 official figures. Two-thirds of the confirmed mined area is in Khatlon region, which includes Shamsiddin Shohin, the most heavily mined district in the country.

Legislative framework on climate change

In October 2019, the Republic of Tajikistan adopted a National Strategy for Adaptation to Climate Change to 2030 (hereafter named the Adaptation Strategy),[79] looking at climate change risks (natural disasters, flooding, droughts, avalanches, landslides) applicable to agriculture, land tenure and food security. The Committee on Environmental Protection is instructed by the Government of Tajikistan to implement the Adaptation Strategy and report on results. The Committee on Environmental Protection has several functions, two of which are:

- developing and implementing measures aimed at the protection and improvement of the environment, rational use of natural resources, water conservation, recreational areas, natural complexes and natural facilities of special scientific, cultural and recreational significance;
- coordinating and ensuring the implementation of conventions and agreements on environmental protection and use of natural resources undertaken by the Republic of Tajikistan.

The Adaptation Strategy includes detailed cross-sector prioritisation of climate change risks and adaptation strategies.

Climate change and the national mine action programme

The Tajikistan national mine action programme is coordinated by the Tajikistan National Mine Action Centre (TNMAC). Two MAOs are currently active in Tajikistan in addition to MoD teams, coordinated by TNMAC, namely the Swiss Foundation for Mine Action (FSD) and NPA.

TNMAC has adopted an NMAS on environment, health and safety, based on the principles of IMAS 07.13, specifically looking at the environmental impacts of demining operations. TNMAC is scaling up its efforts to report on environmental issues. It has recently implemented a post-land release impact assessment which is in the process of being migrated to a Survey123 form. A number of questions within the form are applicable to climate resilience, such as:

- Use of an area before/after land release? (With categories on agriculture, water supply, non-agricultural activities, use of vital infrastructures, use of roads)
- Did the area have an economic development plan before mines were laid?
- Has the economic development plan been implemented in the area after the completion of the land release operations?
- What is the productivity of the land one year following being released?
- What benefits will a cleared area bring to equality in the future?
- Additional requests? (In one example, a community requested that TNMAC construct a water pipe system; as this is out of TNMAC's domain, TNMAC passed the request on to the relevant ministry.)

TNMAC has a prioritisation system based on the following factors:

- threat to human life (accidents or near misses);
- requests by another governmental agency for clearance (for example, the border forces of Tajikistan need clearance to take place in order to build a road);
- access (for example, snow-covered areas may only have a 60-day window per year to work within);
- operators' capacities.

TNMAC provides a quarterly report of its activities to the MoD. While there is some level of coordination, no formal liaison mechanism is yet in place between the Committee on Environmental Protection, its priorities and TNMAC.

NPA and FSD, have placed a priority on measuring community impact and resilience as it relates to socio-economic factors. NPA has developed electronic pre- and post-land release impact assessment forms, and FSD has pioneered a community engagement approach that covers socio-economics, risk education and pesticide risk education. Their environmental community teams conduct a process similar to NTS to determine what/where the needs are for pesticide remediation projects. FSD has also engaged in pesticide risk education in the south of Tajikistan in the past via a project funded by OSCE.

Case study examples

Mine action enabled access to drain canals which had previously been unmaintained. Their subsequent maintenance increased arable land, and thus food security and the economic output of the local the community farm (referred to as *dekhan*). In addition, the maintenance of the irrigation network not only improves water security by enabling the movement of water to where it is needed to support agriculture, but also by managing heavy precipitation and associated flash flooding.

Moreover, it has enabled the safe construction and maintenance of infrastructure (pipelines, roads, community hydro-electric installations, etc.) in mountainous areas that are particularly vulnerable to climate change. Larger agricultural production and water access facilitated by mine action have contributed to strengthening communities' resilience to climate change.

The growing lack of snow cover for longer periods in the year accelerates glacier melt as reflectivity reduces. As pressure on land simultaneously increases, it is likely that uplands previously above the snowline will increasingly be pressed into use and that further explosive ordnance contamination may be encountered.

Like all glaciers in Tajikistan, the glacier supplying water to villages in the Rasht Valley, north-east to Dushanbe, keeps receding in 2021. Given the history of warfighting in the region, the pressure to use land previously above the snowline will likely uncover new contaminated areas. ©iStock.com/Olga Borisova

CASE STUDY 1
WATER SECURITY AND AGRICULTURE IN THE PANJ RIVER

The Panj river demarcates much of Tajikistan's southern border with Afghanistan. In 2001, its basin was designated a wetland of international importance.[80] The area visited during the study included mixed arable farming, market gardens and some livestock from the array of agricultural activities on the Tajik side of the border.

Mines were laid between 1992 and 1998 on the Tajik side of the river during and after the civil war. The presence of mines limited local communities in their ability to maintain the network of open canals and, as a result, some areas that had previously been cultivated became unusable. While wetlands are vital reserves of biodiversity, the food security of the *dekhans*[81] was impacted and an increase in vector-borne diseases was reported in at least one location.

The village of Navobod is a dekhan with a population of over 1,000. It is located less than a kilometre from both the Panj River and the border with Afghanistan. The dekhan is mainly arable (some livestock) and grows significant crops of cotton, potatoes, apples, cherries and apricots. The Panj River supplies both irrigation and drainage. The system of open drainage canals requires annual maintenance and, due to AP mines preventing access to three main drainage canals into the river, an area of 60 hectares had been inundated for approximately ten years.

Flooding and heavy precipitation were cited by interviewees as major sources of climate change-related risks, having significant socio-economic impact. A neighbouring community near Navobod has experienced sustained crop losses following heavy rainfall.

Following a mine-related accidents at the Navobod dekhan with a piece of plant machinery, the community requested for the areas to be cleared. Access to the drainage canals and the land was restored to rainfed pasture following land release operations in 2011, 2018 and 2020.

The total land released amounted to 673,000 square metres. While the soil is friable and prone to wind-blown erosion, it is now being cultivated and used as pasture.

Clearance of a similar set of riverside confirmed hazardous areas 14 kilometres to the southeast, near the village of Gulobod, enabled drainage maintenance and the removal of standing water from an area where vector-borne diseases had been reported.

Mine action operations in the area have been reactive to local community requests for assistance and have been proactive in supporting the Border Forces of Tajikistan to improve access to border outposts. Infrastructure development (roads, electricity) is a prerequisite for improved border security and local communities have benefitted from this. Border security and the associated stability that comes from the rule of law are vital for communities to build resilience to any change.

Slide showing the location of drainage collectors ©TNMAC

CASE STUDY 2
WATER SECURITY THROUGH INFRASTRUCTURE IN THE RASHT VALLEY

The Rasht Valley lies to the north-east of Dushanbe. Within its watershed are multiple glaciers whose meltwaters irrigate a wide-ranging set of crops (for example, potatoes, apricots, wheat). During a visit to the Kadara region, the Deputy Head of Community cited problems with landslides, road damage, higher temperatures and melting glaciers. The community experiences challenges for agriculture regarding water demand management throughout the year and the importance of local authorities' support in maintaining water supply canals.

During the civil war, the Rasht Valley was a stronghold for anti-government forces and, as a result, saw cluster munition strikes and the use of AP mines. The latter were deployed on paths and approach routes to high ground, to protect rebel positions and lines of communication.

Following a mine accident where a shepherd lost a leg, land release teams were deployed to the site. Following land release operations, the irrigation system was repaired to feed water from glacier meltwater and springs. Annual or bi-annual work is required to maintain these water supply pipes but, due to the area surrounding the pipes being contaminated with mines, access to a section of 300 metres of open canal became impossible. Since access to the pipeline was restored in 2019 following land release operations in the area, the community has been able to maintain its water supply.

Mine action has enabled the safe construction and maintenance of infrastructure (pipelines, roads, community hydro-electric installations, etc.) in mountainous areas that are particularly vulnerable to climate change. Larger agricultural production and water access facilitated by mine action have resulted in strengthening communities' resilience to climate change.

AP mines were installed to block access up the ravine in the Rasht Valley, Tajikistan. The release of land in the area has enabled the safe construction and maintenance of infrastructure such as water irrigation systems and roads. (2023) ©GICHD

CASE STUDY 3
DIVERSIFICATION OF SOCIO-ECONOMIC ACTIVITIES IN THE SHAMSIDDIN SHOHIN DISTRICT

Sarigor, in the southeastern region of Khatlon in Tajiskistan, was an abandoned village bordering Afghanistan, heavily mined following the break up of the Soviet Union. 12 years of land release efforts by FSD until 2022 have allowed the villagers to return, rebuild and resume agriculture. ©TNMAC

Shamsiddin Shohin is a district in the Khatlon Region in the southeast of Tajikistan. Sarigor is a village close to the border with Afghanistan. The border area had been heavily mined following the break-up of the Soviet Union and the ensuing civil war in Tajikistan. Russian border troops were stationed along the Tajik–Afghan border until 2005.

During the period 2010–2022, FSD's and MoD's survey and clearance teams carried out survey and clearance of 44 hazardous areas with a total of 1,7 square kilometres of land released, and the disposal of 5,558 explosive ordnance items.

The station and its access road created better access to the village of Sarigor, which had been abandoned. Now cleared, local residents have been able to return, rebuild houses and resume agriculture.

This case study provides an example where mine action has strengthened food security and assisted with diversifying a community's socio-economic base, both of which promote community resilience in general and in terms of climate change impacts. Community resilience has been improved by the new road by reducing access times to market and allowing the reopening of the gold mine as a viable economic activity.

Post land release small scale farming in the Hue Province, Vietnam, has contributed to reducing reliance on imported food, improved water management and enhanced community resilience to climate-related events. ©GICHD

VIETNAM

Overview

Vietnam's long coastline, geographic location, and diverse topography and climates contribute to its being one of the most climate hazard-prone countries of Asia and the Pacific region. Given that a high proportion of the country's population and economic assets (including irrigated agriculture) are located in coastal lowlands and deltas, many rural areas face issues of poverty and deprivation.[82] It has been estimated that climate change will reduce national income by up to 3.5 per cent by 2050.[83]

The country's main vulnerabilities to climate change include chronic heat stress, river flooding and flash floods, and rising sea levels, among others. Vietnam's vulnerability to climate change shocks is compounded by explosive ordnance contamination, which extends across more than 57,000 square kilometres, equivalent to more than 17 per cent of the country's land surface. Contamination, consisting in bombs, mines and other explosive ordnance is mainly concentrated in central provinces including Quang Tri, Quang Binh, Ha Tinh, Nghe An, and Quang Ngai.[84]

Legislative framework on climate change

The Government of Vietnam is a State Party to the UNFCCC, and a signatory to the Kyoto Protocol and Paris Agreement. Vietnam's Ministry of Natural Resources and Environment is responsible for implementing the UNFCCC. Within the Ministry of Natural Resources and Environment, the Department of Meteorology, Hydrology and Climate Change coordinates climate change-related activities, and the Department of Legal Affairs advises on legal aspects of climate change, including legislation development, review and implementation.

In 2011, the Prime Minister approved the National Climate Change Strategy. The National Committee on Climate Change was established as an advisory agency for the Prime Minister and to oversee the implementation of climate change policy. Decision 896, approving the

National Climate Change Strategy through 2050, was issued by the Government of Vietnam on 26 July 2022 to address and mitigate climate change impacts and reduce greenhouse gas emissions. In October 2022, Vietnam published its latest Nationally Determined Contributions (NDC), the Government's climate pledge under the Paris Agreement.

Climate change and the national mine action programme

The VNMAC is the national coordinating entity for mine action operations. The Vietnam national mine action programme is known as Program 504. In the Quang Tri province, the Quang Tri Mine Action Centre plays a lead role in piloting and improving coordination of mine action operations.

As of April 2022, there was no national prioritisation system for clearance of cluster munition remnants, ERW or mines. Prioritisation at the task or lower administrative levels is currently the responsibility of provinces.[85] Existing prioritisation and tasking processes do not yet take climate change challenges or climate resilience aspects into consideration. Following the incorporation of the requirements of Decision 896 within the next Program 504 five-year plan (2026–2030), VNMAC plans to include considerations of climate change challenges when prioritising and tasking mine action.

The collection, processing and dissemination of national geospatial data relating to mine action comes within the purview of VNMAC, which maintains the National Information and Database Centre that is developing Vietnam's IMSMA database further. Hue Union of Friendship Organization operates a database which includes UXO contamination data and Quang Tri Mine Action Centre maintains the Quang Tri mine action database unit. Collected data relates to mapping suspected and confirmed hazardous areas and their proximity to settlements and infrastructure. Beyond land use classification, the databases do not consider environmental and climate-related aspects.

MAOs in Vietnam do not currently implement specific or direct actions relating to climate change when planning mine action activities. Currently, once an operator has been assigned a task by the relevant mine action centre, project planning and execution follows the implementation SOPs that have been prepared in accordance with the national technical regulations and NMASs.

Case study examples

In various regions of Vietnam, mine action has played a pivotal role in addressing climate change challenges and promoting community resilience mine action has contributed to increased agricultural and forestry production, socio-economic development, all of which participate in strengthening communities' resilience to climate change. Mine action has facilitated the creation of economic zones, provided land for agriculture and timber production, prevented disruptions to livelihoods, improved access to services, and supported socio-economic diversification. These initiatives have resulted in sustainable development, boosting agricultural production, reducing reliance on imported food, improved water management and enhanced community resilience to climate-related events.

CASE STUDY 1
AGRICULTURE AND FORESTRY IN SON QUA VILLAGE, PHONG DIEN DISTRICT

The Phong Dien District in Hue Province is an agricultural hub that heavily relies on farming as a major source of livelihood. However, this district is also highly vulnerable to the adverse effects of climate change, particularly flooding and heatwaves. Through interviews with local villagers, it has been observed that these climate change events are occurring more frequently and are becoming more severe over time.

To address the challenges posed by climate change and promote sustainable development, mine action operators have played a crucial role in the district. Their efforts have resulted in the clearance of land previously contaminated by ERW, creating space for new economic opportunities. One significant outcome of this land release is the establishment of a New Economic Development Zone in the area.

The New Economic Development Zone serves as a designated area for economic growth and development, providing a platform for various industries to flourish. The cleared land made available through mine action operations, has become a valuable resource for the establishment of businesses and agricultural ventures within the New Economic Development Zone.

As a direct consequence of land release activities, there has been a notable increase in small-scale agricultural and forestry production at both the individual and village levels. Local farmers and communities have been able to use the cleared land to expand their agricultural activities and cultivate additional crops, including rice and cassava. This diversification of agricultural production reduces the dependence on imported food, especially rice sourced from regions in Vietnam that are likely to experience significant climate stresses.

By promoting local agricultural self-sufficiency, the cleared land and increased agricultural production not only strengthen the resilience of the Phong Dien District against climate-related challenges but also stimulate the local economy. Moreover, reduced reliance on imported food reinforces food security and mitigates the potential economic impact of climate change on the availability and affordability of essential food items.

Overall, the combination of land release operations and the establishment of the New Economic Development Zone in the Phong Dien District has paved the way for economic development, enabling increased agricultural and forestry production. This, in turn, contributes to the long-term sustainability of the community, reduces reliance on vulnerable food sources, and bolsters the resilience of the district in the face of climate change impacts.

In Phong Dien District, Hue Province, Vietnam, a New Economic Development Zone was established after land release. In 2023, a notable increase in small-scale agricultural and forestry production could be seen. ©GICHD

CASE STUDY 2
ECONOMIC DIVERSIFICATION AND CULTURAL LAND USE IN LUONG MAI VILLAGE, PHONG DIEN DISTRICT

In Luong Mai Village, Hue Province, Vietnam, land release allowed not only the productive use for livestock, but also a the establishment of a community cemetery, a cultural and heritage site of significance for the community. ©GICHD

The village of Luong Mai, Hue Province, had long been plagued by the presence of explosive ordnance, which threatened the lives and livelihoods of its residents. The area used to serve as a US military base. Luong Mai village is located on a coastal site, ten kilometres away from the Tam Giang Lagoon and the East Vietnam Sea, making it particularly susceptible to sea-level rise and increased levels of salinity. The area regularly floods during the rainy season. The soil is reported to be of very poor quality but can be used for silviculture[86] and grazing by livestock.

In 2018–2019, NPA cleared 210 cluster munitions and 68 other explosive ordnance items from an area spanning approximately 1,500 square metres. The mission's primary objective was to rid the land of deadly hazards and safeguard the lives of the villagers. The case study revealed that mine action achieved more than just ensuring safety.

It became an invaluable resource for the community, supporting both low-intensity agriculture and forestry. This newfound availability of land brought about a socio-economic upturn that benefitted the villagers in multiple ways.

Not only did it provide ample grazing land for their livestock, but it also offered an opportunity for timber production, becoming a sustainable source of income and resources. The thriving flora and vegetation now absorb carbon dioxide from the atmosphere, making it a source of carbon capture for the community. Additionally, the restored land gained cultural and heritage significance to the community with the establishment of a community cemetery.

These three outcomes benefit the community through socio-economic diversification, facilitated use of marginal land of limited economic value, and support to the development of further community ties with the land.

CASE STUDY 3
RELOCATION, WATER ACCESS AND AGRICULTURE IN TAN HIEP VILLAGE, CAM LO DISTRICT

In 2006, the village of Tnan Hiep in Quang Tri Province was affected by ground collapse, also known as ground subsidence or slumping. Ground collapse is a phenomenon occurring in areas where cavities develop in underlying limestone geology, due to erosion resulting from rainfall. This phenomenon is becoming increasingly prevalent in areas experiencing unusually high rainfall due to climate change.

When the ground collapse occurred, the Provincial People's Committee decided to relocate the 62 affected households to a nearby area, which was contaminated by explosive ordnance. The resettlement of the villagers and building of new houses was therefore possible only after mine action operations were conducted.

Following land release, the Vietnamese Government installed an aqueduct from the local irrigation impoundment to transfer water to the new rice paddies established on the site of a former, forested battle area. Villagers were able to plant rice from 2009 onwards, while at the same time continuing using their fields at the site of the former village for crops (cassava and sweet potatoes). Nowadays, members of the community are employed in the forestry industry. The new village has access to a market access three kilometres away, and the primary and secondary schools are located two kilometres away.

The case study highlights that, in the interests of saving lives, property and livelihoods as well as long-term community sustainability, it was necessary to relocate and recommence building resilience in a more suitable location. Therefore, in this instance, mine action did not assist resilience of the community in its existing location, but ensured that the community stayed together, ultimately preventing its displacement and dispersion. This will hopefully lay the foundation of greater community resilience to climate change in the future.

Additionally, mine action permitted the installation of potable and irrigation water supplies to the new village, and released land permitted the establishment of rice paddies, all of which contribute to climate resilience in the long run.

The rice pads outside the village of Tan Hiep, Qunag Tri Province, Vietnam, constitute evidence of the success of a community relocation due to ground subsidence. Land release was necessary to ensure the establishment of the new village and its community economic activity. ©GICHD

CASE STUDY 4
SOCIO-ECONOMIC DIVERSIFICATION, WOMEN EMPOWERMENT AND SAFE ACCESS TO FORESTS IN TA LAO VILLAGE, DAKRONG DISTRICT

The surroundings of Ta Lao village, Quang Tri Province, have been steadily released from explosive ordnance thanks to mine action operations over the past 40 years.

The village lies in a remote area accessed via an unsurfaced road. Heavy rains cause landslides that block the road. The villagers consider that the climate is getting a lot hotter and there is more rain. Historically, the rainy season extended over two months, now there is rain for six months, which has resulted in more landslides damaging the road and rice paddies. Increased temperatures have affected behaviours in that, to avoid the heat, villagers must start work earlier in the morning, avoid the middle of the day, and work later in the afternoon.

PeaceTrees Vietnam cleared explosive ordnance from 2.4 hectares of land adjacent to Ta Lao, in support of a banana cultivation initiative proposed by the Women's Union of Quang Tri. The project provided financial opportunities to women in the community and, consequently, diversification of their families' incomes. Crops are marketed via social media, leading to greater market exposure for the sale of bananas as well as other village products. Initiatives such as those that apply technology to increase efficiency, and implemented directly by communities, may bring long-term benefits, including greater use of available resources.

In addition to the banana cultivation project, land release enabled the village to construct another irrigation pond, which is also used for fish farming. Furthermore, mine action continues to ensure safe access to forests, which are still partially contaminated by explosive ordnance, allowing villagers access to ecosystem services[87] in the surrounding hills, including firewood, medicinal and edible plants, honey, bamboo shoots and bamboo for construction.

All these initiatives demonstrate how mine action can help to provide all members of a community with opportunities for socio-economic diversification, thereby strengthening resilience to climate-related events as well as economic shocks. Moreover, the cultivation of bananas, a crop with a lower carbon footprint than traditional crops grown in the area (like rice), also contributes to mitigating the effects of climate change and building greater climate resilience.

Besides the banana plantation, further land release activities in forest areas around the Ta Lao village, Quang Tri Province, Vietnam, are allowing villagers access to firewood, medicinal and edible plants, honey, bamboo shoots and bamboo for construction. ©GICHD

An EOD spot task being undertaken in Yemen. The country has an arid tropical climate with extensive areas of desert, being one of the most water-scarce countries in the world. Severe impacts of climate change compounded with yet expanding explosive ordnance contamination has created one of the world's worse humanitarian crisis. © DRC

YEMEN

Overview

Yemen is located at the southern end of the Arabian Peninsula. The country has an arid tropical climate and about half of the territory consists of deserts. Yemen is one of the most water-scarce countries in the world, due to a combination of natural characteristics, high rates of population growth, overuse of water-intensive crops (namely khat), and poor water infrastructure and management.[88]

About 30 per cent of the population's livelihoods is based on small-scale subsistence farming, a sector that is strongly affected by recurring damages to irrigation systems and depleting water sources.[89] Reduced agricultural outputs create further vulnerabilities in a country where over 53 per cent of the population is estimated to suffer from acute food insecurity.[90]

Yemen is already severely affected by the effects of climate change, with recurring droughts, chronic heat stress, increasing rainfall variability and flooding, which often creates irreparable damages to Yemen's already weak infrastructure. The effects of climate change disproportionally affect Yemen's predominantly poor population, especially vulnerable groups such as women and children.[91]

The combined effects of Yemen's prolonged conflict, severe economic crisis and recurrent climate change-related natural hazards have compounded Yemen to one of the world's worse humanitarian crises. Eight years of conflict have also led the country to become largely contaminated by the presence of explosive ordnance. Although the full extent and scope of contamination are not yet known, a baseline survey started in April 2021 in areas controlled by the internationally recognised government has identified 90 square kilometres of land contaminated with landmines, spread across seven governorates.[92] Cluster munition has also been reported in seven governorates.[93]

Legislative framework on climate change

Yemen is a State Party to the UNFCCC and has ratified the Kyoto Protocol and the Paris Agreement. The country submitted its first Intended Nationally Determined Contributions in 2015,[94] and third national communication to the UNFCCC in 2018.[95]

The Environmental Protection Authority, formerly the Environment Protection Council, is responsible for the implementation of the Environmental Protection Law No. 26/1995. It is part of the Ministry of Water and Environment and has the responsibility of issuing regulations, standards and guidelines.

In addition to Law No. 26/1995, Law No. 120/1998 addresses the use of substances that deplete the ozone layer. However, there are no laws yet that specifically address GHG in the context of climate change, despite Yemen's ratification of the Kyoto Protocol.

In April 2009, the Climate Change Unit within the Environmental Protection Authority issued the draft National Adaptation Program of Action to the UNFCCC. The National Adaptation Program of Action identifies three key sectors where adaptation strategies are required: water, agriculture and coastal zones. It aims to address sustainable development, the security of community livelihoods and poverty reduction.

Due in part to ongoing conflict in Yemen since 2014, no substantial progress has been made in the development of climate change policies and measures to mitigate and adapt to climate change.

Climate change and the National Mine Action Program

The management of mine action in Yemen is geographically divided along the lines of the conflict that erupted in March 2015. The Yemen Executive Mine Action Centre (YEMAC) has split into two, YEMAC North based out of Sana'a and YEMAC South based out of Aden. YEMAC South is both the NMAA and a national operator. The Yemen Mine Action Coordination Centre (YMACC) lies under YEMAC South and has responsibility for accrediting international MAOs and issuing task orders. MAOs present in Yemen are DRC, Humanity and Inclusion, NPA, The HALO Trust and Project Masam.

Mine action is operated on an emergency basis, responding to immediate threats from all forms of explosive ordnance, and criteria for prioritising tasks are not well defined. In the South, YMACC operates the IMSMA database. YEMAC has recently approved NMAS, including a chapter on environment, health and safety management.[96] In the absence of related policies and procedures, NMAAs do not specifically consider climate change when issuing task orders, nor require MAOs to implement any specific actions or considerations relating to climate change when carrying out task orders. International MAOs do not have environmental nor climate change policies specific to mine action in Yemen. They implement their organisations' global, generic environmental policies and SOPs, if existing.

Agroecological farming practices such as syntropic agroforestry present many benefits for soils, biodiversity and local communities. Establishing syntropic agroforestry on land previously contaminated by explosive ordnance shows the potential of nature-based solutions for greater climate resilience. ©iStock.com/Alfribeiro

SYNTROPIC AGROFORESTRY

Overview

APOPO has trialled syntropic agroforestry following mine action operations in Zimbabwe, implemented syntropic farming for eight communities elsewhere in East Africa, and has plans to promote the practice in Angola, Cambodia and Ethiopia.

Syntropic agroforestry replicates and accentuates the natural process of ecological succession, giving each plant species ideal conditions for its growth. The system is based on the farmer planting one or a series of crops in locations ideal to their requirements and the surrounding vegetation. Soil structure is maintained, restoring natural nutrient and carbon cycles, which benefits the long-term viability and productivity of the soil. Syntropic farming may result in significant carbon uptake and sequestration in soils, while also creating the necessary plant and soil structure required to naturally regulate rainfall, store moisture and control floodwater, as well as purify groundwater and spring water. Essentially, syntropic agroforestry practices harmonise farming with nature-based climate mitigation benefits provided by ecosystem services.

Syntropic agroforestry in action

In East Africa, the practice has shown benefits for small-holding farmers as well as for commercial farming.

Syntropic agroforestry can be practiced in established fields as well as in areas of forest and scrubland. Following site preparation, which requires targeted clearance of vegetation and trees, waste vegetation ‘mulch’, charcoal (also referred to as ‘biochar’) and manure are mixed and dug into the soil to condition it in preparation for planting.

The trees, shrubs, vegetables and groundcover plants chosen are specific to climate conditions and selected to promote synergistic relationships between plants and trees, and ensure natural benefits associated with plant chemical signalling, nutrient fixing and soil structure. Synergistic interactions between plants remove the need for additional fertilizers, herbicides and pesticides, and significantly reduce irrigation requirements. Depending on growing conditions and the crops sown, fruit and vegetables may be harvested within a few months.

APOPO syntropic farming projects following mine have recently included a community farm on the edge of Gonarezhou Park, southern Zimbabwe, which hope to achieve results similar to the ones pictured above for another syntropic farm also in Zimbabwe ©APOPO

Additional benefits of this form of integrated agriculture and forestry include wildlife diversity in response to the diverse crops planted, and permanent forest cover which not only sequesters carbon but also promotes the development of micro-climates and cooler soils. All of these aspects are essential for mitigating the effects of climate change.

For the communities that implement syntropic agriculture, the practice promotes community collaboration, reduces physical inputs, diversifies diet and nutrition thereby bringing health benefits, and provides year-round crop harvesting and consistent income generation. These elements are, again, central to strengthening community resilience to climate change.

ANNEX II

EXISTING CONTRIBUTIONS AND OPPORTUNITIES FOR CLIMATE RESILIENCE IN MINE ACTION

In line with Recommendation 2.1 to support projects that facilitate climate resilience at the community level, the following table summarises 1) the six climate resilience themes used in this study, 2) examples of mine action's positive contributions to climate resilience at the community level, based on the case studies, and 3) opportunities for climate resilience initiatives in mine action.

IPCC climate resilience themes and descriptions (that are relevant for mine action)	**Examples of community-based climate resilience facilitated by mine action**	**Opportunities for climate resilience in mine action**
 **Societies, livelihoods and economies** ▾ Satisfy communities' basic needs ▾ Improve communities' abilities to sustain their livelihoods and reduce poverty ▾ Societal change and transformation that embrace climate resilient development ▾ Greater climate literacy and information provided through community approaches, including those that are informed by local knowledge	▾ Agricultural diversification in Algeciras, Huila, Colombia Case Study (case study 2) ▾ Farm re-establishment in El Carmen de Bolívar, Bolívar, Colombia Case Study (case study 3) ▾ Small scale agricultural and socio-economic diversification in Caro-Yanbo, Somaliland Case Study (case study 1) ▾ Water Security and Agriculture in the Panj River, Tajikistan Case Study (case study 1) ▾ Diversification of socio-economic activities in the Shamsiddin Shohin District, Tajikistan Case Study (case study 3) ▾ Agriculture and Forestry in Son Qua Village, Phong Dien District, Vietnam Case Study (case study 1) ▾ Economic diversification and cultural land use in Luong Mai village, Phong Dien District, Vietnam Case Study (case study 2)	▾ Continue facilitating communities' sustainable livelihoods through mine action, as a key component of climate resilience ▾ Promote inclusive employment in mine action to strengthen community resilience, especially that of female-headed households ▾ Train and provide sustainable livelihood opportunities to demobilised deminers once mine action operations are completed ▾ In vulnerable agricultural regions, support mine action beneficiaries with programmes that introduce farmers to climate-resilient crops (saline-resistant crops to address increased salinity caused by sea-level rise, water-resistant crops for areas prone to flooding, new/other crops better suited for warmer temperatures or cultivation in higher altitudes), and water and soil management protocols ▾ Strengthen capacities and raise awareness on climate change and its impacts for communities, mine action authorities and MAOs alike, including during community-liaison activities when required ▾ Consolidate indigenous knowledge and local knowledge gained during community-liaison activities to benefit climate change mitigation and adaptation initiatives

IPCC climate resilience themes and descriptions (that are relevant for mine action)	Examples of community-based climate resilience facilitated by mine action	Opportunities for climate resilience in mine action
 **Land, ocean, food and water** ▾ Sustainably sourced agriculture and forest products ▾ Agroforestry ▾ Farm and landscape diversification ▾ Urban agriculture ▾ Conservation, improved management and restoration of forests and ecosystems (especially high-carbon ecosystems, such as peatlands, wetlands, rangelands, mangroves and forests) ▾ Protection and restoration of inland water sources and coastal ecosystems ▾ Ecosystem-based management in fisheries and aquaculture ▾ Land restoration ▾ Cooperation, and inclusive decision-making, with Indigenous Peoples and local communities, as well as recognition of inherent rights of Indigenous Peoples	▾ Ecotourism and sustainable development initiatives in San Luis, Antioquia, Colombia Case Study (case study 1) ▾ Natural resources access and increased business opportunities in the Bjeshkët e Nemuna National Park, Kosovo Case Study (case study 1) ▾ Environmental awareness in Sayla Bari, Somaliland Case Study (case study 3) ▾ Socio-economic diversification, women empowerment and safe access to forests in Ta Lao village, Dakrong District, Vietnam Case Study (case study 4) ▾ Syntropic agroforestry Case Study	▾ Assist appropriately planned restoration of forests and afforestation of marginal land (that is, the establishment of a forest in an area where there was no recent tree cover) ▾ Assist appropriately planned rehabilitation of peatlands, wetlands, rangelands and mangroves for nature-based carbon sequestration ▾ Facilitate and support the introduction of sustainable agricultural, forestry and land use practices, including agroforestry, to beneficiaries of mine action and local mine action staff (building skills which could be used when land release is completed, and staff demobilisation required) ▾ Facilitate and support initiatives for local management of ecosystems and natural resources, including those that have benefitted from mine action
 **Health and nutrition** ▾ Access to potable water and sanitation systems ▾ Access to healthcare systems (including psychosocial care) ▾ Diseases prevention and nutrition improvements	▾ Water security through infrastructure in the Rasht Valley, Tajikistan Case Study (case study 2) ▾ Improved water access in Sayla Bari, Somaliland Case Study (case study 2) ▾ Relocation, water access and agriculture in Tan Hiep village, Cam Lo district, Vietnam Case Study (case study 3)	▾ Assist appropriately planned access to potable water ▾ Assist improvement to sanitation

IPCC climate resilience themes and descriptions (that are relevant for mine action)	**Examples of community-based climate resilience facilitated by mine action**	**Opportunities for climate resilience in mine action**
 **Settlements and infrastructure** ▾ Low-emission construction materials, highly efficient building envelope and the integration of renewable energy solutions ▾ Highly efficient equipment, optimisation of the use of buildings and their supply ▾ Recycling and reusing construction materials ▾ Design standards in sanitation, water, health, transport, communications and energy that account for changing climate conditions ▾ Green/natural and blue infrastructure such as urban forestry, green roofs, ponds and lakes, and river restoration ▾ Water demand management and rainwater harvesting ▾ Energy efficient transport modes	▾ No example collected on mine action's contributions to climate resilience specific to settlements and infrastructures at the community level. ▾ However, examples were shared by MAOs on rainwater harvesting in field offices.	▾ Use nature-based solutions when implementing projects in and around local infrastructures (medical centres, schools etc.). These would support carbon uptake and storage to substantially reduce risks related to extreme events (such as heatwaves, flooding, heavy precipitation and droughts) while generating benefits for health, well-being and livelihoods ▾ For mine action authorities and MAOs, promote organisational GHG reductions by reviewing travel, energy and procurement policies, and by monitoring their own GHG emissions and track progress ▾ Transition fleets to electric vehicles and use sustainable biofuels when appropriate
 **Energy** ▾ Substantial reduction in overall fossil fuel use ▾ Diversification of energy generation sources – from wind, solar or small-scale hydroelectric installations ▾ Energy conservation and efficiency	▾ Livestock farming and renewable energy in Mitrovica, Kosovo Case Study (case study 2)	▾ Promote appropriately planned renewable energy (solar, wind), energy efficiency, water use efficiency for existing and new energy generation systems within communities, and on land that was previously contaminated by explosive ordnance ▾ Transfer mine action offices to renewable energy sources (solar, wind), energy efficiency, water use efficiency for existing and new energy generation systems
 **Industries** ▾ Circularity of materials ▾ Improved water use efficiency	▾ No example collected on mine action's contributions to climate resilience specific to industries.	▾ Implement sector-wide measures addressing material efficiency ▾ Review procurement policies to include principles of local and circular economy and life cycle thinking and assessments

ANNEX III

METHODOLOGY

Study objectives and scope

The objectives of the study were to identify and analyse the links between mine action activities and the resilience of communities to climate change, and to identify further ways that mine action can enhance the resilience of communities to climate change. The following guiding research questions were used to determine the extent to which mine action contributes to climate resilience.

- What mine action policies, strategies, standards, procedures, prioritisation and tasking systems and/or databases are used, which specifically relate to climate resilience?
- In communities previously affected by explosive ordnance, how has mine action facilitated climate resilience aspects?

To answer the research questions, the GICHD consulted with a broad range of stakeholders. Acknowledging that the topic of climate resilience is multidimensional and might apply differently depending on the context, the GICHD conducted five case studies. The selected areas were based on geographical and climatic diversity criteria, and stakeholders' availability to participate in the study. Case studies were conducted in **Colombia, Kosovo, Somaliland, Tajikistan and Vietnam**. Additional country-level and thematic examples were added to complement the case studies, namely from **Palau, Yemen and Zimbabwe**.

For logistical and security reasons, the visits to Colombia, Kosovo, Somaliland, Tajikistan and Vietnam only included a small number of site visits. Nevertheless, mine action authorities and MAOs generously participated in the study process, facilitating access to data and supporting the logistical arrangements for site visits.

Research methods

The study used a combination of desktop research, data collection and review, and direct observation. The research process included a review of the legislative framework of each case study country, and of documents provided by national stakeholders, including policies, SOPs, pre- and post-clearance impact survey data and NMAS. The direct observation included site visits and interviews, both semi-structured using an interview questionnaire and unstructured (mostly with mine action beneficiaries).

It is important to note that the study did not seek to evaluate mine action authorities nor MAOs contributions to climate resilience. The study highlights examples from the mine action sector and recognises the positive contributions it is making towards climate resilience.

The GICHD consulted with 27 institutions, namely nine government institutions (including mine action authorities or centres), six national organisations (civilian or military MAOs), ten international organisations and two civil society organisations. The study team visited 20 communities beneficiaries of mine action in five different countries. In total, more than 40 interviews were conducted and over 110 people met.

The study included both remote consultations and in-person interviews in the form of site visits, which took place between April and July 2023, and detailed in the table below.

20 communities

27 institutions

+40 interviews

+110 meetings

Sites visited		Accompanying organisations
Colombia	Algeciras Municipality, Huila Department	CCBL, OAS
	El Carmen de Bolívar Municipality, Bolívar Department	BDIAN, OAS
	San Luis Municipality, Antioquia Department	OAS
Kosovo	Gjakova and Peja Municipalities	The HALO Trust
	Mitrovica Municipality	NPA
Somaliland	Marodijeh Province	The HALO Trust
Tajikistan	Darvoz and Panj Districts	FSD, NPA, TNMAC
Vietnam	Hue Province	NPA
	Quang Tri Province	MAG, NPA, PeaceTrees Vietnam

The information captured during interviews was cross-referenced with data and information from official documents, as well as reports provided by MAOs. The study used six themes originating from the IPCC's Climate Resilient Development solutions' framework as the main referential for analysis of the data collected.

Carbon footprint of the study

To minimise greenhouse gas emissions, the study team conducted all coordination meetings online. Interviews with national stakeholders were also conducted online when conditions permitted. However, in order to collect first-hand evidence with communities, the study team travelled by air and land to meet with mine action beneficiaries and key stakeholders in their country.

The carbon footprint of this study amounts to approximately 30.25 tonnes of carbon dioxide (CO_2), consisting in scope 3 emissions. In line with the GICHD's Environmental Policy, the GICHD is committed to compensating for these emissions by verified carbon offset initiatives.

GLOSSARY OF CLIMATE CHANGE-RELATED TERMS

The following climate change-related terms are used throughout the study. Unless specified otherwise, all definitions originate from the IPCC's Glossary.[97]

Climate change	"A change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer".
Climate change adaptation	"The process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities".
Climate change mitigation	"A human intervention to reduce emissions or enhance the sinks of greenhouse gases (GHG)".
Climate resilient development (CRD)	"The process of implementing greenhouse gas (GHG) mitigation and adaptation options to support sustainable development for all".[98] CRD requires reducing exposure and vulnerability to climate hazards, cutting back greenhouse gas emissions and conserving biodiversity. Under CRD these are given highest priorities in everyday decision-making and policies on all aspects of society including energy, industry, health, water, food, urban development, housing and transport.
Climate variability	Variations in the mean state and other statistics of the climate on all temporal and spatial scales, beyond individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external factors (external variability)".[99]
Ecosystem	"A functional unit consisting of living organisms, their non-living environment and the interactions within and between them".
Ecosystem services	"Ecological processes or functions having monetary or non-monetary value to individuals or society at large. These are frequently classified as (1) supporting services such as productivity or biodiversity maintenance, (2) provisioning services such as food or fibre, (3) regulating services such as climate regulation or carbon sequestration, and (4) cultural services such as tourism or spiritual and aesthetic appreciation".

Global warming	"The estimated increase in global mean surface temperature averaged over a 30-year period, or the 30-year period centred on a particular year or decade, expressed relative to pre-industrial levels unless otherwise specified. For 30-year periods that span past and future years, the current multi-decadal warming trend is assumed to continue".
Greenhouse gas (GHG)	"Greenhouse gases are those gaseous constituents of the atmosphere that absorb and emit radiation at specific wavelengths within the spectrum of terrestrial radiation emitted by the Earth's surface, the atmosphere itself and by clouds. This property causes the greenhouse effect. Water vapour (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4) and ozone (O_3) are the primary GHGs in the Earth's atmosphere".
Nature-based solutions	"Nature-based solutions are actions to protect, sustainably manage, or restore natural ecosystems, that address societal challenges such as climate change, human health, food and water security, and disaster risk reduction effectively and adaptively, simultaneously providing human well-being and biodiversity benefits".[100]
Resilience	"The capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganising in ways that maintain their essential function, identity and structure while also maintaining the capacity for adaptation, learning and transformation".
Scope 1, 2 and 3	"'Scope 1' indicates direct greenhouse gas (GHG) emissions that are from sources owned or controlled by the reporting entity. 'Scope 2' indicates indirect GHG emissions associated with the production of electricity, heat, or steam purchased by the reporting entity. 'Scope 3' indicates all other indirect emissions, that is, emissions associated with the extraction and production of purchased materials, fuels, and services, including transport in vehicles not owned or controlled by the reporting entity, outsourced activities, waste disposal, etc.".[101]
United Nations Framework Convention on Climate Change (UNFCCC)	"The UNFCCC was adopted in May 1992 and opened for signature at the 1992 Earth Summit in Rio de Janeiro. It entered into force in March 1994 and as of May 2018 had 197 Parties (196 States and the European Union). The Convention's ultimate objective is the 'stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate.' The provisions of the Convention are pursued and implemented by two treaties: the Kyoto Protocol and the Paris Agreement".
Vulnerability	"The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt".

LIST OF ACRONYMS

AP	anti-personnel
AV	anti-vehicle
BDIAN	Demining and Amphibious Engineers Battalion of the Navy
BRDEH	the Colombian Army's Humanitarian Demining Brigade
CCBL	Colombian Campaign to Ban Landmines
CRD	climate resilient development
DRC	Danish Refuge Council (formerly Danish Demining Group)
ERW	explosive remnants of war
FSD	Swiss Foundation for Mine Action
GICHD	Geneva International Centre for Humanitarian Demining
GHG	greenhouse gas
IMAS	International Mine Action Standards
IMSMA	information management system for mine action
IPCC	Intergovernmental Panel on Climate Change
KMAC	Kosovo Mine Action Centre
KPI	key performance indicators
MAG	Mines Advisory Group
MAO	mine action organisation
MCICA	Mine Clearance Information and Coordination Authority (Somaliland)
MoD	Ministry of Defense
NDC	Nationally Determined Contributions
NDP	National Development Plan
NDGAIN	Notre Dame Global Adaptation Initiative
NMAA	national mine action authority
NMAC	national mine action centre
NMAS	national mine action standard
NPA	Norwegian People's Aid
NTS	non-technical survey
OACP	Office of the High Commissioner for Peace (Colombia)
OAS	Organization of American States
OSCE	Organization for Security and Cooperation in Europe
PALARIS	Palau Land and Resource Information System
PM/WRA	US State Department's Bureau of Political-Military Affairs
SOP	standard operating procedure
TNMAC	Tajikistan Mine Action Centre
UNFCCC	United Nations Framework Convention on Climate Change
UNMAS	United Nations Mine Action Service
UXO	unexploded ordnance
VNMAC	Vietnam National Mine Action Centre
YEMAC	Yemen Executive Mine Action Centre
YMACC	Yemen Mine Action Coordination Centre

ENDNOTES

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