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The Challenge of Long-term Risk Management in Mine Action

Robert White
GICHD

Field Notes

The Challenge of Long-term Risk Management in Mine Action[1]

by Robert White [Geneva International Centre for Humanitarian Demining]

States affected by landmines and explosive remnants of war (ERW) are faced with a number of difficult decisions when they establish their mine action program, such as "how deep should operators clear?" and "what tasks should they 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 different contexts.

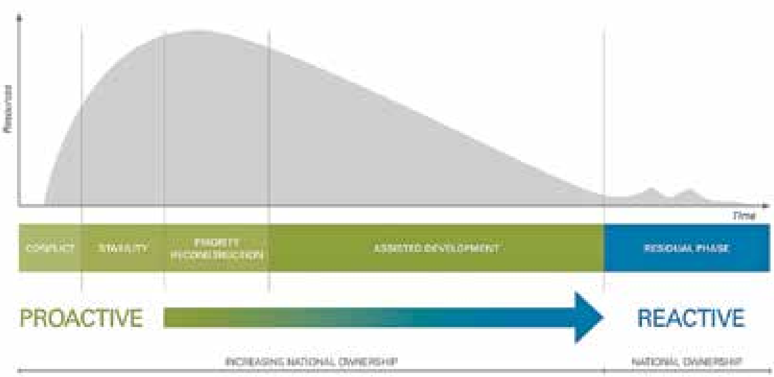

Figure 1. Program life cycle for mine action: planning for long-term risk management.
All graphics courtesy of GICHD.

States embark on proactive efforts to find mines and ERW 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 gradually decline. The analysis of risk and the accompanying mine action response must therefore be carried out for various phases in a mine action program. The shorter-term proactive phase will imply a heavier investment of targeted resources to reduce the risk to acceptable levels, while long-term risk management (LTRM) issues constitute the reactive phase and should be mainstreamed into sustainable, nationally-owned structures. This article describes the process of evaluating the probabilities and consequences of adverse events that determine long-term risk and the implications of effective risk management for how mine action programs are structured and managed over time.[2]

Establishing country-specific roadmaps for transition from proactive survey and clearance to a reactive phase is an important process for each mine action program, as this should define what the residual state will be. It is the prerogative of the national authority to establish what the residual or end state is while working with key stakeholders. 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/CHA). The most difficult 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, and the potential cost of returning to areas and clearing low-density contamination at a later date? Unless recontamination occurs, the commitment of 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, 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 mine/ERW threat, from proactive survey and clearance to reactive risk management strategy. National standards and relevant treaty frameworks require **every effort** in clearing the mine/ERW threat, but there are inevitably diminishing returns in the investment costs of proactive survey and clearance.[3] The ratio of items found against land processed is becoming an increasingly important indicator of effectiveness. Moreover, the cost of clearing areas where no mine/ERW threat is found must be justified more convincingly than suggesting that community **confidence building** is a sufficient rationale to spend donor millions. The balance and tipping point between proactive survey and clearance and reactive risk management strategy is significant in the life cycle of a program.

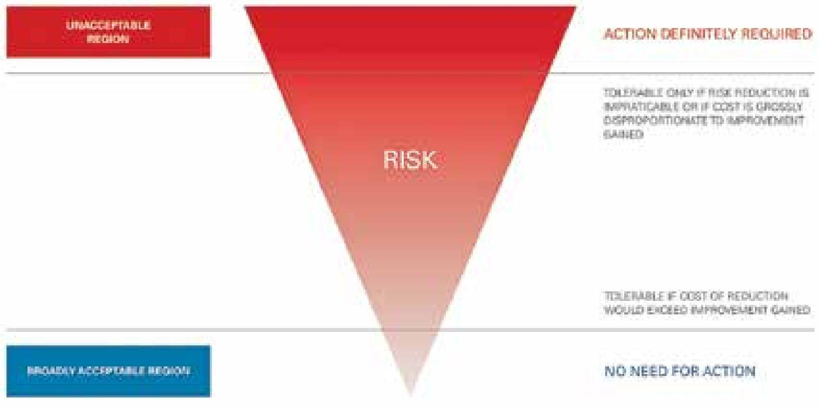

Figure 2. The As Low As Reasonably Practicable (ALARP) concept (after ISO 21010).

Life Cycle of a Mine/ERW Program

As a country or region recovers from conflict, clearing mines and ERW becomes less of an immediate emergency and high priority, with reactive responses replacing proactive survey and clearance program over varying timeframes. As time goes on, the United Nations, specialist NGOs, and commercial operations terminate programs, and leave or hand over assets to national ownership. All mine action/human security programs operate within this continuum, represented in Figure 1. The capacities to respond tend to be confined to a few specialist military/police units, civil defense, fire service, and commercial service provision, the scale of which is determined by the need of governments and/or market forces.[4]

In countries approaching this transition, there are opportunities to apply principles of strategic planning and risk management to develop effective risk management systems addressing any residual mines and ERW that are well adapted to local circumstances and conditions.

A Risk Management Approach

Reducing risk to a level as low as reasonably practicable (ALARP) should apply to the management of residual mine/ERW situations (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 situations. ALARP, and **all reasonable effort** (discussed later in the article) embody a concept that 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 mine/ERW threat.

The International Mine Action Standards (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/ERW through non-technical survey, technical survey and/or clearance."[5] It is logical to understand residual contamination as the sites or areas where mines or ERW are discovered following the application of all reasonable efforts to survey/identify and then process (cancel, reduce, or clear) all known SHAs and CHAs in a given locality.[6]

Reactive management of risks posed by residual contamination requires a different approach to the one that was utilized 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. Whichever approach is adopted in each country-specific scenario will rely on the information that is available to assess risk. Quantifying or predicting the **known unknowns** is problematic and a constraint on stating what level of resource may be required to effectively address any residual contamination.

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.

Figure 3. National mine action program.

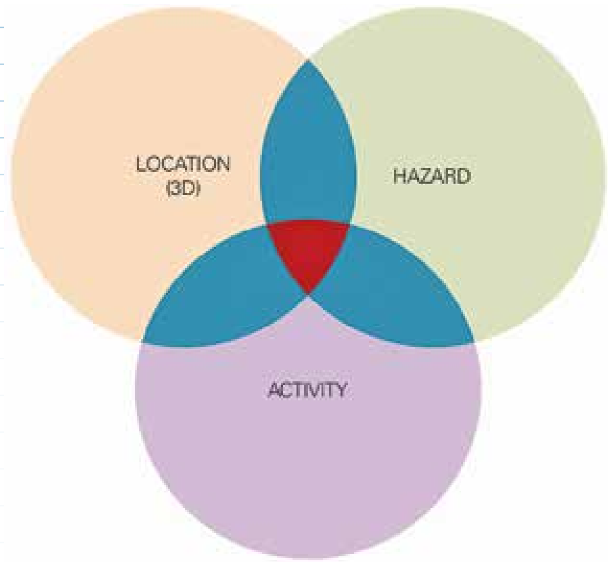

Figure 4. Real ERW risks.

Impact	Extreme/catastrophic 5	10	15	20	25	30
	Major 4	8	12	16	20	24
	Moderate 3	6	9	12	15	18
	Minor 2	4	6	8	10	12
	Insignificant 1	2	3	4	5	6
		1 Remote	2 Unlikely	3 Possible	4 Probable	5 Highly probable
		Likelihood				

Figure 5. Risk matrix scoring of $xy + y$.

A rigorous approach to responding to all mine/ERW risks that affect the achievement of a country`s economic objectives could be one framework on which to base the management of residual mines and ERW. A risk management strategy embedded in a national system would allow the potentially negative impact of residual mines and ERW 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, and then implement sensible, cost-effective measures to minimize the downside and maximize the upside (Figure 3).

The purpose of risk identification is to understand the reality of mine/ERW risks, as opposed to the perception of those risks. The way in which mine/ERW risks are perceived by society and the general public is an important part of the context, but effective management of residual mines and ERW is based upon identifying and understanding the reality of those risks. Residual risks only exist when three associated factors combine: 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 4), 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 mines and ERW, and that perception of risk may extend outside the red zone.

Specific countries or regions that moved from a proactive to a reactive approach to mines and ERW should note the developments made over recent years in approaches to representing risk impact and likelihood. Many organizations 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.[7] 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 mines and ERW, the concept of impact and the likelihood of events occurring should be given prominence in risk assessment and processes.[8]

The risk matrix in Figure 5 shows an approach to representing LTRM in a residual context by increasing the weighting of the potential impact of an event against likelihood. This works on a scoring of $xy + y$, where x is likelihood and y is impact (Figure 5). This formula multiplies impact with likelihood then adds a weighting again for impact. It should be remembered that the scoring of risk magnitude often involves a degree of judgement or subjectivity. Where data or information on past events or patterns is available, it will enable more evidence-based risk judgements. In interpreting the risk matrix the color codes are:

- **Red** represents major or extreme/catastrophic risks that score 15 or more (ALARP: *Unacceptable*).
- **Amber** represents moderate or major risks that score between 8 and 14 (ALARP: *Tolerable only if risk reduction is impracticable, or if cost is grossly disproportionate to improvement gained*).
- **Blue** represents minor or insignificant risks scoring 7 or less (ALARP: *Broadly acceptable region*).[9]

When addressing large, air-dropped munitions, the probability/incidence rate and severe consequence of an accident would support discussion of a greater weighting of impact on the risk matrix to use a formula of $xy + 2y$ (represented in Figure 6). This will allow consideration of the fact that on rare occasions improbable events do occur with devastating effects. The weighting of impact brings almost half the risk

Impact	*Extreme/catastrophic* 5	15	20	25	30	35
	Major 4	12	16	20	24	28
	Moderate 3	9	12	15	18	21
	Minor 2	6	8	10	12	16
	Insignificant 1	3	4	5	6	7
		1 *Remote*	2 *Unlikely*	3 *Possible*	4 *Probable*	5 *Highly probable*

Figure 6. Risk matrix scoring of $xy + 2y$.

management framework results into the ALARP **unacceptable** region, which is a strategic challenge for finding the appropriate response to address residual contamination, particularly for residual large, air-dropped munitions.

Locating UXO on a construction site in the United Kingdom is considered by the Construction Industry Research and Information Association (CIRIA), as a "high consequence but low probability event."[10] CIRIA recommends that "appropriate allowance should be made at the design stage for assessing the risk of encountering UXO on-site and for mitigating that risk if significant," suggesting that factors such as public safety, on-site safety, neighboring buildings, secondary hazards, and the safe excavation and disposal of UXO targets are considerations in developing an investigation methodology.[10] A version of this approach should be applied in countries that reach a residual mine/ERW management state, particularly where large, air-dropped munitions were a feature of the conflict.

Evidence-based Risk Management

A key area of focus for LTRM must be on the integrity of survey and clearance data, and how that can be used to inform risk management decision making once the proactive survey and clearance activity has ceased.[11] 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 in countries such as Cambodia, Laos, and Vietnam, then the national standard survey and clearance depth does mitigate the threat to communities. If land use in specific areas changes through infrastructure development, urbanization, construction, etc., a risk review/response will be needed before activity takes place. 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.

This issue is illustrated using data from the LWCC Quang Tri database in Vietnam. The contamination survey and clearance map (Figure 7) was built using the survey and clearance records from Cam Lo District, Vietnam. Each red dot indicated a mine or item of ERW located and cleared to the 30 cm (11.8 in) national survey and clearance depth.

This returns the land to communities in Cam Lo to safe use for current activity and agricultural practices—a compliant residual state. Any change in land use at a later date, illustrated in Figure 8, will introduce the residual risk-management questions relating to items potentially located below the Vietnam national standard 30 cm (11.8 in) threshold.

The discussions on residual management led to revisiting the question of what the sector means by **safe** following survey and clearance to national standards (when based on IMAS). The standard clearance depths differ from country to country; e.g., for cluster munition remnants: Cambodia's is 20 cm (7.9 in), Lao's is 25 cm (9.8 in), Vietnam's is 30 cm (11.8 in). This represents the national authority agreement, described in the national standards, on the required risk mitigation to an acceptable level in order to hand back land to communities free from immediate threat.

Responsible authorities and mine action operators always ensure that survey and clearance are completed comprehensively, and record the location, items, and depth, guaranteeing that everything is documented for a defined handover to

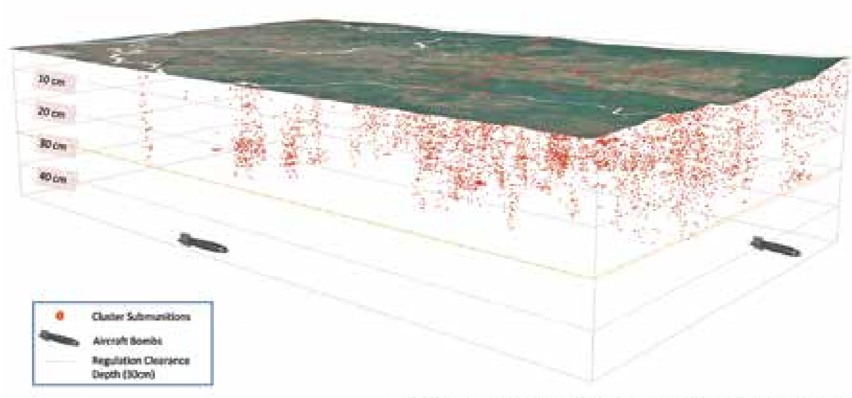

Figure 7. Contamination survey and clearance map of Cam Lo District, Vietnam.

the recognized authority. This activity 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 evidence-based LTRM.

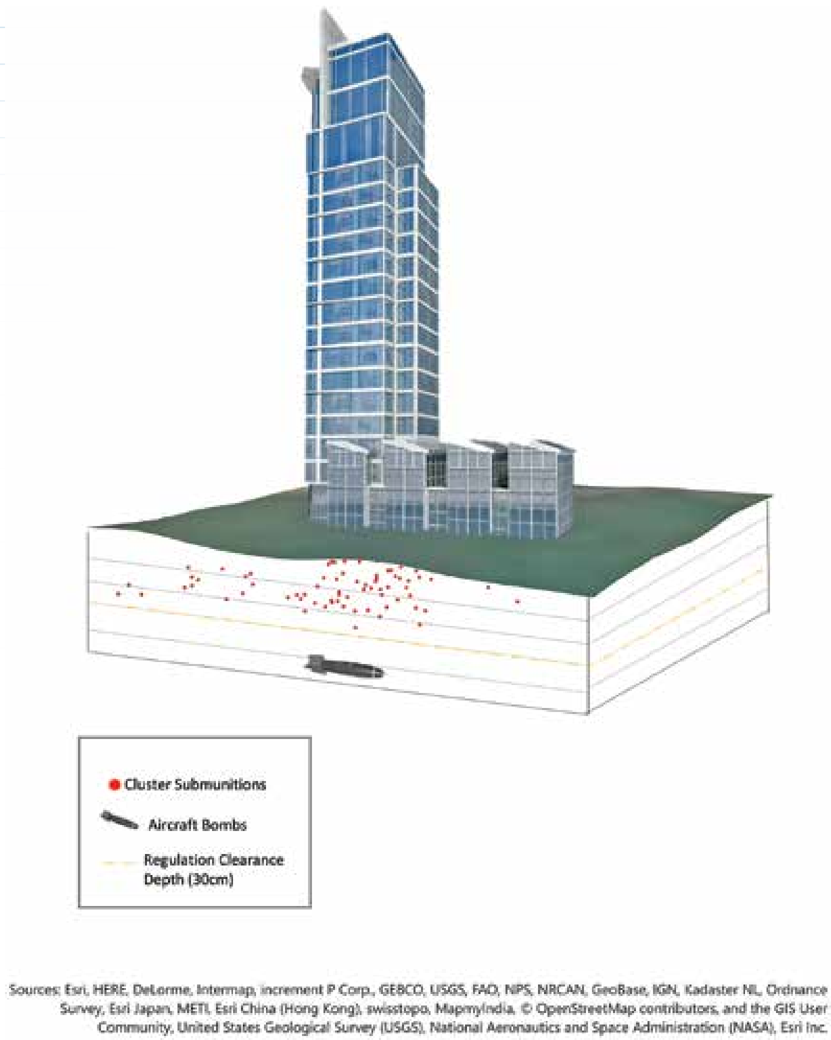

Figure 8. Land-use change.

Summary

The sector needs to continue asking "what needs to be done now to ensure that an effective risk management response can be delivered in the future?" It is important to be able to support evidence-based, risk management decision making with comprehensive data sets on survey and clearance (type of target, location, depth). It is also important to note that the answer to "what is safe?" will change over time as land use changes. Procedures should be adapted in a residual mine/ERW management phase to accommodate this, as has already been demonstrated in post-conflict scenarios in Europe addressing UXO from World War I and II, and in current and concluding mine action programs, particularly when related to infrastructure development and construction. There are key challenges, specific to each country that must be overcome. These include the decision on when to move from proactive survey and clearance to a reactive risk management strategy response, and what constitutes every effort, all reasonable effort, or ALARP to meet treaty obligations and compliance. A risk management strategy is required to understand residual risk on areas released through non-technical survey, technical survey, and clearance. The different contexts found in programs that are geographically and socio-politically diverse will dictate resource management, capacity development, and sustainable choices on relevant tools and approaches, supporting risk management strategies to react cost effectively to a residual mine/ERW threat.

See endnotes page 67

Robert White
Advisor, Strategic Management & Residual Contamination
Geneva International Centre for Humanitarian Demining

Robert White has worked in mine action for over 15 years and joined GICHD in January 2017 as Advisor, Strategic Management and Residual Contamination. The position provides technical assistance to national governments, national mine action authorities, and mine/ERW operators on issues related to strategic management, strategic planning, transition to national ownership, and management of residual contamination. He is implementing the Management of Residual Explosive Remnants of War project, which is primarily focused on delivering long-term risk management approaches in Southeast Asia, specifically the most heavily mine/ERW affected countries: Cambodia, Vietnam, and Laos. White has extensive experience in mine action with MAG (Mines Advisory Group) and other NGOs developing and implementing strategies, structures, and systems to improve operational performance. He holds a master's degree in Poverty, Conflict and Reconstruction from the University of Manchester.