Fractured Flow: The Cascading Impacts of War on Access to Water

The Use of Explosive Weapons in Populated Areas and Their Impact on Access to Water

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Insecurity Insight

Executive summary /report synopsis

Water is the source of life. Functional water infrastructure is the foundation for human well-being, agriculture and the health of the wider economy; it is a vital component of food security and is necessary for raising livestock and cultivating crops. Water and sanitation systems are critical for maintaining high standards of hygiene, reducing disease transmission, and promoting better health outcomes. Properly managed water supply systems also provide safe drinking water, which is essential for human life. This report documents how the use of explosive weapons in populated areas damages or destroys this important type of civilian infrastructure, and discusses the wider implications of this practice.

The report draws on Insecurity Insight's dataset of reports of 308 incidents gathered from open sources in which explosive weapons damaged, destroyed, or disrupted water supply systems or contaminated water sources. These incidents occurred in 21 countries and territories between January 2018 and December 2024. The report covers the damaging or destruction of ten affected components of a water supply system: sources, extraction, treatment, storage, distribution, collection, capacity-building, multipurpose/multifunction infrastructure, water-related infrastructure, and water utilities. Physical water infrastructure and the social organisations needed to run it are distinct from water sources. However, for brevity, the term "water infrastructure" is used in the report to refer to a variety of distinct water-related components.

The report addresses the wider connections between conflict and hunger and the use of explosive weapons. The Political Declaration on Strengthening the Protection of Civilians from the Humanitarian Consequences Arising from the Use of Explosive Weapons in Populated Areas (EWIPA Political Declaration) identified the use of explosive weapons as of specific concern due to the wide-ranging and long-lasting harm they can cause by their direct impact and indirect or reverberating effects. United Nations (UN) Security Council Resolution (UNSCR) 2417 (2018) recognises how armed conflict impacts food supply systems both directly and indirectly. It reinforces protections by explicitly condemning both the starvation of civilians as a method of warfare and attacks on essential civilian infrastructure, which includes water infrastructure. While UNSCR 2417 primarily addresses state actors, its call on all parties to armed conflict to adhere to international humanitarian law (IHL), and the obligation to refrain from using starvation as a method of warfare extends to non-state actors.

While a variety of weapons can damage, destroy or distrupt water infrastructure, the report focuses on the connections between the impact of explosive weapons use on water infrastructure and the resulting consequences for food security during conflict. Insecurity Insight's incident-based methodology enables both the collection of information on explosive weapons use affecting water infrastructure and an analysis of the scale and impacts of these incidents.

The report sheds light on the immediate and reverberating impact of the use of explosive weapons in populated areas and what we can do to mitigate the risk of harm to communities as a result of their use. It builds on existing research and efforts to shine light on the central importance of water infrastructure, and hopes to inspire an increased and more urgent focus on its protection, the monitoring of the impact of its destruction, and efforts to help communities recover from its destruction, including reconstruction efforts.

The report analyses the effects of explosive weapons use on water infrastructure over time, from the direct and immediate effects caused by the blast and fragmentation at the point of detonation; to the short-term indirect effects that result from the explosion interacting with the surrounding environment, such as structural collapse and debris; and the longer-term reverberating effects that arise from the destruction of essential infrastructure and the disruption of basic services.[1] It places a particular emphasis on reverberating effects, highlighting the ways in which the impact of explosive weapons use continues to be felt long after the initial explosion, including cycles of harm and revictimisation for the communities whose health, lives, and livelihoods depend on access to safe, clean water and sanitation.

The recorded incidents show that damage and destruction from explosive weapons use occur both through the direct targeting of civilian infrastructure and indirectly through the deployment of explosive weapons with wide-area effects in populated and urban areas, where various kinds of infrastructure operate in close proximity and are often interconnected and interdependent. In current diplomatic and humanitarian discourse, the impact of explosive weapons use in populated areas is primarily viewed through the lens of direct civilian harm. Death and injury at the moment of impact are stark and emotive, underscoring the severe toll of conflict. This is highly pertinent as urban warfare becomes an increasingly defining feature of contemporary armed violence across the world. However, to more clearly understand the impact of explosive weapons use on the civilian population, it is essential to shift the lens to include the impact on vital civilian infrastructure and the indirect effects of these weapons over time and geographic space, and how these effects contribute to devastating long-term civilian harm over time.

Efforts to protect civilian populations require a renewed focus on civilian infrastructure, which facilitates a deeper understanding of the wide-ranging and long-term effects of explosive weapons use, including the indirect harm they cause weeks, months, and even years after detonation. The violent consequences of explosive weapons use are not only apparent at the moment and location of their detonation, but also occur over time as civilians suffer from barriers to food security, economic stability, and health care, all of which rely heavily on functional water infrastructure. This report examines the impact and foreseeable consequences of the damaging and destruction of water infrastructure by explosive weapons. In the absence of a universally accepted classification or framework for analysis, the report has organised the different types of water infrastructure into ten categories and applied the framework of the *“hierarchy of importance of components”*[2] to analyse the impact of explosive weapons use throughout a water supply system.

The full impact of explosive weapons cannot be captured in one moment, because the effects of their use reverberate over space and time. It is essential to develop long-term monitoring programmes that track both the direct and indirect effects of explosive weapons use. While Insecurity Insight has developed and refined mechanisms to identify reported incidents over the past decade, the inclusion of additional forms of both quantitative and qualitative data in future research and conflict-monitoring efforts could facilitate a more comprehensive understanding of the full scope of the impact and effects of explosive weapons use. This includes indirect and delayed consequences that at first glance may not be obviously linked to the damaging or destruction of water infrastructure, but become clear through a combination of data sources. The use of consistent terminology will also facilitate the production of comparable data across conflicts and locations.

The report underlines the importance of acknowledging functioning water infrastructure as an integral part of civilian welfare pre-, during, and post-conflict, and underscores the urgency of efforts to ensure its protection during conflict. Acknowledging the importance of water infrastructure in research, discourse and humanitarian advocacy is a vital first step. IHL remains the essential framework that prescribes to conflict parties how to anticipate, prevent and avoid civilian harm from military attacks. These parties' transparent and effective implementation of IHL's prescribed principles of distinction, proportionality, and precautions and recognition of the distinct civilian nature of water infrastructure are essential requirements. Functional water infrastructure and access to water are not merely additional considerations in the IHL matrix – they are vital for human survival.

It is hoped that the findings presented here will contribute to ongoing discussions on implementing the EWIPA Political Declaration, state's commitments under UNSCR 2417 and the protection of water supply systems more generally. It is further hoped that a deeper understanding of the full impact of explosive weapons use will enable appropriate harm mitigation and anticipatory action strategies to be developed and implemented. Service providers on the ground can implement mitigation strategies to prevent, or at least limit the impact of, the harm caused by explosive weapons. Finally, it is hoped that the findings presented in this report will contribute to the work streams that address hunger in conflict and a discussion on how the rules of IHL are applied in practice, how their application is collected and analysed, and to whom conflict parties are accountable.

Key findings

- At least 308 incidents of explosive weapons use impacting water infrastructure were reported across 21 countries and territories between January 2018 and December 2024.
- Reports on incidents in which water infrastructure is damaged often lack specificity and standardised language, which affects the quality of the data based on these reports. Information on the type of infrastructure affected and consistent terminology would be invaluable in comparative analyses across datasets and would enable effective impact assessments.
- Few civilian casualties are documented that occurred at the time of the attack that damaged water infrastructure. However, civilian harm accumulates gradually after such an attack, which often results in medium- and long-term effects such as health complications, insecurity in daily activities, and lasting psychological impacts.

- The damaging or destruction of water infrastructure can necessitate emergency evacuations and contribute to the long-term or permanent displacement of communities. Attacks on water infrastructure can be strategically instrumentalised for this purpose.
- Unexploded ordnance (UXO) and explosive remnants of war (ERW) pose an ongoing threat to water infrastructure and communities through the risk of detonation and contamination of the land in which they are embedded over time.

Effects on water infrastructure

- The countries and territories most affected by the use of explosive weapons to attack water infrastructure were Lebanon, the occupied Palestinian territory (oPt), Russia, Somalia, Syria, Ukraine and Yemen. These seven countries or territories accounted for 78% of all 308 reported incidents worldwide, but effects were also reported from 14 additional countries, highlighting that while the overall impact of damage to water infrastructure is concentrated in certain contexts, it is also widespread across conflict settings.
- Infrastructure needed to ensure water distribution was the most frequently impacted component of the water system, accounting for just over two-fifths of infrastructure damaged or destroyed by explosive weapons between 2018 and 2024.
- Water pipes and pipelines were the most frequently affected type of water infrastructure, and were damaged or destroyed in 43 incidents across 11 countries and territories. Their damage was most frequently recorded in Russia (42% of incidents) and Ukraine (33% of incidents).
- In Ukraine, explosive weapons damaged or destroyed water infrastructure across eight different categories of infrastructure, which is the most widespread impact recorded for any country, highlighting the widespread and systematic impact on the whole water supply system.

Direct and reverberating impacts

- Explosive weapons consistently cause widespread damage in dense urban environments, with water supply systems often disrupted indirectly through damage to interconnected and interdependent civilian infrastructure.
- Concurrent damage to water and electricity infrastructure was recorded in at least 48 instances.
- In 27 incidents, agricultural land and crops were directly impacted together with water infrastructure. Four incidents involved simultaneous damage to both markets and water infrastructure. The consequences of these incidents impact people's livelihoods and food security.
- Water-related capacity-building and training activities were impacted by explosive weapons use, eroding long-term resilience and increasing both repair time and cost.

- Connected damage to water infrastructure and health care facilities was reported in 13 incidents, highlighting the immediate risks that explosive weapons use poses to health care systems and outcomes, driving up the indirect conflict death toll. The wider destruction of water infrastructure can pose serious longer-term challenges to public health, contributing to the overall indirect death toll from conflict.

Actors and explosive weapons use

- State actors' use of explosive weapons had a profound impact on water infrastructure. Two out of three incidents were attributed to state actors, with these cases more than tripling between 2023 and 2024.
- Air-delivered explosives accounted for almost half of all incidents overall, and accounted for nearly two-thirds of incidents in 2024. The most prominent weapons-delivery systems in this category were military aircraft.[3]
- Armed drone use that impacted water infrastructure more than quadrupled between 2023 and 2024, increasing from one incident in 2020 to six in 2023 and 33 in 2024. In total, 95% of these incidents were attributed to state actors, and occurred in Lebanon, Libya, Mali, the oPt, Russia, Sudan, Syria, Ukraine, and Yemen.
- Ground-launched explosive weapons use accounted for one-third of all incidents.[4] Their use rose steadily each year from 2022 to 2024.
- Non-state actors relied more heavily on ground-launched explosive weapons, employing them in nearly 60% of their attacks, compared to approximately 35% for state actors.
- Over a fifth of incidents involved the use of directly emplaced improvised explosive devices (IEDs). Nearly half of the incidents were carried out by Al-Shabaab in Somalia.
- Over half of all reported incidents (168 out of 308) were carried out by state actors in foreign or occupied territories. More than half of these incidents were carried out by Israeli forces (in Gaza, Lebanon and the West Bank) and Russian forces (in Syria and Ukraine).
- 13% of all reported incidents involved state actors damaging or destroying water infrastructure domestically. The majority of these were attributed to the Syrian Arab Armed Forces, which attacked water infrastructure across the Syrian territory.
- Qualitative evidence from historic strategic decisions shows that the destruction of water infrastructure can be used strategically to deprive opposing forces of access to water, to weaken the capacity of de facto authorities to provide vital civilian services, and as a tool to force displacement.

This report is part of a series covering the impact of explosive weapons use on water systems, **agriculture** and **markets** during conflict. The data cited in the report can be downloaded **here**, and is referred to in footnotes and references to sources as "2018-2024 EWIPA and Water Data".

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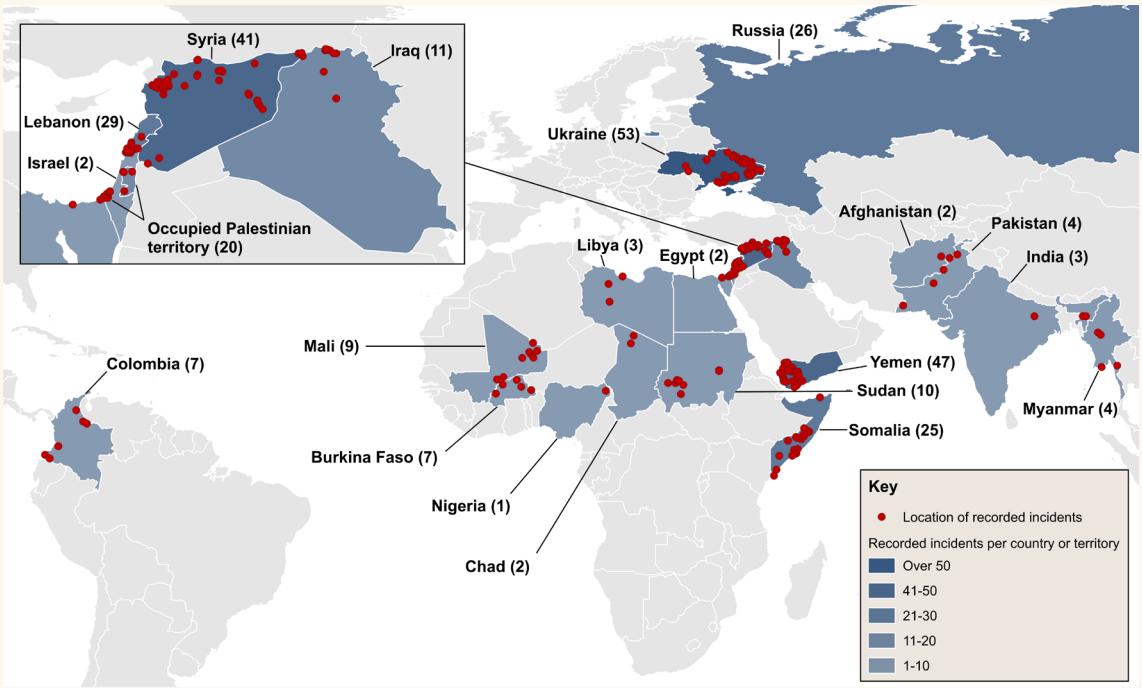
Introduction

According to available data, water infrastructure was damaged or destroyed and water supplies disrupted or contaminated in at least 308 reported incidents in 21 countries and territories between January 2018 and December 2024. The data was compiled from open sources and is neither comprehensive nor complete, but provides insights into changing trends in explosive weapons use affecting water infrastructure and the consequences for civilian systems relying on water for irrigation, hygiene, health care, and community life.

In total, 78% of all 308 reported incidents of explosive weapons use affecting water infrastructure worldwide occurred in just seven countries and territories, Lebanon, the oPt (Gaza and the West Bank), Russia, Somalia, Syria, Ukraine, and Yemen. Expressed differently, the majority of reported incidents occurred in just one-third of all countries affected by the damaging or destruction of water systems through explosive weapons use. While the conflicts in these countries show the highest concentration of harm to water infrastructure, attacks on water infrastructure were also reported in 14 other contexts, highlighting that the issue is not limited to the most-affected countries. The prevalence of reporting is also connected to the frequency of reporting on particular contexts in the media and discussions in public, diplomatic, and government forums.

Together, the global data reveals a consistent pattern: explosive weapons have been used by both state and non-state actors, in both international and domestic armed conflicts, to damage and destroy water infrastructure throughout the entire water system. The targeting and vulnerability of water infrastructure have direct harmful consequences for civilian populations, whose health, lives, and

Map 1: Known locations of 308 reported incidents involving explosive weapons use affecting water infrastructure, 2018-2024[5]



Source: 2018-2024 EWIPA and Water Data

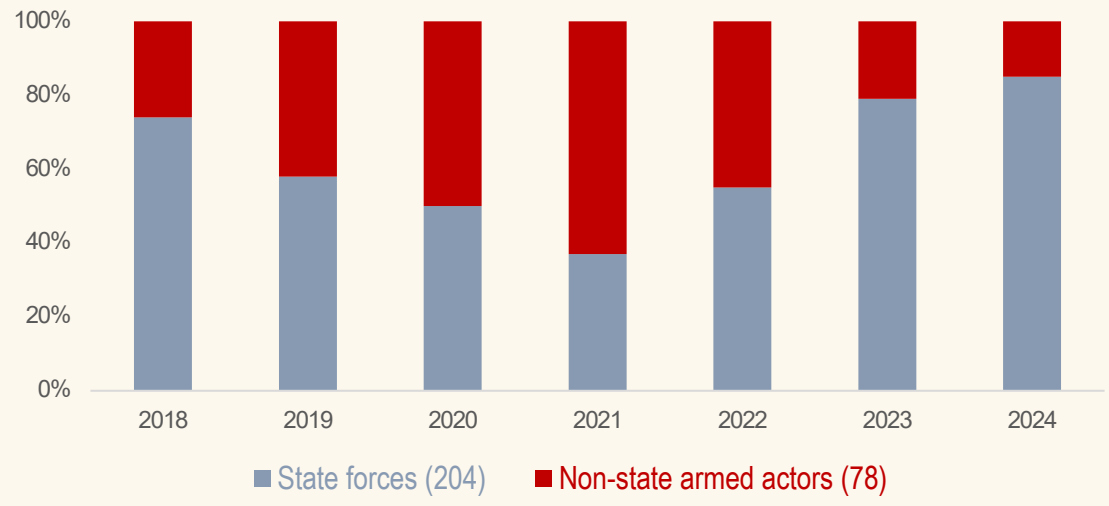
livelihoods depend on it. Whether at the moment of impact or as a result of indirect, reverberating consequences, this damaging or destruction of water infrastructure constitutes a significant driver of human suffering. It is vital to recognise that the protection, development, and maintenance of functional water infrastructure are essential components of human well-being and a productive avenue to remediate the destructive consequences of the use of explosive weapons.

The report addresses a largely under-recognised issue: how the systematic targeting of water supply systems disrupts other essential civilian systems and, over time, contributes to conflict-induced food insecurity, health complications, and the displacement of communities. It uses available data to examine both the direct impact of explosive weapons use on individual components of water infrastructure and the broader consequences of such attacks as they reverberate over time and across space.

Notable increase in 2024 of reported incidents in which explosive weapons use impacted water infrastructure

In 2024, 126 incidents were recorded of explosive weapons use impacting water infrastructure, compared to 45 in 2023. This constitutes the most dramatic surge between years in the dataset, with a rise of 180%. This increase was largely driven by a higher number of incidents in Lebanon, the oPt, Russia, Syria and Ukraine. This took place in conjunction with escalations in Israeli military attacks in Gaza and Lebanon, the ongoing Russia-Ukraine war, and the protracted conflict in Syria prior to the change in political power following the fall of the Assad government in December 2024.[6] These events frequently involved the deployment of explosive weapons with wide-area effects in populated and urban areas, where a range of civilian infrastructures operate in close proximity and are often interconnected and interdependent. 2024 was also the year with the greatest difference in recorded harm caused between state and non-state actors, with 104 incidents attributed to the former and 18 to the latter.

Figure 1: Reported incident in which state and non-state actors' use of explosive weapons impacted water infrastructure, 2018-2024[7]



Source: 2018-2024 EWIPA and Water Data

While the number of attacks on water infrastructure rose in the period 2022-2023, this trend was not a single upward curve in the reporting period. The number of incidents fell and rose between years, influenced by conflict intensity and activities by particular conflict actors. For example, 2021 was one of the lowest years in terms of reported incidents, and was the only year in which more incidents were attributed to non-state actors than state actors. The difference in numbers of reported incidents attributed to state or non-state actors had been small prior to 2023. Since 2023, a rising proportion of incidents were attributed to state actors. Incidents more than doubled between 2021 and 2022, which coincided with the full-scale Russian invasion of Ukraine and the war that followed.

Water infrastructure is complex and includes a range of different components that include water resources, processing, and distribution. To better understand the consequence of damage to or the destruction of individual components, the report draws on Zeitoun and Talhami's framework of the *"hierarchy of importance of components"* [8] in a complex system. Upstream components "produce the items of value that the service delivers", which this report interprets as water sources, and water extraction and treatment infrastructure.[9] Midstream components constitute the components of the water system that are used for the storage of the bulk of the commodity, such as reservoirs.[10] Downstream components *"are those that ensure the storage or delivery to the end users of the service"*,[11] which are covered in this report through reference to water distribution and water collection. These categorisations are not fixed, with some infrastructure potentially spanning across categories due to their multiple functions (see Table 1).

"Upstream failures" in water sources and treatment have the greatest system-wide impact, while "downstream failures" in water distribution systems that occur at the end of a complex system have a more contained but still disruptive effect on end users and the other systems that depend on access to water. Water distribution infrastructure, a central component of the downstream water system connecting sources to end users, was the most frequently impacted category of the water supply system, accounting for just over two-fifths of components damaged or destroyed by explosive weapons in the 2018-2024 reporting period. Water pipes and pipelines were the most frequently affected type of water infrastructure, and also form part of the distribution category. While the impact was comparatively contained in terms of damage to the water supply system as a whole, it had a substantial human impact that led to disruptions in water supplies to tens of thousands of people.

The impact of explosive weapons use on water infrastructure also increases as more components of the overall system are affected. In Ukraine, explosive weapons damaged or destroyed water infrastructure across a total of eight different categories, and impacts therefore span the entirety of the water system and the hierarchy of importance of components[12] from source, to storage, to distribution, and beyond. This constitutes the most widespread impact recorded for a country out of the 21 countries and territories analysed in this report, highlighting the destructive impact of the ongoing war that is degrading water systems, adversely affecting livelihoods, and depriving communities of access to water.

When explosive weapons are used in populated areas, a disproportionately high number of casualties are civilians. However, civilians are less frequently killed or injured at the moments of detonation of explosive weapons that damage or destroy water infrastructure when compared to, for example, the use of such weapons in marketplaces. The impact of damage to or the destruction of the water system occurs often hours, days, weeks, months, and even years later, when the impacts on communities, economies, and essential medical services that are deprived of access to clean water and functional water infrastructure unfold. Damage to or the destruction of water infrastructure directly contributes to increasing the indirect death toll from conflict, and can lead to both long-term and permanent consequence such as the displacement of communities, which is often the case when reconstruction is very slow and financially costly and armed violence persists in the area. Yet, these long-term and indirect effects of damage to or the destruction of water infrastructure on economic survival, food security, and public health remain underdocumented and underanalysed. This report aims to highlight the human impact of targeting water infrastructure and emphasise the importance of the protection, development, and maintenance of functional water infrastructure in efforts to support human well-being and remediate the destructive consequences of the use of explosive weapons.

Purpose, methodology and structure of the report

This report focuses on the ways in which the use of explosive weapons affects water infrastructure, highlighting the impact of these weapons on civilians, food security, related infrastructure, public health and health care in conflict settings. It covers issues directly relevant to international discussions on the implementation of the EWIPA Political Declaration[13] and UNSCR 2417.[14] Key issues covered include the effects of frequently used explosive weapons and delivery systems on human beings and water infrastructure; the corresponding impacts on health care, economies, food security and the displacement of communities; the political significance of water infrastructure and its role in governance; and compliance with IHL during conflict.[15]

Box 1: International instruments protecting water infrastructure from explosive weapons use

IHL[16] is the body of law governing armed conflict. Water infrastructure is protected under IHL, which outlines the obligation of all parties to a conflict to protect civilian infrastructure and regards water infrastructure as *"indispensable to the survival of the civilian population"*.[17]

UNSCR 2417 (2018) recognises how armed conflict impacts food supply systems both directly and indirectly. It reinforces protections by explicitly condemning both the starvation of civilians as a method of warfare and attacks on essential civilian infrastructure, under which water infrastructure falls. It lists "*decreased access to supplies that are necessary for food preparation, such as water"* as an indirect impact of armed conflict on food security, and *"urges all parties to protect civilian infrastructure which is critical to the delivery of humanitarian aid and to ensure the proper functioning of food systems and markets in situations of armed conflict"*.[18]

While UNSCR 2417 primarily addresses state actors, its call on all parties to armed conflict to adhere to IHL and the obligation to refrain from using starvation as a weapon extends to non-state actors. This includes ensuring the unimpeded delivery of humanitarian assistance to civilians in need. Through international pressure, accountability measures, and the promotion of humanitarian access, the resolution aims to mitigate the impact of armed conflict on civilians and uphold the principles of IHL.

UNSCR 2573 (2021)[19] builds on the protections outlined in UNSCR 2417 and has a wider scope by strongly condemning attacks on critical civilian infrastructure that is indispensable to the survival of civilian populations and highlighting that depriving people of the use of such infrastructure results in reduced access to essential services such as water and sanitation, threatens their survival, and should be stopped.

The **Geneva List of Principles on the Protection of Water Infrastructure** (Geneva List of Principles) was published in 2019 by the Geneva Water Hub in recognition of the *"increase in attacks against and the weaponization of water infrastructure"* in contemporary armed conflict. It compiles *"the rules on the protection of water infrastructure during and after an armed conflict under different branches of international law"*.[20]

The EWIPA Political Declaration, which was adopted in 2022, highlights the civilian harm caused by the use of explosive weapons in populated areas and aims to prevent attacks of this kind. Water infrastructure falls under the category of *"critical civilian infrastructure"* outlined in the declaration, which also addresses the reverberating impact of explosive weapons use in populated areas, including psychological and psychosocial harm.

Section 1.4 outlines the interconnectedness of critical civilian infrastructure, such as water and sanitation systems, and the provision of basic needs and essential services, such as health care and education.[21]

Section 3.4 outlines the responsibility of armed forces to *"take into account the direct and indirect effects on civilians and civilian objects which can reasonably be foreseen in the planning of military operations and the execution of attacks in populated areas, and conduct damage assessments, to the degree feasible, and identify lessons learned"*.[22]

The EWIPA Political Declaration addresses the responsibilities of **both states and non-state actors** regarding the use of explosive weapons in populated areas. State parties commit to implementing the policies outlined in the declaration and to train their armed forces to both implement these policies and comply with IHL. While non-state actors cannot endorse the EWIPA Political Declaration, they are still bound by the rules of IHL. The declaration strongly encourages non-state armed groups to adopt policy commitments to avoid the use of explosive weapons with wide-area effects in populated areas and to strengthen the protection of civilians.

This report focuses on explosive weapons, while acknowledging that their use is one among many contributing factors to the overall impact of conflict on water infrastructure; i.e. that explosive weapons are not the only weapons systems that damage and destroy water infrastructure in conflict. For example, chemical weapons can be very dangerous to water systems, and bulldozers are frequently used to demolish water infrastructure. Community access to water supplies can also be negatively impacted by broader conflict-related actions, such as displacement and conflict parties preventing communities from accessing certain

areas. Economic impacts can also exacerbate challenges, when financial constraints inhibit the effective maintenance and reconstruction of water infrastructure. A focus on understanding how a very specific action, such as the use of explosive weapons to attack water infrastructure, contributes to civilian harm allows stakeholders to produce tailored recommendations that are targeted at a specific high-impact cause of civilian harm. This focus is particularly relevant from an IHL perspective, since explosive weapons are often indiscriminate and have a disproportionately destructive impact on both civilians and civilian infrastructure due to their wide blast radius.

The report provides evidence-based insights that inform practical policy and operational decisions within international frameworks. Insights from incident-based data enable readers to better understand this phenomenon and support future anticipatory action, risk assessments, and recovery efforts. To this end, the report applies Insecurity Insight's tried and tested classifications of the Security in Numbers Database (SiND), which is designed to enable structured, incident-based analysis of the impacts of conflict. These classifications support the development of policy-relevant findings while also accounting for the nuances and complexities of real-world conflicts.

The data for the report has been generated using Insecurity Insight's open-source data-gathering methodology, which includes the use of web crawlers that continuously scrape open-source content and uses AI-driven functions to classify information that human researchers then review and classify. This method, although not yielding a comprehensive or fully representative dataset, provides the basis for the analysis of shifts in reported incident patterns over time (see Annex 1).

Definitions

Water infrastructure

In this report, "water infrastructure" is employed as a catch-all term used to refer to elements and structures that contribute to the water supply system as a whole, whether private, state owned or managed by aid agencies. The report covers the damaging and destruction of ten categories of infrastructure across the water system that are grouped in upstream, midstream and downstream system components to better assess the civilian impact of the reported incidents. These categories have been created with an acknowledgement that physical water infrastructure requires human resources to manage water systems at all three levels. Water related infrastructure is also features, acknowledging the interconnectedness of different forms of infrastructure. The impact classification by stream and the hierarchy of importance of components are taken from the International Committee of the Red Cross (ICRC) report on the impact of explosive weapons on urban services.[23] Within this framework are found "upstream" components that *"produce the items of value that the service delivers"*, such as water sources and treatment plants; "midstream components" that are *"necessary for the storage or delivery (but not production) of the bulk of the commodity, action or other items of value"* such as a dam; and "downstream" components that *"ensure the storage or delivery to the end users of the service, such as water distribution networks"*.[24] Upstream failures have the greatest system-wide impact, while downstream failures are more contained, but still disruptive at the end user level. This approach is particularly important when conceptualising the impacts of damage or destruction on water supply systems, but

cannot provide quantitative indicators to calculate precise impacts without detailed knowledge of the entire water system in question.

The report further uses a system of classification of water system components that is informed by Geneva Water Hub's definition of water infrastructure (*"all water and wastewater works, installations and facilities"*[25]) and Ferdowsi et al.'s definition of urban water infrastructure.[26] These components are placed within the system of hierarchies (Table 1). However, components that have multiple purposes in the water system are more difficult to place. For example, the report has placed reservoirs in the upstream category, focusing on their role as a human-made water source, but the ICRC classification places them in the midstream category under water storage, focusing more on the distinction between natural and human-made infrastructure elements. In addition, the broader components of the human management of water systems that may take place outside the actual water infrastructure, but is essential to maintain the system, have been added to the framework, emphasising the continued human input into water supply systems, and their dependency on energy and communications.

Table 1: Components of the water supply system in a hierarchical framework

Upstream	Midstream	Downstream
Water sources such as: • rivers • springs • reservoirs **Water extraction infrastructure and equipment** such as: • wells • boreholes • other extraction equipment **Water treatment infrastructure and equipment** such as: • desalination facilities • tanks • filtration stations • purification stations • distillers • processing systems	**Water storage infrastructure and equipment** such as: • dams • tanks • containers • silos • storage facilities	**Water distribution infrastructure and equipment** such as: • mobile units to deliver water, and water transportation vehicles • pipes and pipelines • distribution systems/schemes • pumping infrastructure and equipment • distribution networks • distribution facilities • distribution equipment **Collection (end user) infrastructure and locations** such as: • supply points • filling stations

Some infrastructure and components of the water system spans across streams, such as:

- **multipurpose/multifunction infrastructure** (such as water towers, factories, plants and stations)
- **water utilities** (such as the Water, Sewage and Sanitation Communal Company in Colombia, Tyr Water Company in Lebanon, and Water and Forest Commissions Buildings in Sudan
- **capacity-building initiatives** (such as projects and workshops to train/upskill water infrastructure staff)
- **water-related infrastructure** (such as energy infrastructure)

The impact framework used in this report builds on existing system-focused work and extends the overall approach by also considering the human activities that support water supply and access. This expanded perspective was chosen to capture the full scope of civilian harm resulting from attacks on water supply systems. The report not only covers fixed infrastructure, but also mobile water delivery units, and resilience and emergency responses such as the management of temporary water distribution points outside homes or training programmes designed to improve water management during crises. This broader definition extends beyond traditional public water systems and incorporates humanitarian and resilience activities that fall outside of the scope of the existing Geneva List of Principles.

The report seeks to reflect the full complexity and interdependence of modern water supply systems and to identify opportunities for intervention that can prevent long-term, cascading impacts that can be mitigated through repair and aid initiatives. By examining both the impact on existing civilian infrastructure and the measures put in place to respond to conflict-induced crises, the report hopes to provide a more comprehensive understanding of how explosive weapons damage individual components of water infrastructure, disrupt the functionality of interconnected established systems, and hinder resilience and aid efforts aimed at maintaining water supplies in crises. This broader lens helps to fully capture the reverberating effects of explosive weapons use in populated areas and the civilian harm these weapons cause.

Classification and categorisations

The purpose of this report is to assess the detailed information on conflict incidents involving water supply systems to assess their impact on civilian populations and to inform questions related to the application of IHL governing the conduct of hostilities. For this purpose, Insecurity Insight classified recorded incidents based on the effects of damage/destruction on water infrastructure, the parties to the conflict, and how the damage/destruction was caused. This requires categorising the type(s) of water infrastructure that were affected, the specific effects of attacks, the methods used to deliver explosive weapons, and whether the responsible conflict parties were state armed forces or non-state actors. These individual information points are then used in a wide impact analysis framework on the immediate and long-term impacts of these attacks.

Categorisation of water infrastructure and effects on the water supply system

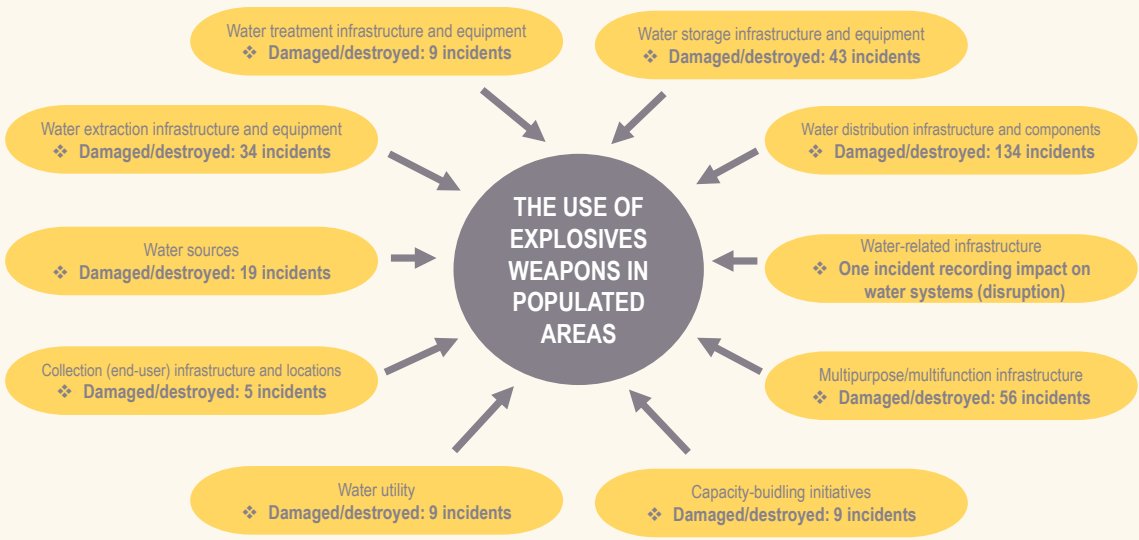
Insecurity Insight systematically classifies both types of water infrastructure and the effects that explosive weapons use have on each component to build datasets that enable detailed analysis of impact. A key part of this process involves categorising water infrastructure into ten components that describe each element's role within the broader water supply system. This classification helps assess how damage to specific components affects the overall functionality of the system.

However, this process is complex in practice. There is no universally recognised categorisation of the various kinds of water infrastructure, and the boundaries between different functions can be fluid. For example, a water treatment facility might serve both treatment and storage functions, making it difficult to assign it to a single category. In some cases, components were classified as multipurpose/multifunction.

Moreover, different components can suffer different types of effects from explosive weapons use. A water source might be contaminated, equipment may be damaged or destroyed, and personnel could be injured or killed.

Figure 2 presents the ten infrastructure categories used in this report, together with the distribution of damage or destruction recorded across the documented incidents.

Figure 2: Water infrastructure components and the effects of explosive weapons use in 308 recorded incidents, January 2018-December 2024[27]



Source: Insecurity Insight

Explosive weapons and delivery systems

The term "explosive weapons" refers to weapons that are activated by the *"detonation of a high-explosive substance that produce thermal energy and a blast and fragmentation zone"*.[28] They have the capacity to affect large areas and to kill or injure any person, or damage or destroy objects, within their blast radius. The term encompasses a broad spectrum of systems, from small hand grenades and suicide vests to large artillery shells, rockets, and aerial bombs (see Annex 2). Their size, yield, and method of delivery produce different effects on people and infrastructure.

Categorisation and data use

To assess their impact and changes over time, this report classifies explosive munitions into three categories based on delivery method. This approach works well for non-military readers because it relies on the observable characteristics of a weapons delivery method: directly emplaced weapons (e.g. car bombs, IEDs), ground-launched weapons (e.g. artillery shells fired from the ground), and air-delivered weapons (e.g. munitions dropped by aircraft or drones). Given the available data, it is feasible to generate policy-relevant insights highlighting technological developments and changes in the conduct of hostilities.

State and non-state actors

This report also classifies the reported users of explosive weapons in terms of state forces and non-state actors (see Annex 3). This distinction is important from a policy perspective. When state forces use explosive weapons to attack water infrastructure, questions of state responsibility and violations of IHL arise. Harm caused by non-state actors is often addressed through counterterrorism frameworks, even though these actors are equally bound by customary IHL despite not being parties to relevant treaties. There are also direct links between the categorisation in terms of state and non-state actors and delivery methods, because non-state actors generally rely on improvised or limited delivery systems to deliver explosive weapons, whereas state forces typically have access to more advanced explosive weaponry, including delivery systems that launch explosives from the air or over long distances. Using both classification systems in the analysis allows the examination of patterns and trends from more than one perspective, which helps to understand nuances (see Annex 2).

To support such an analysis, Insecurity Insight systematically classifies all recorded incidents based on whether the party reported to be responsible for an attack was a state or non-state actor, and whether the incident took place within a state's own territory, an occupied area, or in another country. This classification helps inform legal analysis and operational response planning. However, applying these distinctions to real-world events is often complex. Ambiguities in available information, unclear affiliations and shifting territorial control can make classification challenging in practice. For example, after regime changes, particularly those brought about by the use of force, governments may not be universally recognised, and competing claims can complicate who legally represents a state. In some situations, de facto authorities that control part of a state's territory function much like state forces. The report uses a binary classification of state forces and non-state actors, while recognising that in many contexts the distinction between state and non-state armed actors is rarely unequivocal (see Annex 3 for further details).

State actors

The term "state actors" refers to state armed forces that are the official military of a country, controlled by its government and recognised under national and international law. It usually includes the army (land forces), air force (air and outer space operations), and navy (maritime forces), and may also have other branches such as marines, special forces or intelligence units. Their main role is to defend the country and carry out military operations authorised by the state.

Non-state actors

Non-state armed actors are organised armed actors that are not part of a country's official military or police and are not controlled by a government. They can include militias, insurgent groups, rebel movements, or other organised forces that use weapons and military-style tactics. Their aims and activities vary widely, from controlling territory to challenging governments, but they operate outside the formal command system of state armed forces.

In cases when governments are not universally recognised, difficult judgements need to be made as to which armed force in a given context at a particular point in time can be classified as representing the state (see Annex 3 for further details).

Plausibility and verification

In conflict settings, parties often dispute responsibility for attacks on civilian infrastructure. As a result, the classification of incidents involves both identifying the appropriate status of a conflict party and attributing responsibility for an attack. Insecurity Insight uses a combination of reported information that includes which conflict party an incident is attributed to in the available reports, as well as contextual factors to assess the plausibility of this attribution. Key elements in this assessment include the location of the incident, the presence of specific conflict parties on the ground, and their ability to reach the area, including through remote means. The type of explosive weapon(s) reportedly used can also serve as an important indicator, particularly when only one party is known to have access to a specific category of weapon. Typically, non-state actors rely on improvised or very basic delivery systems, while state actors often have access to more advanced systems, including aerial and long-range launch capabilities. By combining classifications based on both the actor type and the weapon(s) delivery method, the analysis can reveal patterns and trends from multiple angles, providing a more nuanced and evidence-based understanding (see Annex 3).

Impact analysis

The data on individual incidents affecting water infrastructure during conflict was collected to provide policy-relevant evidence of the civilian harm caused by the use of explosive weapons impacting water supply systems. This report evaluates the impact of explosive weapons on water infrastructure using the three-level impact framework of the UN Institute for Disarmament Research, which provides a structured approach to understanding the effects of such weapons on people and infrastructure.[29] This three-level impact framework distinguishes between the direct impact of the blast effect, the subsequent damage caused by the destruction of structures, and the impact of the damage or destruction on society and people.[30]

The impact that the damaging or destruction of a water supply system has on civilian life depends not only on the number of water infrastructure components or objects affected, but also their role and significance within the system. Impact can in part therefore be measured through the classification of upstream, midstream and downstream components to better understand the impact of individual events on water systems.[31]

The maintenance and repair of water infrastructure are essential to prevent contamination and service interruptions. This contributes to the baseline resilience of civilian infrastructure, influencing both the severity and duration of cascading impacts of an attack. The impact of explosive weapons use on emergency measures and aid responses to provide water where supplies have been disrupted are equally important in understanding the full scale of civilian harm.

Water is essential to many processes central to civilian life, including food production, public health and sanitation. An impact assessment therefore examines both the immediate and long-term effects of explosive weapon use on water supply systems, based on reported incident data. It also explores the broader consequences of an attack, such as reduced agricultural output, deteriorating public health conditions and population displacement.

The impact narrative outlines how damage to water infrastructure can trigger cascading effects across interdependent infrastructure systems. However, it does not provide precise, hard figures, as the scale and nature of the impact depend on numerous variables. These include the degree of interconnectedness within the water supply system, the number of people affected, and the specific sectors that rely on the damaged infrastructure, such as the number of hectares of agricultural land that depended on the water supply prior to the attack. The impact on farming, for example, can vary significantly depending on the crop cycle, planting and harvesting seasons, weather conditions, and the availability of alternative water sources. Public health outcomes are similarly influenced by factors such as pre-existing health conditions, sanitation levels, and the capacity of local and international aid systems to respond to a crisis. These variables highlight the complexity of conducting model-based impact estimations in conflict settings.

Data limitations

Insecurity Insight's event-based monitoring of reported incidents of damage to or destruction of water infrastructure from the use of explosive weapons has produced a global dataset on such incidents, building on existing work such as the Water Conflict Chronology[32] and the TIME database on environmental infrastructure damage in the Middle East.[33] This information provides important insights into how water infrastructure is damaged or destroyed and how it is linked to other vital civilian infrastructure, but this information is limited by what observers report. The research process for the present report also highlights that despite the important role of water systems in civilian well-being and survival, food security, and health care, collecting data on attacks on water infrastructure remains markedly inadequate. Many descriptions of incidents are imprecise, offering generic references to "water infrastructure damage" or "explosives" without specifying the type of infrastructure or weapon used. This lack of specificity limits researchers' ability to assess the function and vulnerability of different infrastructure types, undermining efforts to measure reverberating effects and identify appropriate mitigation strategies, which will require further future work.

Structure

This report is divided into three main sections. After an introduction, the next section discusses the impacts of the use of explosive weapons on water infrastructure. The third section, which focuses on patterns and trends in the use of explosive weapons, provides a detailed analysis of available data, offering insights into the evolving ways in which state and non-state actors deploy different explosive weapon systems in attacks on water infrastructure. The third section (Section IV) discusses the legal implications of targeting water supply systems under IHL; the IHL principles of distinction, proportionality and precautions; and the international policy framework. The three main sections are followed by a conclusion, recommendations and annexes.

The report is part of a four-volume series examining how the use of explosive weapons affects key elements of food supply systems, including water supply systems, agricultural production and markets. Collectively, the series illustrates how the use of explosive weapons drives the destruction of food supply systems and, when aid operations are targeted, exacerbates food insecurity and can ultimately lead to starvation.

This series is also connected to broader research examining the impact of explosive weapons on health care systems and the link between conflict and food insecurity. Additionally, they relate to assessments of how the introduction of new drone weapons-delivery technologies has affected the risks associated with delivering aid and health care, as well as the development of associated guidance materials .

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The impact of explosive weapons use on water infrastructure

The damaging or destruction of water infrastructure during armed conflict inflicts deep and lasting harm on civilian populations, yet this devastation does not receive a great deal of public attention. While explosive weapons may not always kill large numbers of civilians at the moment of their impact on water supply systems, their cascading impacts are profound and enduring. When pipes burst, pumps fail, and treatment plants are damaged or destroyed, entire communities are left without water that is safe to use, fuelling disease, impacting animals and agriculture, driving displacement, and causing long-term suffering. As impacts cascade over time and place, there is no single inevitable consequence. The scale of harm depends on a complex web of factors: the function of the damaged infrastructure within the broader water supply system, the extent of the damage, local resilience, reconstruction capacity, and the intensity of ongoing conflict. Assessing these impacts is no simple task. It requires accounting for layered, cumulative effects that unfold over weeks, months or even years, and sometimes across large geographic spaces. Yet such assessments are essential, not only for understanding the true cost of the use of explosive weapons against civilians and civilian infrastructure, but also for anticipating future harm and ensuring that the IHL principles of distinction, proportionality and precautions are upheld.

This section examines the available evidence on the cascading effects of attacks on water infrastructure. Like standard impact frameworks, it begins by assessing immediate and measurable civilian harm, such as structural damage or casualties caused directly by blasts, and distinguishes between civilian populations and water infrastructure workers.

The main focus is on exploring the wide-ranging reverberating effects of attacks using explosive weapons on water infrastructure, with a focus on their impact on food security, public health, the environment and displacement. The evidence shows that some consequences emerge within hours, such as flooding or communities' immediate loss of access to clean water, while others unfold over weeks, months or even years, affecting harvests, disease patterns and migration trends. What makes this damage particularly harmful to civilians is the compounding nature of these short- mid- and long-term effects. Importantly, water infrastructure is not only a source of cascading harm, it is also highly vulnerable to it. Disruptions in interconnected systems like energy, telecommunications and transportation can severely compromise water services, amplifying the overall impact. These interdependencies and their consequences are examined throughout the section. Moreover, it shows that attempts to mitigate the consequences through repair and aid programmes are also affected, contributing to concerning levels of civilian harm.

READ *SHATTERED STALLS, SHATTERED LIVES THE HUMAN COST OF BOMBING MARKETPLACES*

Civilian deaths from damage to or destruction of water infrastructure

Human casualties and injuries from direct blast and fragmentation, and structural damage to water infrastructure

When explosive weapons are used in populated areas, the vast majority of victims are usually civilians, and when water infrastructure is targeted, civilians are also at risk of incidental physical harm. People working on – or merely living in close proximity to – water infrastructure can sustain severe injuries either from the blast effect, fragments from the explosive device, or debris from the destroyed infrastructure. In terms of the physical impact of explosive weapons on human beings, they can cause *"multiple human casualties through injuries from flying glass, crushing, suffocation and burns"*.[34] Anti-personnel landmines pose a particularly serious threat to human beings, with some weapons having a blast range designed to drive hundreds of small fragments into the human stepping on the device. Others are designed to contain flechettes, which are fragments *"designed to penetrate deep into the body"* and others that are *"designed to detonate at waist height and may cause death within 25 meters and injury within 200 meters"*.[35] Immediate civilian harm can also occur from the structural damage to water infrastructure caused by explosive weapons, particularly when storage facilities containing large amounts of water are destroyed and uncontrolled water flows endanger nearby populations.

Box 2: Examples of civilian deaths and injuries while carrying out water-related activities resulting from the damaging or destruction of water infrastructure by explosive weapons

Conducting maintenance and repair work

- **Ukraine, October 2019:** Two people were injured during repair work and a cleaning process at a water-pumping station near Pankivka, Luhansk oblast, by the explosion of an unidentified explosive device.[37]

Driving water transportation vehicles

- **Egypt, January 2021:** The driver of a water truck was killed when the vehicle was damaged by an IED explosion carried out by Islamic State in North Sinai.[38]

Capacity-building

- **Syria, December 2022:** Four workers were seriously injured at a water maintenance workshop near Zur Maghar town, Aleppo, by Turkish Armed Forces shelling.[39]

While working at a water station

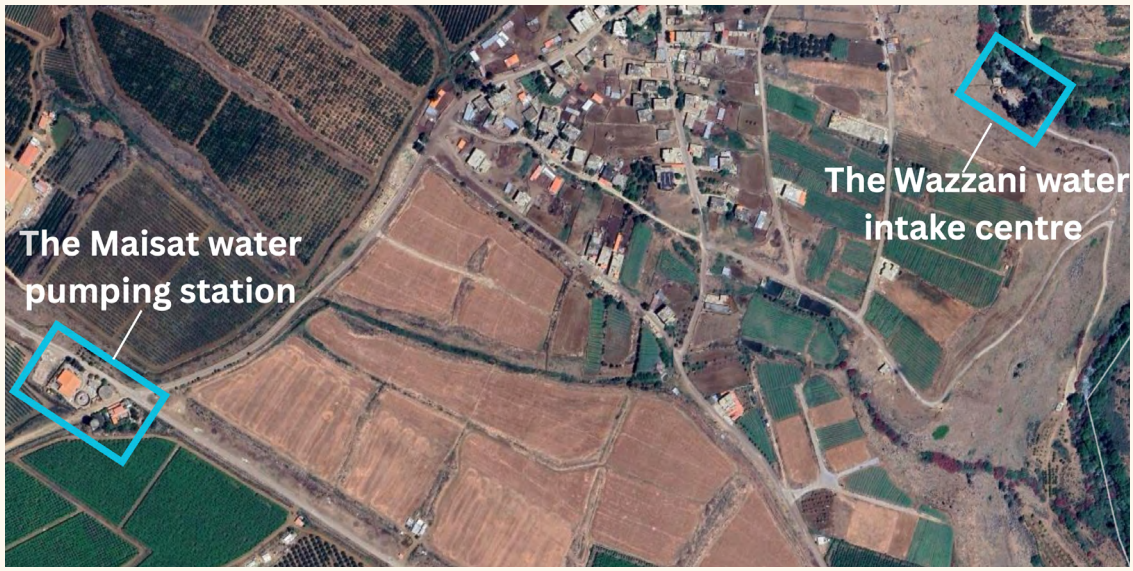
- **Syria, October 2024:** Two workers were killed and a water station was destroyed in Ain al-Zarqa, Idlib, by an air strike carried out by the Russian Armed Forces.[40]

Civilians collecting water

- **Gaza, July 2024:** Ten Palestinians were killed by Israeli artillery shelling while filling water containers in Az Zaytun.[41]

Between 2018 and 2024, reports could be identified that detailed the deaths of 40 people and injuries to 11 during incidents that also involved the damaging or destruction of water infrastructure by explosive weapons, and specified that these people were engaged in water-related activities at the time of the incidents. People were vulnerable at work, and while conducting maintenance and repairs, attending capacity-building workshops, and driving water transportation vehicles, while civilians were vulnerable while collecting water. The range of activities carried out during these incidents highlight that people can be at risk of injury and death when water infrastructure is targeted at any level in the *"hierarchy of importance of components"*[42] of the water supply system.

Figure 3: The Maisat water pumping station and Wazzani water intake centre in Lebanon
Water infrastructure remains a vital component of the functioning of populated areas, even if it is often located just outside built-up areas (often due to concerns over noise or smell or space). Some types of infrastructure require minimal human presence to operate properly, with the exception of the few trained staff whose presence is not permanently required.



Source: Satellite imagery from Google Earth, accessed 13 August 2025. Data visualization by Insecurity Insight
The satellite image above is also featured in the report When Bombs Turn the Taps Off.[42] This report provides an in-depth analysis of the impact of the escalation of conflict in Lebanon and the effects on water infrastructure.

Recorded incidents of civilian deaths and injury during attacks on water infrastructure are notably lower than, for example, those involving explosive weapons used in crowded public spaces such as markets.[43] This relatively low casualty rate during incidents in which explosive weapons were used to attack water infrastructure may be partly due to the location of many water infrastructure components, and especially water sources, treatment plants, and pumping stations, which are often situated in remote areas where few civilians are present, reducing the likelihood of direct harm (see Figure 3).[44] In addition, the inclusion criteria for civilian deaths and injuries in this report requires people to be engaging in water-related activities at the time of the attack, thus excluding incidents where civilian deaths and injuries occur near water infrastructure, as is often the case in densely populated urban environments. In many cases, reports may focus either on damage to infrastructure or on deaths

and injuries, without noting their proximity to, or engagement with, the infrastructure targeted. This is despite the fact that water infrastructure in urban areas is often embedded in residential zones, e.g. water pipes, which are the most affected water infrastructure components in reported incidents. Moreover, incidents where people die from injuries later or suffer long-term health impacts may be entirely overlooked in incident reporting.

Immediate civilian harm can also occur from the structural damage to water infrastructure caused by explosive weapons, particularly when storage facilities containing large water resources are destroyed and uncontrolled water flows endanger nearby populations. For example, in Ukraine in September 2022, a dam and its water-pumping infrastructure were damaged by Iskander rockets launched by Tu-95MS aircraft of the Russian Armed Forces, causing a rapid rise in water levels in the nearby river that put people's lives and livelihoods at risk.[45]

Even when the number of recorded incidents is low, this does not mean that the recorded incidents of explosive weapons use are without consequences for the civilian population. This is because of the cascading effects that often follow such incidents. These broader, reverberating impacts are central to understanding the full cost of such attacks and include indirect deaths and larger reverberating impacts.

Indirect deaths from the destruction of water supply systems through its impact on emergency health care and public health

The destruction of water infrastructure and the resulting reduction in the water supply have severe consequences for health care systems. These effects contribute to rising indirect deaths, which can be defined as conflict-related deaths that are not attributed to direct violence, but occur as a consequence of the broader disruption of civilian life. Immediate impacts occur when damage to water supply systems limits access to clean water for medical personnel providing health care. The absence of clean water can lead to secondary infections, thereby directly increasing the number of indirect deaths. The disruption of the water supply in health care facilities can also increase the number of immediate civilian deaths during periods of intense explosive weapons-related violence, when large numbers of casualties require trauma care, but medical evacuations and emergency response are hindered by the ongoing violence. In addition, the lack of water affects routine medical needs such as safe childbirth and the care of chronically ill or vulnerable patients.

The dataset for this report includes 13 recorded incidents that described direct links between attacks on water infrastructure and the delivery of health services. These were reported in Gaza, the West Bank (oPt), Sudan, Ukraine and Nigeria.[46] This relatively low number likely reflects not an absence of impact, but gaps in data collection, especially in complex environments where both water supply and health care systems are frequently targeted. According to the Safeguarding Health in Conflict Coalition 2024 report, a record 3,623 incidents affecting health care systems were documented in 2024, marking a 15% increase from 2023 and a 62% rise from 2022,[47] which makes it highly likely that water supply systems were more frequently affected, but the incidents remained unreported.

Box 3: How damage to a water tank and the surrounding water infrastructure combined to severely impact the functioning of a hospital: the example of the Indonesian Hospital in northern Gaza

In December 2024, a drone strike by the Israel Defense Forces (IDF) hit water tanks at the Indonesian Hospital in northern Gaza, injuring three members of the hospital's technical staff. The damage reduced the hospital's capacity to provide care at a time when it was already overwhelmed by high numbers of injured and sick patients. The situation was worsened by the extensive destruction of the surrounding urban environment, which made it impossible to compensate for the water system loss through alternative means.

The critical importance of context in shaping the impact of this drone strike is illustrated by satellite imagery (Figure 4), which compares the environment around the hospital between 15 July 2023 and 4 June 2024. By February 2025, over 89% of WASH (water, sanitation and hygiene) assets in Gaza had been either destroyed or partially damaged. In such a context, damage to water infrastructure has devastating consequences: there are no alternative sources of water, no backup storage facilities, no distribution systems and no realistic repair options.

Compounding this, as of 22 May 2025, the World Health Organization reported that at least 94% of all hospitals in Gaza had been damaged or destroyed, leaving the health care system on the brink of total collapse.[48]

Figure 4: The Indonesian Hospital and surrounding areas in northern Gaza, 15 July 2023 and 4 June 2024

The Indonesian Hospital is marked by an H in a red circle and identified by a white arrow.

15 July 2023

4 June 2024

Source: Satellite imagery from Google Earth, accessed 5 August 2025. Data visualisation by Insecurity Insight

Disruptions to the water supply also have serious public health consequences, particularly in communities where households are unable maintain basic hygiene standards. The risk of waterborne disease outbreaks, such as cholera, increases significantly under these conditions. This threat is especially severe when already weakened water supply systems experience cross-contamination between drinking water and waste water, a situation identified as *"the clearest risk for the outbreak and spread of cholera"*.[49] These issues were observed during Yemen's cholera outbreaks in 2016 and 2017, when over 2 million cases were recorded.[50] The effects of damage to or the destruction of water supply systems are extended with the resultant public health risks. More recently, in 2022, Houthi forces reportedly destroyed 53 water tanks in Al Jufaynah, Yemen's largest IDP camp, where nearly 60,000 people lived, compounding human suffering and heightening the risk of further disease "in an already fragile context".[5152]

Damage to water supply systems that disrupts the supply of clean water to health services or communities affects public health and contributes to increasing indirect conflicts deaths.

The impact of explosive weapons use on water supply systems

Widespread damage to civilian infrastructure is one of the defining features of urban warfare when explosive weapons are used in densely populated areas. In cities, civilian infrastructure such as water supply systems, electricity grids and communications is not only concentrated, but closely interconnected. This means that when one system is hit, the damage often spills over to others. A single strike can trigger a chain reaction, simultaneously disrupting multiple essential services and compounding the harm to civilians who rely on them for daily life and vital services such as health care, yet systematic documentation remains limited.

Water supply systems themselves are complex. In peace time, these systems are usually managed through fixed infrastructure. During conflict, emergency supply mechanisms can be put in place that are often mobile, most visibly affecting the distribution system. The impact on water supply systems is the most severe when more than one of the ten water infrastructure components of the upstream, midstream, or downstream levels in the broader water supply system are damaged or put out of action. When multiple components are damaged, the effects on the system are cumulative, leading to increasingly severe disruptions in water access and functionality that are increasingly difficult to mitigate. From a systems perspective, the impact is most profound when it affects upstream water sources. The data for this report shows that from a civilian harm perspective, the community impact is most acutely felt at the downstream level, where people access water.

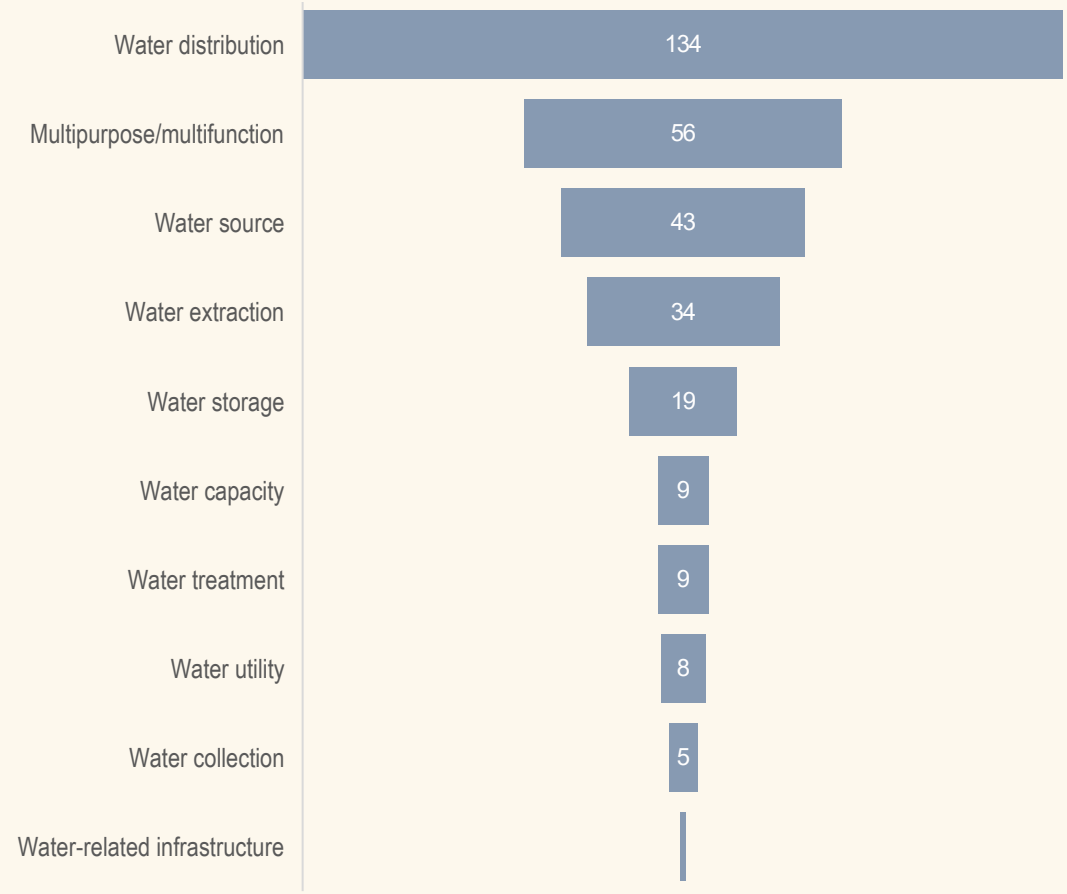
Downstream: civilian harm from damage to water distribution infrastructure

Incident report data from 2018 to 2024 shows that water distribution systems are the most frequently reported water infrastructure component that sustained damage from the use of explosive weapons, accounting for just over two-fifths of all reported damage. Water pipes and pipelines were damaged or destroyed in 43 reported

incidents across 11 countries and territories, including Burkina Faso, Colombia, Iraq, Israel, Mali, Myanmar, the oPt, Russia, Syria, Ukraine and Yemen, with very high rates of damage being reported from Russia and Ukraine accounting for 42% and 33%, respectively.

This points to a widespread and immediate impact on civilians that often outweighs the technical significance of the damage to the water supply system itself. Water distribution lies at the downstream end of the system and is typically considered less critical than upstream sources or midstream storage in terms of overall system function. However, the disruption of distribution networks has direct and far-reaching consequences for communities: households lose access to running water, hospitals struggle to maintain hygiene standards and deliver adequate care, and water truck drivers face deadly risks as their vehicles become targets during efforts to provide alternative supplies of water. While upstream damage may compromise long-term system recovery, damage to distribution networks inflicts some of the most profound and visible harm on civilian lives. This also highlights that the estimated impact of attacks on water infrastructure depends on the chosen perspective and analytical framework; specifically, whether the focus is on the functionality of the system itself or the effects experienced by the civilian population.

Figure 5: Components of water infrastructure affected in each category



Source: 2018-2024 EWIPA and Water Data

Isolated single water supply systems

In Yemen in 2020, the only water well providing water to displaced communities in a particular area was reportedly shelled and damaged by Ansar Allah (commonly known as the Houthis).[53] When communities have limited access to comprehensive, permanent, and functional water infrastructure, the damaging of a single infrastructure can have significant negative impacts and result in communities relying on mobile supplies, such as trucked water. While damage to the primary water source in the Yemen example posed a significant threat to those that relied on it, ultimately the well was quickly repaired, limiting the reverberating or long-term impact. This highlights the importance of repair and maintenance capacity in general, but particularly in such contexts. In 2023 in Dnipropetrovsk oblast, Ukraine, the Russian Armed Forces damaged a gas pipeline and the power line serving a water-pumping station, disrupting water supplies for 35,000 people.[54] These instances highlight the broad impact that a single incident can have on the water supply system, depending on how isolated or interconnected the affected infrastructure is. Knowledge of the type of infrastructure, its function, connectedness and the surrounding environment influences assessments of the impact of damage, and can facilitate the provision of appropriate humanitarian support and the assessment of prospective recovery periods.

Upstream: the vulnerability of water sources to complex impacts

Longer-term impacts can also be observed, particularly when upstream components of the water supply system are damaged, leading to the most far-reaching and substantial impacts across the system. For example, damage to oil infrastructure can cause the contamination of water sources. This took place on at least four occasions in Colombia in the period 2019-2020,[55] when explosives were used to damage oil pipelines, leading to environmental damage from subsequent oil spills into water sources,[56] causing the contamination of local water springs[57] and rivers.[58] Affected rivers include the Arauca, Guisa and Pianulpi. Insecurity Insight's data, with only four recorded incidents of contamination/pollution of natural and human-made water sources,[59] reflects a World Bank observation that *"there is limited information regarding the extent of the freshwater sources of pollution"*.[60] The absence of data does not reflect the absence of this issue in reality, but instead highlights the need for further investigation and data collection to better understand the frequency of attacks and the impact of explosive weapons use on water sources.

The impact on water supply systems when multiple system components are affected

In Ukraine, reported damage to or destruction of water infrastructure covered eight of the ten categories of components – the most widespread impact recorded per country out of the 21 countries and territories analysed in this report. The breadth of damage and destruction highlights the extent to which Ukraine's water infrastructure is being eroded by ongoing armed violence and war, with impacts felt throughout the water supply system. This includes the upstream components integral to the

functioning of the system, the midstream components of storage and treatment capacity, and the downstream ability to distribute water to end users. For example, over the reporting period, Donetsk oblast experienced damage to a reservoir, water treatment and storage facilities, distribution infrastructure, a water utility, and a capacity-building mineral water-bottling workshop. The broader the scale of damage/destruction, the broader the reach of negative impacts and the more challenging recovery and resilience become. This is a troubling prospect for Ukraine, because by February 2025 the water supply and sanitation (WSS) sector had incurred an estimated US$4.6 billion in damage, and approximately 8.5 million people were in need of essential WSS services in the country.

Interconnectedness between water supply systems and other infrastructure

The functioning of a water supply system also depends on other services, and their disruption can have profound impacts on water supply. Energy and telecommunication infrastructure are important for the monitoring of water supply systems' performance, particularly when motorised pumps form part of the distribution system. Disruptions to energy and telecommunications infrastructure can have severe impacts on the operation of water services and expose utility staff to additional harm if they have to visit pumping stations and other facilities in person rather than being able to monitor or manage them remotely. Damage to power/electricity infrastructure has the potential to completely halt water supply to certain areas, causing disruptions at the downstream level of the water supply system. In the 308 recorded incidents used as data for this report, water and gas infrastructure was concurrently damaged in ten incidents,[61] water and internet infrastructure in one incident,[62] water and telecommunications infrastructure in one incident,[63] and water and power/electricity networks and infrastructure in 48 incidents.[64]

Protracted conflict and compounded impacts

Protracted and ongoing violence, widespread infrastructural damage, and limited financial resources for repair have compounding negative effects on water supply systems. This is the case in Syria, where over 50% of the country's water treatment plants and sewerage systems had been damaged or ceased to function, and the country's water supply has decreased by 40% compared to pre-war levels.[65]

The extent to which the consequences of the destruction of water infrastructure are managed and mitigated depends in part on the decisions of management staff, including their ability to prioritise limited water resources and arrange viable alternatives that reinstate access to clean water. However, even the most competent decision-making has limited capacity to offset the impact of explosive weapons use on water supply infrastructure, particularly in contexts where repeated strikes and targeted attacks occur, and people suffer prolonged deprivation of vital resources.

Box 4: The anticipatory mindset needed to halt cascading impacts

Anticipatory action *"saves lives and livelihoods before a humanitarian disaster has occurred, helps to preserve people's dignity, provides value for money, and protects development gains. [It] can contribute to the efficiency of the [humanitarian aid] system, reducing humanitarian needs and thereby saving costs"*.[66]

In conflict, events that will damage and destroy water supply systems cannot be predicted, but aid actors applying an anticipatory mindset can use the analysis of reported events impacting such systems to anticipate possible harmful scenarios and on this basis take measures to avoid the harm caused by a series of cascading consequences.

Employing an anticipatory mindset *"involves proactively monitoring violent events that pose risks to food security, public health and displacement so that their worst foreseeable consequences can be mitigated or prevented through early conflict-sensitive actions"*.[67]

Mitigation and mobile water supply

When permanent distribution infrastructure such as pipes, pipelines, and pumping stations are damaged or destroyed, temporary or mobile water delivery systems often serve as a critical lifeline to mitigate the impact. In the report's dataset, water transportation infrastructure was reported to be affected in 33 incidents, making it the third highest type of water infrastructure impacted by explosive weapons use (after pipes, pipelines and water storage infrastructure). These findings underscore not only the disruption to essential services, but also the strain on community resilience efforts and humanitarian aid and resilience operations that seek to mitigate the effects in particular of the use of landmines and IEDs.

Box 5: Examples of landmines damaging water infrastructure and killing people

- **Syria, August 2023:** A vehicle used to transport water and livestock was damaged by the detonation of a previously emplaced landmine in As-Suwayda governorate.[68]
- **Syria, October 2024:** A water tanker was damaged and the driver killed in rural Aleppo by the detonation of a previously emplaced landmine.[69]

The data also highlights how the cumulative impact of damage to water supply systems on civilians increases over time, even when the physical damage is partially mitigated by various actors. While formal repair efforts are typically the responsibility of water infrastructure authorities, voluntary groups or humanitarian organisations often step in to fill the supply gap. The water supply situation becomes critical when financial or material constraints limit the ability to repair damaged infrastructure. When these aid efforts are themselves targeted or disrupted, civilian suffering intensifies significantly.

The reverberating effects of damage to and destruction of water supply systems

The immediate and long-term impacts on food supply, production, and security[70]

Agriculture is fundamentally dependent on reliable water supplies for irrigation, livestock care and food processing. When water supply systems are damaged or destroyed, the effects on food production can be immediate and far-reaching. Irrigation networks dry up, livestock are left without sufficient water and food supply chains begin to falter. In conflict-affected areas, where farming communities are already vulnerable, the loss of access to water can lead to reduced crop yields, livestock deaths and long-term food insecurity. The destruction of water infrastructure does not only disrupt daily agricultural operations, but threatens the stability of entire food supply systems, with consequences that ripple from local markets to national or even international economies.

Box 6: Examples of water infrastructure and agricultural land being simultaneously damaged

- **Libya, July 2020:** Water irrigation facilities were damaged by Turkish Armed Forces drones in Sirte.[71]
- **Syria, July 2021:** A water-pumping station was damaged and 3,500 hectares of farmland were destroyed by air strikes carried out by the Russian Armed Forces in Sahel a-Rouj , Idlib governorate.[72]
- **West Bank, June 2024:** Water lines, greenhouses and agricultural equipment were damaged by bombs dropped by the IDF near the separation wall in Shuwaikh.[73]
- **Syria, August 2023:** A vehicle used for transporting water and livestock was damaged by the detonation of a landmine in As-Suwayda governorate.[74]

Agricultural irrigation systems are often directly installed on agricultural land. When these irrigation systems are attacked, agricultural work is also directly and immediately affected. The report's dataset contains 27 recorded incidents where explosive weapons reportedly damaged agricultural land, crops or livestock, and water infrastructure simultaneously.[75] In these situations, the impact on agriculture occurs simultaneously with the damage to water infrastructure, but the consequences can also be long-lasting.

The immediate impact on agriculture, crops or livestock can also occur from fires and floods as a result of the secondary effects of explosive weapons use. Fires may be ignited by explosions, while flooding can result from structural damage to water sources or storage infrastructure. For example, in Iraq in 2020, an air strike by Turkish warplanes ignited a fire that destroyed a village's only water source, along with several homes.[76] In Mali, explosives used by insurgent group Jama'at Nasr al-Islam wal-Muslimin (JNIM) destroyed a dam, leading to the flooding of rice paddies.[77] As a result, the fields could no longer be harvested or used for future food production. These fires and floods form part of a chain reaction of damage that not only harms agriculture, but also degrades water infrastructure and undermines the overall functionality of the water supply system.

The impact of water system damage on agriculture can intensify gradually over time, impacting food production in the long term. The destruction of irrigation systems disrupts crop production, and insufficient access to water can threaten livestock health. These effects may become evident within days of the attack, particularly in areas where no immediate alternative water sources are available. In some cases, the shortfall can be temporarily addressed by trucking in water until the infrastructure is repaired. Such measures are particularly important to ensure the well-being of livestock. The severity of the impact also depends on weather conditions and is generally more pronounced during hot and dry periods, while sufficient rainfall can help mitigate the consequences of an attack.

Box 7: Examples of fires caused during incidents in which explosive weapons damaged or destroyed water infrastructure

- **Iraq, May 2021:** Fires broke out following air strikes by the Turkish Armed Forces in four locations (Keste, Hirur, Celke and Baziv), setting the areas ablaze and destroying water supply infrastructure, groves, and farmland.[78]
- **Ukraine, May 2023:** A water tower was damaged by shelling delivered from a self-propelled Russian forces artillery system. The shelling also caused a fire and damaged private houses, cars, and a farming enterprise warehouse.[79]
- **Gaza, October 2024:** The desalination station for the haemodialysis department of Kamal Adwan Hospital was damaged by an air strike carried out by the IDF. The air strike ignited a fire that destroyed medical supplies. Four medical staff were injured while attempting to extinguish the fire.[80]
- **Lebanon, June 2024:** Water and electricity networks were damaged by an air strike carried out by the IDF. The air strike also injured four people and triggered a fire in the area, during which two Lebanese civil defence rescue workers were injured while attempting to extinguish it.[81]

When no alternative water sources can be provided, the destruction of the water supply system will undermine food security for the broader community, lead to increased prices for foodstuffs and threaten livelihoods, all of which can weaken the economy. In addition, at the sales and consumer level, there were four recorded incidents of water infrastructure being damaged by explosive weapons at the same time as markets were targeted in Burkina Faso, Russia, Syria and Yemen.[82] These cascading effects highlight the variety of ways in which the negative effects of explosive weapons use persist and compound over time.

The immediate and long-term impacts that trigger displacement

In the medium and long term, the damaging and destruction of water infrastructure caused by explosive weapons use can also contribute to the displacement of communities for varying lengths of time. Components of water infrastructure are *"objects indispensable to the survival of the civilian population",*[83] and therefore without sufficient functioning water infrastructure, it is often not feasible for displaced communities to return to their land and homes, even after armed hostilities have

ended. The cost of repairs to damage is a further barrier to their return. This can result in long-term or even permanent displacement.

In addition to the loss and challenges displacement causes to individuals and families, it also incurs financial costs for host societies and humanitarian initiatives seeking to feed and house displaced populations.

Box 8: The high cost of repairing damage to water infrastructure

Water infrastructure is often expensive to both construct and to repair. For example, as of March 2025, the water, wastewater and irrigation sector in Lebanon had reportedly incurred US$356 million in damages, US$171 million in losses and US$508 million in recovery needs as a result of the 2023-2024 conflict.[84] These are substantial financial costs during conflict and in circumstances where economies are already strained and donor governments find it harder to justify funding international support efforts.

External donors are also often unwilling to provide support while conflict is ongoing, given the high risk of repeated damage ordestruction. Donor fatigue and external pressures can also serve as barriers to undertaking repairs. For example, the Canada well in Tel al-Sultan[85] in the Gaza Strip, which had been funded by international donors at a cost of US$1,700,000, was destroyed by Israeli forces in July 2024. While official statements and edited media outlets only called for investigations, on social media users displayed greater scepticism, demanding "Stop wasting Canadian taxpayer money!" or asking, *"Why can't the Canadian politicians look after the welfare of its citizens before poking their nose in other countries [sic] business"*.[86] These incidents raise important questions about how reconstruction ought to be funded and who should ultimately bear responsibility for recovery efforts.

The destruction of water infrastructure functions as a mechanism triggering the long-term or permanent displacement of populations, and can also be strategically instrumentalised for this purpose. While such strategic objectives are rarely, if ever, made public during a conflict, historical records show that water infrastructure has been deliberately targeted for this purpose. For example, the 2017 declassified Israeli ministerial discussions from 1967, in the months following the Six-Day War,[87] included such reflections. During one of these meetings, Israeli prime minister Levi Eshkol stated, *"precisely because of the suffocation and imprisonment there, maybe the Arabs will move from the Gaza Strip…Perhaps if we don't give them enough water they won't have a choice"*.[88] Access to such reflections depends on accurate minutes, proper archiving and public release processes. Because few conflict parties follow such practices, a broader understanding of the extent to which attacks on water systems are a strategic choice designed to force displacement remains challenging and in some cases impossible.

Patterns and trends in the use of explosive weapons against water infrastructure

Despite the adoption in 2022 of the EWIPA Political Declaration and various UNSC resolutions on protecting civilians, the use of explosive weapons against water infrastructure increased significantly from 2023 to 2024. These attacks caused not only visible physical destruction, but also profound disruptions to civilian infrastructure, community health, and economic and food security. In the interest of protecting civilian infrastructure and reducing civilian harm, this section explores shifts in how various conflict actors employ explosive weapons and the extent to which this has increased the vulnerability of water infrastructure. These changes signal concerning trends in the conduct of hostilities, including a shrinking respect for IHL, particularly among state actors. Examining these patterns is crucial, not only to document their human and economic toll, but also to inform more effective protection strategies and interventions.

State and non-state actors' use of explosive weapons affecting water infrastructure

In 2018, 2019, 2022, 2023 and 2024, state actors were more frequently linked to incidents where water infrastructure was damaged or destroyed by explosive weapons than non-state armed groups. Overall, 13 state actors were responsible for 204 incidents, or 66% of all recorded cases, compared to 78 attributed to non-state armed actors.[89] Two out of every three incidents were therefore linked to state forces.

Until 2023, incidents involving water supply systems were relatively balanced between state actors and non-state armed groups, with non-state groups linked to the majority of incidents in 2021. By 2023, the disparity widened, with 79% of cases linked to state actors and 21% to non-state armed groups.[90] In 2024, the disparity became stark, with state forces named in 85% of incidents and non-state armed groups in 15% (see Figure 7).

In 2024, over 75% of incidents attributed to state forces involved three state actors damaging or destroying water infrastructure in multiple countries, i.e. the IDF in the oPt and Lebanon, Ukraine Armed Forces in Ukraine and Russia, and Russian Armed Forces in Syria and Ukraine. This took place in conjunction with escalations in Israeli military attacks in Gaza and Lebanon, the ongoing Russia-Ukraine war, and the protracted conflict in Syria followed by a shift in political power culminating in the ousting of the Assad government in December 2024.[91]

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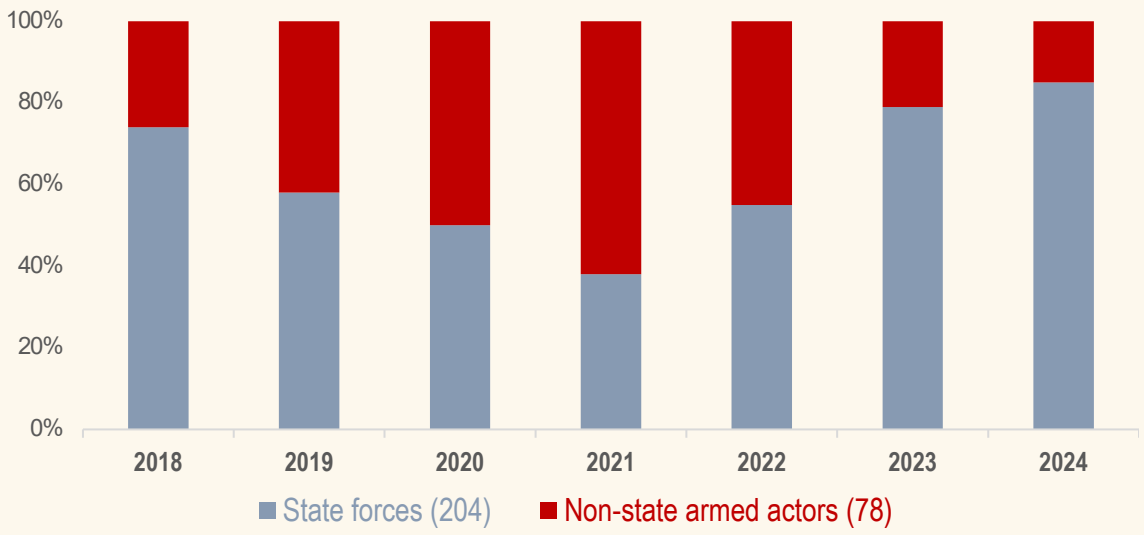
Figure 7: Reported incidents in which explosive weapons use affected water infrastructure, by perpetrator, 2018-2024[92]



Source: 2018-2024 EWIPA and Water Data

The destruction of water infrastructure

From 2018 to 2024, the destruction of water infrastructure that resulted in the system becoming inoperable was reported in 66 incidents (22%) across 17 countries, while damage was reported in 237 incidents (77%) across 20 countries.[93] While more incidents were attributed to state actors overall, state and non-state actors contributed to an almost equal number of cases of destruction of water infrastructure. State actors were reportedly responsible for 33 incidents of water infrastructure destruction and non-state actors for 32, with one incident of an unidentified actor causing the destruction of a water station in Jabal al-Gharbi, Libya, in 2021. One explanation for the large proportion of non-state actors causing such destruction is the frequency with which these actors use directly emplaced explosive weapons, which enable precise targeting, irrespective of how sophisticated the weapon is. For example, in 2024, Al-Shabaab destroyed a water borehole in Somalia by attaching a magnetic IED to the human-made water source and detonating the device, leading to the borehole's destruction. This tactic is effective because magnetic materials such as steel are often used in borehole casing to ensure the integrity of the infrastructure, preventing collapse and surface contamination.[94] Another example of the precisely targeted damage that IEDs can cause took place in 2018, when National Liberation Army (ELN) members detonated an unspecified IED inside one of the water pipes that formed part of the water supply system in the targeted area in Colombia.[95]

Box 9: Explosive weapons use by state and non-state actors affecting water supply systems

State forces and non-state armed actors do not have equal access to explosive weapons, which influences patterns of harm caused by attacks. Depending on their budgets and access to weapons manufacturers, state forces can deploy a wide range of military-grade explosive weapons systems and munitions, and maintain complex delivery and maintenance systems, including air forces. Non-state armed actors, by contrast, often rely on IEDs that they manufacture themselves, or on artillery systems and rockets seized from state arsenals.

As such, the differences between state actors and non-state actors are not necessarily indicative of one actor impacting water infrastructure more frequently than the other. Rather, the data in this report is skewed toward state actors, because it focuses specifically on the use of explosive weapons affecting water supply systems. Water infrastructure can also be damaged or destroyed using a range of non-explosive weapons, such as bullets from a machine gun, or equipment, such as bulldozers used for demolitions. Explosive weapons are more commonly employed by state actors largely due to their high cost and the greater financial and logistical capacity of state militaries to procure both the munitions and the systems used to deliver them, as well as restrictions placed on sales to non-state actors. This analysis excludes weapons that are less expensive and less regulated, and that would be more accessible to non-state actors with smaller financial capacities that would need to use informal channels to acquire weapons. The identified trends reflect this accessibility gap.

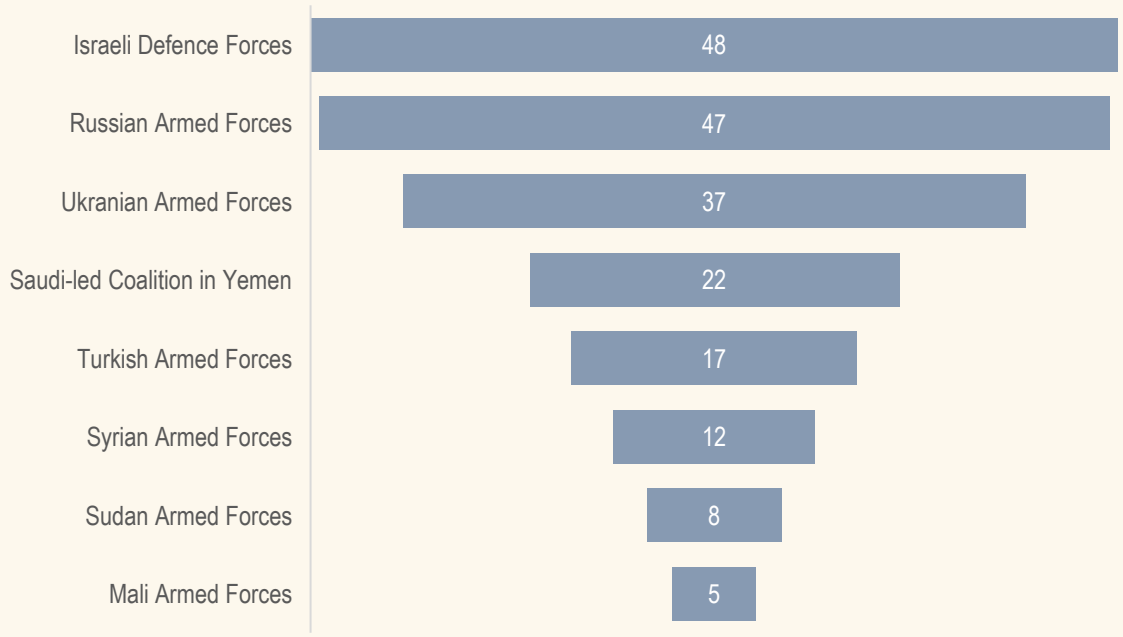
Different explosive weapon systems cause different patterns of harm. Trend analysis that combines information on users with information on the method of deployment and weapons systems provides insights into the broader global trends in how water infrastructure is exposed to the effects of explosive weapons use.

Overall, non-state actors used explosive weapons that impacted water infrastructure in more countries and territories than state actors, although the difference was marginal. Incidents attributed to non-state armed groups were reported in as many as 15 countries and territories, i.e. two more than recorded for state actors. Most incidents were linked to non-state armed actors in a single country, except for Islamic State, which were named in incidents in Egypt, Iraq and Syria. In contrast, four state forces acted across borders: Israel, Russia, Türkiye and Ukraine.

State actors' increasing use of explosive weapons affecting water infrastructure

From 2018 to 2021, state actors predominantly used air-delivered explosive weapons that affected water infrastructure, peaking at 100% in 2021, when all incidents attributed to states across Gaza, Iraq and Syria involved air-delivered explosives and the use of military aircraft.[96] This shifted in 2022, with incidents of ground-launched explosive weapons use affected water infrastructure more frequently, rising from zero identified incidents in 2021 to 18 in 2022, four of which took place in Syria[97] and 14 of which took place in Ukraine.[98] In 2023, 66% of damage to or the destruction of water infrastructure by states was caused by ground-launched weapons, followed by a sharp shift in 2024, when air-delivered weapons accounted for the vast majority of incidents. In 2024, state actors were responsible for all of the recorded incidents in Lebanon, the oPt, Russia and Ukraine, and the majority (69%) of incidents in Syria.[99]

Figure 8: Reported incidents in which explosive weapon affected water infrastructure, by named state forces, 2018-2024[9697]



Source: 2018-2024 EWIPA and Water Data

State actors damaging or destroying water infrastructure domestically

State actors also damaged or destroyed water infrastructure in their own country. Often, this occurred when government forces targeted infrastructure in areas that were outside government control, for reasons such as to weaken the capacity of de facto authorities to provide services to civilians and to prevent armed opposition groups from utilising water infrastructure. This was evident in the six instances of the Syrian Arab Armed Forces using explosive weapons to damage and destroy water infrastructure in opposition-held Idlib,[100] suggesting that these attacks were intended to support the Syrian government's efforts to regain territorial control and to undermine the governance capabilities of the de facto governing actor, Hay'at Tahrir al-Sham (HTS), at the time. Throughout the available data, the Syrian Arab Armed Forces was the state actor responsible for the most domestic attacks, i.e. 12 in total, with incidents occurring during every recorded year from 2018 to 2024.[101]

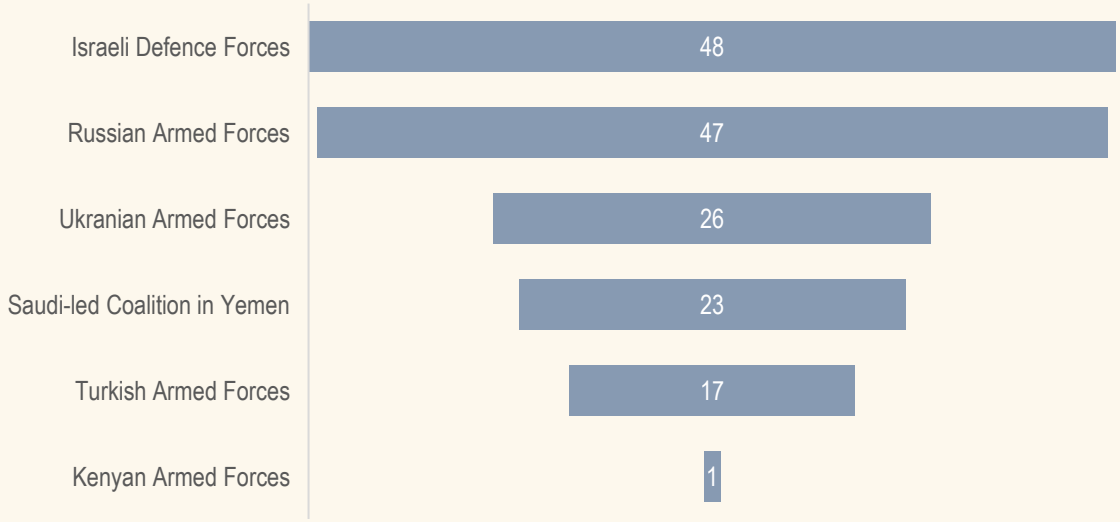
The Ukraine Armed Forces damaged water infrastructure within Ukraine on 11 occasions. In seven instances, explosive weapons were reportedly used to target Russian, so-called Donetsk People's Republic, and Donetsk People's Militia positions, and water infrastructure was damaged in the process.[102] The remaining four incidents took place in Donetsk oblast, Beryslav raion, and Kherson oblast without an explicit explanation of motives, although the Russian occupation of Donetsk could be inferred as a possible motivation for the attacks in that

location.[103] These incidents highlight the pervasive reality of military objectives being prioritised over the protection of civilian infrastructure, a trend also evident in the widespread damage caused in urban environments across the world. When military objectives are prioritised over the protection of civilians and civilian infrastructure, the consequences can be fatal and enduring.[104]

State actors damaging or destroying water infrastructure in conflicts outside their own territory and in occupied territories

The majority of incidents involving state actors damaging or destroying water infrastructure in conflicts outside of their own countries and in occupied territories were attributed to the IDF and Russian Armed Forces. All 48 incidents attributed to the IDF took place in conflicts outside their own territory (28 incidents in Lebanon and 20 in the oPt (16 in Gaza and four in the West Bank). The first recorded incident took place in May 2021, when the IDF conducted air strikes in Beit Lahiya, Gaza, leading to the widespread destruction of civilian infrastructure such as water pipes, electricity and communication networks, and education centres, as well as deaths and injuries.[105] Systematic violence against water infrastructure in the oPt has been a long-standing reality, spanning decades.[106] All remaining incidents attributed to the IDF took place since October 2023, indicating that the damaging or destruction of water infrastructure have been prominent features in IDF armed violence in Gaza and Lebanon. The distribution pattern of the Russian Armed Forces differs slightly, with the overwhelming majority of incidents taking place in Ukraine (41 incidents) and a minority taking place in Syria (six incidents).

Figure 9: Incidents in which state actors used explosive weapons to damage or destroy water infrastructure in foreign countries and occupied territories[107]



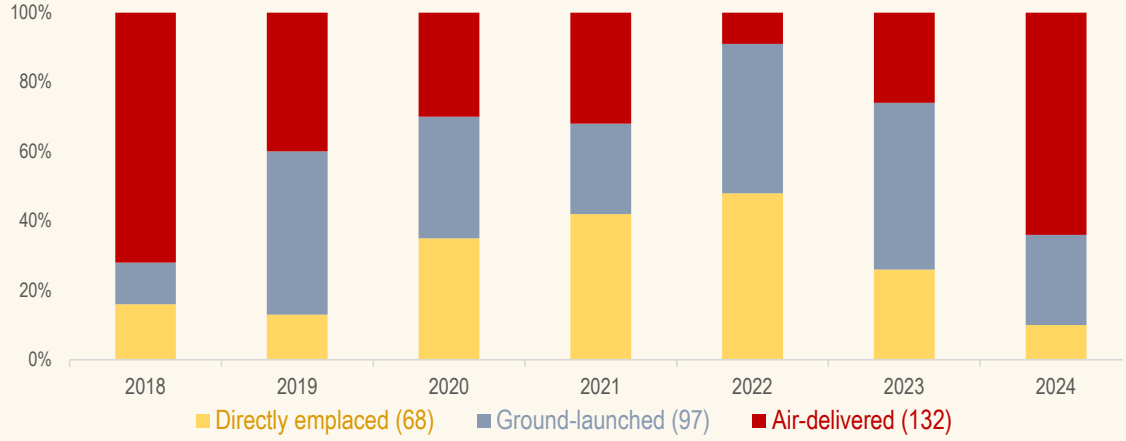
Source: 2018-2024 EWIPA and Water Data

Changes in delivery method: a return to the dominance of air-delivered weapons

The delivery system for explosive devices affecting water infrastructure has changed over time. Air-delivered explosive weapons dominated in 2018 and again in 2024, while directly emplaced explosive devices were used to attack the highest number of water infrastructure components in 2022, whereas ground-launched systems dominated in 2023.

Figure 10: Reported incidents where explosive weapons impacted water infrastructure, by delivery method, 2018-2024[108]

From 2018 to 2024, incident patterns shifted between state and non-state actors, with 2020 showing balance in both perpetrators and delivery methods, 2022 being marked by directly emplaced explosives, and 2024 seeing a return to air-delivered explosives.



Source: 2018-2024 EWIPA and Water Data

Air-delivered explosives: aircraft and drones posing a growing threat to water infrastructure

In 2018 and 2024, air-delivered explosives were the most frequently reported type of weapon used to attack water infrastructure. Between 2018 and 2024, known delivery methods included military aircraft, such as fighter jets and Tu-95MS bombers, which were involved in 90 out of 308 recorded incidents, accounting for over two in five attacks on water infrastructure, while in 40 cases drones were used to deliver explosive munitions.

Incidents involving air-delivered explosive weapons of varying types increased from four in 2022, to 11 in 2023, to 80 in 2024. This sharp increase coincides with the intensifying conflicts in Gaza, Lebanon, and Ukraine, which have caused the widespread destruction of populated areas and civilian infrastructure.[109] In Lebanon, where over a quarter of cases were reported in 2024, all 25 incidents involved air-delivered explosive weapons damaging or destroying water infrastructure, particularly in the South and Nabatieh governorates. Other cases where air-delivered explosives impacted water infrastructure in 2024 were reported in Iraq, Mali, Nigeria, Russia, Sudan, Syria and Yemen. Thus, water infrastructure, which serves as a vital component of food security, economic stability and health care, is more often under threat from the skies than from the ground.

Since 2020, the use of armed drones has increasingly impacted water infrastructure, rising from one incident in 2020, to six in 2023, and then jumping to 33 incidents in 2024. These 40 incidents of drone use from 2020 to 2024 took place in nine countries and territories. These findings **correspond** with the observed global increase in the use of drone-delivered explosives and the growing availability of drones that are accessible to non-state armed actors, particularly given that drone strikes are cheaper than aircraft-delivered strikes.

In more than 95% of cases, drone use was attributed to state actors. The first documented case of a drone being used to attack water supply systems was reported from Libya, where imported Turkish drones were used to strike water irrigation facilities in Sirte in 2020. Drones were reportedly used by the Ukraine Armed Forces, IDF, Turkish Armed Forces, Mali Armed Forces and Sudan Armed Forces. The Russia-Ukraine war accounted for 70% of all recorded incidents of the use of drones to attack water infrastructure.

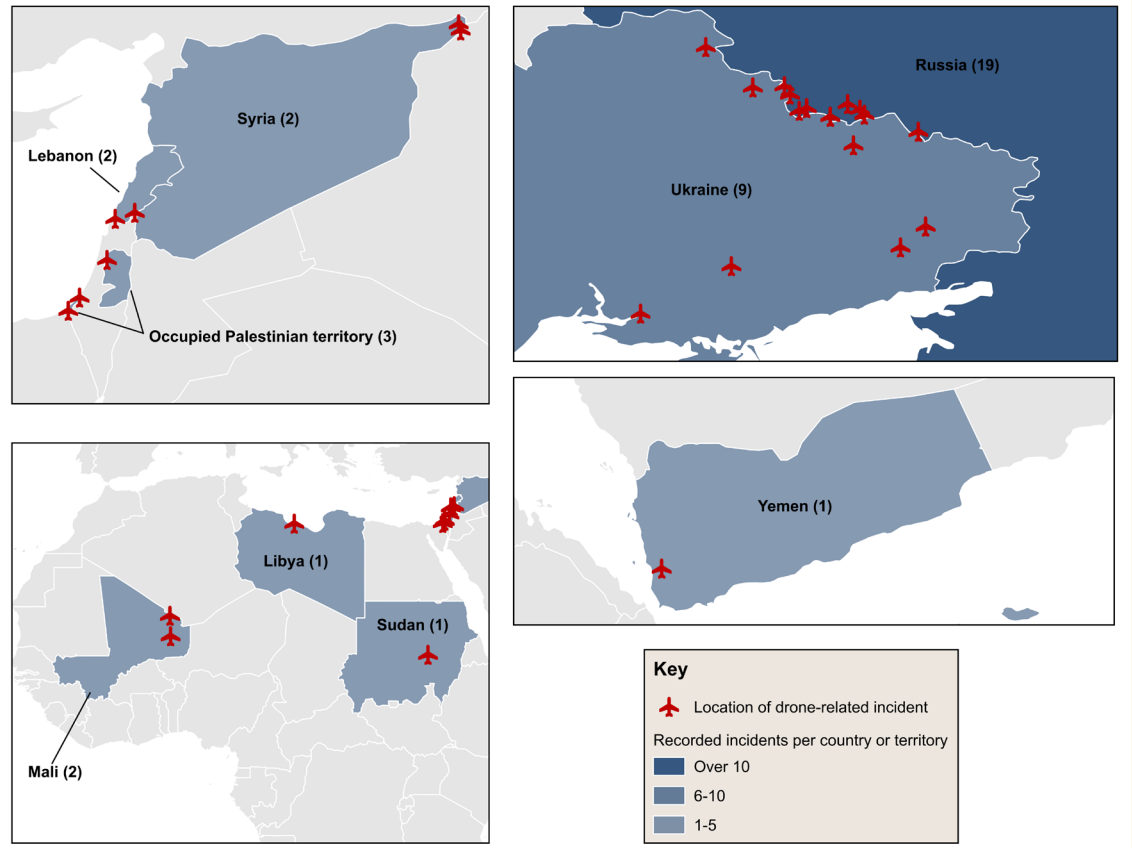
In most cases, drones are only the delivery system for explosive weapons. In three cases, kamikaze drones, also known as loitering munitions or suicide drones, were used against water towers in Russia and Ukraine and a water tank in Lebanon.

Box 10: Examples of explosive munitions dropped by drones on water infrastructure

- **Gaza, December 2024:** Water tanks at the Indonesian Hospital in northern Gaza were struck and damaged by Israeli military drones.
- **Russia, June 2024:** A water pipe was damaged by a drone strike carried out in Belgorod by the Ukraine Armed Forces.
- **Syria, January 2024:** Water storage facilities in rural Al-Hasakeh governorate were hit by drone strikes carried out by the Turkish Armed Forces.

Map 2: Reported incidents where drone-delivered explosive weapons impacted water infrastructure, 2020-2024

One drone-related incident took place in 2020, six in 2023, and, in a significant rise, 33 in 2024. These incidents affected water sources; water extraction, storage, distribution, and multipurpose/ multifunction infrastructure; and water collection infrastructure at the end user stage.



Source: 2018-2024 EWIPA and Water Data

Directly emplaced explosive weapons used to attack water systems: hand grenades, IEDs and landmines

The use of directly emplaced explosive weapons to attack water systems was reported throughout the period 2018-2024. In total, hand grenades, landmines and IEDs, including cylinder bombs, magnetic IEDs, remote-controlled IEDs (RCIEDs), and a suicide vehicle-borne IED (SVBIED), were used in 67 incidents across nine countries.[110] Most incidents of directly emplaced explosive weapons use were attributed to non-state armed actors (46 incidents), with the only state-led incident recorded in 2022, when the Russian Armed Forces "mined" a water processing system in Ukraine in April 2022.[111] Unlike air-delivered explosive weapons, which often caused widespread damage to multiple types of infrastructure through blast impact and fragmentation, the direct emplacement of a mine in a water-processing system reflects a more precise and deliberate intent to target water infrastructure. The precision and accessible nature of directly emplaced weapons enable their use to inflict substantial damage on water infrastructure and civilian populations.

IEDs (non-conventional weapons primarily used by non-military actors) were the most commonly used directly emplaced explosive weapons used in approximately two-thirds of recorded incidents (45 out of 68 incidents).[112] Over half (52%) of the recorded incidents involving damage to water transportation vehicles were caused by IEDs, highlighting the risks these weapons pose to workers operating water infrastructure at the distribution level.[113]

Between 2018 and 2024, IEDs were the most commonly employed explosive weapon type used by non-state armed groups in incidents where water infrastructure was damaged or destroyed.[114] Of the 36 such incidents, Al-Shabaab in Somalia was the most prominent perpetrator, named in nearly a third of them. Over half of these incidents damaged or destroyed boreholes, often occuring during wider attacks on civilians, particularly in Hiiraan and Galgaduud between August 2022 and September 2023. Reported motivations included disputes with the Hawadle clan, in part due to alleged clan support for government operations in the area, and retaliation against civilians who refused to pay Al-Shabaab "taxes". These attacks were frequently accompanied by other forms of violence, including the destruction of homes that displaced 60 households in Hiiraan in August 2022.[115] The group also detonated IEDs at water collection points, heightening the risk of civilians being harmed while trying to access water.[116]

Other non-state armed groups named in incidents where water infrastructure was affected by IEDs include Al-Qaeda in the Arabian Peninsula in Yemen; Baloch separatists and Tehrik-i-Taliban Pakistan in Pakistan; the Communist Party of India (CPI)-Maoist in India; the National Liberation Army in Colombia; Islamic State in Egypt and Syria; JNIM in Burkina Faso and Mali; and the Wagner Group (accompanied by the Mali Armed Forces) in Mali. These actors damaged or destroyed water infrastructure across five categories, including capacity-building, multipurpose/multifunction, extraction, distribution, and storage. The most frequently impacted component was water distribution infrastructure, contributing to this being the most frequently affected category in the dataset as a whole.

Box 11: Examples of IEDs damaging or destroying water infrastructure

- **Syria, July 2018:** A water station was damaged and a civilian was killed by an SVBIED used by an unknown armed actor.[117]
- **India, November 2021:** A water tank was destroyed by cylinder bombs used by the CPI-Maoist party.[118]
- **Somalia, February 2024:** A water tanker was damaged by an RCIED detonated by Al-Shabaab.[119]
- **Somalia, November 2024:** A borehole was destroyed by a magnetic IED attached by Al-Shabaab.[120]

Ground-launched explosive weapons impacting water infrastructure

Ground-launched explosive weapons use impacting water infrastructure nearly halved proportionally, but increased in number between 2023 and 2024. The use of ground-launched explosives such as artillery shells, rockets and mortars against water infrastructure were the most prominent methods witnessed overall in 2019 and 2023. Ground-launched explosives impacted water infrastructure at least 97 times between 2018 and 2024, representing nearly one-third of all incidents involving damage to or the destruction of water infrastructure. These reported incidents impacted water infrastructure throughout the water supply system, including upstream, midstream, and downstream components such as a water reservoir, a water desalination plant, wells and dams, water towers and stations, storage facilities, water pumps, pipes, supply networks and water tankers.

From 2018 to 2024, state actors used ground-launched weapons nearly three times more often than non-state actors to attack water infrastructure (71 incidents compared to 25, with one additional incident attributed to an unidentified armed actor) . The majority of these 97 incidents involved state actors (73%), despite their use fluctuating between years from 12% in 2018 to a peak of 48% in 2023. High numbers of such attacks were reported in 2019 and were most frequently attributed to non-state actors, including the Houthis and aligned groups and the West Coast Joint Forces in Yemen and Palestinian Islamic Jihad in Israel. In the same year, the only state actor to employ ground-launched explosives was the Syrian Arab Armed Forces. This pattern shifted in 2023 from predominantly involving non-state armed groups to state forces, including those of Russia, Türkiye, Ukraine, Israel, Myanmar and Syria. In addition, their use almost doubled that of air-delivered and directly emplaced methods (21 incidents compared to 11). While the proportion of incidents involving ground-launched explosives impacting water infrastructure decreased from 48% to 26% between 2023 and 2024, the number of cases rose from 21 to 33, reflecting an overall rise in incidents recorded in 2024.

Box 12: Examples of ground-launched explosive weapons damaging or destroying water infrastructure

- **Ukraine, March 2024:** A water utility was damaged after being hit by Russian Armed Forces shelling.[121]
- **Somalia, January 2021:** The perimeter wall of a well and two water reservoirs were destroyed by RPG rounds fired by Al-Shabaab.[122]
- **Syria, January 2022:** A water station in Raqqa was rendered inoperable by Turkish Armed Forces shelling.[123]

READ *BROKEN HARVESTS HOW EXPLOSIVE WEAPONS DEVASTATE FARMLAND AND LIVELIHOODS*

International law and other instruments, and the protection of water infrastructure during conflict

The protection of water infrastructure under international law

Water infrastructure is a form of civilian infrastructure that ensures communities' access to water fit for human consumption and forms a key component of other essential services, such as health care. Under the general IHL principle of distinction, water infrastructure components, as civilian objects, are protected from attack at all times. If there is any doubt as to whether water infrastructure is being used for military purposes and has therefore temporarily lost its protection from attack, it should be presumed that it has not until a further assessment is conducted.[124]

Building on this general protection, customary IHL rules specifically prohibit both attacks on *"any part of the natural environment"* and *"the use of methods or means of warfare that are intended, or may be expected, to cause widespread, long-term and severe damage to the natural environment"*.[126]

Water infrastructure also enjoys special protection under IHL: drinking water installations and supplies and irrigation works[127] are considered to be *"objects indispensable to the survival of the civilian population"*, and their destruction is therefore prohibited.[128] In its 1987 Commentary to Additional Protocol I, the ICRC elaborated on these specific protections, explaining that the verbs *"attack"*, *"destroy"*, *"remove"*, and *"render useless"* were deliberately chosen to encompass all possible methods of harm, including pollution by chemicals.[130] The Commentary further clarifies that drinking water installations and supplies are regarded as "especially protected" objects,[131] meaning that parties to a conflict not only have a negative obligation to refrain from damaging or destroying them, but also a positive duty to actively safeguard and preserve these resources. Even when water installations may incidentally benefit opposing forces, the ICRC notes that this does not justify depriving them of the protection afforded under IHL.[132]

Additionally, water infrastructure is also protected because of its role in farming and the production of foodstuffs, which are important components of the system for supplying and distributing food to the civilian population. These provisions are directly linked to the prohibition on using the starvation of civilians as a method of warfare, and destroying food sources or rendering them useless not only violates the protection of civilian objects, but may also constitute a form of starvation of civilians, particularly since their destruction denies the civilian population their sustenance value.[133] Since water infrastructure plays a vital role in the food supply system in the form of crop irrigation in particular, it is protected for this reason. Installations such as dams or dykes are also explicitly protected under IHL.[134]

In situations of occupation by military forces, the occupying power, which is recognised as a temporary administrator, has an obligation to "restore, and ensure, as far as possible, public order and civil life".[135] Accordingly, it must safeguard the resources of the occupied territory and has no legal authority to exploit them for its own benefit.[136] The ICRC adds that the occupying power *"may not destroy objects located in occupied territory which are indispensable to the survival of the civilian population"*.[137]

Human rights law remains applicable during armed conflict, and particularly in situations of occupation. The protection of water infrastructure is recognised as integral to the enjoyment of fundamental rights, including life, health, property, and privacy, all of which may be affected by the destruction of water infrastructure or deprivation of access to safe drinking water and sanitation. Human rights law also directly protects *"the right of everyone to an adequate standard of living"* and *"the continuous improvement of living conditions",*[138] both of which are closely linked to the fundamental right to secure access to land, and freedom from hunger and malnutrition. Reliable water infrastructure and access to water that is treated and safe for use also facilitates *"the creation of conditions which would assure to all medical services and medical attention in the event of sickness"*.[140]

The protection of water infrastructure under other policy instruments or commitments

Recent policy initiatives have also focused on regulating the use of explosive weapons in armed conflict, particularly in terms of their impact on civilians and essential resources. Both the EWIPA Political Declaration and UN General Assembly Resolution 64/292 (2010)[141] affirm the human right to water and sanitation, emphasising that water is essential to life and dignity, and relevant to humanitarian access and post-conflict recovery, while UNSCR Resolution 2417 (2018) notes that injunctions against conflict-induced food insecurity and the threat of famine are grounded in IHL, which is the key legal framework for achieving the objectives of these three instruments.

The preamble to the EWIPA Political Declaration reaffirm[s] the applicability of IHL, including the principles of distinction, proportionality, and precautions, to the use of explosive weapons in populated areas.[142] The operative section outlines specific commitments to the use of explosive weapons in populated areas and commits states to go beyond the foundations laid down by IHL and establish their own military policies and practices specific to the use of explosive weapons. In section 3.3, states commit to *"restricting or refraining, as appropriate, from the use of explosive weapons in populated areas when their use may be expected to cause harm to civilians or civilian objects"*. In section 3.4, states commit to ensuring that their armed forces take into account the direct and indirect effects on civilians and civilian objects that can reasonably be foreseen in the planning of military operations and the execution of attacks in populated areas, and conduct feasible damage assessments to identify lessons learned after such attacks.[143] Other specific commitments require states to develop new military policies and practices that both ensure compliance with IHL and go beyond it, which includes as a first step a review of national policies and appropriate training for a country's armed forces. As of September 2025, 88 states had endorsed the EWIPA Political Declaration.[144]

UNSCR 2417 calls upon all parties to armed conflicts to comply with their obligations under IHL. This includes ensuring the protection of civilian infrastructure critical to the delivery of humanitarian aid and the proper functioning of food supply systems and markets. The resolution emphasises the importance of adhering to IHL principles to prevent and mitigate the impact of conflict-induced hunger. It reaffirms that states bear the primary responsibility for protecting their populations throughout

their entire territory. This responsibility should ensure that IHL is respected and that actions leading to food insecurity, such as the unlawful denial of humanitarian access, are prevented and addressed. The resolution strongly condemns the use of the starvation of civilians as a method of warfare, and underscores that such actions may constitute a war crime under IHL.

While these instruments apply to both states and non-state actors, the latter can also sign the Geneva Calls' Deed of Commitment[145] for the Prevention of Starvation and Addressing Conflict-related Food Insecurity.[146] This instrument underscores the links between food insecurity, displacement, health, and environmental degradation; recalls IHL protections for displaced persons, health care systems, and the natural environment; and highlights the severe and lasting impacts of armed conflict on food security, health, education, sustainability, and peace. So far, only one non-state actor, Nduma pour la défense du Congo-Rénové/Guidon in the DRC, has signed the Deed of Commitment on the Prevention of Starvation, pledging to protect objects indispensable to the survival of the civilian population, such as foodstuffs, agricultural areas for their production, crops, livestock, drinking water installations and supplies, and irrigation works, including when such objects are part of the natural environment.[147]

Box 11: IHL principles protecting water infrastructure during conflict

1. Principle of distinction

Parties to a conflict must always distinguish in their attacks between military objectives and civilian objects.[148] Attacks can only be directed at military objectives. Deliberately targeting civilians and civilian objects is prohibited and amounts to a war crime.[149] The various forms of water infrastructure are protected as civilian objects under IHL and must never be attacked. Civilian objects may temporarily lose their protection against attack if and for such limited time as they are used for military purposes. Even in such instances, attacks on civilian objects are only permissible if they comply with the IHL principles of proportionality and precautions (see below). In situations where there is doubt regarding whether such an object constitutes a legitimate military target, it must be treated as civilian, and conflict parties must protect it from attack.[150]

Embedded in the principle of distinction is the prohibition on indiscriminate attacks.[151] Parties to conflicts are prohibited from launching attacks that fail to distinguish between military targets and civilian objects, or that employ weapons that cannot be directed at specific military objectives, or the effects of which cannot be limited as prescribed by IHL.[152] For instance, the use of inherently indiscriminate weapons, such as landmines, violates this principle. More broadly, the use of explosive weapons with wide-area effects on or near water infrastructure in populated areas often causes damage well beyond the intended target and results in widespread infrastructural damage and high numbers of civilian casualties, raising serious concerns over compliance with the prohibition on indiscriminate attacks.

In addition to the general protection afforded to all civilian objects during armed conflict, drinking water installations, supplies and irrigation works[153] benefit from special protection under IHL. This is because they are classified as *"objects indispensable to the survival of the civilian population"*[154] and, as such, must never be attacked, destroyed, removed or rendered useless. Attacks against these objects are only permitted in narrowly defined exceptions: when the objects are used exclusively to sustain enemy armed forces (however, it can reasonably

purported that drinking water installations are unlikely to be used solely for the benefit of armed forces) or are directly supporting military action.[155] But even in these exceptional cases, IHL explicitly prohibits any action against these objects that *"may be expected to leave the civilian population with such inadequate food or water as to cause its starvation or force its movement"*.[156]

2. The principle of proportionality

The principle of proportionality obliges all parties to a conflict to assess whether the expected incidental harm to civilians and civilian objects, such as water infrastructure, from an attack against a legitimate military objective would be excessive in relation to the concrete and direct military advantage that could be gained.[157] This principle prohibits attacks likely to cause disproportionate harm to civilians or to essential civilian infrastructure. In assessing proportionality, particular weight must be given to the potential damage to objects indispensable to the survival of the civilian population, taking into account both the immediate and long-term consequences of an attack for civilian well-being. The use of explosive weapons with wide-area effects against or in the vicinity of water infrastructure in densely populated areas is almost certain to result in civilian casualties, cause widespread infrastructural damage, and disrupt the functioning of essential services such as health care, depriving communities of access to such services.

3. The principle of precautions

The principle of precautions requires that constant care be taken in the conduct of military operations to spare the civilian population and civilian objects. Even when a military target is lawful and the anticipated civilian harm is deemed proportionate to the military advantage gained, conflict parties carrying out attacks are still required to take all feasible precautions to avoid or minimise harm to civilians and damage to civilian infrastructure, including water facilities.[158] This includes verifying that the intended target is a legitimate military objective and selecting means and methods of warfare that are least likely to cause civilian harm or damage to civilian objects such as water infrastructure.[160] "Feasible" refers to what is practically achievable, based on the conditions at the time of an attack, and requires balancing humanitarian concerns and military imperatives. This includes *"verifying targets"*,[161] *"minimising harm"*[162] and cancelling attacks if it becomes obvious that a target is not lawful or the expected civilian harm would be excessive.[163] Precautionary measures also extend to the timing and location of attacks, e.g. avoiding strikes at times when civilians are known to frequent water collection points.

The protection of water infrastructure and the pattern of explosive weapons use impacting water supply systems

A review of patterns in the use of explosive weapons and their impact on water infrastructure and water supply systems highlights serious concerns regarding contemporary compliance with IHL. Publicly available information indicates that, in many cases, the fundamental IHL obligation to always distinguish between military objectives and civilian objects, including water infrastructure, has not always been respected. This conclusion is supported by the high likelihood that the use of explosive weapons with wide-area effects in densely populated areas will cause indiscriminate effects and harm to civilian infrastructure caused by the use of such weapons. While these findings cannot be considered conclusive, they raise serious legal and humanitarian concerns that merit further examination.

When explosive weapons with wide-area effects are used in densely populated areas, they are likely to cause indiscriminate harm, challenging compliance with the IHL principles of distinction between civilians and military targets. Their use in populated areas not only has immediate consequences, such as civilian casualties, but also produces foreseeable reverberating effects on water and food supply systems and essential services. Such characteristics raise critical questions about how the principles of distinction, proportionality, and precautions are applied in incidents in which water infrastructure is attacked using explosive weapons, and whether adequate measures are taken to prevent and/or mitigate the resulting water scarcity, food insecurity, and disruption to civilian livelihoods and other essential services.

Challenges to respect of the principle of distinction when using explosive weapons with wide-area effects

IHL requires all parties to a conflict to distinguish between civilians and combatants, and between civilian objects and military objectives. In some incidents there are claims that a strike that damaged water infrastructure was directed towards opposing armed actors operating in close proximity to the water infrastructure. For example, in March 2024, the IDF reportedly announced that its aircraft had struck Hezbollah cells in Ras al Naqoura town, Lebanon. This air strike also led to the deaths of four people, including a health care worker, and the destruction of water and electricity networks in the town.[164] It is not clear whether this would constitute an attack on a legitimate military target; however, in most cases there is no publicly available information about the definitive presence or absence of armed actors.

Even if a military target is situated near or in water infrastructure, any attack must not cause incidental civilian harm that is excessive in relation to the direct and concrete military advantage that was anticipated. The use of explosive weapons with wide-area effects, particularly air-delivered or artillery-based weapons, often results in disproportionate harm in densely populated areas where water infrastructure components such as water networks, pipes and pipelines are commonplace. A single strike can cause dozens of civilian casualties, destroy entire economic lifelines, and disrupt access to health care, i.e. effects that are unlikely to meet the proportionality standard. In one example, in November 2024, the Russian Armed Forces conducted air strikes with KAB guided missiles in Zaporizhia oblast, Ukraine. This led to the deaths of ten civilians, including a one-year-old child; injuries to over 40 people; and damage to a cancer treatment centre, over 40 private buildings, and water and power infrastructure.[165]

Additionally, when an attack takes place, all feasible precautions must be taken to minimise harm to civilians and civilian objects. This includes verifying the target, choosing appropriate means and methods of warfare for an attack, and cancelling or suspending attacks if it becomes clear that the target is not lawful or the anticipated harm is excessive to possible military gains. The pattern of repeated attacks on water infrastructure, especially during activities such as workshops, training or while people were collecting water, suggests a failure to take such precautions. For example, in October 2024 an IDF drone struck a group of Palestinians at a water collection station in Rafah, Gaza, killing eight people and leaving others injured.[166] In all the cases referred to in this report, it is unclear what precautions were taken by attacking parties, including if any warnings were issued prior to an attack.

Foreseeable excessive and long-term impacts on water supply systems during conflict

IHL protects people's access to safe water, hygiene facilities and sanitation, because they are indispensable to the survival of the civilian population. Water infrastructure and water supply systems are central to ensuring such access, because they are vital for the treatment and storage of water, and its distribution to communities. When explosive weapons with wide-area effects are used in or near water infrastructure, the consequences extend far beyond the immediate casualties. They damage supply and distribution networks, destroy stored goods, can lead to the contamination of water sources, and disrupt transport systems essential for mobile water delivery units in contexts where permanent infrastructure is absent or has been damaged or destroyed.

The foreseeable excessive impact of explosive weapons use on water and food supply systems is both immediate and long term. In the short term, attacks on water infrastructure can cut communities off from running water, limit the functioning of hospitals, disrupt livelihood activities, weaken urban and rural economies, entrench food insecurity when irrigation systems are affected, and push families into displacement and long-term reliance on humanitarian assistance. These impacts are compounded when attacks also affect other parts of the food chain, such as agricultural land, storage facilities or transport infrastructure, magnifying the cumulative disruption.

Under IHL, parties to a conflict are required to assess the proportionality of an attack and take all feasible precautions before launching it that could affect civilian objects, including those essential to food and water supply security. The impact of the use of explosive weapons on civilian infrastructure raises serious concerns about compliance with IHL and the protection of civilian access to food and water during conflict.

IHL protection for water infrastructure: conclusion

While definitive conclusions remain impossible in the absence of information provided by conflict parties, the patterns described in this report raise significant questions about how the IHL principles of distinction, proportionality, and precautions are applied in incidents involving the use of explosive weapons to attack components of water infrastructure. They also raise questions about what measures, if any, are taken to prevent the damaging or destruction of water infrastructure during armed conflict. Even if individual incidents cannot be conclusively assessed, the cumulative characteristics of such attacks raise critical concerns about compliance with IHL. While IHL does not require conflict parties to explain their decisions, it is nonetheless urgent that diplomats, parliamentarians, civil society and others demand explanations from conflict parties on the ways in which these principles were applied in reported incidents. This report suggests that this would necessitate investigating the actions of state armed forces in particular, which have dominated the landscape of damage to and destruction of water infrastructure through the use of explosive weapons.

Water infrastructure represents an integral component of civilian well-being, influencing the functionality of health care systems, food supply systems, education systems and others. The repeated attacks on and destruction of this infrastructure by explosive weapons directly impact these systems, contributing to the deprivation of goods and services essential to human well-being and survival. This, in turn, increases the risk of conflict-induced illness and starvation when insufficient precautions are taken to mitigate the foreseeable humanitarian consequences of such attacks. Further work is required to better measure the impact of explosive weapons on water infrastructure in its various forms, the reverberating impact of such incidents and the ways in which they negatively impact the civilian population during conflict.

Although the strategies and tactics behind such attacks remain opaque in many instances, the wide-area effects of explosive weapons, and their repeated use in populated areas and against both permanent infrastructure and mobile water units raise serious concerns about the issue of indiscriminate targeting and a diminishing respect for IHL protections globally.

Conclusion

A detailed review of 308 reported incidents involving damage to or the destruction of water infrastructure across 21 countries and one territory over a seven-year period (2018-2024) reveals that water infrastructure remains vulnerable to attack from armed actors across the spectrum using a variety of weapons. During this period, state actors have posed the most significant threat to water infrastructure through the use of explosive weapons, a trend that has become increasingly apparent in recent years and during armed violence throughout 2024. The use of armed drones as a feature of this violence has steadily increased among state actors. Non-state actors also posed a significant threat, frequently damaging or destroying water infrastructure through the use of directly emplaced weapons. Within this reality, civilians inevitably suffer.

Traditionally, civilian harm has been measured by the number of casualties that occur during conflict or as a result of armed violence. In recent years, however, awareness has grown that damage to vital civilian infrastructure is itself a major driver of harm, and the damaging or destruction of water infrastructure illustrates this. When such infrastructure and systems are rendered inoperable, communities can be left without clean water, health care, education, or reliable information, creating cascading impacts that extend far beyond the immediate aftermath of an explosive weapons attack and contribute to indirect conflict deaths and displacement.

As more and more people live in densely built urban environments, and as our food, health care, and information networks become ever more globally interconnected, the impact of damage to water supply systems and other civilian infrastructure becomes even more pronounced. It is vital to understand its components as interdependent lifelines that are integral to human well-being and survival. Understanding the ways that their breakdown fuels human suffering enables us to measure, prevent, and redress harm that results from actors using explosive weapons to damage or destroy such infrastructure.

It is hoped that this report will inform discussions around the implementation of the EWIPA Political Declaration related to water supply systems and its important role in preventing civilian harm, and will support the Conflict and Hunger agenda. Shortage of water is an important contributing factor in triggering food insecurity, which then causes and exacerbates a range of health and economic issues.

The report also underlines the need for context-specific assessments. Different elements of water infrastructure have varying degrees of impact on the water supply system, and attacks on them can cause varying degrees of civilian harm. While all damage or destruction has serious effects, damage to different types of water infrastructure does not trigger the same predictable impact. The way in which the ripple effects reverberate throughout the system depends on the specific function of each element within the wider water supply system, as well as the extent to which damaged infrastructure can be quickly repaired and/or replacement water sources can be provided, along with how effectively limited water resources are allocated. In order to gain the full picture of civilian harm, the impact of the damaging or destruction of water supply systems also needs to be examined in conjunction with other vital systems, such as food security and health care.

While the specifics may be too complex to precisely predict consequences, the use of explosive weapons to attack water infrastructure produces foreseeable and far-reaching consequences for agriculture, health care systems, and displacement patterns. These factors must be taken into account by conflict parties in terms of proportionality assessments and precautions when they are assessing and planning their military operations.

Humanitarian actors can also pay more attention to the indicators for increasing humanitarian needs. Such an anticipatory mindset can facilitate cost savings by prioritising the rapid repair of damaged water infrastructure as a form of early support to strengthen the resilience of communities, thereby avoiding the far greater challenge of supporting large numbers of displaced people over extended periods of time.

Recommendations

The damaging or destruction of water infrastructure and its long-term, cumulative effects on communities and economies should become central to monitoring systems, legal compliance, strategic policymaking, and humanitarian and development planning. Implementing the following recommendations would strengthen alignment with commitments in the EWIPA Political Declaration, IHL duties, and the goal of protecting civilians and their essential infrastructure during conflict. The recommendations are structured thematically, and are as follows:

1. Support for coordinated international efforts

- States should fully support the work of the UN and relevant stakeholders in identifying and implementing best practices for the assessment, clearance, and rehabilitation of urban and rural environments contaminated by ERW and other conflict-related debris.
- States, donors and humanitarian organisations should invest in explosive ordnance risk education programmes, humanitarian demining work, and efforts to safely dispose of UXO, in order to prevent future injuries and deaths, and the destruction of civilian infrastructure.
- States should collaborate with humanitarian mine action organisations, WASH ministries, water utilities, and local communities to coordinate clearance and restoration priorities.
- Stakeholders should advocate for the provision of financial and technical support for the repair and maintenance of vital civilian infrastructure damaged by explosive weapons, ensuring that the burden does not fall on affected communities.
- Stakeholders should ensure that the damaging or destruction of civilian infrastructure, particularly water infrastructure, is a central component during all discussions of civilian harm and efforts towards related mitigation strategies.
- Stakeholders should support and fund the construction and maintenance of sustainable water infrastructure in collaboration with local authorities and communities and reduce reliance on temporary mobile units.

2. Justice and accountability efforts

- Stakeholders should document where water infrastructure is damaged or destroyed with the intention of forcing changes in the settlement patterns of populations, and should conduct data collection with the aim holding perpetrators to account and directing efforts towards the repatriation of forcibly displaced communities.
- Stakeholders should impress upon parties to a conflict the importance of adhering to their obligations under IHL, and invest in accountability efforts targeted at those who violate IHL.
- Stakeholders should hold accountable actors who violate IHL through the intentional targeting of civilian infrastructure and continuously affirm the necessity of adherence to IHL.

3. Strengthening systematic research, data collection and analysis

- Interested parties should make available a standardised lexicon for the use of a wide range of stakeholders to support a more common understanding when describing the impact of explosive weapons use on water infrastructure.
- Stakeholders should connect experts who understand water, health care, and food supply systems to fully understand the reverberating effects of damage or destruction on water supply systems, and how best to mitigate the consequences.
- Stakeholders should invest in research to understand how the damaging or destruction of water infrastructure triggers cascading and reverberating effects, and identify strategies to strengthen resilience so that the worst outcomes can be prevented.
- Stakeholders should draw on a combination of data sources, including incident-based open-source data and qualitative and quantitative sources, to gain a rich understanding of the context, the role of the affected infrastructure and the long-term impact of attacks. For example, a substantial body of evidence suggests that water sources are primarily affected in indirect ways, such as through infrastructural damage that leads to the discharge of untreated wastewater.[167] These longer-term impacts are difficult to capture in incident reporting alone, highlighting the potential benefit of combined data collection methods in more comprehensive studies.
- Stakeholders should conduct research over extended periods in order to collect data on the reverberating effects of explosive weapons use over time. Future research would benefit from collecting data on the damaging or destruction of related infrastructure and analysing the extent to which this may impact water infrastructure in each context. Analysis of this kind will likely require comprehensive contextual knowledge of the ways in which infrastructure is interconnected and interdependent on a case-by-case basis.

Annex 1: Insecurity Insight's incident identification methodology

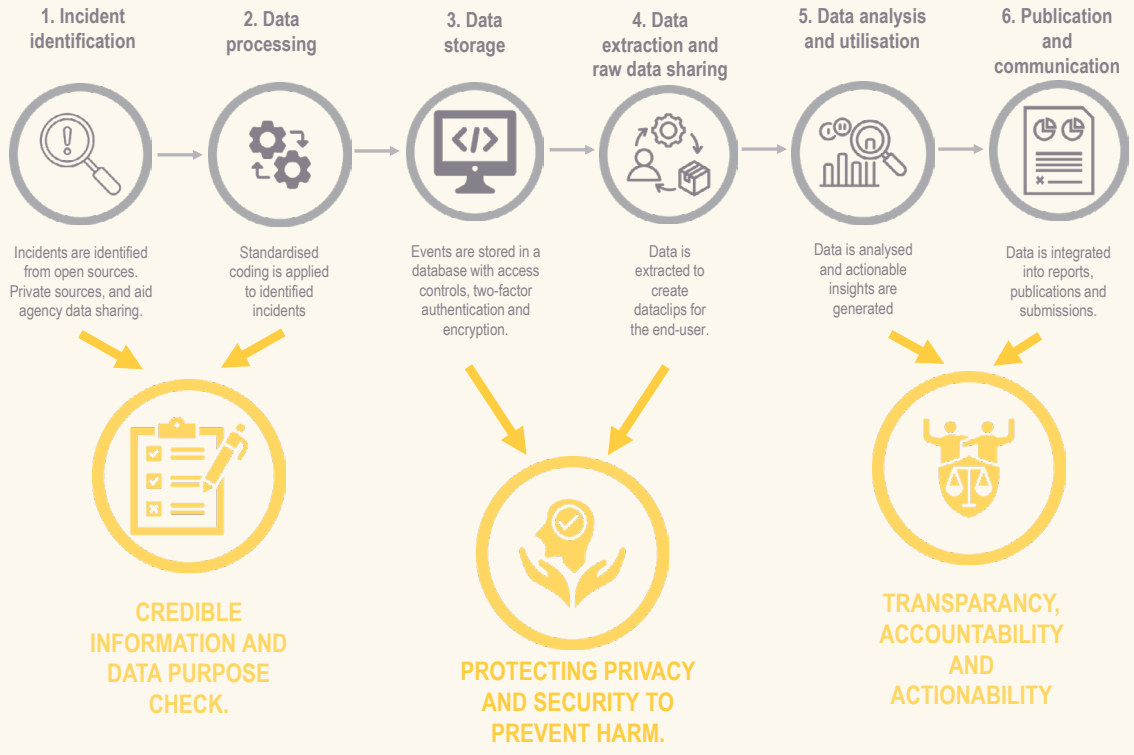
Insecurity Insight works to mitigate violence against aid operations, strengthen the duty of care towards staff and local aid partners, and improve humanitarian access. It supports analysis on how vital civilian services – such as food supply, health care, education, protection and aid delivery – are affected by conflict. It also promotes strong data responsibility practices and ethical standards for data on conflict incidents, ensuring that information is handled with integrity. The methodology's adaptive, database-driven design is built to flexibly generate and tailor data that can inform and support humanitarian policies across the aid sector.

Insecurity Insight's six-step data-processing procedure

1. Incident identification

Insecurity Insight uses an event-based approach to document incidents affecting humanitarian operations, health care, education, food systems, and protection. Event-based information is documented from three primary sources: open sources (information publicly available on the internet, usually taken from edited media or from organisations identified through our AI-supported search functions), private sources (information on incidents provided by individuals) and aid agency data-sharing mechanisms. Documented incidents must provide sufficient information to ensure that events are verifiable, fostering trust in the data. Information is collected on when and where an incident occurred, what or who was affected, and how they were affected (including information on the conflict actor an incident was attributed to, the type of weapon used and how it was launched or delivered).

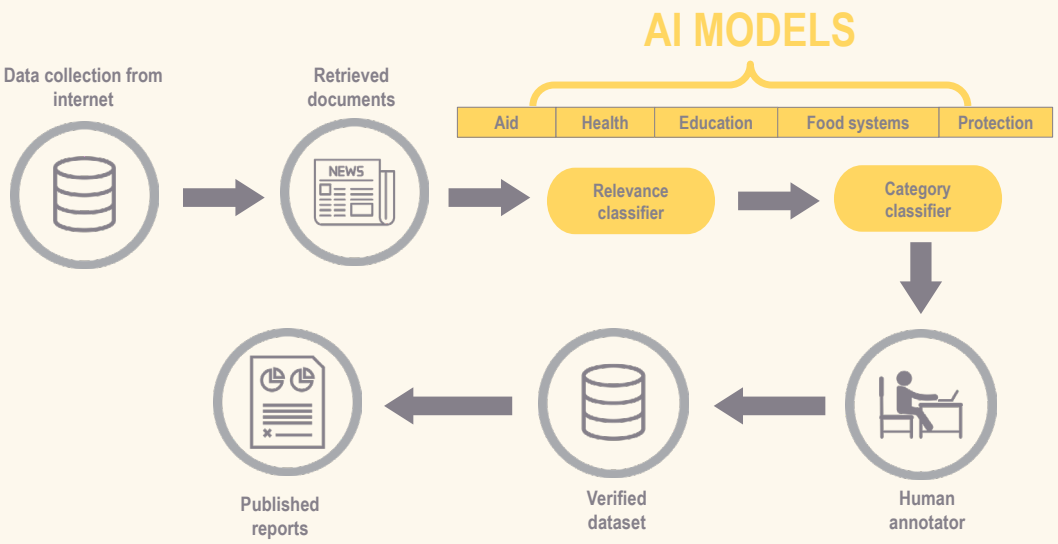
Figure A1: Insecurity Insight's six-step data-processing procedure



Source: Insecurity Insight

Figure A2: AI-supported open-source search functions

To identify relevant event descriptions in the vast amount of information available online, Insecurity Insight has developed a web crawler that continuously scrapes open-source content. This system uses AI-driven functions and advanced deep-learning techniques to retrieve information on potential events, which is then processed by a natural language-processing classifier and categorisation tools in English, French, and Arabic. These tools are trained on over 15 years of our experience collecting event data on incidents affecting aid access and vital civilian services in conflict zones. The retrieved data is automatically fed into a platform, and tagged with suggested relevance levels and thematic categories. Our team of human researchers then reviews the suggested content and determines which information meets our inclusion criteria and will become part of the event-based data analysed in reports. This system was short-listed for an award at the AI for Good Global Summit in 2025.



Source: Insecurity Insight

This event-based data can be combined with first-hand accounts and other on-the-ground sources to build a rich, contextualised understanding of how ongoing conflict affects civilian well-being and humanitarian aid access and delivery. It allows us to understand the context of a given situation and helps us analyse trends and patterns of attacks.

This report includes incidents where water infrastructure was described as having been impacted by explosive weapons use. Information on these incidents was collected using Insecurity Insight's overall data collection system, making use of the best available sources. Incidents affecting people have only been included if they occurred while the person was carrying out a water-related activity, such as conducting repair works at a water tower, driving a water tanker or collecting water from a well. Incidents involving the damaging or destruction of water-related infrastructure, such as electricity/power infrastructure, were only recorded when the impact on water supply was explicitly stated in the source. The countries included in this study are a reflection of where our open-source data collection system identified incidents, rather than a preselected set of case study countries. The scope of the report focuses on water infrastructure in its various forms, i.e. civilian infrastructure that is indispensable to the survival of the civilian population and plays an integral role in food security and health care

2. Data preparation

Data preparation follows a standardised coding system inspired by the approach of the Taback-Coupland model for analysing armed violence, which is built around the six Ws (**W**ho did **W**hat to **W**hom, **W**here, **W**hen and with what **W**eapon). This method turns the elements that make up a violent event into independent and structured data points. Events are coded with their date, location, and perpetrator along with information on the affected civilian infrastructure and victim attributes, where relevant.

All data preparation follows defined quality control standards, including credibility checks to verify incidents wherever possible and cross-checking sources to prevent duplication, ensure consistency, and complete missing information. These steps support comparability and interoperability across datasets. Data is prepared according to internal protocols and codebooks, which define standards for collection, formatting, and consistency. All data is selected to enable data use for action, in accordance with Insecurity Insight's data responsibility policy.

3. Data storage

Events are stored and managed in the strictly confidential Security in Numbers Database (SiND), an event-based database built on the general principles of event recording.[168] All data is stored securely on encrypted servers with strict access controls to protect sensitive information. User access is limited to authorised personnel and safeguarded through multifactor authentication and regularly updated passwords. Routine security audits and system backups ensure data integrity and resilience against loss or unauthorised access. All of Insecurity Insight's staff are given cyber-security training. These measures collectively uphold high standards of data protection and confidentiality throughout the data management process.[169]

4. Data extraction and raw data sharing

Insecurity Insight shares raw data through private partnerships, online platforms and application programming interfaces (APIs) with partners to allow them to use the data for their own analysis. Data sharing is based on memorandums of understanding or other specific agreements. Data included in the data-sharing process must comply with Insecurity Insight's data responsibility policy and allow end users to meaningfully use the data without exposing anyone to harm. In countries where information-sharing protocols to govern data and information sharing exist, usually with the host government or among UN and humanitarian actors, Insecurity Insight takes note of these protocols and will comply as far as they are compatible with its own data responsibility policy.

Data is extracted into data clips using query language to filter, organise, and classify information into relevant and usable categories based on different stakeholders' use cases. Each incident is assigned a unique event ID number to ensure traceability and consistency. The process is designed to make the data accessible and meaningful for end users, while excluding all confidential or personally identifiable information.

Datasets of all the data used in this report are made publicly available through Insecurity Insight's **HDX** (Humanitarian Data Exchange). Data collection on the topic of this report continues and datasets are updated beyond the content of the report and are automatically updated through APIs every Monday. The information is also available through the relevant **country pages**, where it is combined with other incident data documenting the impact of a particular incident on aid and vital civilian services. Curated datasets are also available on request.

Insecurity Insight also supports data collection and data analysis for the **Coalition Against Conflict and Hunger** and the **Explosive Weapons Monitor**.

5. Data analysis and utilisation

Insecurity Insight produces data tailored to enable it to be used for action. Data use is central to Insecurity Insight's data responsibility policy and focuses on support for aid sector decision-making, and for practices that uphold the rights and dignity of affected individuals and communities, in order to enable their empowerment and support humanitarian access and respect for IHL. Responsible data use is linked to aid agency operations, but also to policy and advocacy for aid policy.

Insecurity Insight's data is used in a variety of ways. It forms the basis of the organisation's own reports. Insecurity Insight also generates data for NGO coalitions and their reports, such as the **Safeguarding Health in Conflict Coalition** report, the Conflict and Hunger Coalition, the **Explosive Weapons Monitor** yearly report and the annual **Protection of Civilians** report, among others. Various NGOs and organisations also use the data for confidential internal processes.

Finally, Insecurity Insight makes available selected datapoints for aid policy documents, such as submissions to UN Special Rapporteurs, responses to other groups' calls for information and data, and statements issued by various coalitions and NGOs, which may use the data for both public and internal processes.

6. Publication and communication

Insecurity Insight publishes information on conflict incidents affecting aid agencies and vital civilian infrastructure to strengthen trust in conflict-related incident data, amplify the voices of affected communities, and support policy processes by enabling stakeholders to integrate the data into their own policy processes. Insecurity Insight communicates sufficient detail to allow stakeholders to assess the credibility of information and to understand data limitations.

It publishes selected data from the SiND in its various thematic or commissioned reports. Data publication in such reports is subject to situational analysis, and context-specific editorial guidelines apply. Insecurity Insight communicates metadata and documentation outlining limitations, uncertainties, and data reliability, as well as copyright information.

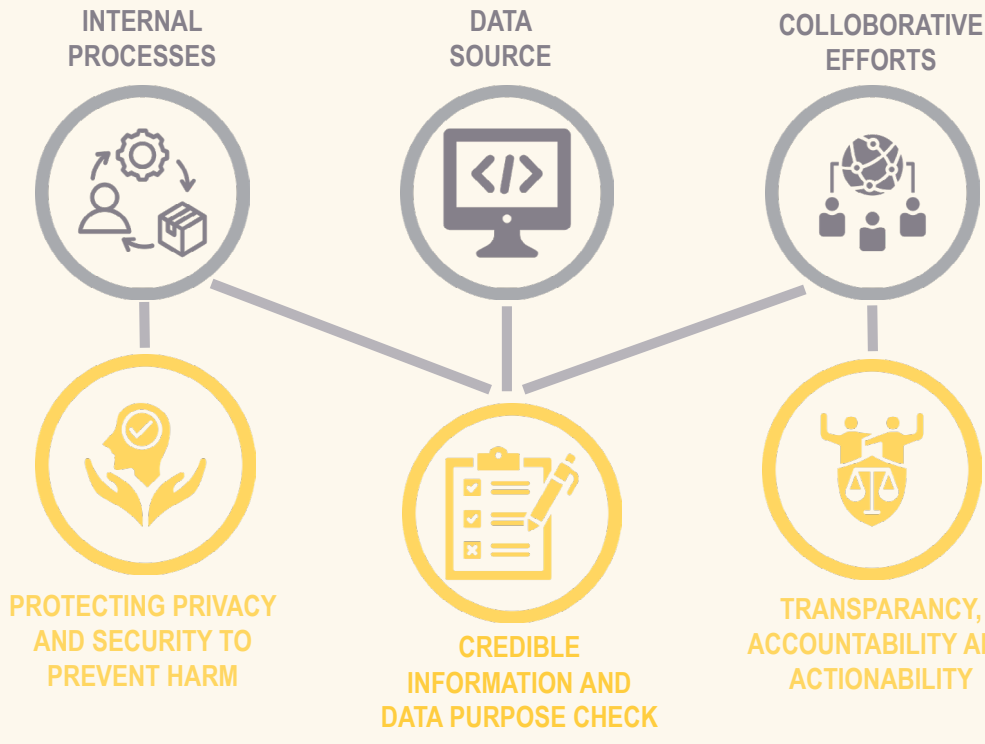
Insecurity Insight's data quality assurance process

Insecurity Insight's data responsibility policy is designed to ensure safe, ethical and effective data management. To achieve this, Insecurity Insight applies a comprehensive data quality assurance process to maintain the accuracy, credibility, reliability and ethical integrity of its datasets. Quality assurance is embedded throughout all stages of the six-step data processing procedure, with additional checks conducted whenever information on incidents is updated or backdated. The process covers three steps of credibility and data purpose checks designed to protect privacy and security in order to prevent harm, and ensure transparency, accountability and understandability. These steps are applied through three interconnected components: internal mechanisms, collaboration efforts and source verification.

1. Internal processes

Internal quality assurance relies on strong standardisation, continuous training, and the ongoing development of our research and coding systems. This includes the consistent application of definitions, terminology, and coding practices, as well as ongoing training for data coders and regular updates to guidance materials. The process integrates thematic classification systems such as explosive weapons launch systems, water-related categories, and food-system classifications to ensure coherence across datasets. These measures strengthen the link between methodological purpose and assurance practices, ensuring that outputs remain consistent, transparent, and comparable across projects.

Figure A3: Insecurity Insight's data quality assurance process



Source: Insecurity Insight

2. Data sources

Rigorous source verification underpins the final layer of quality assurance. Analysts consult multiple types of evidence, including other verified databases such as the Armed Conflict Location & Event Data (ACLED) database, Aid Worker Security Database (AWSD) and the Surveillance System for Attacks on Health Care (SSA); contextual reporting; and satellite imagery to cross-check and triangulate incidents. Specific thematic standards, such as those used in incidents affecting children in armed conflict, EWIPA, food supply systems, and conflict-related sexual violence frameworks, are also applied to ensure consistency with broader humanitarian and protection classifications.

The widespread use of internet-based communication – through mobile phones, apps and social media – has broadened the range of conflict reporters. While the risks of misinformation and disinformation are well documented, this technological shift has also democratised and diversified the production of publicly available narratives. It has brought greater visibility to the lived experiences of affected populations, reshaping perceptions. Direct and self-initiated information sharing by affected communities is one way in which local actors are actively working to influence and reshape humanitarian action.

Across all components, Insecurity Insight continuously refines its internal guidance documents, integrates evolving standards, and adapts to new data challenges, focusing on accuracy, understanding of data gaps, and consistency. This cyclical and collaborative approach ensures that the Security in Numbers Database remains a robust, transparent, ethically managed repository of conflict-related event data.

3. Collaborative efforts

Quality control is further enhanced through collaboration with partners and experts. Insecurity Insight maintains two-way communication with field-based and external partners to validate incidents, identify gaps, and ensure that data reflects grounded and trustworthy information rather than unverified reports. Collaboration is conducted sensitively to avoid causing reputational or operational harm to aid agencies, particularly in contexts where findings may be politically sensitive or controversial.

Methodological challenges

Despite the significance of water supply systems for civilian well-being and survival, food security, and health care, data collection on damage to water infrastructure remains markedly inadequate. Information on explosive weapons use impacting water infrastructure often lacks adequate detail on the type of water infrastructure affected and the connectedness and role of the affected infrastructure within the larger water supply system. Many incident descriptions are often imprecise, offering generic references to “water infrastructure damage” or “explosives” without specifying the type of infrastructure or weapon used. This lack of specificity limits the ability to assess the function and vulnerability of different infrastructure types, undermining efforts to measure reverberating effects and identify appropriate mitigation strategies, and will require further future work. In addition, information on the immediate, mid-, and long-term impacts of such damage or destruction is often absent from incident reports, and requires the long-term monitoring of communities and essential services.

Annex 2: Explosive weapons in populated areas (EWIPA)

Explosive weapons are weapons that are activated by the *"detonation of a high-explosive substance that produces thermal energy and a blast and fragmentation zone"*.[170] They have the capacity to affect wide areas and to kill or injure any person or damage or destroy objects within their blast radius. There are many different types of explosive weapons, including bombs, missiles, artillery shells, and IEDs, and they can be delivered in various ways such as air-delivered (e.g. by aircraft or drones), ground-launched or directly emplaced.

The term **"explosive weapons in populated areas (EWIPA)"** refers to explosive weapons used in areas containing large numbers of people such as towns, cities, refugee camps or markets. Many types of explosives are designed to be used in open battlefields and not urban settings, such as artillery shells, large mortar bombs, unguided rockets or tank gun shells. These weapons have large blast radiuses or wide-area effects, and their inaccuracy means that in populated areas their effects extend far beyond the intended military target. They can not only kill or injure civilians, but also damage or destroy civilian infrastructure, including homes, hospitals, schools, markets, water supply systems, power grids and roads, which leads to cascading effects on essential services.

However, in recent years, precision-guided munitions, smaller shaped charges or carefully applied close-support munitions are designed to be used in urban areas, but the same provisions to prevent civilian harm apply.

Delivery systems for explosive weapons

Explosive weapons range from small hand grenades or suicide vests to larger artillery shells, rockets, and aerial bombs. Their size, yield, and method of delivery produce different effects on people and infrastructure. To help with analysis, they can be grouped into three categories:

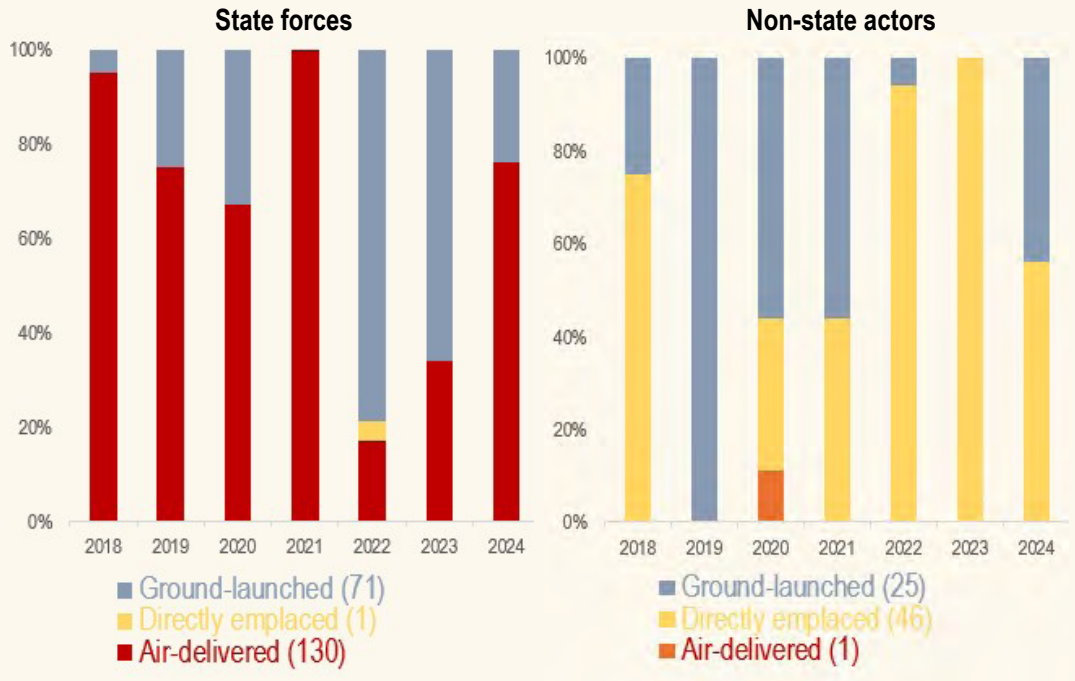
- **Directly emplaced weapons** (IEDs, grenades, suicide vests) are placed in position manually and are often used by non-state actors inside markets or near market stalls or water infrastructure, causing concentrated but lethal harm.
- **Ground-launched systems** (artillery shells, mortar bombs, rockets) are deployed by both state and non-state actors, are fired from fixed or mobile platforms, and can carry moderate to large explosive charges, often damaging large areas of open markets, surrounding shops, and wider infrastructure, including water supply system components.
- **Air-delivered systems** (bombs, missiles, rockets) are deployed from aircraft or drones and can involve very large payloads able to create extensive blast and fragmentation effects over a wide radius. These explosives are primarily used by state forces, because they are more likely to afford to maintain an air force capable of delivering such explosives. However, drone use has increased among both state forces and non-state actors, but varies in terms of systems, with states having access to military-grade armed drones, while many non-state actors have been known to use civilian and commercial drone systems and modify them to carry explosive weapons.

Insights based on weapon delivery classification

Information on the reported use of explosive weapons needs to be accurate, yet most civilian observers documenting the effects of explosive weapons use are not weapons experts. As a result, most available information does not contain technical information, such as the precise types or manufacturers of explosive weapons. However, most non-expert observers can reliably identify how a weapon arrived at its place of impact – whether it was planted, fired from the ground or dropped from the air – making this classification a useful tool for systematically analysing incidents and their humanitarian impacts.

For the analyst, information on the weapon delivery method provides important added information. Firstly, it helps to confirm or raise questions about the conflict party the incident has been attributed to, and helps to apply impact frameworks. Different conflict actors tend to have different access to weapons systems, thus allowing for the cross-checking of incident reports. State forces are more likely to deploy manufactured systems from licensed defence industries, including precision and heavy-payload weapons for air strikes, while non-state actors use more IEDs or may have access to certain ground-launched or drone-delivered explosives, depending on their external supporters or supply networks. As Figure A4 shows, clear patterns can be observed of different conflict parties using different types of explosive weapons delivery systems.

Figure A4: Reported incidents of explosive weapon use and their delivery method attributed to state forces and non-state actors, 2018-2024



Source: 2018-2024 EWIPA and Water Data

Secondly, the classification-by-delivery method allows for a clearer understanding of the scale and wide-area effects of explosive weapons use, and thus the foreseeable humanitarian impacts of different types of explosive weapons, which supports approaches to examining compliance with IHL. Classifying explosive weapons into directly emplaced, ground-launched, and air-delivered systems provides important indicators that help in discussions of the key IHL principles, including distinction, proportionality, and precautions.

Directly emplaced explosive weapons

Landmines

Landmines are explosive devices that are deployed on, under, or near the ground and designed to destroy or damage vehicles, or wound or kill people, or otherwise restrict their activities.[171] They can be activated by being stepped on or struck, or can be triggered by direct pressure, tripwires, or on command, and some can also be bobby-trapped. There are various types of landmines, including anti-personnel mines and anti-vehicle mines, as well as improvised landmines.

Improvised explosive devices (IEDs)

The use of the term "IED" is widespread; however, there is a vast range of IEDs, including vehicle-borne IEDs and improvised landmines (which are of most concern for their impact on agricultural work). Improvised anti-personnel mines fall under the scope of the Ottawa Convention (Mine Ban Treaty), which requires that landmines be called what they are, and not as a separate technical category of IEDs. Therefore, for the purposes of this report, we have referred to all such weapons collectively as "landmines".

Conflict actors make many different types of landmines and improvised mines, and distinguishing between types of directly emplaced explosives is challenging due to limited reporting, overlapping incidents, and the often-indistinguishable nature of the resulting damage. For example, many devices that are described as IEDs are in fact landmines. Many reports frequently lack sufficient detail to differentiate between specific types of explosive weapons.

Explosive remnants of war (ERW)

ERW are explosive munitions that have been fired, thrown, dropped or launched and fail to detonate. They include artillery and tank rounds, mortar rounds, grenades, rockets and cluster munitions. They are often extremely unstable and can detonate when touched or disturbed, and detonations can be more lethal than landmines due to their higher explosive and fragmentation content.[172]

Areas that have experienced bombing or prolonged conflict are likely to contain large quantities of ERW, with estimates of 30% of cluster munitions failing to explode on impact.[173] Therefore, they pose a serious threat for years after a conflict has ended; e.g. it is estimated that in Ukraine over 130,000 m2 of land (20% of the country) is contaminated by ERW.[174]

The **principle of distinction** requires parties to differentiate between combatants and civilians and between military objectives and civilian objects. Weapons with wide-area effects such as artillery shells, rockets or large air-delivered bombs present challenges for distinction, especially in populated areas or near civilian infrastructure like markets, water supply systems, or agricultural land. The **principle of precautions** obliges parties to take all feasible measures to minimise civilian harm, which can include selecting more precise delivery systems, adjusting the timing of an attack or avoiding densely populated areas. The **principle of proportionality** prohibits attacks in which expected civilian harm would be excessive relative to the anticipated military advantage gained in an attack. Directly emplaced weapons like IEDS or landmines,

while locally contained, can still violate these principles if left in areas frequented by civilians. Ground-launched and air-delivered systems vary in precision: unguided munitions often produce widespread, indiscriminate effects, while guided systems may allow for the more precise targeting of military objectives. Understanding the characteristics of each delivery system is therefore crucial to evaluating compliance with IHL and the foreseeable risks to civilians and civilian infrastructure

In 22 incidents, the delivery method of the explosive weapon was unspecified. Table A1 provides a breakdown of the weapons delivery systems and explosive weapons identified in the 308 incidents that constitute the sources of this report's data.

Table A1: Weapons and their delivery systems identified in data sources, by launch type

Categories	Weapons delivery systems	Explosive weapons
Air-delivered (132 incidents)	• Aircraft • Drone • Loitering munition/kamikaze drone	• Aerial bomb • Light aerial bomb • Loitering munition/kamikaze drone • Missile • Rocket
Ground-launched (97 incidents)	• Artillery • Multiple-launch rocket system (MLRS) • Missile system • Mortar • Rocket launcher • RPG launcher • Self-propelled artillery system	• Artillery round/shell • Incendiary shell • Missile • Missile warhead • Mortar bomb/round • Munition • Rocket • Rocket-propelled grenade (RPG)
Directly emplaced (68 incidents	• Attached • Placed • Thrown • Vehicle (used to deploy SVBIED)	• Bomb • Grenade • IED • Landmine • Mine

Notes to Table A1: definitions of IEDs identified in the incident data

- **Vehicle-borne IED (VBIED):** a "vehicle that has been fitted with an interior or exterior explosive payload".[175]
- **Suicide vehicle-borne IED** (SVBIED): a "VBIED that is detonated from inside the vehicle by the driver".[176]
- **Propane gas cylinder bomb:** "a type of IED that uses commercially available gas cylinders as the main charge for the IED".[177]
- **Remote-controlled IED (RCIED):** "an IED which can be initiated wirelessly using a transmitter and receiver (i.e. personal mobile radio, mobile phone, cordless phone, etc.)".[178]
- **Magnetic IED:** an IED that can be magnetically attached or magnetically triggered. In the case of magnetically triggered IEDs, magnetic refers to "a proximity switch using a magnetic field to arm or fire an IED. This can sense an active field and close the switch when the field is disturbed; or react upon coming near a magnetic field".[179]

Annex 3: State forces and non-state actors

Clear distinctions between state and non-state actors are vital for policymaking and for ensuring accountability under international law. However, classification becomes complex when state authority is disputed and governments or their armed forces are not universally recognised. From an analytical standpoint, it is equally important to define these categories conceptually and to establish consistent criteria for assigning classifications in contested political settings.

State forces

The terms “state actors” and “state forces” are used to refer to state armed forces that are the official military forces of a country, controlled by its government and recognised as such under national and international law. They usually include the army (land forces), air force (air and outer space operations), and navy (maritime forces), and may also have other branches such as marines, special forces or intelligence units. Their main role is to defend the country and carry out military operations authorised by the state.

In some contexts, the attribution of responsibility for a specific action is complex. Some authorities may lack effective control over the armed forces or may not be internationally recognised as a government, or a country may have competing or parallel authorities.

For the purposes of this report, the following categories have been applied to address such complexities. They are employed exclusively for coding purposes and do not imply endorsement or recognition of any authority, government or territorial claim.

State actor: This refers to a legally recognised government directing its armed forces.

State armed forces: This refers to national armed forces under government control.

Acting state armed forces: This refers to de facto forces controlling a country’s capital that are not internationally recognised.

Non-state actors

Non-state actors are organised armed actors that are not part of a country’s official military or police forces and are not controlled by a government. They can include militias, insurgent groups, rebel movements, or other organised forces that use weapons and military-style tactics. Their aims and activities vary widely – from controlling territory to challenging governments – but they operate outside the formal command of state armed forces.

- forces seeking to attack or gain territory that are opposing a recognised or de facto state military force; and
- military branches of de facto territorial authorities that are not internationally recognised and that do not control the capital of a recognised state.

This report used a binary state v. non-state classification for armed actors, while recognising that in many conflicts the distinction between state forces and non-state armed actors is not clear-cut. Some forces, such as paramilitaries or government-aligned militias, may operate with state support or coordination, but without being fully integrated into the official state chain of command. In other cases, breakaway factions may originate within the state security apparatus, but later act independently or in opposition to the government. Situations can be further complicated when a government is not internationally recognised after a coup or contested government transition, raising questions about whether its armed forces are representing the state and should be considered "state" armed forces under international law. Foreign involvement can blur the lines even more: troops from other states may be deployed under formal agreements, while private military companies such as the Wagner Group/Africa Corp operate in support of a government's objectives, but remain outside the official armed forces. These grey-area actors challenge straightforward classification and complicate the application of legal frameworks and monitoring and accountability mechanisms.

State actors identified in the incident data

- Chad National Army
- International coalition forces in Syria
- International coalition forces in Yemen
- Israel Armed Forces (IDF)
- Kenyan Armed Forces
- Mali Armed Forces
- Myanmar Armed Forces
- Nigerian Armed Forces
- Russian Armed Forces
- Sudan Armed Forces
- Syrian Arab Armed Forces
- Turkish Armed Forces
- Ukraine Armed Forces

Non-state actors identified in the incident data:

- Afghanistan Freedom Front
- Al-Qaeda in the Arabian Peninsula
- Al-Shabaab
- Ansar Allah (Houthis)
- Armed actor affiliated with the Government of National Accord

- Baloch separatists
- Communist Party of India-Maoist
- Ejército de Liberación Nacional (ELN)
- Fuerzas Armadas Revolucionarias de Colombia (FARC)
- Giants Brigade (West Coast Joint Forces, WCJF)
- Hezbollah
- Islamic State
- Jama'at Nasr al-Islam wal-Muslimin (JNIM)
- Militia affiliated with the Kuki people (India)
- Palestinian Islamic Jihad
- People's Defence Force (Myanmar)
- Pro-Hadi forces (Yemen)
- Pro-Houthi forces (Yemen)
- Pro-Iranian militia (Syria)
- Pro-Islah security forces (Yemen)
- Rapid Support Forces (RSF)
- Syrian Democratic Forces (SDF)
- Tebu militia (Libya)
- Tehrik-i-Taliban Pakistan (TTP)
- Wagner Group (Russian state-funded private military company)
- West Coast Joint Forces (WCJF)

Endnotes

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2 This structure is based on the EWIPA framework of primary, secondary and tertiary effects of explosive weapons use as outlined in C. Wille and J. Borrie. 2016. “Understanding the reverberating effects of explosive weapons: a way forward.” UN Institute for Disarmament Research. 31 May, p. 5. https://unidir.org/publication/understanding-the-reverberating-effects-of-explosive-weapons-a-way-forward/.
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5 Ibid.
6 The numbers in brackets indicate the number of recorded incidents that occurred in that country or territory. The colours in the map represent the number of recorded incidents over time, with darker blue indicating a higher number of recorded incidents. Entire countries are coloured accordingly, but the locations of the incidents are represented by the red points on the map. In cases where the number of red points appears lower than the total number of incidents, this may be due to multiple incidents occurring in the same location or in very close proximity and, as a result, the data has been overlaid.
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9 Zeitoun and Talhami, 2016, p. 57.
10 Ibid.
11 Ibid.
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13 Ibid.
14 UNODA (UN Office for Disarmament Affairs). 2022. Political Declaration on Strengthening the Protection of Civilians from the Humanitarian Consequences Arising from the Use of Explosive Weapons in Populated Areas. 18 November. https://ewipa.org/the-political-declaration.
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16 The report is part of project implementation under two ECHO-funded projects entitled Promoting Actions to Strengthen the Protection of Civilians and Prevent Humanitarian Consequences from the Use of Explosive Weapons in Populated Areas; and Hunger and Conflict: Protecting People in Armed Conflict and Related Violence Settings from Food Insecurity, Promoting IHL Compliance.
17 “It is prohibited to attack, destroy, remove or render useless objects indispensable to the survival of the civilian population, such as foodstuffs, agricultural areas for the production of foodstuffs, crops, livestock, drinking water installations and supplies and irrigation works, for the specific purpose of denying them for their sustenance value to the civilian population or to the adverse Party, whatever the motive, whether in order to starve out civilians, to cause them to move away, or for any other motive” (Additional Protocol I to the Geneva Convention (1949), art. 54(2). https://ihl-databases.icrc.org/en/ihl-treaties/api-1977/article-54).
18 Ibid.
19 UN, 2018.
20 UNSC. 2021. Resolution 2573 (2021). S/RES 2573 (2021) of 27 April. https://docs.un.org/en/S/RES/2573(2021).
21 Section 1.4 of the EWIPA Political Declaration reads: “When critical civilian infrastructure, such as energy, food, water and sanitation systems, are damaged or destroyed the provision of basic needs and essential services, such as healthcare and education are disrupted. These services are often interconnected and, as a result, damage to one component or service can negatively affect services elsewhere, causing harm to civilians that can extend far beyond a weapon’s impact area” (UNODA, 2022).
22 Section 3.4 of the EWIPA Political Declaration reads: “Ensure that our armed forces, including in their policies and practices, take into account the direct and indirect effects on civilians and civilian objects which can reasonably be foreseen in the planning of military operations and the execution of attacks in populated areas, and conduct damage assessments, to the degree feasible, and identify lessons learned” (UNODA, 2022).

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25 Ibid., p. 57.
26 Geneva Water Hub, 2019, p. 13.
27 A. Ferdowsi et al. 2024. "Urban water infrastructure: a critical review on climate change impacts and adaptation strategies." Urban Climate, 58 (November). https://doi.org/10.1016/j.uclim.2024.102132.
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32 Zeitoun and Talhami, 2016, p. 57.
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39 2018-2024 EWIPA and Water Data, incident number 99506.
40 2018-2024 EWIPA and Water Data, incident number 99441.
41 2018-2024 EWIPA and Water Data, incident numbers 91993.
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55 2018-2024 EWIPA and Water Data, incident number 99434.
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57 2018-2024 EWIPA and Water Data, incident number 99435.
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77 2018-2024 EWIPA and Water Data, incident number 99513.
78 2018-2024 EWIPA and Water Data, incident number 99458.
79 2018-2024 EWIPA and Water Data, incident numbers 99500; 99501; 99498.
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99 2018-2024 EWIPA and Water Data, incident numbers 99472; 99469; 99443; 99444; 99448; 99450; 99465; 99466; 99467; 99468; 99471; 99474; 99475; 99477.
100 State actors were responsible for 100% of these recorded cases in Lebanon, the oPt, Russia and Ukraine. In Syria, state actors were still responsible for the majority of incidents (11 out of 16), with four incidents attributed to non-state actors and one to an unidentified armed actor.
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102 2018-2024 EWIPA and Water Data, incident numbers 93004; 99564; 91465; 99431; 99544; 99541; 99413; 99464; 91866; 91468; 91466; 91467.
103 2018-2024 EWIPA and Water Data, incident numbers 99363; 99402; 99522; 99390; 99395; 99375; 99359.
104 2018-2024 EWIPA and Water Data, incident numbers 99574; 99377; 99370; 99360.
105 Although not in the context of state actors damaging or destroying water infrastructure domestically, a similar pattern was notable in Lebanon. In March 2024, the IDF reportedly announced that its forces "had struck Hezbollah cells" in Ras al Naqoura town, which led to the deaths of four people, including a health care worker, and the destruction of water and electricity networks in the town (2018-2024 EWIPA and Water Data, incident number 96126; see incident number 96128 for a similar case).
106 2018-2024 EWIPA and Water Data, incident number 99502.
107 See Oxfam. 2024. "Water war crimes: how Israel has weaponised water in its military campaign in Gaza." July. https://oxfamilibrary.openrepository.com/bitstream/handle/10546/621609/bp-water-war-crimes-180724-en.pdf?sequence=1; Amnesty International. 2017. "The occupation of water." 29 November. https://www.amnesty.org/en/latest/campaigns/2017/11/the-occupation-of-water/; Amnesty International. 2009. "Israel/occupied Palestinian territories: demand dignity: troubled waters – Palestinians denied fair access to water." 27 October. https://www.amnesty.org/en/documents/MDE15/027/2009/en/.
108 Two incidents have been recorded as involving state actors, but have been excluded from Figure 9 because there was a lack of clarity regarding whether the Russian Armed Forces or Syrian Arab Armed Forces carried out the attacks (2018-2024 EWIPA and Water Data, incident numbers 99572; 99573).
109 Totals exclude the 22 incidents where the delivery method of the explosive weapon is unspecified.
110 For example, see Forensic Architecture. 2025. "A cartography of genocide." https://gaza.forensic-architecture.org/database.
111 See Box 11 for examples and notes to Table A1 in Annex 2 for definitions of the various kinds of IEDs.
112 2018-2024 EWIPA and Water Data, incident number 99472.
113 The UN Mine Action Service (UNMAS) defines IEDs as devices "placed or fabricated in an improvised manner incorporating destructive, lethal, noxious, pyrotechnic or incendiary chemicals and designed to destroy, incapacitate, harass or distract" (UNMAS. 2017. "Improvised explosive device lexicon." https://www.unmas.org/sites/default/files/unmas_ied_lexicon_0.pdf).
114 Eighteen out of 33.
115 The Mali Armed Forces and the Russian state-funded private military company Wagner (also known as the Wagner Group) were recorded as working together to cause damage and destruction to water infrastructure in four incidents in Mali (2018-2024 EWIPA and Water Data, incident numbers 88905; 88906; 89279; 89301). In two incidents (incident numbers 88905; 88906), the incident perpetrator was coded as "state actor", with the Mali Armed Forces coded as the primary actor. This is the standard practice for coding incidents where state and non-state actors work in tandem. However, two other incidents (incident numbers 89279; 89301) were coded as "non-state actor". This is because these incidents involved the use of IEDs, which are generally the purview of non-state actors. As such, an assumption was made that the use of IEDs was more likely attributed to the Wagner Group than the Mali Armed Forces in these instances. However, please note that the two armed actors were reportedly working together in all four incidents.
116 2018-2024 EWIPA and Water Data, incident number 99460.
117 2018-2024 EWIPA and Water Data, incident number 99437.
118 2018-2024 EWIPA and Water Data, incident number 99559.
119 2018-2024 EWIPA and Water Data, incident number 99490.
120 2018-2024 EWIPA and Water Data, incident number 93072. This weapon was also used in incident number 99519.

121 2018-2024 EWIPA and Water Data, incident number 99358.
122 2018-2024 EWIPA and Water Data, incident number 99389.
123 2018-2024 EWIPA and Water Data, incident number 99507.
124 2018-2024 EWIPA and Water Data, incident number 99483.
125 ICRC, International Humanitarian Law Databases, Customary IHL (CIHL), rule 10, https://ihl-databases.icrc.org/en/customary-ihl.ule.
126 Ibid., rule 43.
127 Ibid., rule 45.
128 Additional Protocol I to the Geneva Conventions, art. 54 (2); Additional Protocol II, art. 14; see also ICRC, CIHL, rule 54.
129 Ibid.
130 ICRC. 1987. "Commentary of 1987." https://ihl-databases.icrc.org/en/ihl-treaties/api-1977/title/commentary/1987.
131 Ibid., para. 2101.
132 Ibid., para. 2102.
133 Ibid., para. 2110.
134 Additional Protocol I to the Genevan Conventions, art. 54(1).
135 Ibid., art. 56; Additional Protocol II, art. 15; ICRC, CIHL, rule 42.
136 1907 Hague Regulations, art. 43; see also Fourth Geneva Convention, art. 64.
137 1907 Hague Regulations, art. 55.
138 ICRC, 1987, para. 2123.
139 International Covenant on Economic, Social and Cultural Rights, art. 11(1).
140 Ibid., art. 11.
141 Ibid., art. 12.
142 UN General Assembly. 2010. The Human Right to Water and Sanitation. A/RES/64/292 of 3 August. https://docs.un.org/en/A/RES/64/292.
143 UNODA, 2022.
144 Ibid., secs. 3.1 and 3.2.
145 Explosive Weapons in Populated Areas. 2025. "Endorsement." May. https://ewipa.org/endorsement.
146 Geneva Call's Deeds of Commitment are mechanisms designed for armed groups or de facto authorities through which they pledge to respect humanitarian norms stemming from IHL and international human rights law, and to be held accountable for their commitment. To date, Geneva Call has developed five Deeds of Commitment, which deal with a total ban on anti-personnel mines and cooperation in mine action, the protection of children from the effects of armed conflict, the prohibition of sexual violence in situations of armed conflict and towards the elimination of gender discrimination, the protection of health care in armed conflict, and the prevention of starvation and conflict-related food insecurity.
147 Geneva Call. 2021. "Deed of Commitment under Geneva Call for the Prevention of Starvation and Addressing Conflict-related Food Insecurity." https://www.genevacall.org/wp-content/uploads/2023/07/Official-DoC-Preventing-Starvation-And-Adressing-Conflict-Related-Food-Insecurity.pdf.
148 Geneva Call. 2024. "Acte d'engagement auprès de l'appel de Genève pour la prévention de la famine et la lutte contre l'insécurité alimentaire liée aux conflits." March. https://www.genevacall.org/wp-content/uploads/2024/03/DoC-Famine_NDC-R_2024_signed_FR.pdf.
149 ICRC, CIHL, rule 7; see also rules 8 and 9.
150 OHCHR (Office of the UN High Commissioner for Human Rights). 1998. Rome Statute of the International Criminal Court. https://www.ohchr.org/en/instruments-mechanisms/instruments/rome-statute-international-criminal-court. Intentionally directing attacks against civilian objects during a non-international armed conflict is not listed as a war crime in the ICC Statute; see arts. 8(2)(b)(i), 8(2)(b)(ii) and 8(2)(e)(i).
151 See J.-M. Henckaerts and L. Doswald-Beck. 2005. Customary International Humanitarian Law: Vol. 1: Rules. ICRC, rule 10, pp. 34-36. https://www.refworld.org/reference/research/icrc/2005/en/98261.
152 ICRC, CIHL, rules 11 and 12.
153 Ibid., rule 12.
154 The types of objects covered by the rule could also include types of energy or communications infrastructure on which objects indispensable to the survival of the civilian population depend.
155 ICRC, CIHL, rule 54.
156 Ibid., explanation of rule 54.

157 Ibid.
158 Ibid., rule 14.
159 See Henckaerts and Doswald-Beck, 2005, rule 15, pp. 51-55.
160 ICRC, CIHL, rule 16.
161 Ibid., rule 17.
162 See Henckaerts and Doswald-Beck, 2005, rule 21, pp. 65-67.
163 See ibid., rule 17, pp. 56-58.
164 ICRC, CIHL, rule 19.
165 2018-2024 EWIPA and Water Data, incident number 96126.
166 2018-2024 EWIPA and Water Data, incident number 99361.
167 2018-2024 EWIPA and Water Data, incident number 90944.
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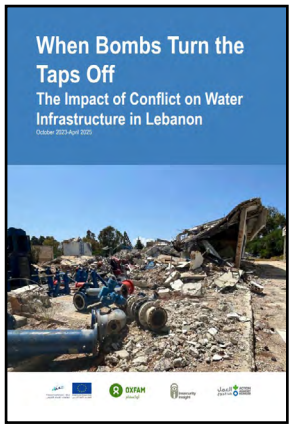
Other resources by Insecurity Insight

At least 150,000 people remain without running water across the South of Lebanon after Israeli attacks damaged and destroyed swathes of water sanitation and hygiene (WASH) facilities since the beginning of the conflict in Lebanon in October 2023, according to a report from Action Against Hunger and Insecurity Insight released today. The **report** found there had been devastating immediate and long-term impacts of repeated attacks by Israeli forces on Lebanese water infrastructure between October 2023 and April 2025. Six months after the fragile ceasefire, more than 30 villages remain without any connection to running water.



Armed drones are an escalating threat in humanitarian settings, with their use expected to grow. Once rare, they are now a defining feature in modern conflicts. Adapting to the growing threat of drones means rethinking security risk measures in high-risk contexts. This practical guide by Insecurity Insight brings together current best practice and is available in **Burmese**, **English** and **French**. Individual resources:

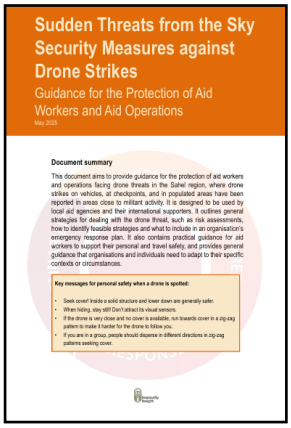
Outside When a Drone is Spotted: **Arabic**; **Burmese**; **English**; **French**

Inside a Building During a Drone Attack: **Arabic**; **Burmese**; **English**; **French**

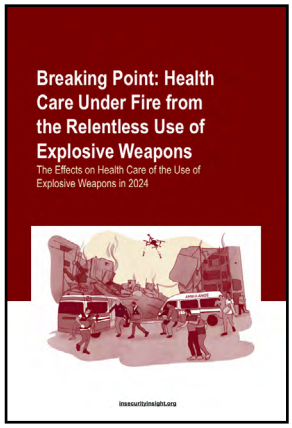
Responding to Drone Attacks on Aid Work: **Burmese**; **English**; **French**

Traveling in High-Risk Areas: **Burmese**; **English**; **French**

Adapted for the protection of health services based on case studies on Myanmar in **English** and **Burmese**.



Violence impacting health care reached unprecedented levels in 2024, with the use of explosive weapons in populated areas emerging as a dominant and devastating trend. Health care is directly impacted when explosive weapons damage or destroy hospitals, health centres, and ambulances, or when they kill or seriously injure health workers and patients. These weapons cause indirect harm through their cumulative and reverberating effects on civilian infrastructure. This **second edition** of Insecurity Insight's *The Effects on Health Care of the Use of Explosive Weapons* discusses new trends in and impacts on global health care systems in 2024. The data cited in this report can be downloaded **here**.



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As an H2H (humanitarian-to-humanitarian) association, Insecurity Insight supports the work of aid agencies; the providers of health care, education, and protection services; and other civil society organisations by providing publicly available information that humanitarian organisations can use to design evidence-based policies to guide their activities and operations. We collect and analyse data about violence against civilians and the damaging and destruction of vital civilian infrastructure in order to strengthen civilian protection and the delivery of aid in contexts affected by armed conflict.

Insecurity Insight. 2025. Fractured Flow: The Cascading Impacts of War on Access to Water (November 2025). Switzerland: Insecurity Insight. https://bit.ly/EWIPAWater2025

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