ACTION ON ARMED VIOLENCE

AOAV

HOW TO ADDRESS THE HARMS FROM IEDS

High-level recommendations for practical approaches

Report by
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Cover illustration
Police investigating the site of the Marrakech suicide bombing where 17 people died on 28 April 2011. The photo was taken just a few hours after the incident. “File:Marrakech Argana Bomb Site 2011.jpg” by Bjørn Christian Tørrissen is licensed under CC BY-SA 3.0.

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RECOMMENDATIONS

Improvised Explosive Devices (IEDs) kill more people globally each year than any other explosive ordnance. The worldwide response to this IED harm must be kept simple, expertly informed and considered with the following recommendations in mind:

- **Improving international collaborations; sharing threat and IED information;**
- **Enhancing national Explosive Ordnance Disposal (EOD) capabilities to match the threat;**
- **Boosting international funding to support 3rd party IEDD operations in affected areas;**
- **Increasing international regulation to frustrate access to dual purpose components and precursors.**

In this paper we explore these four recommendations of collaborations, capabilities, funding and regulation, and show evidence they are at the core of addressing the IED threat.

Tarana Akbari, 12, screams in fear moments after a suicide bomber detonated a bomb in a crowd at the Abul Fazel Shrine in Kabul on December 06, 2011. More than 70 people lost their lives in the deadliest strike on the capital in three years. “Ashural Bombing” by Knight Foundation is licensed under CC BY-SA 2.0..

OVERVIEW

In 2021, Improvised Explosive Devices (IEDs) accounted for 43% of all global civilian casualties from explosive weapons, as reported in English language media. That year, some 4,726 people were killed or injured by a makeshift explosive weapon that, over the last decade, has caused more harm to civilians than any other singular type of explosive device.

In other words, suicide bombings – which resulted in 14,112 civilian deaths and injuries – were reportedly nine times more injurious than all forms of mines (anti-personnel and anti-vehicle) combined, according to reputable English language media sources.

The rise of the IED has been well noted by those working in the landmine sector. In 2018, the Landmine

Top six countries for civilian casualties of IEDs in 2021

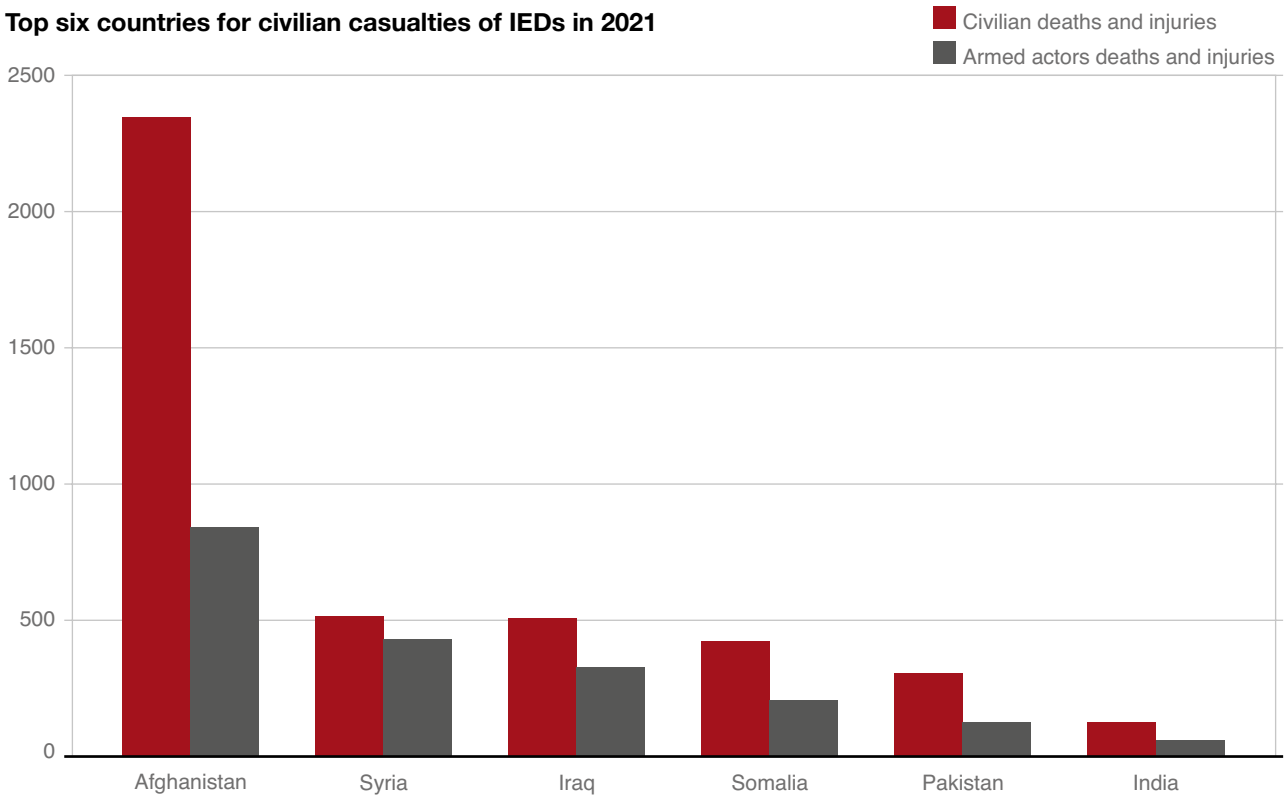

Figure 1: AOAV's list of the most impacted countries from IED usage in 2021.

The global impact of IEDs is staggering. Between 2011 and 2020, IEDs caused at least 135,800 civilian deaths and injuries around the world. When such weapons were used in towns and cities, 90% of those harmed were civilians.

Indeed, of all explosive weapon harm globally over the last 10 years, 53% of all civilians were harmed by IEDs. This is compared to 23% by air-launched weapons, and 21% by ground-launched attacks. Of note, the impact of IEDs was significantly higher than landmines. Whereas 55,275 civilians were reported killed or injured from car bombs, and 9,919 from roadside bombs, 1,638 civilians harmed by mines (as reported by English language media).

Monitor cited an interview with Mines Advisory Group (MAG) and Janus Global Operations (when working in northern and central Iraq respectively in 2017). It reported that IEDs made up well over 90% of the items they cleared.[1]

Whilst the last few years have seen a reduction in the number of civilian casualties from IEDs, this is more likely driven by the COVID pandemic as opposed to any significant international intervention. COVID has undoubtedly diminished the dedicated logistic and financial support enjoyed by terrorist and criminal actors. The virus may also have had an impact upon donor funding within the Humanitarian Mine Action (HMA) sector with a 16% decrease in funding to support

Mine Action in 2021 (US$643.5 million) compared to 2017 (US$771.5 million). Some affected countries informally reported a far higher decrease in funded support.

The threat of the IED may well, however, persist far longer than the virus, and this paper forms a call to arms on how to prevent this from happening.

It is not just civilians who have borne the brunt of this rise in IED harm. Over the past 50 years of military experience, the IED has become the most injurious mechanism in Explosive Ordnance Disposal (EOD) clearance as opposed to landmines (even of an improvised nature). Within a military context, such types of IED can be precisely classified, owing to timely exploitation and informed technical reporting. We know, for example, that 58% of recorded UK/US military conflict deaths since 1969 were from command- or victim-operated IEDs.[2]

Whilst this active military 'operating envelope' is not the same as HMA operations, the devices that militaries and HMA face are effectively the same in most 21st century post-conflict scenarios. One would, therefore, hope for the same level of assistance (training, equipment, information management or human factors) to those conducting humanitarian IED clearance operations in such semi-permissive and permissive environments.

Despite the paradigm shift in the waging of modern warfare, and the civilian harm that has gone along with it, the international community has been slow to respond imaginatively or decisively to address the realities of improvisation.

With exceptions, uncertainty at donor level remains about IED disposal (IEDD). There appears to be a funding process signed off by individuals who might not be familiar with the full spectrum and harm of IEDs. And there is a marked lack of civil society focus on IEDs to raise the profile of their harm and impact.

To respond to this distance between reality and process/perception, this proposal offers up four interlinked thematic areas that the authors believe are necessary to consider when tackling the ubiquitous presence of the IED. Recognising that more than 50 countries and territories are now affected by IED harm[3], we provide examples to underpin each thematic proposal, with a focus on the most badly affected regions.

Civilian casualties by weapon type 2011-2020

Weapon type	Civilian casualties	Average civilian casualties per incident
Air-launched	**60202**	**8**
Air Strike	46888	8
Air-dropped bomb	8905	15
Missile	3184	5
Multiple explosive weapons	740	44
Rocket	485	10
Ground-launched	**54910**	**7**
Artillery shell	3544	6
Grenade	8951	5
Missile	2036	9
Mortar	13327	9
Multiple explosive weapons	5341	20
Rocket	5841	7
RPG	355	2
Shelling	14707	5
Tank shell	808	11
IED	**135800**	**11**
Car bomb	55275	24
Multiple explosive weapons	5738	51
Non-specific IED	64868	10
Roadside bomb	9919	3
Mine	**1638**	**2**
Anti-personnel mine	15	1
Anti-vehicle mine	108	5
Landmine	1515	2
Multiple types	**9013**	**24**
Multiple explosive weapons	9013	24
Naval-launched	**79**	**4**
Artillery shell	27	4
Missile	22	4
Mortar	7	7
Rocket	10	10
Shelling	13	3
Unclear	**771**	**10**
Missile	283	6
Rocket	488	18

Figure 2: Global civilian casualties by weapon type: A Decade of Explosive Violence Harm, 2011-2020, Action on Armed Violence (2021)

OBSERVATIONS

We invite States Parties to note that:

- the 21st Century challenge to HMA involves complex urban terrain and unpredictable IEDs, particularly in terms of design, emplacement and functionality, with human factors considerations (both physical and psychological) playing a key role in safeguarding;
- the environment is now “three-dimensional”, with HMA organisations increasingly focused on urban survey and clearance;
- training, personnel and equipment drive the costs necessary to conduct safe IED disposal within this context, yet budgetary process often lacks understanding, or is hindered by the fact that quantifying clearance is harder than a simple equation of km2;
- no coherent and effective measures have been adopted between humanitarian agencies and Member States to share information relating to IEDs – to do so would inform safety, improve understanding and allow effective budgetary decisions to be made;
- the exploitation of IEDs should be a routine activity since it does not pose a problem to HMA if we remain focused on post-conflict clearance; and
- the UN is the most appropriate instrument to champion effective regulatory response within global supply chains.

Rescuers carry a body recovered from a burnt shop at the scene of twin bomb blasts at terminus market in the central city of Jos on May 21, 2014. Twin car bombings in central Nigeria killed at least 118 people and brought entire buildings down. AFP Photo/STR. “Nigeria-Unrest” by Diario Critico Venezuela is licensed under CC BY 2.0.

THEMATIC APPROACH

The global response to IED harm must be kept simple, informed by appropriate experts.

Our four recommendations are a response to four interlinked thematic areas that have been identified as core to the challenges the threat poses:

- threat assessment (to understand and inform) and information management (to inform and protect);
- national capacity development (to deliver economies of scale);
- focused funding (to support and specify);
- focused regulatory improvement (to mitigate and predict).

Staff Sgt. Nicholas B. Hudson, a combat engineer with Company A, Brigade Special Troops Battalion, 173rd Infantry Brigade Combat Team (Airborne), uses an ice pick to trace and locate an improvised explosive device wire during a practical counter-IED class with Bulgarian Soldiers on Caserma Del Din in Vicenza, Italy, Sept. 10. Photo by Sgt. A.M. LaVey. "Locating improvised explosive devices" by U.S. Army Europe is marked with Public Domain Mark 1.0.

1. THREAT ASSESSMENTS AND INFORMATION MANAGEMENT

The environment engulfing explosive violence is three-dimensional, involving an eclectic mix of mines and ERW. The main costs to such a threat are predominantly urban survey and clearance. Demonstrating progress in this environment is often neatly reportable as metres squared cleared, but such metrics are frequently of little relevance to the civilians living in the shattered cities of Iraq, Syria, Afghanistan, Somalia and Yemen.

It is, suffice to say, notoriously difficult to cost three-dimensional clearance; Figure 3 demonstrates such complexity.

which recognises that bodies lie within. There are the complications of secondary hazards being discovered (all too often within damaged infrastructure). There is the ingenuity and cruelty of bomb-makers who set out to make the defusers' role all the more challenging.

An article written by the co-author in 2018[4] describes the 21st Century challenge to HMA as a triumvirate of complex urban terrain, unpredictable IEDs (in terms of complexity, design, emplacement and functionality) and human factors (physical and psychological). Far more challenging and nuanced, it may be said, than the

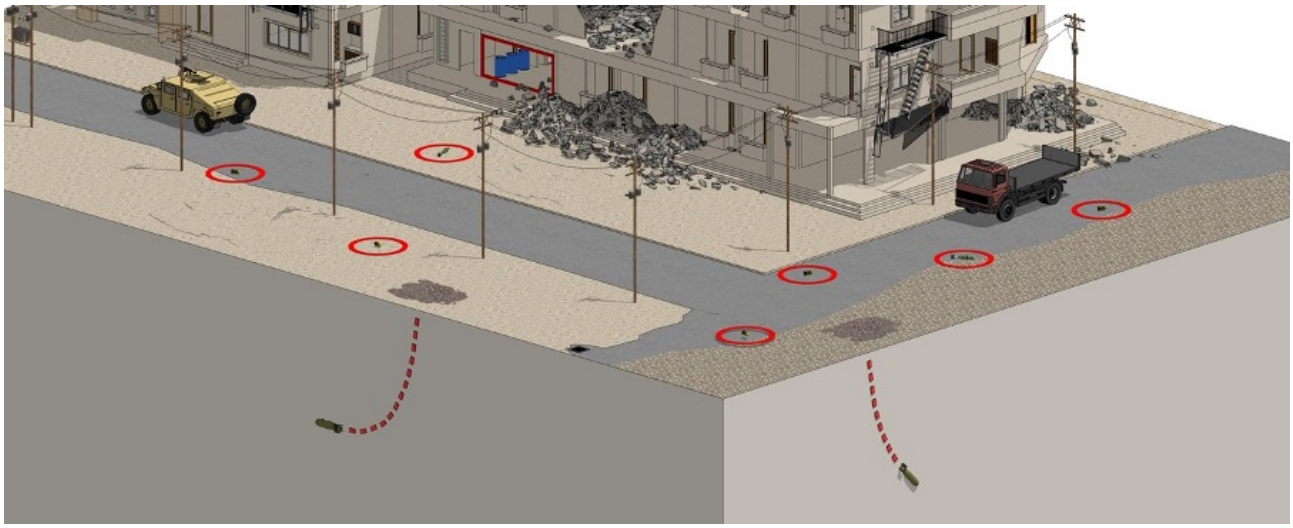

Figure 3: The complexity of the 21st century post-conflict urban environment (red outlined circles represent the presence of IEDs within the mix of ERW) – courtesy Artios Global.

What is clear is this: clearing IEDs is not like clearing a conventional minefield. And the global mine action community has known this reality since, at the least, early 2016 (Ramadi, Iraq). Despite such awareness, there is little data, no central repository of information, that can neither explain nor justify the cost of the much-needed three-dimensional approach. This is despite tens of millions of dollars having been already expended on the challenges that clearance in three-dimensional, complex urban environments bring.

The challenges of such environments are many. There is the fact that, often, the site of concern contains human remains and as such needs to be treated not just as a threat, but with a process and dignity

world of 'conventional' landmines, one neatly captured (not least, in the minds of donors) by the evocative image of Princess Diana bravely navigating a mine-field.

That article outlined how costly clearance operations emerged within the scope of mine action principles. The article described deminers coming across locations of varying complexity and threat, dependent upon the perpetrators who occupied them and their supply chain. It argued that, to be safe, adequate and reliable in this context, required a rare breed of team leaders and operators who are not only IED disposal experts, but who also possess a deep knowledge of foreign munitions, weapon-design and the effect of blast on structures to do their jobs.

Given this, it is clear that a "two-dimensional" framing of IED and mine action hazard to donors is in danger of being inaccurate and misleading, generating a sense that all is well. Such framing, above all, fails to recognise that Explosive Ordnance Risk Education (EORE) and desk survey is insufficient to combat the threat.

It is hard to underplay just how complicated the new realities are. Figure 4. demonstrates the complexity of a typical clearance operation in the urban context and the nature / types of IED discovered in a typical urban setting. In this example, the threat is varied. In the space of 30 metres you have improvised-mines, victim-operated IEDs, command-initiated IEDs, multiple-main charges linked to one switch, and the specific-targeting of the operator.

Those experts should not only be operators with the aptitude to attain the highest levels of EOD and IEDD qualification, but to have held safeguarding responsibility at a senior professional level. This will deliver informed costing and underpin relevant assurance mechanisms (See AOAV's IED papers 3 and 4 below).

Controversially, perhaps, these experts may not always lie within the cohort of HMA organisations upon which the sector has become dependent. As Henry Ford once wrote, "if you always do what you've always done, you'll always get what you've always got."

In addition to the above issue of informed threat assessment and responses to it, a parallel and connected theme throughout AOAV's research

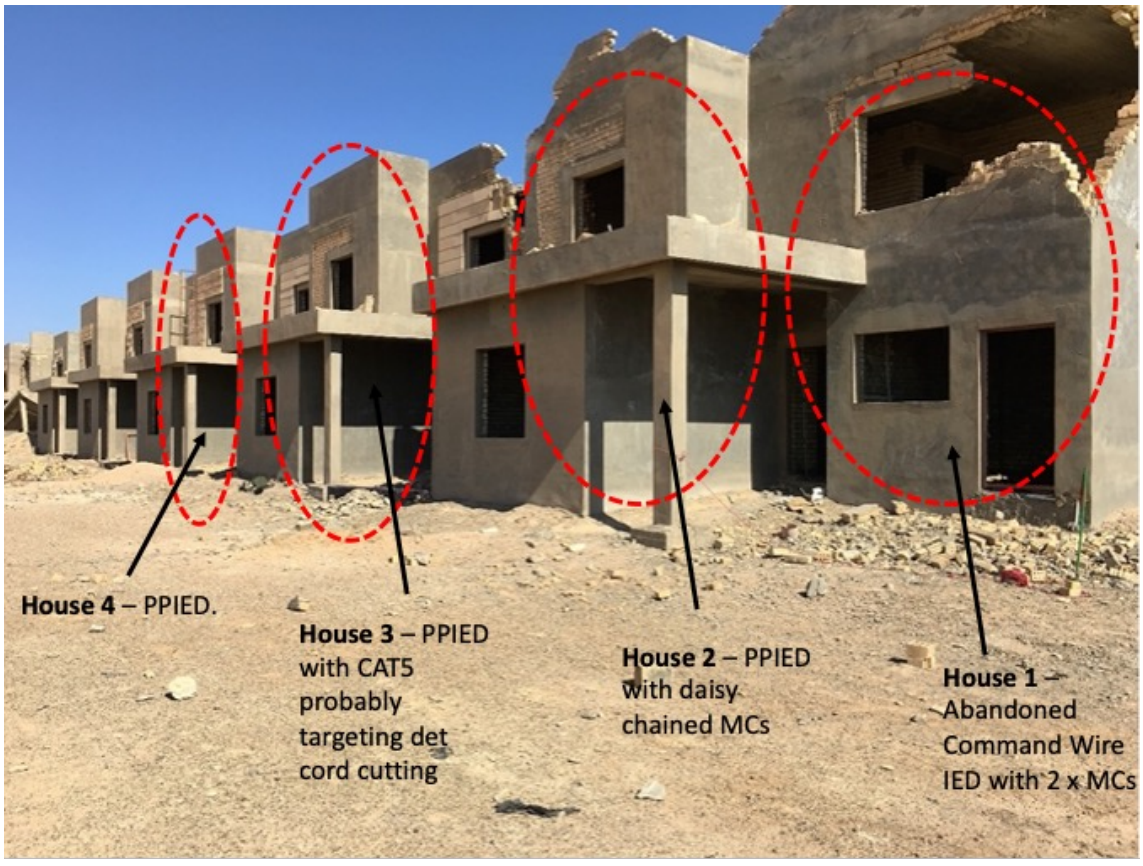

Figure 4: Four houses in one street containing a mix of IEDs – only house 4 contains a mine of an improvised nature.

In line with this, these authors believe that Member States must expend effort in identifying the appropriate level of IEDD expertise to conduct country and regional threat assessments prior to humanitarian interventions where IEDs are encountered.

concerns the poor quality of IED data available to those engaged in the field.

Whilst many stand-alone IED Information Management (IM) systems exist, there has not, to date, been a comprehensive and persistent way to share information

relating to IEDs (historical, extant and emerging threat) created between humanitarian agencies and Member States.

Such a database could, for example, detail the types of devices used; in which countries/regions; the favoured components chosen within a supply chain; and recommended render-safe procedures. Not only would this provide greater levels of understanding and safety among operators, it would provide assurance to new agencies starting work in a State or Region, and facilitates opportunities for regulation.

The collection, interpretation and dissemination of IED data is therefore vital and must be accompanied by technical exploitation, especially given the findings of AOAV's Paper 3 (below).

We are at a stage where energetic components are moving ever towards unpredictable home-made variants (where precursors remain inadequately policed) and where the 'internet of things' offers an endless choice of switches as defined by UNMAS[5] (see Figure 5). This same degree of variation is not found in conventional mines where extensive mitigation is already in place.

At the moment, such exploitation of data remains unpalatable – concerns over neutrality and impartiality persist. To some degree, this is understandable. The gathering of IED data might pose difficulties, especially in the face of some armed groups, such as those who use IEDs to pursue a strategy of terror, leaving little room for cooperation or compromise. But, within the context of HMA at least, consideration here is solely

Figure 5: Mock-up of a Hezbollah 'rock bomb'. This is not a mine! © BCL.

given to those IEDs found after the active conflict has ceased, with such devices being referred to the local security forces.

In such circumstances, should it not pose a problem if HMA data-gathering remained rooted to post-conflict clearance and focused on national capacity development? And, if so, where does the information on legacy IEDs now reside, given the HMA community has been clearing them for so many years?

We recommend, too, that technical investigations (wherever possible) also be conducted into the IED death, injury or 'near-miss' suffered by each deminer, with cause validated externally, so that appropriate remedial action can take place across organisations involved in this line of work. Very seldom have the authors seen any technical investigation report shared with the wider community from humanitarian or commercial contractors. Some HMA operators do not even disclose the numbers of killed operators on their websites, let alone share publicly the sad lessons identified from each avoidable death. Discussions within the HMA sector have shown to one of the authors an institutional-wide reluctance to engage on this matter.

This paper argues, then, that a combination of a focused approach to the training of EOD operators, informed by a global database on IED harm, would be a major step towards addressing global harm. AOAV's explosive violence monitor provides a conceptual template for such a database, but does not have the granularity not the security clearance for it to be truly useful. A UN-run dataset, however, could be.

Firefighters and rescuers extinguish a fire at the scene of a bomb blast at Terminus market in the central city of Jos on May 20, 2014. Twin car bombings killed at least 46 in central Nigeria. AFP Photo/STR "Nigeria-Unrest" by Diario Critico Venezuela is licensed under CC BY 2.0.

2. NATIONAL CAPACITY COUNTER-IED DEVELOPMENT

IED intervention is historically costly. For example, the price of providing immediate emergency clearance activities in Ramadi (late 2016) and the subsequent training and development of civil clearance teams was estimated at US $100 million per year. This figure was based on UNMAS' strategic planning considerations from experience in South Sudan, Mali, Lebanon and Somalia.

That 'cost', though, deserves to be compared with reference to the scale of effort required by the Multi-National Force (Iraq) to stabilise IED threats under Generals Casey and Petraeus in 2006/07[6]. In the end, approximately 2.7% of Operation Iraqi Freedom's campaign expenditure was spent on IED clearance. Of that, just over half was expended on training, equipping and fielding 140 multinational clearance teams to facilitate the render safe of 30,000 IEDs and the removal of 40,000 tonnes of UXO from Iraq's cities and towns.

This equated to roughly US $12.5 million per team in a highly kinetic environment[7], where protected mobility, force protection and specialist equipment consumed the lion's share.

What is clear is that the high-levels of training needed and the necessary equipment-costs to conduct safe IED disposal in the humanitarian urban context should no longer be a surprise to donors.

What is not clear is why personnel, training and equipment are all too frequently the focus of budgetary cuts, despite their crucial roles. It can only be assumed that such cuts, wielded seemingly without an analysis of the evidence, are rooted in a fundamental lack of understanding by donors on details such as threat assessments.

What is needed is for civilians and military alike to universally accept both the philosophy and the principles which underpin IED disposal[8,9], and also to accept that qualifications and competence are an absolute requirement to address the varying levels of threat, complexity, and intent of the perpetrator. From this starting point wider recovery mechanisms could be established.

Standardised training and assurance mechanisms not only underpin an appropriate response to threat assessment, but also allow those tasked to deliver within a timeframe that is commensurate with the capacity of the State requiring assistance. Not every state can adopt or afford remote means, for example, but with widespread and comprehensive training and mechanisms in place, activities addressing the IED threat could be prevented from stalling.

An example of this, within the context of economies of scale, is Yemen, where IED threat assessment and community consultation led to the identification of training, equipment and risk education shortfalls in four governorates badly impacted by IEDs in the urban context. IEDs were causing huge harm in these places.

Data on civilian impact from such harm showed that – between January 2018 and December 2021 – IEDs had a far greater impact on civilian populations in Yemen than other non-kinetic threats. On average, some 7.11 Yemeni civilians were killed or injured per IED explosion compared to UXO (3.82) and mines (2.88). Such statistics were reached through inexpensive improvements to Yemen's information management system (IMSMA), that delineated a 30/70 split in terms of IEDs to other types of mine[10].

Figure 6: A selection of switches found in an ISIL cache.

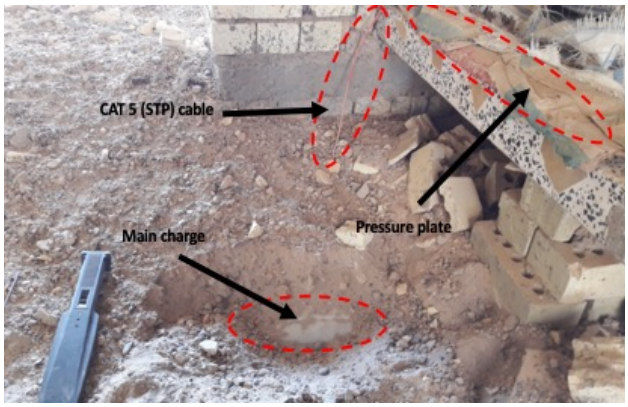

Figure 7: Complexity and ingenuity shown in one simple IED which has 2 switches wired in parallel and a third underneath the main charge with a separate power source.

As noted above, data-dictated responses have been shown, again and again, to be fundamental to mission success. Threat assessment, consultations, training, delivery of equipment for national mine action authorities, local security forces (in Yemen this came in at 20% the cost of proposed international interventions based on tenders received) – all have been shown to be successful.

Simple responses were at the heart of this data-led review. For instance, when shortfalls in training of deminers were identified in the threat assessment, a training-needs analysis was undertaken. This identified that a key factor in operators being killed on mission was their lack of separation from the bomb during EOD action. The response? Given that remote means were neither possible nor affordable within that particular conflict, the teams improvised and created locally-resourced semi-remote capacities (see Figure 8). Necessity was, in this case, the mother of innovation.

The development of this semi-remote capacity not only created work opportunities within the local community, but also, by being local, meant that any broken or worn-out items could be cheaply and swiftly replaced. Local solutions, in this way, have the capacity to empower and protect operators more than high-tech ones.

Similarly in Yemen, Explosive Ordnance Risk Education (EORE) focused on specific, not generic, threats. Educational material was created for those at greatest risk (especially children and youth – see Figure 9).

Figure 8: An officer of the national mine action authority uses simple hook and line procedures to remove a pressure plate from an offset directional main charge. Courtesy UNDP Yemen 2021.

In the space of just 12 months 161,844 civilians received targeted EORE sessions; 16,000 EORE products were distributed; over 200 community leaders established community feedback mechanisms; and 73 bomb disposal officers received semi-remote training and equipment to a local and manageable standard (not to IMAS' standards, but to a necessary competence: the IMAS training was too long and unwieldy to deliver appropriate trained response).

These simple interventions against IEDs had noticeable impact[11]:

- 266 IEDs were rendered safe with no casualties amongst operators or first responders (prior to the training there had been one operator fatality per 13 IED disposals);
- 10,407 other types of mines and ERW were recovered;
- 29,296 civilian lives and livelihoods were protected;
- other types of violence / concern were reported within these community networks, facilitating other meaningful interventions.

One final element of nimble and national EOD training must lie in regard to addressing the psychological harm of the work. Those looked at for this type of work must be properly scrutinised to establish how they might respond to stress; those chosen must be trained up to cope with the risk and the unpleasant nature of the work. Beyond training, it should be taken as a given that EOD operators and searchers will experience some form of traumatic overload.

This paper, then, argues that the best way forward to EOD response is for there to be responsive and agile local, national interventions and training, informed by data and supported by funding, that is commensurate to the skill and capacity of state harm. To some degree this is already being done in the global EOD community, but successes need to be shared more and a one-size fits all approach must be accepted with caution.

Figure 9: Children in high-threat area receiving EORE in Taiz governorate – courtesy of UNDP Yemen 2021.

3. BETTER, MORE FOCUSED FUNDING

Donor-funding support is the golden thread that permeates throughout the thematic areas. This is not least because the unit costs of clearing IEDs (whether per item, per operator, per task or per square metre) will always exceed that of conventional landmine clearance.

The simple cost logistics created by the size of some IEDs must give pause for thought. For example, a vehicle-borne IED (VBIED) can contain up to 10,000 kg of explosive (and perhaps such a weight of material lies crushed underneath rubble, alongside critical infrastructure). Buried main charges can be anywhere between 0.5 kg (sufficient to kill or maim a human) and often over 50 kg (designed to destroy vehicles). The diversity of the challenges that these IEDs pose in their removal is staggering.

A conventional landmine on the other hand, such as the TM57, contains no more than 6.5 kg of explosives. The damage parameters of conventional vs improvised are therefore poles apart if a mistake should be made during render safe. Not only can more lives be lost in a single event, but damage to critical infrastructure could also occur with the obvious political, reputational, and financial risks associated.

The Geneva International Centre for Humanitarian Demining (GICHD) clearly articulated the conundrum relating to cost in its 2016 study into mine action and IEDs[12], but it may have underplayed its findings. The paper's strategic focus centred on Northern Iraq, highlighting the developing technical/contextual complexity of the 'operating envelope' in terms of active and non-active conflict and the appropriate response. That paper, however, pre-dated key developments in Anbar province (the liberation of Ramadi and Fallujah) and the subsequent liberation of Ninewah (see Figure 10), and the sheer devastation that followed.

Figure 10: Federal Police move cautiously through the shattered remains of Al-Maydan, Western Mosul. Copyright Simon Boxton/Insta@SimonBuxton).

If we consider the changing landscape and overlay this with sound mine action principles, then we observe two entirely different triangles of effort developing (see Figure 11).

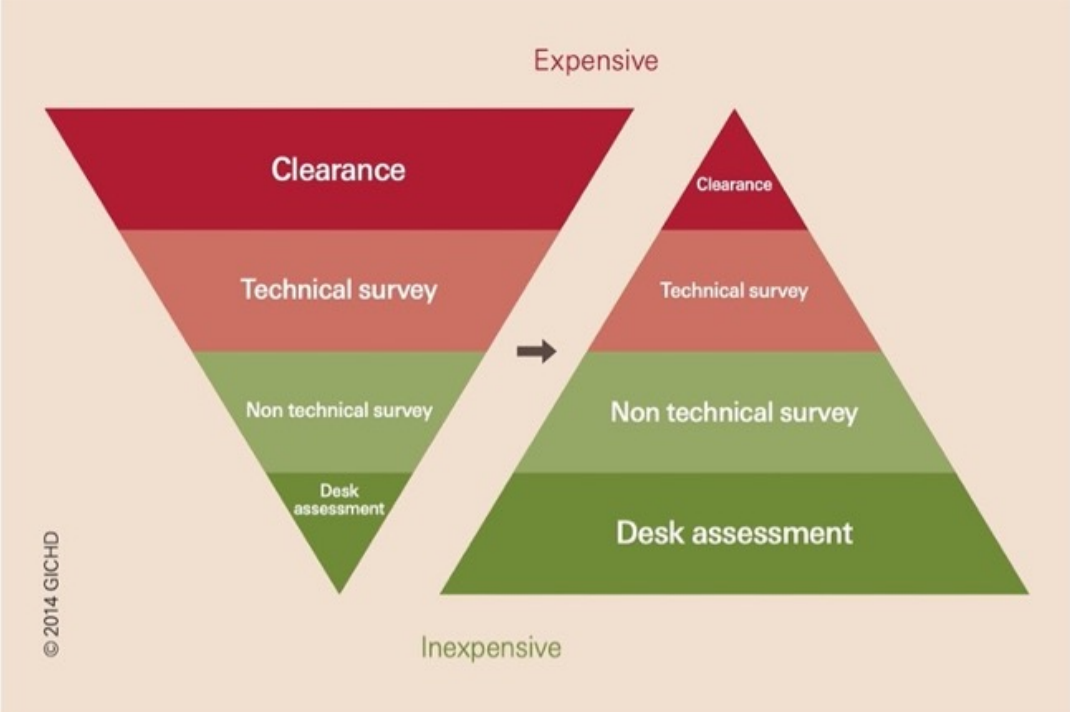

Figure 11: HMA principles applied to the IED context © GICHD

For humanitarian purposes, the donor prefers the triangle on the right, with a relatively inexpensive focus on desk assessment, NTS and EORE. Whilst these are low cost and high impact (relating specifically to beneficiaries), the contested space of the 21st century sits in the left-hand triangle. Here the beneficiary receives (at best) short-term relief.

With IEDs, it is clear that funding must be primarily expended on clearance and technical survey in order to support stabilisation and reconstruction efforts. This would be a high cost, and one with no tangible immediate data points that could be seen as 'good' investment to the donors (e.g. the metres squared cleared are limited; the number of beneficiaries difficult to determine without longer term census).

But funding needs to be found. AOAV's 'Propaganda of the Deed' report (Paper 2) shows how such a failure to address IEDs also plays into the perpetrator's hands. Communities remain isolated, humanitarian funds escalate to sustain IDPs in tented camps, reconciliation remains a distant dream, and a resurgence of violence becomes an almost inevitable consequence.

What is clear is that experience in Iraq, Syria, Afghanistan and Yemen to date should be sufficient evidence for Member States and others to prioritise more appropriately EOD funds, with a focus on clearance.

We contend that donors must also strive to be better educated on the realities faced on the ground, and must adjust their expectations accordingly. Cost reduction is possible through informed threat assessment, and donors can witness such reductions by identifying the appropriate expert to apply the intelligent application of IED philosophy and principles to potential technical project proposals (the economies of scale). In this way, any cost which is identified as 'X' is likely – in the end – to be 'X'.

In this way, this paper argues for better, more focused funding, rooted in clearance and technical survey. In the face of the costs of other stresses on funding pillars, such as natural disasters and pandemics, this call for more money might be a bitter pill, but the interminable rise of the IED has shown that stemming its tide earlier than later will, in the end, reap dividends.

4. BETTER, MORE CONSIDERED REGULATION

Our final thematic recommendation focuses on regulation surrounding the most likely components used in the manufacture of IEDs, and the supply chains that make such construction and deployment possible.

AOAV's initial approach has always been to consider explosive components, notably the detonator, booster and main explosive charge, whether they be military, commercial or home-made.

Whilst some regulations – such as effective Physical Security and Stockpile Management (PPSM) and targeted sanctions – have shown significant headway in restricting the use of some military and commercial explosives, such engagement falls short. Rather, it is the domain of explosive chemical precursors (ECP), those used in the manufacture of home-made explosive alternatives, that requires far, far greater focus.

Recent academic literature[13] identifies several cases where existing regulation is insufficient; it describes, for instance, how risk and risk management to explosive chemical precursors could be better applied.

This recommendation paper argues that the UN is the most appropriate instrument to champion such activity. This is most certainly one for thematic discussion by Member States, not least in determining appropriate global regulation for key offenders such as ammonium nitrate, potassium chlorate, hydrogen peroxide and those precursor chemicals most certainly identified in detonator manufacture. Somalia provides a test case on some of the broader shortfalls using improvised dynamite, as an example.

Potassium nitrate and concentrated nitric acid are both listed on the Programme Global Shield (PGS) explosive precursor chemicals dataset, and as such are subject to stringent regulation within the global supply chain.

Potassium nitrate is not an explosive, but when mixed with other fuels can generate energetic compositions (gunpowder being the oldest known)[14].

Nitric acid has no practical domestic use but is an essential precursor in the manufacture of nitroglycerine and dynamite. Concentrated sulphuric acid is often

State police officials inspect the wreckage of burnt vehicles at the scene of twin bomb blasts at terminus market in the central city of Jos on May 21, 2014. AFP PHOTO: STR. "Nigeria-Unrest" by Diario Critico Venezuela is licensed under CC BY 2.0.

used with nitric acid to optimise the nitration reaction. As a liquid explosive, NG can generate velocities of detonation approaching 7700 ms^{-1}. Its performance in the manufacture of military dynamites[15] is cited in the region of 4400 ms^{-1}.

For illustration on the need to address such dynamites - comprising potassium nitrate and nitroglycerine - it is worth noting they have been used in Somalia since 2017[16]. The devastating effect of Al-Shabaab 'dynamite' was felt on 14th October 2017, when the organisation detonated a vehicle-borne IED (VBIED) at a busy crossroads near the Safari Hotel in Hodan District, Mogadishu. 587 people were killed, with over 316 injured. The main charge was estimated at 2,000 kg, comprising 'dynamite' and harvested TNT.

According to subsequent laboratory analyses provided by the FBI's Terrorist Explosive Device Analytical Centre (TEDAC) and additional exploitation by UNMAS Somalia, the trend of Al-Shabaab producing 'dynamite' has increased further since the summer of 2018. Most interestingly, the UNODC GMCP[17] identified a 10-fold increase in sulphuric and nitric acid imports to Somalia during 2017 – trends that were not formally identified until publication of their November 2020 report. The most notable attack at scale since 2017 was in December 2019, when a 4,000 kg truck bomb exploded in Mogadishu, killing more than 80 people[18].

As for demand, Somalia took delivery of 127,600 kg concentrated nitric acid from India, Kenya and the UAE in 2020. This was accompanied by 334,602 kg concentrated sulphuric acid received from India and 40,000 kg potassium nitrate received overland from Kenya. Consultations with the Maritime Police Force confirmed that the end-user of these explosive chemical precursors was not known in most cases and that resolutions left governance open to human interpretation[19]. Programme Global Shield was, in this case, simply not working.

There have been over 470 IED incidents since resolution 2498 (2019) came into force[20]. However, without effective investigation (see above), it is not possible to determine precisely how many have contained improvised NG. Upon consultation with experts in the Somalia-Yemen mine action sector, though, it emerged that the majority did contain 'dynamite', each in the region of 200 kg. Given that the tactic to bulk out VBIEDs with 'dynamite' was evident since 2017, this works out at about 52 IED attacks throughout 2018/19 using 'dynamite' weighing up to 10,400 kg. The amount of nitric acid required to complete the successful synthesis of NG in such a quantity is estimated at 2 percent of annual imports. This clearly needs to be addressed.

This paper argues – then – that there needs to be, through a careful noting of what explosive chemical precursors are repeatedly reported present in major IED incidents, a more focused and better funded approach towards global regulation of such precursors.

For too long the traceability of core ingredients – such as potassium nitrate and nitric acid – has been considered an often less-than-urgent priority in the focus efforts to curb terrorism. This needs to be addressed.

Young Somalis look on near the wreckage of a car bomb after a double suicide attack by Al-Qaeda-affiliated extremist group Al Shabaab killed 18 people and injured dozens more at a popular Mogadishu restaurant in the Somali capital 07 September 2013. AU-UN IST Photo/Stuart Price. "2013_09_07_Village_Restaurant_ Attack_007" by AMISOM Public Information is marked with CC0 1.0.

CONCLUSION

Many thousands of ideas and recommendations have been proposed by the international community regarding IEDs, with focus and direction being applied from the UN Secretary General and Heads of Member States downwards.

Countering IEDs (C-IED) remains the 'buzz word' with humanitarian organisations debating what this means and sometimes offering up 'cut and paste' military doctrine to suit an undefined purpose.

The truth, though, is that the debate has become increasingly confused, dense and immobile. Policy-makers and funders are best advised that C-IED is all about cross-government capacity development, not just within a regional context but also amongst the communities exposed to the problem.

Given this overly complex situation, our response needs to be kept simple.

It is hoped these recommendations offer a way forward:

- **Improving international collaborations; sharing threat and IED information;**
- **Enhancing national Explosive Ordnance Disposal (EOD) capabilities to match the threat;**
- **Boosting international funding to support 3rd party IEDD operations in affected areas;**
- **Increasing international regulation to frustrate access to dual purpose components and precursors.**

An Afghan women is rushed by Afghan security forces from the scene of a suicide car bomb in Kabul, Afghanistan on Dec. 15, 2009. Afghan authorities reported that eight people were killed and 40 were wounded. "ferguson__MG_2918.jpg" by nveenstra1 is licensed under CC BY 2.0.

BACKGROUND

AOAV was commissioned by the United Nations Mine Action Service (UNMAS), with the support of the French government, to produce four expert papers on IEDs as part of a two-year study; this commenced in October 2019. Each author has been collegiate in approach, offering a mix of academic understanding and practical experience of the IED from the tactical (hands-on disposal operations) to the strategic (former responsible owners for regional planning). A summary of each paper and a link to its content is provided below.

Paper 1

IEDs past, present and future

This paper identifies the reality that the IED is here to stay, that it is nothing new, yet it has far surpassed the landmine as the most injurious feature in explosive violence towards civilians today. The reasons for this are in part symptomatic of the underlying causes of violence and violent extremist organisations, specifically chronic and persistent instability, and the breakdown of states and civil society across much of the Middle East, South Asia and North and Central Africa. It is also a consequence of admirable effort towards a mine free world (the Maputo aspiration) and improved ammunition physical stockpile and security management (PSSM). This leaves terrorism and criminality little recourse but to improvise. Whilst IED attacks will not decrease until these root causes of vehement discontent are effectively addressed, there is a degree of mitigation that can be applied.

Authors: Iain Overton (Action on Armed Violence); Roger Davies (www.standingwellback.com); Dr Louise Tumchewics (Centre for Historical Analysis and Conflict).

Paper 2

An examination of the precursor chemicals found within IEDs

Examines the global supply chains available to terrorists and those items most commonly in use, highlighting problems with existing regulation for even the most frequent use items (such as nitrates, chlorates and peroxides), a lack of coherence in our approach towards HMA, and the emergence of the '*internet of things'*. The days of the conventional minefield are over within the context of the 21st century conflicts we face, with the IED network becoming a misnomer of focus. IED networks do not exist in isolation since global illicit trade involves the economic or ideological exchange of illegal goods and services. These networks are readily established and a major business for transnational criminal organizations, estimated at US $2.2 trillion per annum, or 3 % of the world's global economy. Advocates of terror using the IED therefore sit within the broader context of criminality, and it is in this arena that the most appropriate levers should be applied.

Author: Brigadier Gareth Collett (Brimstone Consultancy).

Paper 3

The Challenge IEDs Pose for the Humanitarian Mine Action (HMA) Sector

Considers the challenges that the IED poses to the HMA sector. While some HMA organisations have shown that they can step up to the challenge using transferable skills, it must be recognised that IEDs pose a much higher level of threat than conventional landmines. Donor resourcing sees us lost in the search for definition, as opposed to focusing on qualification, competence, and aptitude. Capabilities vary from organisation to organisation and country to country, there is no central regime for addressing skill fade, or for following up on operator fatalities and injuries to determine cause, effect and future capacity development focus. Quality Management (QM) and assurance are lacking.

Author: Col Steve Smith (Action on Armed Violence).

Paper 4

The Improvised Explosive Device and 'The Propaganda of the Deed'

The propaganda of the deed analyses the symbiotic relationship between the improvisational form of violence that is offered by the IED and the ideological drivers behind use. The suicide bomber stands out as a form of the IED that has become emblematic of the Propaganda of the Deed. However, the international community does not address acts of such terror in the same investigative fashion as that of criminality. Does this therefore mean that acts of terrorism are treated as the lesser evil to criminal acts of murder? International law and the unlawfully killed / injured victims would expect an IED incident to be treated as a crime scene with technical exploitation a matter of routine.

Authors: Iain Overton (Action on Armed Violence) and Sean McCafferty (University of Glasgow).

ABOUT THE AUTHORS

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Gareth Collett is a former British Army officer who specialised in counter-terrorist bomb disposal. He was appointed CBE in 2013 as the head of the United Kingdom's bomb disposal profession and principal proponent for the safeguarding of multinational EOD operations worldwide. Gareth is a world leading and published subject matter expert on countering improvised explosive devices (C-IED), blast mitigation and post-blast forensics, having recently completed post-blast evaluation on the Beirut disaster for the Lebanese government and the potential impact upon the environment following fuel-air explosions aboard FSO SAFER. In his spare time, Gareth is a pro-bono Board Member and Ambassador to two International Victim Assistance Charities, a senior member of the Civilian Stabilisation Group and Fellow of the Institute of Explosive Engineers. He is currently the Chief Technical Advisor for the United Nations Development Programme.

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Iain Overton is the Executive Director of Action on Armed Violence. He has been a member of an expert working group on explosive weapons for the Geneva International Centre for Humanitarian Demining, sits on the advisory committee to the UK's All Party Parliamentary Group on Explosive Weapons, and is an expert member of the Forum on the Arms Trade. He also sits on the Advisory Board for the NIHR Global Health Research Group on Post Conflict Trauma; PrOTeCT at Imperial College London. He is the author of two books, including a history of the suicide bomber: The Price of Paradise.

END NOTES

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