



# ICRC

## Preventing and mitigating the indirect effects on essential services from the use of explosive weapons in populated areas

### ICRC recommendations

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## Introduction

The most visible effects of an attack using explosive weapons in a populated area are the immediate (or “direct”) civilian deaths and injuries and damage to civilian objects caused by the weapons’ blast and fragmentation effects. Less visible – yet equally devastating – are the indirect or “reverberating” effects (often referred to as first-, second- and third-order effects in military doctrine) triggered by the direct impact of an attack. Indirect effects can last over the short, medium or long term and cause extensive civilian suffering, especially when heavy explosive weapons are used, including large bombs and missiles, indirect fire (such as most mortars, rockets and artillery), multi-barrel rocket launchers and certain types of improvised explosive devices.

Indirect or reverberating effects are interconnected and affect many aspects of people's lives. They tend to accumulate and exacerbate over time. For example, in addition to causing civilian deaths and injuries, an attack might also damage an electrical substation or transformer. The latter damage will generally interrupt supply of electricity and affect services that require electrical power to function – such as water and sanitation and health care – leading to additional civilian harm in both the short and long term (e.g. the spread of illness, disease, even deaths).

While indirect effects can result from any type of attack in populated areas, explosive weapons with wide area effects have the potential to produce particularly grave indirect effects owing to their large destructive (blast and fragmentation) radius and/or lack of accuracy.

Indirect effects are multifaceted, but a significant proportion of the civilian suffering they cause results from the disruption or deterioration of essential services: electricity, health care, water and wastewater treatment and solid waste disposal, as well as the market systems that provide food and other household necessities, telecommunications, financial systems, transportation for people and goods, education – in short, all of the interrelated systems that people need to live safely in cities and other populated environments.

The use of explosive weapons commonly has a harmful effect on the critical civilian infrastructure necessary for the provision of essential services, whether it is targeted directly or incidentally damaged or destroyed. Built-up populated areas, such as cities and towns, typically have a complex web of fragile, centralized and interconnected service infrastructure located underground (e.g. water and wastewater pipelines), at ground level (e.g. electrical substations, health-care facilities) and above ground (e.g. overhead power lines, elevated water reservoirs). Often, this infrastructure extends to the periphery of the populated area (e.g. power plants, water and wastewater treatment plants). Critical civilian infrastructure is rarely built to withstand damage from explosive weapons. The extent to which civilians are harmed by infrastructure damage often depends on its position in the supply system. For example, damage to an upstream urban facility, such as a water treatment plant, can deprive hundreds of thousands, even millions of people of drinking water, whereas damage to a downstream distribution line typically affects a smaller area and consequently a smaller number of people.

The effective delivery of essential services also depends on people (e.g. service provider personnel, private-sector contractors, hospital workers) and a steady supply of consumables (e.g. fuel, chlorine, medicines). Both are put at risk by the use of explosive weapons in populated areas (EWIPA). For example, if bombing or shelling incidentally destroys a warehouse containing spare parts or consumables needed to keep a water treatment plant functioning – or injures the plant's operators and maintenance staff – the plant is unlikely to continue operating even if the structure itself remains intact, resulting in a drinking water shortage with indirect effects on public health. Heavy bombing or shelling of populated areas also give rise to mass displacement, leading to a lack of staff to keep essential services functioning.

The interdependent and interconnected nature of essential services makes it more likely that disruption of one service will have a domino effect on others. For example, damage to a power station causes power shortages that disrupt the functioning of hospitals and water purification stations. This may in turn lead to patient deaths, the spread of disease and displacement of the population. Other important services that rely on that specific power station – such as food production and distribution infrastructure, schools, telecommunication and transportation systems, banking, financial and emergency services – may also be affected.

During intense or protracted hostilities, the direct and indirect effects of explosive weapons accumulate. This makes the restoration of essential services particularly difficult and time-consuming. The incremental degradation of infrastructure and systems drives a vicious cycle of decline in services and increased suffering. Ultimately, indirect effects can significantly affect sustainable development and recovery efforts. They can hinder progress – or cause significant setbacks – in the achievement of objectives such as implementation of the United Nations 2030 Agenda for Sustainable Development, even long after hostilities have ended.

Armed conflict in populated areas can also result in weapons remaining in civilian spaces. This includes emplaced devices (e.g. landmines, booby-traps, some types of improvised explosive devices) and explosive remnants of war, or ERW (e.g. ordnance that has failed to explode or has been abandoned). This poses significant risks to civilians even after the fighting is over. Such weapons can hinder the work of essential service personnel and the delivery of humanitarian aid, obstruct efforts to clear rubble or repair lines of communication, impede access to services and make vital subsistence activities (e.g. farming on the city outskirts) hazardous. Both emplaced devices and ERW also have long-term environmental impacts. They can contaminate soil, water and farmland, which in turn disrupts the delivery of essential services to civilians. The risks posed by weapon contamination in populated areas are often underestimated by armed forces. The International Committee of the Red Cross (ICRC) has observed that there is often a lack of resources dedicated to timely, safe surveys and clearance efforts following armed conflicts.

Furthermore, the accidental or deliberate release of toxic industrial materials such as chemical, biological and radiological agents often occurs following attacks that are directed at, or incidentally harm, industrial infrastructure. This can have long-term effects on human health, ecosystems and essential service systems. When industrial facilities within populated areas are damaged or destroyed, civilians risk being exposed to asbestos, heavy metals, halogens, dioxins, pesticides and other carcinogens. The natural environment may also be polluted by the release from industrial sites of toxic substances into the air, groundwater and soil. As a result, the land may remain polluted for years, leaving people with no safe access to vital resources and jeopardizing their health.

The use of EWIPA thus has a wide range of indirect effects on civilians' lives, health and livelihoods that extend well beyond the impact area and last long after the explosion itself. Regrettably, urban warfare is becoming increasingly prevalent. Numerous studies of its humanitarian consequences and advances in remote-sensing technology, however, mean that indirect effects are better understood and reasonably foreseeable. It is thus important to consider the full spectrum of civilian harm and how first-, second-, third- and higher-order effects intersect and accumulate when training for, planning and conducting military operations.

## ICRC evidence-based analysis

While working to protect and assist people affected by armed conflict around the globe, for decades the ICRC has witnessed the human suffering that results from widespread disruptions to essential services.<sup>1</sup> Often these impacts are the indirect effects of EWIPA in places such as Afghanistan,

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<sup>1</sup> ICRC, *Urban Services during Protracted Armed Conflict: A Call for a Better Approach to Assisting Affected People*, Geneva, 2015; ICRC, *Explosive Weapons With Wide Area Effects: A Deadly Choice in Populated Areas*, Geneva, 2022; ICRC, *War in Cities: Preventing and Addressing the Humanitarian Consequences for Civilians*, Geneva, 2023;

Colombia, Gaza, Iraq, the Lake Chad region, Lebanon, Libya, Myanmar, Nagorno-Karabakh, the Philippines, Somalia, Sri Lanka, Syria, Ukraine and Yemen. The weapons of concern include large bombs and missiles, rockets, indirect (and often inaccurate) fire weapon systems such as artillery and mortars, and multi-barrel rocket launchers.

The International Red Cross and Red Crescent Movement, along with other humanitarian organizations, continues to strengthen its capacity to prevent and respond to such situations.<sup>2</sup> However, when critical infrastructure is severely damaged and essential services are disrupted for a prolonged period, the scale and complexity of humanitarian needs almost always exceeds the technical, practical and financial capacities of our collective response.<sup>3</sup> It is important to note that the parties to an armed conflict bear primary responsibility for meeting the basic needs of the civilian population under their control. While humanitarian organizations play an important role, it is a subsidiary one. For this reason, the ICRC has long urged the parties themselves to do more to prevent, mitigate and respond to the indirect effects of explosive weapons on essential services in cities and other populated areas.

For over a decade, the ICRC has been calling on states and parties to armed conflicts to avoid using explosive weapons with a wide impact area in densely populated areas, due to the significant likelihood of indiscriminate effects, and despite the absence of an express legal prohibition for specific types of weapons.<sup>4</sup> This call has also been made by the Movement as a whole.<sup>5</sup> Likewise, the Secretary-General of the United Nations has called on states to avoid the use of explosive weapons with a wide impact area in populated areas.<sup>6</sup>

The ICRC's call for an avoidance policy means that heavy explosive weapons should not be used in populated areas unless sufficient mitigation measures are taken to reduce the wide area effects and consequent risk of civilian harm. In 2022, the ICRC published the report *Explosive Weapons with Wide Area Effects: A Deadly Choice in Populated Areas* presenting observations and conclusions on the humanitarian, technical, legal and military operational considerations related to heavy explosive

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ICRC, [Childhood in Rubble: Humanitarian Consequences of Urban Warfare on Children](#), Geneva, 2023; ICRC, [Displaced in Cities: Experiencing and Responding to Urban Internal Displacement Outside Camps](#), Geneva, 2018; ICRC, ["Food Security and Armed Conflict"](#) (policy brief), Geneva, 2022.

<sup>2</sup> For example, in June 2022, the [Movement Action Plan to Prevent and Respond to the Humanitarian Impacts of War in Cities \(2022–2027\)](#) was adopted in Resolution 6 of the 2022 Council of Delegates. See also ICRC, [Present and Engaged – How the ICRC Responds to Armed Conflict and Violence in Cities](#), Geneva, 2023; ICRC, [Marking Ten Years of Health Care in Danger in the International Red Cross and Red Crescent Movement](#), Geneva, 2022; ICRC, [Weapon Contamination in Urban Settings: An ICRC Response](#), Geneva, 2019; ICRC, [Increasing Resilience to Weapon Contamination Through Behaviour Change](#), Geneva, March 2019.

<sup>3</sup> Recognizing the need to respond at scale has led us to forge new relationships, including with development actors. Together with the World Bank and UNICEF, we have developed a series of joint recommendations for systemic change in the report [Joining Forces to Combat Protracted Crises](#), which focuses on water and sanitation. See World Bank, ICRC and UNICEF, [Joining Forces to Combat Protracted Crises: Humanitarian and Development Support for Water and Sanitation Providers in the Middle East and North Africa](#), Washington, D.C., 2021 and ICRC, [Towards More Effective Humanitarian Operations in Urban Areas of Protracted Armed Conflicts](#), Geneva, 2022.

<sup>4</sup> ICRC, [Explosive Weapons With Wide Area Effects: A Deadly Choice in Populated Areas](#), Geneva, 2022.

<sup>5</sup> See para. 4 of Resolution 7, "Weapons and International Humanitarian Law", adopted by the 2013 Council of Delegates, which calls on states to "strengthen the protection of civilians from the indiscriminate use and effects of explosive weapons, including through the rigorous application of existing rules of international humanitarian law, and to avoid using explosive weapons with a wide impact area in densely populated areas".

<sup>6</sup> See, for example: United Nations Security Council, [Protection of Civilians in Armed Conflict](#), S/2022/381, New York, 2022, p. 19. The United Nations Secretary-General has made the same or similar calls in all of his reports to the Security Council on the protection of civilians in armed conflict since 2012, including in a 2019 [joint appeal](#) with the President of the ICRC.

weapons. The report also contains detailed good-practice recommendations for political authorities and armed forces on prevention and mitigation measures for better protecting civilians from such weapons and implementing a policy of avoiding their use.<sup>7</sup>

## Political declaration and ICRC-organized expert meeting on indirect effects

The Political Declaration on Strengthening the Protection of Civilians from the Humanitarian Consequences Arising from the Use of Explosive Weapons in Populated Areas (the political declaration) was adopted in November 2022. It has since been endorsed by 85 states. This milestone declaration recognizes, *inter alia*, the grave indirect effects resulting from the use of explosive weapons in populated areas. Among other actions, states that have endorsed the political declaration commit to take meaningful measures and adopt policies and good practices that will alleviate the human suffering caused by indirect effects of EWIPA on essential services, both during and after armed conflicts.

The ICRC supports all efforts to better protect civilians and increase compliance with international humanitarian law (IHL), including by supporting states in implementing commitments made under the political declaration. In addition to participating in expert meetings and exchanges, we engage in bilateral confidential dialogue with states, their armed forces and non-state armed groups to identify and promote political and practical measures to that end.

The ICRC organized an online meeting of experts on 3, 5, and 9 October 2023 to exchange views on how best to implement commitments made under the political declaration. Discussions focused on preventing and mitigating the indirect effects of the use of EWIPA on such essential services as electricity, water, sanitation, solid waste disposal and health care. The meeting also aimed to inform the first international follow-up conference to review implementation of the political declaration, to be held in Oslo in April 2024. It brought together 21 military experts with experience in ground-based fires and aerial targeting processes – as well as engineers and legal advisers – from 17 states that have endorsed the political declaration. Representatives of the ICRC, the United Nations, other international organizations, civil society and independent experts also attended.

Existing good practices for anticipating, preventing and mitigating indirect effects of EWIPA on essential services were discussed. Challenges, gaps and areas for improvement in military doctrine and practice were identified, as well as actions required for advancing implementation of paragraph 3.4 of the political declaration. A more detailed record of the discussions has been published in a separate report.<sup>8</sup>

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<sup>7</sup> ICRC, *Explosive Weapons with Wide Area Effects: A Deadly Choice in Populated Areas*, Geneva, 2022.

<sup>8</sup> ICRC, ICRC Expert Meeting: Preventing and Mitigating the Indirect Effects on Essential Services of the Use from Explosive Weapons in Populated Areas, Geneva, ICRC, April 2024.

## Recommendations from the ICRC

The following recommendations are submitted under the ICRC's responsibility and aim to inform discussions at the 2024 Oslo conference and beyond. They are informed not only by the views shared at the October 2023 expert meeting but also by the ICRC's own experience and analysis, building upon *Explosive Weapons with Wide Area Effects: A Deadly Choice in Populated Areas* and other ICRC reports.<sup>9</sup> As such, the recommendations presented below go beyond the good practices discussed at the expert meeting.

These recommendations are relatively detailed. The aim is to present a range of possible measures for States to consider and work towards over the coming years as they implement their commitments under the political declaration, both during and after armed conflicts.

While most of the recommendations focus on measures regarding the use of explosive weapons by own forces, coalitions and partners, some also touch on possible measures to be employed when explosive weapons are used in populated areas by an adversary.

These prevention and mitigation measures focus on the indirect effects of EWIPA on essential services. They are without prejudice to existing obligations under IHL and all other measures that must be taken to protect civilians against the direct or indirect effects of armed conflict.

### 1. Prior to operations

- 1.1. Strengthen the resilience of essential service systems pre-conflict, including by building redundancies into systems and critical infrastructure so that, during an armed conflict, essential services can continue to operate at capacity and maintain a level of service necessary to meet civilians' basic needs and preserve their lives, security, physical integrity and dignity.
- 1.2. Improve defence industry knowledge and understanding of the diverse and wide-ranging risks to civilians posed by the indirect effects of EWIPA on essential services, and of best practices for preventing and mitigating harm, so that such considerations can be factored into future capability development.
- 1.3. Cooperate with civilian authorities (including municipalities, specialized government ministries, essential service providers) and entities (academic institutions, think tanks, private sector as appropriate), to form a knowledge base that can be used for doctrine development, military training and education, data modelling and subsequent operational planning.
- 1.4. Ensure that military authorities develop specific doctrine and/or adapt existing doctrine to prevent, mitigate and respond to the humanitarian concerns and operational challenges posed by the indirect effects of EWIPA on essential services. These doctrines should:
  - 1.4.1. reflect the requirement to restrict or refrain from the use of such weapons in populated areas as appropriate in accordance with paragraph 3.3 of the Political Declaration and, in particular, by avoiding the use of heavy explosive weapons, which should not be used in populated area unless sufficient mitigation measures can be taken to reduce the weapons' wide area effects and the consequent risk of civilian harm.
  - 1.4.2. stress the importance of ensuring service continuity during armed conflict. In doing so, priority should be given to the repair and maintenance of infrastructure and equipment,

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<sup>9</sup> See note 1Error! Bookmark not defined..

the safety and security of essential service personnel, the supply of necessary consumables (e.g. fuel) and service delivery (e.g. health care).

- 1.4.3. require that attention be paid to how women, men, girls and boys – including people with disabilities – are impacted differently by disruptions to essential services.<sup>10</sup>
- 1.4.4. incorporate best practices and procedures for recording, retaining and transmitting information about the use and effects of explosive ordnance, including the effects on essential service delivery.<sup>11</sup>
- 1.5. Develop and further refine existing procedures for estimating collateral damage/incidental harm during targeting operations. Ensure that such processes can account for reasonably foreseeable indirect effects, including cumulative effects such as the impact of destroying or damaging critical civilian infrastructure on the services enabled by that infrastructure, and the capacity and time required to repair the damage and restore service.
- 1.6. Work with service providers and humanitarian organizations to better understand service providers' emergency preparedness plans and develop standard operating procedures to be used in joint training and/or adapted for specific military operations. For example, consider: establishing a coordination mechanism (including an emergency hotline where appropriate), preparing or updating lists of service provider vehicles if feasible, pre-positioning emergency equipment, ensuring increased visibility for service providers and providing personal protective equipment.
- 1.7. Ensure that armed forces at all levels of operations are provided with sufficient and suitably trained personnel and materials to prevent, mitigate and respond to indirect effects on essential services, including effects that armed forces may have deemed lawful at the time of attack. This includes capacity to support the response of local authorities and service providers, mount a direct response to restore or replace services and strengthen the resilience of essential service infrastructure.
- 1.8. Ensure that the wide impact area of certain explosive weapons, and their foreseeable indirect effects on essential services, are given due consideration when developing and acquiring such weapons and when conducting legal reviews. Prioritize, as appropriate, the development and procurement of precision-guided munitions with a low explosive payload and pre-fragmented casing.
- 1.9. Enhance the accuracy and precision of indirect fire by modernizing fire control systems and the fire direction centre of artillery and mortar units, and by using robust calibration techniques and procedures.
- 1.10. Examine options for reducing technical errors in the use of munitions to prevent or mitigate damage to critical components of essential service systems.

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<sup>10</sup> For child-specific recommendations regarding urban warfare in general, see: ICRC, [\*Childhood in Rubble: Humanitarian Consequences of Urban Warfare on Children\*](#), Geneva, 2023. For more specific recommendations on integrating gendered impacts of hostilities into military doctrine and data collection, see: Chapter 1 of ICRC, [\*International Humanitarian Law and a Gender Perspective in the Planning and Conduct of Military Operations\*](#), Geneva, 2024.

<sup>11</sup> On some of the challenges specific to ERW, see: ICRC, [\*Identifying and Addressing Challenges to Implementation of Article 4 of Protocol V to the CCW\*](#) (expert meeting report), Geneva, 2012.

- 1.11. Ensure effective maintenance, appropriate storage and safe transit of explosive weapons and munitions. Avoid deploying poorly maintained or stored weapons or munitions in populated areas.
- 1.12. Make the export of heavy explosive weapons conditional on recipients avoiding their use in populated areas. In particular, require that such weapons not be used unless sufficient measures can be taken to reduce wide area effects and the consequent risk of civilian harm.

## 2. Operational planning

- 2.1. Provide overarching political and military direction on the importance of protecting civilians and the natural environment from the indirect effects of EWIPA on essential services. Make continuity of essential services explicitly mission-essential at all levels of operations, and – to the maximum extent feasible – allocate sufficient personnel and resources accordingly.
- 2.2. Ensure that practical measures aimed at preventing and mitigating indirect effects and ensuring essential service continuity are clearly articulated in operational frameworks such as the concept of operations, operational orders, rules of engagement, no-strike and restricted target lists, special instructions, fires annexes, tactical and targeting directives, fire support control measures and standard operating procedures.
- 2.3. Place critical civilian infrastructure – such as hospitals and other health-care facilities,<sup>12</sup> water, electricity, wastewater, food production and distribution infrastructure, financial institutions, communications infrastructure and facilities containing toxic industrial material, on no-strike lists. Apply strict criteria to the removal of such infrastructure from no-strike lists (including during dynamic targeting and situations of self-defence/troops in contact).
- 2.4. Ensure that military personnel are aware of the position of critical civilian infrastructure so that they avoid incidental damage when targeting military objectives in the vicinity.
- 2.5. Parties to the conflict should seek to agree on establishing protected zones around critical civilian infrastructure that is especially vulnerable. These may include hospital zones, safety zones, neutralized zones and demilitarized zones. When establishing protected zones:
  - 2.5.1. Prioritize based on the severity of the consequences if infrastructure in the zone is damaged or destroyed, the number of people likely to be affected and the availability (or lack thereof) of harm mitigation mechanisms and their effectiveness.
  - 2.5.2. Ensure that the protection afforded is effective, including through: complete demilitarization; clear and visible markings to be made by the party in control of the zone; clear directions to military personnel that the zone is neither to be used for military purposes nor to be attacked; and establishment, if possible, of a supervisory mechanism as described, for example, in the draft agreements contained in Annex I of the First and Fourth Geneva Conventions.
  - 2.5.3. Enable safe access to the zone for maintenance and operation of critical infrastructure, including safety from ERW.
  - 2.5.4. Accept support, if necessary, from a neutral intermediary such as the ICRC.

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<sup>12</sup> For more detailed operational practices aimed at ensuring safe access to, and delivery of, health care, see: ICRC, [Protecting Health Care: Guidance for the Armed Forces](#), Geneva, 2020 and ICRC, [Protecting Health Care from Violence: Legislative Checklist](#), Geneva, 2021.

- 2.6. Put in place a system for recording and retaining, to the greatest extent possible, information on the use or abandonment of explosive ordnance. Create a process for providing that information to organizations engaged in clearance and other mitigation activities, as appropriate.
- 2.7. Consider the specific characteristics of protracted conflict, including the cumulative impact on essential services, when deciding courses of action, assigning tasks and allocating resources. Account for the three components of essential services: hardware (infrastructure, equipment, etc.), people (e.g. essential service providers) and consumables (e.g. fuel, medicines).
- 2.8. Prevent and mitigate risks associated with the release of toxic industrial materials due to use of EWIPA. For example: take into account the toxicity of certain munitions; avoid – or in any event, minimize the effects of – attacks directed at, or incidentally harming, industrial facilities; provide or facilitate appropriate medical treatment for civilians and combatants exposed to toxic industrial materials, and plan for remediation activities.
- 2.9. As appropriate, develop relationships with essential service providers prior to operations so as to understand their needs, capacities and existing systems for ensuring resilience and protecting their personnel. Those needs might include:
  - 2.9.1. passive security (e.g. bunkers, anti-blast film on windows, safe rooms) and related requirements (e.g. electricity and heat in bunkers)
  - 2.9.2. personal protective equipment or other special clothing for personnel and increased visibility for personnel, vehicles and infrastructure (e.g. high-visibility clothing, vehicle types/markings/plates, beacons, signage)
  - 2.9.3. necessary consumables, such as for provision of health care (e.g. first aid kits and training materials, and appropriate medical supplies (e.g., war surgical supplies, medicines, post-exposure prophylaxis kits and paediatric, obstetric and gynaecological equipment)
  - 2.9.4. logistical support (e.g. supply lines, safe transport of goods, spare parts, storage, cold chain)
  - 2.9.5. training on the risks associated with ERW and exposure to toxic industrial materials (chemical, biological or radiological agents) released during military operations.
- 2.10. Develop or further refine military tools and methodologies for comparing courses of action (wargames, simulations and other such exercises) to anticipate the impact of indirect effects of EWIPA on essential services and the possible responses by civilians (remain or evacuate). Integrate the results of these exercises into the planning process and involve experts in pre-deployment training and operational planning. Such experts might include:
  - 2.10.1. advisers on political matters, human security, culture, gender, child protection, civil–military cooperation, etc. to provide contextual information, including on patterns of civilian life (which vary by age, gender and disability) and the likely impact of essential service disruption on each category, particularly during protracted hostilities

- 2.10.2. environmental experts to provide information on the likely impact of service disruption on the natural environment<sup>13</sup>
- 2.10.3. where appropriate, government bodies (e.g. ministries of education, health or environment) and humanitarian or local organizations (e.g. human rights groups, women's groups, environmental organizations).
- 2.11. Establish a liaison system or, if one is already in place, connect with the host nation's military–civilian coordination mechanism for information on the current location, nature and status of essential service infrastructure. Take essential service providers into consideration when planning for large-scale humanitarian pauses, for example by ensuring access to besieged or encircled areas.

### 3. Intelligence support to military operations including targeting

- 3.1. Identify and map critical civilian infrastructure (whether at, above or below ground level) and the essential service systems it serves. This information should be continuously updated to account for the cumulative impact of hostilities. It is important to consider critical infrastructure located outside, or on the periphery of, urban areas, which may nevertheless impact essential services (e.g. power stations, supply routes, water and wastewater treatment plants, farmland, commercial warehouses).
- 3.2. Allocate qualified personnel and intelligence capabilities for collecting and analysing information on the nature, location, condition and interconnectedness of critical civilian infrastructure. This should be done holistically notably by including the relevant expertise in the targeting process.
- 3.3. Make timely communications of information to military commanders and their planning staff. In particular, develop and refine effective information management systems and intelligence-sharing processes that enable the timely communication of reliable and actionable intelligence regarding critical civilian infrastructure and the essential services it enables, including among coalition/partner forces.
- 3.4. Develop, implement or further refine tools and procedures for using, updating and sharing no-strike and restricted target lists, fire support coordination measures and no-fire areas throughout the operation.
- 3.5. Explore ways to leverage technology to ensure that those carrying out aerial/naval strikes and ground operations are provided with relevant and reliable information that is updated as appropriate in real-time. Prior to an attack, combatants should understand essential services, their interconnectedness and the impact if such services are disrupted.
- 3.6. Ensure that tools and procedures are in place for collecting and analysing data to enable assessment of indirect effects on essential services, both ahead of and during dynamic targeting and situations where troops are under attack (i.e. self-defence and troops-in-contact scenarios).

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<sup>13</sup> For a list of good practices, see: ICRC and Swiss Confederation, *State Expert Meeting on International Humanitarian Law: Protecting the Environment in Armed Conflicts: Chair's summary*, Geneva, 2023, section 2.2, pp. 9–12.

- 3.7. Plan for the use of open-source information, satellite imagery and remote sensing to increase accessibility and reliability of information during expeditionary operations and/or situations where territorial control is lacking.
- 3.8. When ascertaining whether a piece of critical infrastructure that is being used for both military and civilian purposes may lawfully be attacked, conduct a comprehensive assessment – without relying on assumptions, generalizations or speculation – of the extent to which the infrastructure is effectively contributing to the adversary’s military action and the military advantage of targeting the infrastructure.
- 3.9. Collect and analyse data on how military operations are impacting essential service personnel’s ability to work safely and on the availability of necessary consumables in addition to structures, facilities, etc. Ensure that the data are taken into account, as appropriate, by political and military authorities when planning and prioritizing operations and giving tasking orders.
- 3.10. Ensure that data shared by civilian entities (such as essential service providers and humanitarian organizations) for the purpose of deconfliction remain secure and are not used for targeting processes.

#### 4. During military operations

- 4.1. Ensure that military objectives (e.g. troops, weapons) are located at a sufficient distance from critical civilian infrastructure to reduce the risk of incidental harm. Avoid using critical civilian infrastructure for military purposes.
- 4.2. Clearly separate parts of the electrical system used for military purposes from those dedicated to civilian use (e.g. by marking them). Where this is not possible, do whatever you can to mitigate the risk of disruption if the system is attacked, for example by providing alternative power sources (e.g. generators and fuel) so that health-care facilities, water supply, sanitation and food production and distribution can continue to function even if electricity is reduced or cut off.
- 4.3. In addition to weapons experts and legal advisers, consult with structural and field engineers with expertise in water, wastewater and electrical systems, urban planners, geomatics technicians, communications specialists and political and cultural advisers. These experts can ensure better understanding, anticipation and mitigation of indirect effects of EWIPA on essential services, including by advising on the structural make-up of buildings, the location of critical civilian infrastructure, the interconnectedness of essential services, the cumulative impact of hostilities on their functioning and the danger posed by secondary explosions and release of toxic industrial materials.
- 4.4. Where appropriate, share information on the condition (maintenance status, capacity, fuel, etc.) of critical civilian infrastructure, with a view to strengthening its protection against indirect effects.
- 4.5. Refrain from using EWIPA if it is not possible to anticipate the indirect effects on essential services with sufficient certainty, or when the indirect effects would be excessive. Instead, choose other munitions or courses of action and take additional precautions (e.g. regarding accuracy and explosive payload).
- 4.6. Take steps to reduce the risk of misidentifying targets, including through robust target identification practices and the use of observed fires.

- 4.7. Conduct collateral damage assessments of both pre-planned and dynamic targeting (even if the latter is less comprehensive) as well as self-defence and troops-in-contact situations.
- 4.8. Take into account the duration of effects on civilians and the natural environment, and the difficulty of reconstruction, when:
  - 4.8.1. targeting critical infrastructure that has become a military objective and selecting specific part(s) of the infrastructure to be targeted
  - 4.8.2. anticipating incidental damage to critical civilian infrastructure that is not a military objective.
- 4.9. Limit the use of airstrikes and the calibre of munitions used in the vicinity of critical civilian infrastructure.
- 4.10. Where feasible and appropriate, use precision-guided munitions with low explosive payload and pre-fragmented casing to minimize the occurrence and extent of incidental harm to essential service systems and indirect effects.
- 4.11. Attack moving targets only when they are outside of populated areas. If this is not possible, only attack when they are at a safe distance from critical civilian infrastructure.
- 4.12. Implement mission abort procedures – such as redirecting munitions in-flight to detonate on another target or on empty ground – if the expected indirect effects on essential services increase during execution.
- 4.13. Ensure that decision support systems used in course-of-action execution incorporate data that support assessment of the indirect effects on essential services caused by the use of EWIPA.
- 4.14. Record comprehensive and accurate information on the explosive munitions employed or abandoned by armed forces, including types and quantities, location of targeted areas, identification measures and methods of safe disposal. Identify the risks posed by ERW in populated areas and conduct or facilitate risk education, marking and clearance.<sup>14</sup>
- 4.15. Ensure that essential services can continue to operate at the capacity necessary to meet civilians' basic needs and preserve their lives, security, dignity and physical and integrity.
- 4.16. Prioritize the repair and maintenance of critical infrastructure and the supply of necessary consumables, and support retention of essential service personnel with local knowledge and experience.
- 4.17. Allow and facilitate the rapid and unimpeded passage of humanitarian aid for civilians in need, subject to the right of control. Cooperate and take tangible steps to facilitate the work of humanitarian personnel.
- 4.18. Ensure that essential service providers and humanitarian organizations have safe and sustained access to deliver steady supply of consumables, operate, maintain and repair critical infrastructure and stem the rate of declines in service. For example:

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<sup>14</sup> For details on how IHL provides a robust framework of obligations to prevent and mitigate the risks caused by ERW, see: ICRC, [\*Preventing and Eradicating the Deadly Legacy of Explosive Remnants of War\*](#), Geneva, 2023.

- 4.18.1. Agree on coordination and communication measures and procedures with essential service providers and, if possible, other parties to the conflict to ensure that they have safe and sustained access, including safety from ERW.
- 4.18.2. Where appropriate, facilitate the protection of essential service personnel by increasing their visibility and inform subordinates accordingly.
- 4.18.3. Support passive security measures for essential service facilities and personnel close to front lines.
- 4.18.4. Allow essential service personnel priority passage through checkpoints to minimize delays.
- 4.18.5. Consider working with a neutral intermediary to ensure that all necessary consumables, spare parts and equipment can cross front lines.
- 4.18.6. Improve the authorities' response capacity and increase essential service personnel's safety by reducing their need to move through areas where hostilities are taking place.
- 4.18.7. Where appropriate, consider using technology to enhance the resilience of essential service systems, such as through automation of system components so that they can be operated remotely and reduce personnel's exposure during hostilities.
- 4.18.8. Explore alternative power generation methods that can reduce the need for generators and thus for fuel deliveries.
- 4.19. As soon as feasible after the cessation of active hostilities, mark and clear, remove or destroy ERW in territories under your control.
- 4.20. Provide support for ERW risk education, marking and clearance activities by the authorities, humanitarian organizations and essential service providers by providing them with data on the use of explosive weapons, including the location of areas targeted, the approximate number, type and nature of the weapons used and the general location of known or likely unexploded ordnance.
- 4.21. Plan for remediation activities aimed at clearing toxic industrial materials (e.g., chemical, biological and radiological agents) released deliberately or incidentally following the use of EWIPA.
- 4.22. In situations where services cannot be restored in a timely manner, provide or facilitate life-saving measures if there is an urgent and immediate need that cannot be met any other way (e.g. emergency water-trucking, provision of generators)

## 5. Lessons learned and training

- 5.1. When conducting after-action reporting, battle damage assessments and other investigations, ensure that these processes record both direct and indirect effects on people and objects (including the natural environment) beyond the target of the attack. This should include damage to critical civilian infrastructure and the resulting impact on essential services. Seek to allocate a range of technical and analytical capabilities for reconstructing a comprehensive picture of events from which lessons can be drawn. Ensure that these lessons are incorporated as soon as possible into future operations, doctrine and training.
- 5.2. Leverage expertise and information from coalition/partner forces to strengthen battle damage assessment processes in the context of partnered operations, in particular as regards the consideration of indirect effects on essential services.

- 5.3. Use alternative tools and processes to enable remote assessments of indirect effects on essential services, even in cases where territorial control – or even access – is lacking.
- 5.4. Put in place national mechanisms – including civilian casualty tracking systems, disaggregated by age and sex where feasible – to collect data on indirect effects on essential services, and support other entities in collecting such data, so as to:
  - 5.4.1. document indirect, systemic short- and long-term effects on essential services
  - 5.4.2. increase understanding and predictability of indirect effects
  - 5.4.3. ensure that armed forces incorporate the information into military decision-making at all levels for both deliberate and dynamic targeting.
- 5.5. Conduct or commission research on the indirect effects of EWIPA on essential services, including on the interconnectedness of such services and best practices for prevention, mitigation and response.
- 5.6. Cooperate with civilian authorities during disaster relief operations, where appropriate, to draw information and lessons on preventing and mitigating the disruption of essential services.
- 5.7. Share good practices, experience and lessons learned, either publicly or in structured dialogue with the ICRC or other relevant organizations.
- 5.8. Ensure that uniformed personnel at all levels receive training that covers:
  - 5.8.1. how IHL protects critical civilian infrastructure and the personnel responsible for maintaining, repairing and operating that infrastructure, as well as additional protections afforded by the political declaration on EWIPA and domestic law or policy. There should also be focus on the critical role that such protections play in supporting human life and dignity and maintaining public health.
  - 5.8.2.a comprehensive understanding of the urban fabric, the specific vulnerabilities of civilians living in urban areas, how weapon effects interact with both the built and natural environment, the interconnectedness of critical civilian infrastructure and essential services, and the cumulative impact of protracted conflict on continuity of those services.
  - 5.8.3. how to identify critical civilian infrastructure (aboveground, at ground level and – to the extent possible – underground) and how to anticipate the indirect effects of attacks on that infrastructure (for personnel involved in targeting operations, including joint terminal attack controllers, forward observers and forward air controllers).
  - 5.8.4. necessary restrictions and limitations for preventing and mitigating the indirect effects of EWIPA on essential services during military operations, particularly attacks.
  - 5.8.5. risks to civilians associated with ERW and exposure to toxic industrial materials (chemical, biological and radiological agents) released during military operations, such as attacks on industrial facilities.
  - 5.8.6. best practices and procedures for recording, retaining and transmitting information on the use and effects of explosive ordnance, including on essential service delivery.<sup>15</sup>

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<sup>15</sup> On some of the challenges specific to ERW, see: ICRC, [\*Identifying and Addressing Challenges to Implementation of Article 4 of Protocol V to the CCW\*](#) (expert meeting report), Geneva, 2012.

- 5.9. Use realistic and demanding training scenarios and facilities that replicate, to the greatest extent possible, the characteristics of urban areas, including buildings and civilian movements by people of different ages and genders, including those with disabilities. Ensure that weapon-users understand the effects of their weapons, including in populated areas, and the indirect effects on essential services.
- 5.10. Where appropriate, conduct joint training with civilian authorities/entities (e.g. municipalities, specialized government ministries, essential service providers) and humanitarian or local organizations (e.g. human rights groups, women's groups, environmental organizations). For example, seek to better understand each other's emergency preparedness plans and refine standard operating procedures.