The use of explosive weapons in Syria
A time bomb in the making

Analysis of weapons contamination in Syria
1. INTRODUCTION

Since March 2011, Syria has descended into chaos. The number of individuals killed exceeds 220,000\(^1\) and 1 million others have been injured\(^2\). More than 11.5 million people (or half the population) have been forced to flee their homes. Among them, more than 3.9 million Syrians fled to neighboring countries and 7.6 million are internally displaced\(^3\). Besides the human toll, the conflict has had a dramatic impact on socio-economic indicators: Syria's Growth Domestic Product (GDP) shrunk by 40% since the conflict started in 2011, and life expectancy dropped by 20 years in that same time, down to 55.7 years\(^4\).

Violence continues unabated throughout the country. The ongoing pattern of fragmentation and consolidation of armed groups, the emergence of militias and the varying levels of interference by foreign countries are all contributing factors to the intensification of the conflict and eruption of new frontlines.

The pool of available weaponry has expanded since the beginning of the conflict, due to the steady flow of arms into Syria. The international community was unable to prevent weapon proliferation. For instance in June 2013, the European Union failed to renew the ban on the export/import of arms and equipment for internal repression.

No diplomatic solution seems to be emerging to a peaceful solution to the conflict. In the meantime, despite the adoption of Security Council resolution 2139 which demands that all parties immediately cease all attacks against civilians, as well as the indiscriminate employment of weapons in populated areas\(^5\), explosive weapons, including forbidden weapons such as cluster munitions, have been and continue to be widely used in populated areas, maiming and killing at the time of use but also contaminating large areas for years to come.

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1. OCHA  UN statistics as of January 15, 2015.
5. UN Security Council resolution, 2139, Operational paragraph 3 February 2014.
In order to document and analyze weapons contamination in Syria for programming purposes, Handicap International began to gather data on the types and use of conventional weapons: small arms and light weapons, explosive weapons such as rockets, mortars, artillery shells, cluster munitions, landmines as well as improvised explosive devices (IEDs). By compiling secondary data, including reports of clashes, datasets from UN agencies and International Non Governmental Organizations, open source media and social media reports, the research team created a consolidated database of incidents. This available data was then used to map the frequency and severity of incidents in order to evaluate the weapons contamination that is currently affecting and will continue to affect the civilian populations in Syria if no action is immediately taken to develop an appropriate humanitarian response.

The data included in this report has to be considered as trends and estimates. Due to the nature of the ongoing conflict, systematic data collection in Syria remains impossible so the information provided here is not to be seen as a comprehensive compilation of all incidents. The information was collected between December 2012 and March 2015, by several organizations (including UNMAS United Nations Mine Action Service and Human Rights Watch) that agreed to share data with Handicap International. The estimation of the contamination’s toll on the population was done according to a severity scoring approach, which compared population density and the number of incidents per sub district (see detailed methodology in annex).

While this information will be used to inform operations planning (in particular on risk education and clearance), the aim of this report is to raise awareness among key decision makers about the extent of weapons contamination, and on the need to mobilize the resources for a long term response. It also aims to ensure the coordination and mainstreaming of Conventional Weapon Risk Reduction into humanitarian programming.

In general, this report will show how urgent it is for the international community to address the harmful effects of the use of explosive weapons in populated areas on civilians.

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6. An incident is defined according to IMAS as “an event that gives rise to an accident or has the potential to lead to an accident” International Mine Action Standards (IMAS), Glossary of Mine Action Terms and abbreviations, Second edition January 2013.

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Handicap International activities in the region

Through its extensive experience intervening in complex emergencies and crisis settings, as well as its 25 year experience in mine action, Handicap International has comprehensive insight about how armed conflicts negatively impact the quality of life of civilians.

Handicap International provides physical rehabilitation, psychosocial support and emergency distributions to people with injuries, people with disabilities and the most vulnerable people in Syria and in neighboring countries. Additionally, it conducts risk awareness education with exposed, local populations to prevent accidents caused by explosive weapons. Handicap International operates in health centers, camps and communities.
This map depicts the intensity of use of explosive weapons in Syria between December 2012 and mid of February 2015. A color gradient portrays the severity and location of incidents reported in Syria. The darker the color, the higher the number of incidents, the higher the impact and the larger the number of victims, and people who have been affected by those incidents.

These charts depict the affected population based on age (adults, and children aged 18 and younger) and distributed by Syrian governorates. Explosive weapons have dramatically affected the lives of more than 5.1 million Syrians, many of whom are taking refuge inside the country not able to return to their homes. The danger still exists as numbers of incidents soars.
Between December 2012 and March 2015, 77,645 incidents were recorded following conventional weapons and IEDs use in Syria. Explosive weapons have been massively used by all parties to the conflict, and represent the greatest threat to civilians: they account for 3.3 of recorded incidents. This gives an indication of the type of warfare taking place in Syria (compared with other recent conflicts where the use of small arms and light weapons tends to be more important) and shows the high intensity of the fighting. Besides, 16.27% of recorded incidents were caused by small arms and light weapons.

5 recorded incidents involving explosive weapons occurred in densely populated areas. This suggests that the belligerents have no intention of effectively distinguishing between civilians and combatants which constitutes a violation of International Humanitarian Law.

The use of explosive weapons in a conflict is not prohibited by the Geneva Conventions; but due to their blast and fragmentation effects, using them in populated areas is unlawful as they fail to discriminate between civilian populations and infrastructures and military targets.

7. Explosive weapons entail explosive ordnance such as mortars, rockets, artillery shells, aircraft bombs, cluster munitions and mines, as well as improvised explosive devices (IEDs).
8. For the purpose of the report all sub districts with a population density below 150 inhabitants per km² are classified as rural.
10. Indiscriminate attacks are those:
(a) which are not directed at a specific military objectives
(b) which employ a method or means of combat which cannot be directed at a specific military objective; or
(c) which employ a method or means of combat the effects of which cannot be limited as required by international humanitarian law; and consequently, in each such case, are of a nature to strike military objectives and civilians or civilian objects without distinction. Jean Marie Henckaerts and Louise Doswald, Customary International Law 2009.
The data in Chart 4 shows, by category of weapons used, the concentration of incidents at the governorate level. Again, in each governorate, explosive weapons have been used extensively, confirming the intensity of the fighting.

Based on the analyzed data, the governorates of Aleppo, Dar'a, Homs, Idleb and Rural Damascus are the most contaminated areas and account for 70% of the total number of recorded incidents involving explosive weapons. Those governorates include major cities in Syria such as Aleppo, Dar'a, Damascus, Homs, Idleb and Tartous.

Out of 267 sub-districts, only 26 are not affected by the use of conventional weapons and IEDs or incidents were not recorded there. Based on the severity scale, 79 sub-districts are considered "highly affected" by the use of conventional weapons and IEDs. This implies that the population of those sub-districts is appallingly exposed to explosive weapons. As an indication only for Damascus governorate, 5,353 incidents were counted during the period, an average of seven incidents each day.

It is estimated that 5.1 million people are living in those highly contaminated areas, and more than 2 million children\(^1\) are directly exposed to the risk of explosive weapons. Aleppo and Rural Damascus are the most dangerous governorates for children.

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\(^{11}\) According to the United Nations Population Division, 41% of the Syrian population is below 18 (2012).
In April 2014, nine-year-old Yara and two friends were about to leave their school in Daraa city when the building was struck by a bomb. She says, “It was the end of classes and we were going out of school. I was looking for candies in my bag when bombs started to fall down all over the place. My friend and I got injured. But our other friend died in the explosion.” Due to the blast and shrapnel, Yara lost her left eye and got both legs fractured.

The effects of explosive weapons are difficult to fully anticipate and control — especially when used to such a large scale as in Syria. As a leading cause of death and injuries at the time of their use, these weapons may also cause an important number of injuries, disabilities and deaths long after the conflict until proper clearance of the contaminated areas is carried out.

People injured by explosive weapons face a higher risk of developing permanent impairments. Because explosive weapons use blast or fragmentation effects around the point of detonation, they create complex injuries that require immediate access to adequate medical care and trauma surgery, and require long-term post-operative care in order to avoid complications or death. A previous study conducted by Handicap International among Internal Displaced Persons (IDPs) in Syria showed that 60% of respondents injured by explosive weapons had fractures or complex fractures, including open fractures, requiring emergency medical care; 21% faced peripheral nerve injury; and 25% had undergone amputations.

Psychological trauma associated with the use of explosive weapons can be immense if no proper support is provided to the victims. With more than 1 million people injured, and with the destruction of Syria’s health system, building an inclusive society in the future will be a critical challenge. A significant level of resources is needed, both now and in the long term, to ensure equal quality of life for all citizens.

In April 2014, Youssef was working in his field when a large explosion occurred, “I remember touching something with my foot, then everything exploded. I remember seeing the cultivator continue its course... but after that everything up to waking up in Amman, is a total blank,” the teenager explains. “The night before the accident, there were a series of bombing raids in the region,” continues Reya, his mother.

Long-term impact of explosive remnants of war on services and infrastructure
A percentage of explosive weapons fails to detonate on impact, leaving behind unexploded ordnance — a deadly, long-term threat to the population. In particular, key infrastructure such as housing, schools, health centers, and water/sanitation systems are repeatedly targeted. Those which have not been destroyed will remain unsafe for use because of the contamination from explosive remnants of war. The impact of explosive weapons thus goes beyond the immediate casualties: the presence of explosive remnants of war remains an obstacle not only for the security and the wellbeing of the civilian population, but also for the overall reconstruction of the country.

Nowhere to be safe
While urban areas are the targets of most attacks, rural areas provide no safe haven. Chart 2 shows that while bombing and shelling are very common in densely populated areas, landmine-related incidents are more frequently recorded in the Syrian countryside and the high presence of IEDs remains an important threat. Al Hassakeh, Ar Raqq and Deir ez Zor are the most mine-affected governorates. Landmines and IEDs are particularly difficult to detect and pose long-term threats to the safety and the livelihoods of the Syrian population.
Landmines are planted along roads, preventing the population from moving to safer areas, or are concealed in fields and pasturelands, near wells and riverbanks, affecting agriculture-based livelihoods. In the long term, landmines and IED contamination will jeopardize the means of subsistence of those Syrians relying on agriculture and will impede economic recovery.

The data analysis shows that the opposition controlled areas are the most exposed to incidents. The number of retaliation attacks may explain the fact that opposition controlled areas are particularly affected by explosive weapons related incidents.

A total of 1.7 million IDPs live in both contested and opposition areas. A large proportion of those IDPs (more than 800,000) are located in highly affected, contested areas. This finding raises the issue of protection of IDPs, who seem trapped in the most contaminated areas.

In December 2013, Yasar’s village in Homs Governorate was bombed, forcing hundreds of people to flee. The 22 year old recalls, “we walked for five days, all together - women, men, children - to escape the bombing. Four months after, the village where we had found refuge was also bombed. Together with my relatives, we decided to flee again and cross the border to Lebanon. We had to cross an open field to reach the border. Landmines started to randomly explode all around us. A lot of men died that day, including my father and my cousin. This was the journey of death.”

16. Territorial control in Syria has changed many times since the country’s uprising began. The contested areas refer to territories where rival groups are struggling to impose full control on their enemy.
17. Testimony collected among Syrian refugees by Handicap International in Lebanon.
In Syria, 5.1 million people, among them more than 2 million children, are living in areas highly affected by explosive weapons.

The high level of contamination poses a long term threat to the safety and the livelihoods of the Syrian population. Key infrastructures such as schools and health centers hit by explosive weapons will remain contaminated by explosive remnants of war, preventing the population from accessing them safely until trained clearance teams can neutralize the danger. Infrastructures are also damaged as roads, factories and agricultural fields have been largely targeted and thus contaminated, hampering future economic development.

Weapons contamination will also slow the return of displaced populations to their homeland, even in the event of a peaceful resolution of the conflict.

The social and economic legacy of explosive weapons is immense, and should be addressed as an urgent matter.

Emergency decontamination must be considered in stabilized locations, particularly in populated areas, and a thorough decontamination of affected areas must be the priority once a peaceful resolution to the conflict is found. In the meantime, it is vital that a coordinated approach towards weapons risk education and information management prevails. In order to save as many lives and limbs as possible, the population needs to be rapidly and thoroughly informed of the risk posed by the use of explosive weapons and the relevant safe behaviors.

Safa is 7 years old. After being severely injured in a bombing, she had her right leg amputated. In December 2013, when she was still living in Za'atari camp, she received a prosthesis from Handicap International. She now lives with her parents and siblings in Amman. She is being followed by Handicap International again in order to get her prosthesis adapted. Here in the orthopedic devices workshop in Amman to take measurements. © Sarah Pierre/Handicap International.
RECOMMENDATIONS:

Warring parties should abide by International Humanitarian Law, and:

Immediately end the use of explosive weapons with wide area effects in populated areas;
Immediately end the use of cluster munitions and landmines in accordance with the international treaties banning them;
Ensure communication with affected populations, and raise their awareness about the risks posed by the use of conventional weapons including unexploded ordnance;
Allow and facilitate the safe passage of relief convoys and humanitarian personnel into and across territories within their control, especially to facilitate emergency access to and transportation of the injured;
Protect civilians by ensuring unhindered opportunities for all civilians that wish to flee the conflict zones.

The international community should:

Strongly condemn the use of explosive weapons in populated areas and in particular the use of banned weapons such as cluster munitions and landmines in Syria;
Advocate for the effective implementation of Security Council Resolution 2139 on Syria, which called for increased access of population to humanitarian aid and for protection of civilians;
Support the implementation of risk education, clearance and victim assistance efforts, including rehabilitation, in Syria in the short and long term;
In particular, ensure that the rights of the victims are recognized and that their access to services is ensured;
Support the development of an international commitment to end the use in populated areas of explosive weapons with wide area effects;
Share their national policies and practices related to the use of explosive weapons in populated areas according to the UN Secretary General recommendations.

The humanitarian community should:

Improve coordination and information sharing among Conventional Weapon Risk Reduction (CWRR) stakeholders. Cluster coordination groups should systematically include CWRR actors in order to ensure the cross cutting conventional weapons and IEDs needs are met. Specific working groups on CWRR should be established immediately in Jordan, Turkey and Lebanon, with regular reporting links to each other;

The humanitarian impact of the use of explosive weapons in populated areas has attracted growing attention these last years: about 40 countries have publicly expressed concern on this issue, and the UN Secretary General and the International Committee of the Red Cross have called on states to avoid using explosive weapons with wide area effects in densely populated areas. Further discussions are planned in 2015, with a view to developing an international political declaration on this topic. Handicap International, which co-founded the International Network on Explosive Weapons (INEW) with other NGOs in 2011, is mobilized to achieve that goal.

CWRR groups should first develop a coordinated CWRR plan of action which will include:

Risk Awareness activities to be systematically rolled out in the most affected areas (Aleppo, Dar'a, Homs, Idleb and Rural Damascus), focusing on high risk groups such as children, IDPs and returnees;
Coordinated information, education and communication materials to be developed in participation with those groups most at risk;
The integration of risk education training in school curriculums to be examined and addressed to all schools in Syria through formal and informal education systems;
Local community leaders should be trained in risk education to further expand awareness to local, displaced and returning populations;
Training programs and support to local partners to be developed to address basic clearance needs and rubble removal issues in area of return and/or displacement in both rural and urban areas.

Implement victim assistance efforts, including rehabilitation, in Syria in the short and long term.
The data included in this report was collected between December 2012 and March 2015 by several organizations that agreed to share this information with Handicap International. The incidents represented in this report are derived from a variety of sources including open source media reporting, social media reports, as well as reports from organizations within Syria neighboring countries. Where possible, those organizations attempt to triangulate incidents so they are reflective of the underlying security context, however on occasions where this may not be possible, the data is indicative rather than a fully accurate account.

One of the important steps of control and data preparation consisted of an early familiarization with the raw data. At this stage, it was important to identify possible extreme values, identify possible associations between pairs of quantitative variables and identify the missing values. Prepared data were then merged into a single database for the purpose of the analysis.

The variables that were included in the data analysis focused on information mainly concerning the incidents and related data reported by the various sources:
- Geographical location (governorate, district, sub-district, village and GPS coordinates);
- Nature of the incident (clash, shelling, fighting, etc.),
- Date of the incident,
- Type of weapons used (cluster bombs, mortar, small arms and light weapons, etc.),
- Demographic data at sub-district level: pre-war population, estimated current population, IDPs and returnees.

Datasets (i.e. databases of incidents collected by organizations) were collected from a number of sources. Most of the sources were focusing on collecting generic data about incidents, without classification or categorization of incidents per type or source. Using information from various datasets may result in double reports of the same incidents, which could create duplication in our master database. Attention was paid to this risk and the reports of incidents were not seen to overlap. The datasets covered different time periods, with minimal overlap, creating an uninterrupted flow of incidents. Handicap International cannot guarantee that no duplication exists, but it will remain minor and should not affect the overall analysis.

For some variables, observations contained missing values for various reasons:
- Omission of values that did not provide an indication of an incident,
- Registration of incorrect or illegible responses,
- Transcription error or data entry.

Missing values were replaced by appropriate estimates (mean, median, extrapolation or external reliable information) to supplement the data sets to be subjected to analysis and reduce the bias of analysis. When the replacement of missing values was not possible, observations with persistent missing values were excluded from the database.
For some variables, observations contained extremes primarily related to recording errors, transcription or data entry. When these outliers were detected in the data, the first task was to determine the extent of their impact on the analysis. Some missing values were replaced by appropriate estimates (mean, median, extrapolation, etc.) to complete the data set to be submitted for analysis and reduce the bias of survey estimates. When the substitution of outliers was not possible, they were excluded.

The ratio between the number of incidents and the population density was based on available demographic data at the sub district level to the set up of a severity scale.

Once the aggregated data was integrated to the Geographic Information System (GIS) software, the first step was to visualize the data, looking for variances or irregularities and cleaning when necessary. Once this process was completed, data was ready to be spatially analyzed.

Spatial point patterns are based on the records of the incidents in Syria. Each event attributes include the date of the incident, type and classification of the incident, population information and communities associated to a location. The purpose of point patterns is to detect whether the event occurred at random or represents a clustered or regular pattern and how it is associated to other events recorded in that point or the area of intersect.

Two heat maps representing years 2013 and 2014 were produced and then compared with a population grid map from 2013.

18. In 2012, the population in Syria was estimated at 21,889,000 according to the United Nations Population Division.
Spatial join

Another method of spatial analysis is to join the points features with the sub district polygons features based on the intersection of points in each sub district polygon, and output a new attribute of the number of incidents per sub district polygon. The output feature portrays a geo referenced table with all sub districts and the count of incidents in each polygon. To visualize the new features graduated colors were used to represent the level of impact of the conflict on areas. The number of incidents was divided by the areas of the sub district to depict a realistic visualization of the extent of the conflict.
Abandoned explosive ordnance (IMAS 04.10 Second Edition Glossary of mine action terms, definitions and abbreviations (Amendment 6, May 2013))

Explosive ordnance that has not been used during an armed conflict, that has been left behind or dumped by a party to an armed conflict, and which is no longer under control of the party that left it behind or dumped it. Abandoned explosive ordnance may or may not have been primed, fused, armed or otherwise prepared for use.

Cluster munitions (Convention on Cluster Munitions, 30th May 2008, Article 2)

Cluster munition refers to a conventional munition that is designed to disperse or release explosive submunitions, and includes those explosive submunitions.

Conventional weapons (Convention on Certain Conventional Weapons and other international agreements on mine action)

Conventional weapons can be defined by what they are not: nuclear, biological, or chemical weapons.

Explosive ordnance means conventional munitions containing explosives.

Explosive remnants of war (IMAS 04.10 Second Edition Glossary of mine action terms, definitions and abbreviations (Amendment 6, May 2013))

Explosive remnants of war mean unexploded ordnance and abandoned explosive ordnance (Convention on Conventional Weapons, Protocol V, Article 2).

Explosive weapons (IMAS 04.10 Second Edition Glossary of mine action terms, definitions and abbreviations (Amendment 6, May 2013))

Explosive weapons entail mortars, missiles, rockets, artillery shells and aircraft bombs and other weapons which under the Convention on Certain Conventional Weapons and other instruments are referred to as explosive ordnance, as well as improvised explosive devices (IEDs). Different technical features dictate their precision and explosive effect, but these weapons generally create a blast and fragmentation zone.

Impersonal explosive device (IMAS 04.10 Second Edition Glossary of mine action terms, definitions and abbreviations (Amendment 6, May 2013))

A device placed or fabricated in an improvised manner incorporating explosive material, destructive, lethal, noxious, incendiary, pyrotechnic materials or chemicals designed to destroy, disfigure, distract or harass. They may incorporate military stores, but are normally devised from non military components.

Incident (IMAS)

An event that gives rise to an accident or has the potential to lead to an accident.

Internal Displaced person (Office of the United Nations High Commissioner for Refugees)

Unlike refugees, IDPs have not crossed an international border to find sanctuary but have remained inside their home countries. Even if they have fled for similar reasons as refugees (armed conflict, generalized violence, human rights violations), IDPs legally remain under the protection of their own government even though that government might be the cause of their flight.

Unexploded ordnance (IMAS 04.10 Second Edition Glossary of mine action terms, definitions and abbreviations (Amendment 6, May 2013))

Explosive ordnance that has been primed, fused, armed or otherwise prepared for use or used. It may have been fired, dropped, launched or projected yet remains unexploded either through malfunction or design or for any other reason.

Small Arms and Light weapons (International Instrument to Enable States to Identify and Trace, in a Timely and Reliable Manner, Illicit Small Arms and Light Weapons)

Any man portable lethal weapon that expels or launches, is designed to expel or launch, or may be readily converted to expel or launch a shot, bullet or projectile by the action of an explosive (e.g.):

(a) Sm all arms a re, broadly speaking, weapons designed for individual use. They include, inter alia, revolvers and self loading pistols, rifles and carbines, sub machine guns, assault rifles and light machine guns;

(b) Li gh t weapons a re, broadly speaking, weapons designed for use by two or three persons serving as a crew, although some may be carried and used by a single person. They include, inter alia, heavy machine guns, hand held under barrel and mounted grenade launchers, portable anti aircraft guns, portable anti tank guns, recoilless rifles, portable launchers of anti tank missile ad rocket systems, portable launchers of anti aircraft missile systems, and mortars of a caliber of less than 100 millimeters.

Submunitions (IMAS 04.10 Second Edition Glossary of mine action terms, definitions and abbreviations (Amendment 6, May 2013))

Any munitions that, to perform its task, separates from a parent munition (i.e. cluster munition).

Abbreviations

RR Conventional Weapon Risk Reduction
R Explosive Remnants of War
G Global Positioning System
ID Internal Displaced Person
ID Improvised Explosive Device
IAS International Mine Action Standards
HA Office for the Coordination of Humanitarian Action
U United Nations
D United Nations Development Program
H World Health Organization
e would like to thank U   AS Human Riights atch and the other contributors or hain shared data with Handicap International and I  A or their collaboration on the data analysis.

For further information please contact:
For the region: Anne Garella, Emergency Regional Representative in Amman  coordo.region@hi emergency.org
At international level: advocacy@handicap international.org.