Lessons Learned from Iraq and Syria Debris Management and Rubble Clearance

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This paper, authored by Stephen Ingram, Global Technical Advisor for Humanitarian Mine Action at MAG (Mines Advisory Group), was prepared for the 21st International Symposium on Mine Action 2025, which took place from 1-3 April in Cavtat, Croatia. It was subsequently published in the Mine Action 2025 Book of Papers. You can access the full publication here.

Drawing from MAG's 30 years of experience in Iraq and its work in post-ISIS clearance operations in northeastern Syria, this paper explores the progress still needed and the lessons learned from past efforts. It also looks ahead to the future of debris management and rubble clearance in Lebanon, Gaza, and Syria, highlighting the strategies and innovations required for safe, effective, and efficient post-conflict recovery.

In the lead-up to Mine Action 2025, the BBC released an article, 'Mosul's landmarks rise again after IS destruction' (Usher, 2025), showcasing the rebuilding of Mosul and some of its key landmarks. This article vindicates many of the mine action professionals who worked tirelessly in northern Iraq clearing rubble post-ISIS.

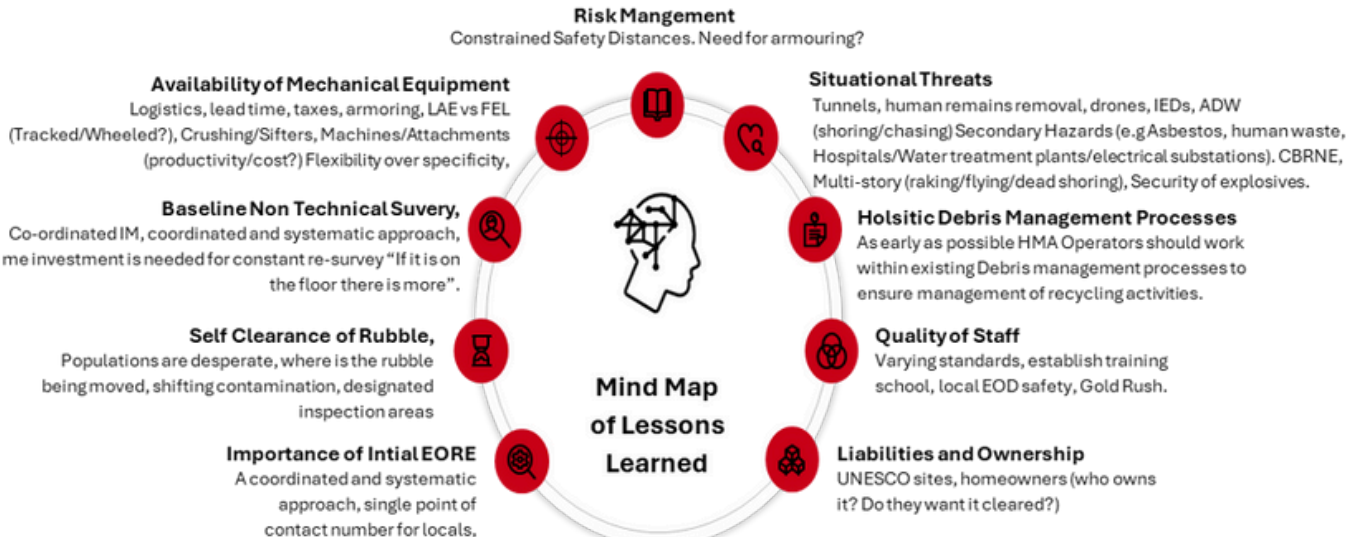
Since the ISIS offensive in 2014, MAG's work in Iraq and Syria has led to the removal and destruction of nearly 150,000 items of unexploded ordnance, including 50,000 Improvised Explosive Devices (IEDs). In light of this, and on the 10th anniversary of the Sinjar massacre—ISIS's attack on Iraq's Yezidi ethnoreligious minority - MAG commissioned an independent study on the impact, challenges, and best practices from its work in the Sinjar and Tel Afar districts (MAG, 2024). The report provides clear evidence of the importance and impact of mine action in enabling stabilisation, recovery, and development activities in these regions. However, it also outlined nine key areas for improvement. Much of the clearance conducted by MAG was in densely contaminated urban environments, focusing on debris management and rubble clearance. Therefore, Recommendation 7 of the report recommended the development of a good practice guide for planning and managing mine action in urban environments. This initiative began in 2021 when MAG was looking to trial the now-unreleased GICHD Urban Approach Model paper, this was put on hold due to the COVID-19 pandemic. However, most experts in the field would agree that despite the excellent work completed in Iraq and Syria, there are many lessons that could improve the efficiency and effectiveness of debris management and rubble clearance.

These lessons are now more relevant than ever, as many countries affected by recent conflicts face similar challenges. In Gaza, the most recent estimates from UNEP calculate the total debris quantity at over 50 million tons (UNEP, 2024) – a staggering amount compared to even the massive estimated 8 million tons of debris in Iraq (DDG, 2019).

Similarly, the current debris contamination in Lebanon is expected to be 8 Million Tons (UNH, 2024) Considering the size of the geographical areas affected in Gaza and Lebanon, and the socio-economic challenges pressing population returns, the time and investments required for rubble management and rubble clearance, and the immediacy of the response will be more dire compared to Iraq.

Sources in Ukraine have put a rough estimate of 600,000 Tons of rubble. (UST, 2024), though this is likely an underestimate, as it doesn't account for occupied territories and other active conflict zones. This is not an exhaustive list of the many ongoing conflicts, nor does it cover unfinished work in underfunded and heavily damaged cities like Sirte in Libya and Raqqa in Syria. With funding instability and new operations on the horizon, it is more important than ever that the safety, efficiency, and effectiveness of debris management and rubble clearance operations are prioritised.

This brief paper explores the initial steps toward developing a good practice guide for planning and managing mine action in urban environments, drawing on 10 key lessons learned from debris management and rubble clearance in Iraq and Syria. The lessons have been distilled into a mind map that can be seen below, which explores various areas where learning has occurred. The second part of this paper will briefly discuss how these lessons are being applied as MAG begins its work in Lebanon and plans for Gaza.



Humanitarian Mine Action (HMA) clearance remains a small part of the larger debris management process. The question of how involved HMA operators and National Mine Action Authorities (NMAA) should be is context-dependent and varies according to individual organizational strategies. HMA operators often overstep into debris management activities without considering the full range of expertise needed to rehabilitate urban environments. Ultimately, it depends on the capabilities of operators, logistical restrictions and the balance between Explosive Ordnance (EO) risk and other threats. HMA operators must engage with a broad array of stakeholders to ensure that complex issues, such as environmental management, recycling, and housing, land, and property (HLP) rights, are addressed.

The importance of context-adapted and continuous Explosive Ordnance Risk Education (EORE) relevant to the needs and circumstances of affected populations cannot be overstated. The highest casualty rates among civilians typically occur during the early stages of conflict as civilians flee to safety out of or through highly contaminated zones, and soon after access allows eager - and too often, resource deprived - populations to return to their homes and reclaim their sources of livelihood. Immediate and targeted in-person EORE activities, supported by mass media and digital EORE, should always be a priority at the onset of HMA interventions, and in parallel to clearance operations.

As rebuilding efforts demonstrate, local populations will not wait for the slow mobilisation of funds or HMA and debris management operators and traditional funding levels do not account for the scale of debris in areas like Gaza.

In the meantime, EO risk education and community liaison are the only means possible to mitigate populations' risk of injury and death from EO.

In MAG's experience, EORE has as well proven to be critical for the safety of civilians taking immeasurable risks during active conflicts, notably in highly populated and built-up areas such as Gaza and Lebanon, while attempting to rescue loved ones from collapsed buildings or hasten to retrieve their sparse belongings amidst EO infested rubble. Lastly EORE is necessary to safeguard first responders and those who will clear contaminated rubble regardless of the inherent dangers, as well as aid workers and rubble management contractors who may encounter EO in "low-risk" areas and need guidance on risk mitigation.

Conducting a baseline survey in urban environments presents significant challenges, but it is vital to take a coordinated and systematic approach to prioritise high-risk areas. Tasks should be prioritised based on the balance between the likelihood of threats, using both direct and indirect evidence, and land use considerations. Given that HMA clearance capabilities are limited and urban clearance is time-consuming, assets must be concentrated on the most pertinent tasks. MAG's experience has shown that the adage "if it's on the floor, there's more" often holds true when it comes to EO contamination in rubble. However, in Gaza, Lebanon and Syria, the increased use of sophisticated guided weapons and drones, coupled with surface contamination being swiftly removed for various reasons, complicates the assessment of whether tasks are truly "high threat." As a result, non-technical surveys increasingly require more technical expertise, and the IMAS Technical Note for Mine Action 10.10/03 Explosive Hazard Risk Assessment in Debris Management (Rubble Removal) Operations (IMAS, 2018) remains highly relevant.

The availability of mechanical equipment has proven to be a force multiplier in HMA clearance. In Iraq, thanks to generous donor support, MAG has trialled nearly every permutation of equipment and attachments used in demolitions and clearance. Creating a pipeline for the procurement and support of such equipment is crucial. MAG has found that simplicity and flexibility in equipment, as opposed to overly specialized, single-purpose tools, are optimal. This is demonstrated by the robust tracking of mechanical operational outputs versus costs. It is critical that lessons learned from previous operations are applied to prevent the purchase of ineffective "white elephants."

In EOD, there has always been an unwritten rule advocating for a pragmatic approach to risk. This balance is particularly critical in urban clearance environments. Experienced EOD operators with a solid understanding of explosive effects are required to make nuanced risk mitigation decisions. For instance, it is nearly impossible to consistently achieve the necessary safety distances or protective works to render a 2000LB Mark 84 bomb safe in dense urban environments like Gaza. Accepting this reality, along with establishing a clear and robust risk mitigation chain, is essential for both HMA operators and NMAAs. Furthermore, the deployment of difficult-to-acquire armoured machinery should be targeted and relevant. It is important to remember that, like demining PPE, machine armouring is not designed to protect against high-velocity fragmentation, which opens the possibility for more selective use of unarmoured machines where appropriate.

Situational threats and secondary hazards remain prominent in HMA clearance. A non-exhaustive list includes tunnels, human remains removal, drones, IEDs, anti-detonation walls (ADWs), multi-story damaged buildings (and their remediation), secondary hazards (like asbestos, human waste, electrical and water management systems, and critical infrastructure such as hospitals, water treatment plants, and electrical substations.) CBRNE threats, and securing EO found all require coordinated and specialised capabilities. Where possible, coordination of resources should be considered, with preparations made before threats materialise.

The availability and training of staff with all these specialized skills and qualifications require decades of experience. It is essential that these varying levels of expertise are integrated using agile team methodologies to ensure decision-makers are appropriately empowered and advised. In conclusion, the lessons learned from MAG's extensive work in Iraq and Syria provide invaluable insights for future debris management and rubble clearance efforts in post-conflict environments.

As regions like Gaza, Lebanon, and Ukraine face similar challenges, the need for efficient, safe, and well-coordinated operations has never been more critical. By applying the lessons from past operations, prioritising risk education, and leveraging mechanical equipment and technical expertise, the humanitarian mine action community can better navigate the complex tasks of post-conflict recovery. Moving forward, continued innovation and collaboration will be key to addressing the growing scale of debris contamination and ensuring sustainable, effective recovery in urban environments.

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