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Residual Risk Management

Warning

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Foreword

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

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

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 Over time, some TNMA may be 'promoted' to become full IMAS, while others may be withdrawn if no longer relevant or if superseded by more up-to-date information.

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

TNMA are compiled by the Geneva International Centre for Humanitarian Demining (GICHD) at the request of the United Nations Mine Action Service (UNMAS) in support of the international mine action community. They are published on the IMAS website at www.mineactionstandards.org.

Introduction

Every armed conflict leaves behind explosive ordnance (EO[1]), also sometimes referred to explosive remnants of war (ERW[2]) in lesser or greater quantities depending upon the nature and duration of the conflict and the types and quantities of weapons used. How EO are dealt with reflects local circumstances and conditions, as well as commitments made by affected states under international humanitarian law (IHL), the availability of resources, and prioritisation choices made by governments, international institutions and agencies.

In almost every case, an initial period of proactive effort to clear the threat posed by EO is followed by the adoption of more reactive policies and practices. Whether states are signatories to international treaties or not, the principle of using 'All Reasonable Effort' to remove EO and landmines should be followed. The duration of the transition period varies from state to state, but in every case a situation eventually arises when the EO that remain, and yet remain unknown to the relevant authorities, are treated as 'residual'. The potential for a given weapon to cause harm to human activities is a fundamental part of the long-term risk assessment and management process. A policy that assumes potential for interaction, when such potential does not in fact exist, is likely to be inappropriate and inefficient. A lack of information and understanding (meaning uncertainty), leads to poor risk management polices / procedures. Conversely, evidence-based decision-making and policy-development are more likely to be appropriate, well targeted and efficient.

No post-conflict environment is risk-free, and risk cannot be totally eliminated, but it can and should be mitigated and managed. It is the responsibility of the national or regulatory authority to ensure that residual risk mitigation and management policies / procedures are in place to ensure that the EO residual risk is at a level agreed as 'tolerable' by authorities and stakeholders. What constitutes "All Reasonable Effort" to survey locations of EO is currently unclear and is a key area where Information Management and historical data become critical to evidence-based decisions making[3]. It should be noted that risks are not only those that have the potential to cause direct human harm, but may also include those that can influence economic activity, freedom of movement, and other aspects of importance to a society and economy.

[1] Explosive Ordnance refers to all munitions containing explosives, and is defined in Article 3.99 of IMAS 4.10 (Amendment 8, 2018). By definition EO includes ERW, defined below.

[2] Explosive Remnants of War (ERW) is an umbrella term first defined in Article 2 of Protocol V of the Convention on Certain Weapons, November 2003. It defines ERW as either unexploded ordnance (UXO) and abandoned explosive ordnance (AXO). ERW excludes mines, booby traps and other devices as defined in Protocol V of the CCW as amended on 3 May 1996. This document references IMAS 4.10 (Amendment 8, 2018), which incorporates the CCW reference.
https://unog.ch/80256EDD006B8954/(httpAssets)/5484D315570AC857C12571DE005D6498/$file/Protocol+on+Explosive+Remnants+of+War.pdf
https://www.mineactionstandards.org/fileadmin/MAS/documents/imas-international-standards/english/series-04/IMAS_04.10_Glossary_of_mine_action_terms__definitions_and_abbreviations.pdf

[3] If signatory to APMBC or CCM 'tolerable' risk is determined as 'every effort' or 'All Reasonable Effort' to remove all known landmines/cluster munitions.

1. Scope

This TNMA describes the general principles and framework for Residual Risk Management in mine action. States affected by EO are faced with a number of difficult decisions when they establish their mine action program, such as "to what depth should operators clear?" and the prioritisation of "what tasks to do first?" The deliberations and conclusions that ultimately are drawn together in national standards are part of an implicit or explicit risk management approach. Over time, risk assessments require review and modification to reflect evolving contexts. States often start with proactive efforts to find EO, often prioritising those that pose the greatest risk immediately after a conflict (typically aided by the international community). Thanks to the survey and clearance carried out in the proactive phase, risks affecting large areas gradually decline and operations can be combined with reactive EOD / spot task as determined by the risk assessment relating to the remaining EO. The analysis of risk and the accompanying mine action response must therefore be carried out for various phases in a mine action programme. Overall, the shorter-term proactive phase will imply a heavier investment of targeted resources to reduce the risk, often over large areas, to acceptable levels[4], while Long-Term Risk Management (LTRM) issues constitute the reactive site-specific phase and should be mainstreamed into sustainable, nationally owned structures.

Establishing state-specific roadmaps for transition from proactive survey and clearance to a reactive phase is an important process for each mine action programme. It is the prerogative of the relevant national authority to establish what the residual context is while working with key stakeholders[5]. The mine action sector has spent much time and energy in productively developing and improving cost-efficient methodologies for land release through survey and clearance of suspected and confirmed hazardous areas (SHA and CHA). A complex element of these discussions involves the criteria for releasing land in a national context. For example, what are the determined clearance depth and fade-out requirements as well as the potential cost of returning to areas and clearing low-density contamination at a later date? Unless recontamination occurs, the commitment of using additional resources is considered unreasonable since the costs for logistics and support in clearing the site would be roughly doubled. These discussions will inevitably lead to a review and evaluation of the relative cost of survey and clearance efforts, and the opportunity costs of resources that are, or can be, made available. These issues need to be considered against appropriate strategic planning and risk management methodologies to develop effective/efficient systems for addressing any remaining EO threat, from proactive survey and clearance procedures to a reactive risk management strategy.[6]

National standards and relevant treaty frameworks require every effort and/or `All Reasonable Effort` in clearing the EO threat. There are inevitably diminishing returns in the investment costs of proactive survey and clearance. The balance and tipping point between proactive survey and clearance and a reactive risk management strategy is significant in the life cycle of a programme[7].

[4] If a state is signatory to the APMBC or CCM the 'acceptable level' is determined by the respective treaty obligations. It is a responsibility of the state to clarify what 'All Reasonable Effort' is relating to land release, or treaty obligations (APMBC, Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on Their Destruction, 1999; . The Convention on Cluster Munitions, 2008)

[5] Ibid.

[6] Ibid.

[7] Ibid.

2. References

A list of normative references is given in Annex A. Normative references are important documents to which reference is made and form part of the provisions of this TNMA. Informative references are made throughout the document (footnotes), particularly including references from the *Journal of Conventional Weapons Destruction* article, entitled "The Challenge of Long-term Risk Management in Mine Action."

3. Residual risk management – background

As a country or region recovers from conflict clearing EO becomes less of an immediate emergency and high priority, with, over varying timeframes, reactive responses replacing proactive survey and clearance programmes[8]. Responses to EO and landmine risk become less centrally managed and are demand driven. As time goes on, UN, specialist NGOs and commercial operations wind up programmes, and leave or hand over assets to national ownership. All mine action/human security programmes operate within this continuum, represented in Figure 1, with each state or region progressing to their own transition point from proactive survey and clearance to reactive risk management strategy of a residual EO threat. The capacities to respond tend to be confined to a few specialist military/police units, civil defence, fire service, and commercial service provision, the scale of which is determined by the need of governments and/or market forces[9]. Government wholly finances police and military resources, with commercial clients and investors paying for EO search and mitigation functions only when necessary.

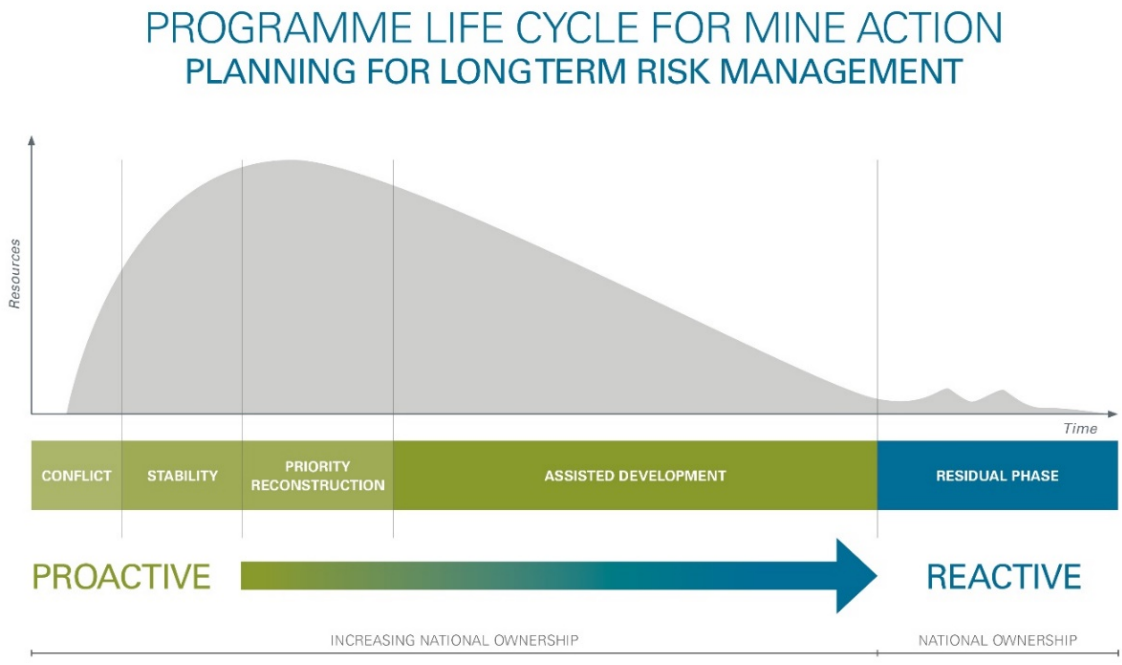

Figure 1: Evolution of Risk Management Response. Adapted, GICHD

[8] States that are signatory to APMBC or CCM to address every known landmine/cluster contamination area (APMBC, Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on Their Destruction, 1999; The Convention on Cluster Munitions, 2008)

[9] https://www.gichd.org/fileadmin/GICHD-resources/rec-documents/MORE_Issue_Briefs-June2015.pdf , accessed 14 September 2017

States subject to this transition have opportunities to apply principles of strategic planning and risk management based on local circumstances and conditions to develop efficient and effective residual EO risk management systems.

4. Risk management approach

The mine action sector is making more use of structured risk management principles and tools across all activities and at all levels within the sector. Risk is typically expressed as the 'combination of the probability of occurrence of harm and the severity of that harm' (IMAS 04.10 and ISO Guide 51:2014). It can also be expressed as the effect of uncertainty on objectives (**ISO 31000: 2018)**. The primary means of reducing uncertainty, and consequent risk, in any situation or circumstance, is the systematic collection and analysis of sufficient, relevant information.

4.1 Tools of risk management approaches[10]

Reducing risk to a level as low as reasonably practicable (ALARP) should apply to the management of residual EO (see Figure 2). There are risks that are generally accepted as being so low that no action is required, and there are risks that are clearly unacceptable. Between those two relatively straightforward categories lies a range of risks and varying conditions. ALARP and `All Reasonable Effort` embody a concept in which additional survey and clearance cannot be justified in terms of the benefits that would accrue from the extra expenditure of time, resources, or money, leaving the challenge of managing the residual EO threat. IMAS define residual risk as "the risk remaining following the application of all reasonable efforts to identify, define and remove all presence and suspicion of mines/EO through nontechnical survey, technical survey and/or clearance." It is logical to understand residual contamination as the sites or areas where mines or EO are discovered following the application of `All Reasonable Effort` to survey/identify and then process (cancel, reduce, or clear) all known SHAs and CHAs in a given locality.

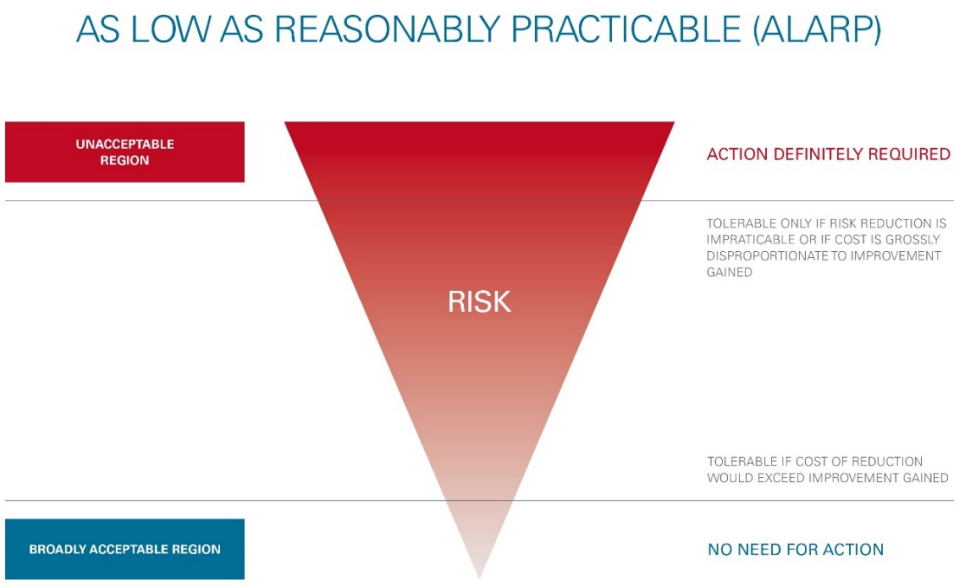

Figure 2: Illustrating the ALARP concept (after ISO 31010)

[10] IMAS 07.14 Risk Management in Mine Action aims to provide mine action managers, at every level, with the guidance they need to identify and manage the risks associated with their work and responsibilities.

Reactive management of risks posed by residual contamination requires a different site-specific risk management approach to the one utilised during the proactive survey and clearance phase. This requires a review of the established institutional architecture, as well as the development of evidence-based systems, tools, and processes, such as one depicted in Figure 3. Whichever approach is adopted in each state-specific scenario will rely on the information that is available to assess potential risks. Quantifying or predicting the known unknowns is problematic and remains a constraint on identifying what level of resources may be required to effectively address any remaining residual contamination.

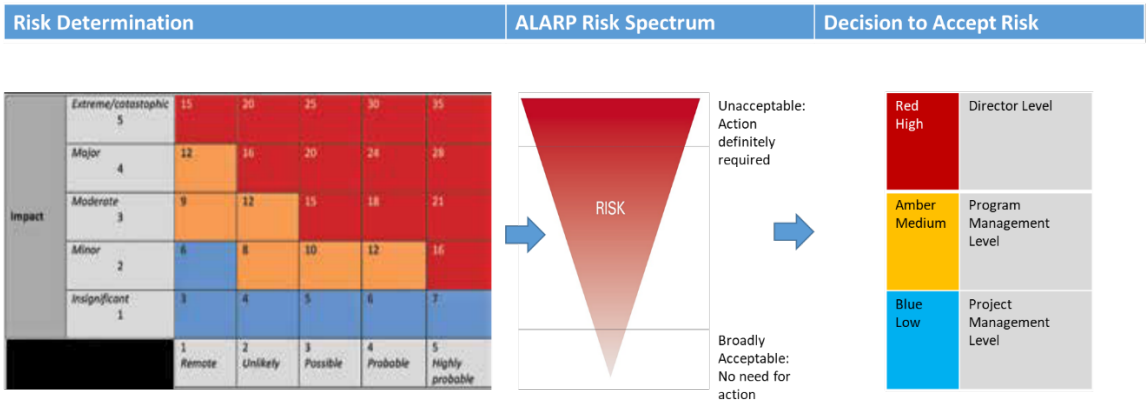

Figure 3: Risk scoring, corresponding ALARP action, and responsibility level for decision.

A rigorous approach to respond to all EO risk that affect the achievement of a state`s economic objectives is one framework on which to base the management of residual EO contamination. A risk management strategy embedded in a national system will allow the potentially negative impact of residual EO to be mitigated effectively. The objective of residual risk management is to fully understand the nature of the residual risks to which governments and communities are being exposed in order to implement sensible, cost-effective measures to minimise the downside and maximise the upside, Figure 4.

Figure 4: The Risk Management Cycle

The following examples illustrate possible actions, relating to several components of mine action management represented in Figure 4:

- The risk may need to be avoided by ending that activity (e.g. stopping work in a particular area)
- The risk liability could be transferred to a third party (through contracting services)
- The risk liability could be shared with others (e.g. a joint venture project)
- The risk impact can be reduced or eliminated by establishing or improving control procedures (e.g. quality management, risk management - residual risk management systems)
- The risk may need to be insured against (this often happens for residual risk in other contexts, e.g. employers liability, third party liability, theft, fire)
- The risk may be accepted as being unlikely to occur and/or of low impact and therefore, will just be reviewed periodically or as required.

The driver behind continual improvement processes is the Plan – Do – Check – Act (PDCA) cycle occurring at every level, and within every mine action activity. For most people principles of continual improvement are instinctive, but within organisations the improvement process should be managed in a structured way.

The purpose of risk identification is to understand the reality of EO risks, as opposed to the perception of those risks. The way in which EO risks are perceived by society and the general public is an important part of the context, but effective management of residual EO is based upon identifying and understanding the reality of those risks. Residual risks only exist when three associated factors are combined: An explosive **hazard** must be present at a **location** where an **activity** capable of interacting with the hazard is taking place or will take place. In the Risk Diagram (Figure 5), a real risk only arises in the central red zone of the diagram. All three contributing factors need to be understood when identifying residual risks of EO, and that perception of risks may extend outside the red zone.

Figure 5: Risk Diagram: Risk arises where all three factors overlap

Specific states or regions that moved from a proactive to a reactive approach to EO contamination should acknowledge the developments made over recent years in regards to approaches to tackling / assessing risk. Many organisations outside mine action now take account of adverse events that are rare or unprecedented, where the rules are unknown or rapidly changing, or where risks are driven by external factors beyond their control. These risks, which have high impact and low likelihood of occurrence, are now accepted by many as having greater importance than those with a high likelihood of occurrence and an insignificant impact. In the case of residual EO, the concept of impact and the likelihood of events occurring should be given prominence in risk assessments and processes.[11]

The aim of a residual risk management strategy needs to include a comprehensive list of risks associated with the potential presence of EO. It should be noted that risks are not only those that have the potential to cause direct human harm, but may also include those that can influence economic activity, freedom of movement and other aspects of importance to a society and economy.

If a geographic location is susceptible to an event that potentially might have an extremely high impact on its surroundings, the risk should be considered and evaluated regardless of how remote the likelihood of its happening appears to be. Mine action authorities (national governments) will need to find the balance between weighing the nature of the risk and its impact alongside its likelihood of occurrence, and cost. With limited resources, the risks and the benefits or rewards from the activity concerned will need to be considered in addressing the residual risk.

4.2 Evidence based risk management

A key area of focus for long term risk management must be on the integrity of land release data, and the integrity of spot task data, including GPS and sketch map, as well as the condition of items found (i.e. abandoned or unexploded). Systems need to be developed and established so that relevant data can be used to inform risk management decision making once the proactive survey and clearance activities have ceased. Future decision making will benefit from access to comprehensive data on survey and clearance. The risk management issue of clearance depth relates directly to land use. If the land is for current agricultural use, for example in states such as Cambodia, Laos, and Vietnam, then the national standard survey and clearance depth does mitigate the threat to communities. When agricultural practices are being developed and, for example, heavier machinery is used, or land use in specific areas changes through infrastructure development, urbanisation, construction, etc., a risk review/response is needed before activity takes place, see Figure 6. Accident data should also be noted as contributing to the risk analysis. Therefore, communication and record keeping during the land release process is crucial for the future management of residual risk. If the survey and clearance data is absent or inconsistent, the residual risk management approach has less evidence on which to base decisions.

[11] Charities and Risk management (CC26) (new format February 2017), https://www.gov.uk/government/publications/charities-and-risk-management-cc26 , p14

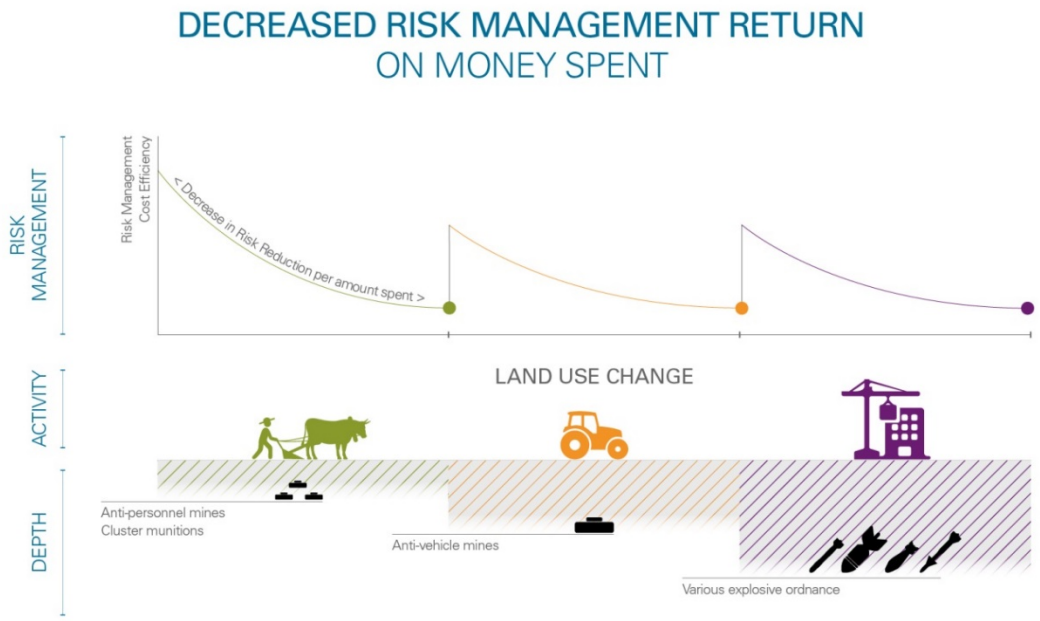

Figure 6: Risk Management Cost Effectiveness evolution with change in Land Use

Using evidence to support decision making is fundamental to risk management and quality management in mine action. Similar to IMAS 07.11 Land Release, 08.10 Non-technical Survey and 08.20 Technical Survey, residual risk management approaches are dependent on the collection and analysis of evidence to support valid and efficient decision making, in a residual context when land use change requires a new risk assessment of previously surveyed and cleared locations. Responsible authorities and mine action operators should always ensure that survey and clearance is completed comprehensively, that the location, items and depth are recorded, and that all is documented for a defined handover to the recognised authority. This delivers a specific defined record of the safe land, to allow communities and others to manage future developments. Inconsistencies in recording data, and in data management remain ongoing challenges for long term, evidence-based risk management policies / procedures. Every effort for treaty compliance does not include proactively searching for all deep buried, large air dropped munitions targets. This is the domain of the reactive mitigation of EO in a residual context, and is one area where establishing effective long-term risk management strategies can focus.

4.3 Terms and definitions relating to residual EO / residual contamination

IMAS 04.10, Second Edition (Amendment 8), July 2018; 3.248: `Is the risk remaining following the application of all reasonable effort to identify, define, and remove all presence and suspicion of explosive ordnance through non-technical survey, technical survey and/or clearance`. The IMAS Review Board sub-committee (2016) also proposed the following definition of residual contamination: 'Residual contamination refers to contamination which gives rise to residual risk'. The definition states that `All Reasonable Effort`[12] has to be applied before reaching a residual state, and using additional resources shall be considered 'unreasonable' in relation to the results expected. The definition of what is 'unreasonable' has to include considerations of what the tolerable level of risk is (ALARP).

[12] The Term "All Reasonable Effort" is defined in IMAS 4.10: "all reasonable effort describes what is considered a minimum acceptable level of effort to identify and document contaminated areas or to remove the presence or suspicion of mines/EO. All reasonable effort has been applied when the commitment of additional resources is considered to be unreasonable in relation to the results expected."

The current definition of residual contamination in IMAS implies that a residual context is the result of the application of `All Reasonable Effort` to release land (survey, identify, remove and/or destroy all EO hazards from a specified area to a specified depth. The concept of `All Reasonable Effort` has been applied, when the commitment of additional resources is considered to be unreasonable in relation to the results expected[13]. The definition of what is unreasonable should include considerations of what is the tolerable level of risk. These considerations and decisions must be made on the level of national authorities / government institutions. The application of residual risk management requires a clear definition of what is nationally considered to be a tolerable level of risk for residual EO.

Before processes, tools and protocols to identify and manage residual EO can be established, the scope of 'residual EO / contamination' must be defined. As listed above, IMAS 04.10 gives several definitions relevant for the determination of risk related to residual EO contamination.

The terms 'mine free' and 'impact free' express two very different approaches to how a contamination problem can be treated. 'Mine free' means that all mines in a contaminated area have been cleared to a certified depth or that a specific area or state does not contain/have any mines. This term is related to the Article 5 obligation of the Mine Ban Treaty[14], which demands the destruction of "(…) all mines in mined areas (…)". The Oslo Convention[15] requests a similar treatment of cluster munitions contamination by demanding the destruction of "(…) all cluster munition remnants (…) ".

The IMAS definition of 'impact free' is applied to countries "that my still have mines but where the mined areas are not having a negative socio-economic impact on communities"[16]. 'Impact' is furthermore explained as the product of the presence of an EO hazard in a community, the number of victims of EO incidents within the last two years and the intolerable risk associated with the use of infrastructure or livelihood activities.

IMAS also offers two definitions related to risk. 'Tolerable risk' is defined as risk, which is accepted in a given context based on current values of society[17]. 'Residual risk' relating to treaty compliance, is related to the term 'mine free' and is used to describe the risk remaining following the application of `All Reasonable Effort` to remove and/or destroy all EO hazards from a specified area to a specified depth.

The specific term 'residual EO / contamination' is not used in IMAS. The current listed terms and definitions therefore cover two different viewpoints in regard to a contamination problem: It can be seen as a problem to be dealt with as a matter of treaty principle (aiming to clear all known contamination) or with regard to its impact. The first approach is mandatory for all convention state parties regarding the mine and cluster munitions contamination but allows states to treat their other EO contamination according to risk and impact. Non-state parties are of course not obliged to clear all known contamination. The application of residual risk management requires a clear definition of what is nationally considered to be a tolerable level of risk, so that the transition from proactive to reactive EO response can be understood and defined in terms of policy and practice. Defining a national level of

[13] IMAS 04.10 (UN Inter-Agency Coordination Group on Mine Action, 2003)

[14] APMBC, Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on Their Destruction, 1999

[15] The Convention on Cluster Munitions, 2008

[16] IMAS 04.10, 3.136. Impact free, 2004: a term applied to countries that may still have mines but where the mined areas are not having a negative socio-economic impact on communities, e.g. the mines may be in remote, marked and unpopulated areas.
Note: In most cases, "impact free" should be considered in a static sense (i.e. impact free at this point in time) because changes in socio-economic patterns may bring people into contact with mines/ERW that previously had no impact.

[17] IMAS 04.10, 3.287. tolerable risk: risk which is accepted in a given context based on current values of society. [ISO Guide 51:1999(E)]

tolerable risk in regard to EO contamination should be based on evidence-based decision making, and include risk evaluation, risk treatment and risk review (the risk management cycle).

5. Variation in approach to responsibilities and liability in the legal framework

Key considerations for the effective management of residual risk concern the legal framework, and establishing responsibility for action and accountability. There is a good international practice from Europe and other states where the proactive clearance has been completed. Some examples include:

Germany

Germany regulates rights and duties in the basic law but leaves the management of it completely to the different states[18]. The states have independent mine action centres (the so-called "Länderräumdienste") responsible for EOD callouts, most disposals of located EO and information management. The responsibility for area clearance is with the "disturber"; the landowner who is obliged to investigate the EO threat on his or her land, if he or she plans any "disturbances" (e.g. construction work). The mine action centres support such investigations complementarily with available data and expertise in the planning of risk mitigation measures, and rarely also with the implementation of measures. But generally, clearance is conducted by commercial companies, which are paid by the landowners (from case to case with a participation of the state, depending on the planned project and benefit of the project). The Armed Forces are only responsible for UXO clearance on their own training grounds.

United Kingdom,

In the UK, the responsibility for UXO threat is with the employers and regulated under the Health and Safety at Work etc. Act 1974 and the Management of Health and Safety at Work Regulations 1999 (Health and Safety Executive, 1974 and 1999). Construction professionals have further specific duties under the Construction (Design and Management) Regulations 2015 CDM2015 (Health and Safety Executive, 2015). Under CDM2015, the client has the legal responsibility for the way that a construction project is managed and run and is held accountable for the health and safety of those working on or affected by the project. The responsibility can therefore be seen as being with the "disturber" as well. A specific guideline published by the Construction Industry Research and Information Association CIRIA (2009) gives detailed information on how to conduct EO threat assessments, but this is taken legally as good practice but not mandatory under law. EO threat assessments are at a first stage usually done by the employers, but for any further assessments and risk mitigation measures, commercial contractors are mandated.

United States of America, Canada and Switzerland

In the USA and Canada, where the contamination is caused by their own Armed Forces, the EO problem is managed within the regulations for all contaminated sites under the environmental law. In both countries the environmental agencies are the decisive authorities concerning the need and kind of risk mitigation measures, but Defence Departments are generally responsible for detailed risk assessments (technical survey) and clearance. They contract commercial companies if needed to assist them or to share the workload. As the government is the "polluter", the costs are covered by government agencies. The situation in Canada, where EO contamination can be found on former training grounds already in

[18] Leitstelle des Bundes für Kampfmittelräumung, 2014

use by civilians, is similar to the situation in Switzerland, where contamination (of the own Armed Forces) is widespread and on ground that are only partly known to be former training grounds. The Department of Defence covers clearance and EOD callouts all over Switzerland, but is in principle just responsible for remnants of Swiss Armed Forces ammunition. Clearance is conducted with support of commercial companies, as resources of the Armed Forces are limited. Other ammunition (e.g. WWII EO along the German and French border) are principally in the responsibility of the police, but as the national EO hotline is maintained by the Armed Forces and most announcements are made over this hotline, tasks are often handled in cooperation of the police and the Armed Forces. The environmental legislation in Switzerland covers ammunition-contaminated sites in regard to the water and soil pollution with toxic components, but not in regard to the EO threat. The management of the EO threat is handled within the Department of Defence and regulated under a specific decree, military regulations for EOD and national standards for clearance of ammunition remnants.

Republic of Croatia

The Republic of Croatia has established various mechanisms to manage the reactive phase of survey and clearance operations. These activities are undertaken in close cooperation between Police EOD teams, the Ministry of Interior and the Croatian Mine Action Center (CROMAC).

Currently, the response to EO call-outs and spot tasks is managed in two ways:

- If a mine/EO is discovered in a previously marked CHA that was reported as cleared, the Croatian police will be notified. If the item was found below 20cm of depth, and is confirmed to be located in a previously marked polygon, CROMAC is informed and examines whether the area needs to be re-included in a SHA and/or whether a formal investigation has to be initiated by the Ministry of Interior. Depending on the result of the investigation, the Ministry of Interior will ask CROMAC for additional documentation and/or issue a fine for the respective commercial company responsible for clearance[19].

- If a mine/EO is discovered outside a previously recorded SHA/CHA (and within 20cm depth), the police will be responsible for the survey and clearance of the area. In these instances, the civil protection services are contacted and witnesses are gathered to collect additional information on the surrounding area. Each geographical district in Croatia has its own Police EOD Disposal unit. In case of no evidence for a dense placement of EO, the item will be destroyed on site. This second mechanism has been the established practice for how Croatia has managed the clearance of EO left over from World War II.

All geographical information and data on residual EO are included in the CROMAC database. After the proactive clearance effort will be phased out in 2026, the Ministry of Interior will take over the management of that database and will be the primary focal point for any issues related to residual contamination.

Vietnam

While the EO contamination in Vietnam remains significant, an example of a reactive response capacity can be found in the Provincial Military Command (PMC) EOD teams in Quang Tri province. The PMC EOD teams are responsible to provincial leaders for responding to disaster assistance and supporting socio-economic development plans, and as such are considered an intrinsic part of their communities. Relations with the community are strong. There are many instances where local residents approach

[19] Since the beginning of 2019 CROMAC is a department of the Ministry of Interior

PMC EOD Teams during an incident, reporting additional, previously unknown EO contamination. The teams are tasked by the province authorities and have been addressing disposal of large air-drop munitions, using a mobile cutting system, and other EO in support of the national and international humanitarian organisations working on mine action in Quang Tri. Unlike neighbouring provinces where the PMCs manage EO responses without a dedicated mine action centre, the Quang Tri Mine Action Center (QTMAC) coordinates all emergency responses or requests for EOD support from the Quang Tri community. The volume of QTMAC tasks for PMC EOD responses have increased dramatically as PMC EOD capabilities improved. In 2019, the PMC EOD Teams responded to over 400 emergency response requests from QTMAC.

The comparison with other states affected by residual EO shows that there is not one single right approach regarding the setting up of a regulatory framework and the allocation of responsibilities. It depends on the state context and through which perspective the problem is addressed, on the nature and extent of the contamination problem, the authorities and agencies involved, and on how the EO response evolved over time. Every state that faces reactive residual management issues will need to review and manage changes over time in the shape and form of a risk system architecture prescribed in various policies and regulations. These will reflect the different circumstances found during a period of conflict, immediately after that period, and over the longer term when EO typically becomes a less immediate, front line issue.

6. Summary

- Residual risk management addresses the reality of risk by considering the nature of the EO contamination, the location of the contamination and activities at that specific location, once proactive land release and/or EOD response has finished. If these three factors combine, the EO threat represents a potential risk.

- Identified risks are mitigated to a tolerable level by using the ALARP concept. If a state is signatory to the APMBC or CCM the level of 'tolerable risk' is defined within the obligations of the respective treaty.

- The risk management cycle (Avoid, Treat, Transfer, Accept) is used to guide the residual risk management process.

- The application of the residual risk management focusses on two different purposes: The identification of the residual context and the reactive management of the residual EO risk. Reactive risk management requires a different approach to the one taken during the proactive survey and clearance phase.

- Residual risk management policies / procedures require a review of the established institutional architecture, as well as the development of appropriate evidence-based systems, tools, and processes.

- Completion plans: On a national scale, to manage the proactive clearance to a reactive response requires the establishment of policies / procedures and resources for residual risk mitigation of EO. This will be supported by adopting a comprehensive risk management approach to the remaining EO threat. It should be noted that risks are not only those that have the potential to cause direct human harm, but may also include, but are not limited to the risk that can influence economic activity, freedom of movement, and other aspects of importance to a society.

Annex A:
(Normative)
References

The following normative documents contain provisions, which, through reference in this text, constitute provisions of this part of the standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of the standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid ISO or EN:

a) IMAS 04.10 Terms and definitions;

b) IMAS 05.10 Information management for mine action;

c) IMAS 07.10 Guidelines and requirements for the management of survey, clearance and residual contamination operations;

d) IMAS 07.11 Land Release;

e) IMAS 07.14 Risk Management in Mine Action;

f) IMAS 08.20 Technical Survey;

g) IMAS 08.30 Post-clearance documentation.

This TNMA relies in large part on work done, and previously published by, members of GICHD. In particular, this TNMA refers significantly to the article, entitled *The Challenge of Long-term Risk Management in Mine Action* published in the Journal of Conventional Weapons Destruction.[20]

[20] White, Robert (2017) "The Challenge of Long-term Risk Management in Mine Action," *Journal of Conventional Weapons Destruction*: Vol. 21 : Iss. 3 , Article 17. Available at: http://commons.lib.jmu.edu/cisr-journal/vol21/iss3/17

Annex B:
Terms and definitions relating to risk

The following terms and definitions reference IMAS 4.10 (Amendment 8, 2018) with updated reference to ISO Guide 51:2014

3.249.
risk
combination of the probability of occurrence of harm and the severity of that harm. [ISO Guide 51:2014(E)]

3.250.
risk analysis
systematic use of available information to identify hazards and to estimate the risk. [ISO Guide 51:2014(E)]

3.251.
risk assessment
overall process comprising a risk analysis and a risk evaluation. [ISO Guide 51:2014(E)]

3.252.
risk evaluation
procedure based on the risk analysis to determine whether tolerable risk has been exceeded. [ISO Guide 51:2014(E)]

3.253.
risk reduction
actions taken to lessen the probability, negative consequences or both, associated with a particular risk.

3.254.
safe
(2009)
the absence of risk. Normally the term tolerable risk is more appropriate and accurate.