



AMERICAN  
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# THE SOCIO-ENVIRONMENTAL IMPACT OF WHITE PHOSPHOROUS AMMUNITION IN SOUTH LEBANON

## ANALYSIS AND RISK MITIGATION STRATEGIES

Authors:

**ANTOINE KALLAB | LEILA ROSSA MOUAWAD**



**Cover Page Picture**

©AP/Hussein Malla – White phosphorus airstrike in Al Bustan, Lebanon

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## INTRODUCTION

Southern Lebanon witnessed an increase in military strikes by the Israel Defense Forces (IDF) on civilian population, land and infrastructure following the start of the October 2023 hostilities. In several of these attacks, White Phosphorus (WP) ammunition was used.<sup>1</sup> These munitions are causing significant environmental damage, threats to public health and economic losses.

The use of WP by the IDF against Lebanese territories is a repetitive phenomenon over the years. While their legality remains a contentious topic, their use is impacting civilian health and livelihood. The threat they pose on welfare and collective wellbeing therefore imposes the intervention of public institutions. Local and central governments must develop a clear and comprehensive strategy to mitigate the danger of these attacks. Alongside mitigation, this strategy should include recovery projects in the areas where WP ammunition was deployed.

In this brief, we examine the direct and indirect impact of the use of WP in warfare, specifically in Lebanon. We also discuss appropriate mitigation measures to combat its long-lasting effect on local communities.

## WHAT IS WHITE PHOSPHORUS?

WP is a highly reactive chemical compound that instantly ignites when exposed to air and burns at extremely high temperatures. It can cause fires that spread rapidly when surrounded by vegetation and other combustible material. WP can reignite weeks after its original deployment if exposed to oxygen and produce toxic fumes harmful to human health. The material itself is not explosive, but can react violently with other chemical compounds, causing a significant explosion hazard.<sup>2</sup>

WP is detrimental to human health upon contact, and can cause respiratory disorders, organ failure and third-degree burns. These effects can leave patients with long-term physical and mental trauma.

The first commercial uses of WP can be traced back to the 19<sup>th</sup> century, typically in the manufacturing of matches. Contemporary uses have extended to pesticides, fertilizers, food additives, cleaning detergents, and fireworks.<sup>3</sup>

## USE IN WARFARE

Over time, WP became increasingly employed in conflicts around the world for its ability to instantly generate dense smoke to camouflage troop movements. The use of WP munitions can be recognized by the distinctive smoke plumes and the dense white clouds they generate.



The legality and morality of the use of WP in warfare are contentious topics. White phosphorus cannot, in the strict sense, be characterized as an “incendiary weapon” or a “chemical weapon”.<sup>4</sup>

The Convention on Certain Conventional Weapons (CCW), specifically its Protocol on Prohibitions or Restrictions on the Use of Incendiary Weapons (Protocol III), regulate the use of incendiary weapons. White phosphorus is mainly designed to create smoke, illuminate targets and camouflage ground forces. Under the CCW, its incendiary properties are not considered to be the primary purpose behind its use in conflicts, but rather an incidental effect. Therefore, according to Protocol III’s definition, WP munitions are not classified as an “incendiary weapon”, as opposed to Napalm or flamethrowers, to cite a few.<sup>5</sup>

The use of Chemical weapons is regulated by the Convention on the Prohibition of the Development, Production, Stockpiling, and Use of Chemical Weapons and on their Destruction (CWC). However, not all munitions with harmful chemical properties are considered as chemical weapons under the treaty. Even though WP is a chemical agent, is it not subject to the CWC because it is not primarily used to inflict harm by interacting with human physiology. Furthermore, tetraphosphorus, the substance present in these munitions, is not listed as a chemical in the CWC annexes.<sup>6</sup>

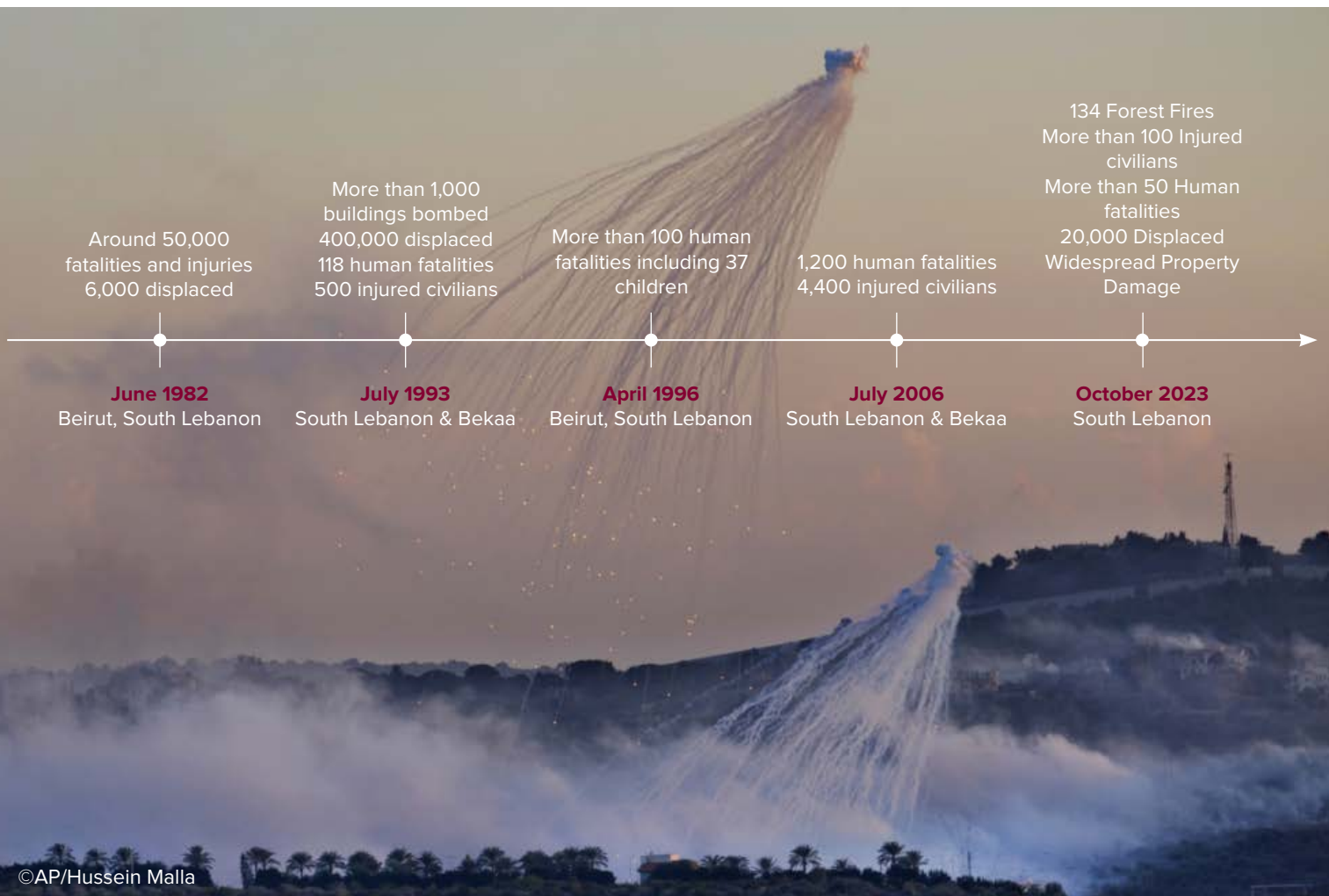
Under customary international humanitarian law, applicable to all states, using weapons or methods of warfare that cause unnecessary losses or excessive suffering is strictly prohibited. Customary international humanitarian law also requires countries to adopt all feasible precautions to avoid the harm to civilians caused by incendiary weapons.

Nevertheless, in conflicts around the world, WP munitions are causing direct and indirect harm to civilians and their belongings as a result of chemical reactions between the substance and oxygen.

It is important to know that while Lebanon has ratified the CCW, Israel remains one of the few countries that hasn’t. However, customary international law is a legal framework that is applied to all states.

## USE IN LEBANON

Our research identified at least five instances when the IDF employed WP munitions against Lebanese citizens and targets. Over time, these attacks resulted in significant damage to human life, property and the natural environment. The numbers below portray the total damage caused by these attacks, as it is not possible to isolate the specific impact of WP munitions.<sup>17 8 9 10</sup>



## **IMPACT**

### **INJURIES AND LONG-TERM SEQUELS ON HUMAN HEALTH**

According to the World Health Organization (WHO), individuals exposed to direct skin contact with burning WP suffer from extremely painful burns with fatal consequences. The chemical composition is of such toxicity that burns affecting merely 10% of the body will lead to the death of the victim.<sup>11</sup> These injuries require immediate access to specialized care, oftentimes not available in conflict zones.<sup>12</sup>

Upon contact with the eyes, WP fumes can cause severe irritation and ocular damage. Moreover, people who inhale WP smoke often suffer from medical complications such as respiratory disorders, gastrointestinal irritations, and bone deformations.<sup>13</sup> Given the high toxicity of the substance, survivors are left with high risks of organ failure including the heart, kidneys and liver.<sup>14</sup>

In the days, weeks, and months after injury, individuals who survive from WP attacks require extensive medical care as they are at higher risk of developing secondary infections, long-term health issues, and even disability.<sup>15</sup>

**“ANY TIME THAT WHITE PHOSPHORUS IS USED IN CROWDED CIVILIAN AREAS, IT INCREASES THE RISK OF LIFELONG SUFFERING”**  
LAMA FAKIH, HRW Director for the Middle East and North Africa<sup>16</sup>

Individuals exposed to a WP attack also describe the experience as “traumatizing”. The impact on their psychological health is directly linked to the extent and severity of the injuries they or others suffer from. Survivors of a WP explosion report feelings of generalized weakness, insomnia and fear of the dark. These testimonies align with the known psychological impact of incendiary weapon attacks, namely emotional distress, anxiety, post-traumatic stress disorder (PTSD) and even depression.<sup>17</sup>

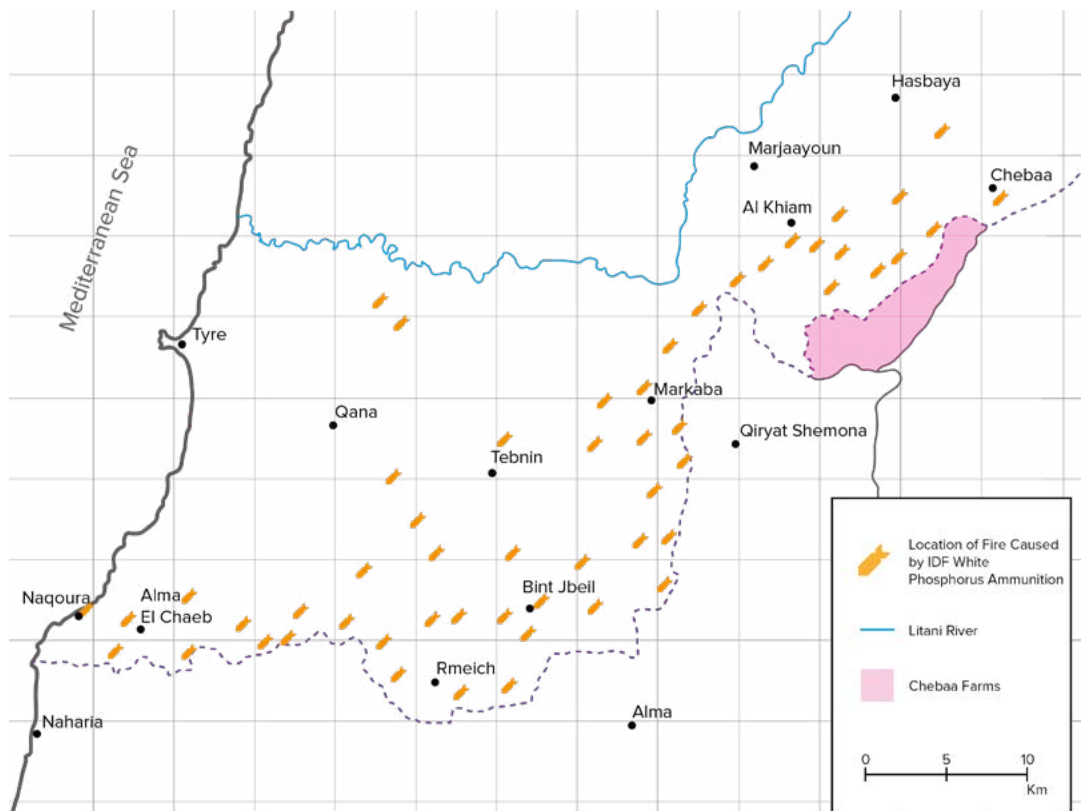
Both physical and mental traumas generated by the WP attacks significantly affect the victims’ ability to sustain economic activity and livelihood. The risk multiplies if they need long-term assistance and recovery. This situation is exacerbated by the weak welfare services across Lebanon.<sup>18</sup>

### **ENVIRONMENTAL DAMAGE**

Upon exposure to WP munitions, agricultural land is subject to decreased productivity. Existing plants could suffer from adverse effects including desiccation, dieback and wilting. WP shelling can also cause extensive fires that spread over large areas and continue to burn until the material is fully depleted. Research shows that various factors need to be considered and complemented with on-site data collection to determine the severity of the hazards.<sup>19 20 21</sup>

In Lebanon and the region, these incendiary weapons are damaging forest ecosystems and the endemic biodiversity they host.<sup>21</sup>

The National Council for Scientific Research (CNRS) mapped and assessed the intensity of fires in South Lebanon.<sup>22</sup> Between October and November 2023, 462 hectares of forests and agricultural fields have been completely ravaged according to the statements from the ministry of the environment, partially due to WP.<sup>23</sup>



Map of areas affected by WP in 2023 produced by AUB-NCC based on data from the Lebanese Ministry of Agriculture. An estimated one million citizens fulfill their water consumption needs from the Litani River.<sup>24 25</sup>

Soil infiltration of WP threatens a variety of living organisms. Once the substance reaches rivers and aquifers, it can affect any population consuming water from these sources. The risk is multiplied with the susceptibility of waterbodies to foster eutrophication and excessive algae growth.<sup>26</sup>

The resulting effects are multidimensional. First, agricultural land relying on these sources for irrigation effectively become contaminated. Local crops and cattle become immediately at risk, and require testing for contaminants. The buildup of phosphoric acid can also deplete the soil from its fertility and expose the land to the erosion risk.<sup>27 28 29</sup>

Second, the spread of WP can affect multiple ecosystems and may jeopardize food security on the local scale. The contamination of water streams can impact the health of nearby communities relying on these sources for drinking water and other uses. Nearby fishery also become at risk of contamination, which could be transferred to humans through ingestion.<sup>30</sup>

**THE USE OF WHITE PHOSPHORUS MUNITIONS LEAVES 10% OF PHOSPHORUS IN THE SOIL OR WATER<sup>31</sup>**

As a result, it is important to understand that the use of WP munitions cannot be limited to the immediate and above-ground surrounding but will rather have severe consequences within an extended range. Persistent toxic residues require long and expensive decontamination processes to protect nearby communities and living organisms.<sup>32</sup>

## **SOCIOECONOMIC IMPACT**

The use of WP munitions is leading to direct and indirect damage to property. Besides the immediate physical destruction from the shells themselves, WP is causing fires in houses, commercial units, cars and agricultural land. Many citizens are therefore incurring significant financial losses without clear compensation mechanisms. The situation will exacerbate local inequalities if residents cannot cover the cost of repairs, or are forced to temporarily suspend their economic activities.<sup>33</sup>

During the same period, IDF raids led to the destruction of more than 40,000 ancient olive trees, partially through the use of WP. The cultivation of these trees generates indispensable income for local communities that depend on the harvest of olives and production of olive oil.<sup>34</sup> Furthermore, these trees are an essential part of local cultural and heritage practices passed down from generation to generation, and often connected to social and identity narratives.

These weapons are also contributing to the internal displacement of tens of thousands of inhabitants. Hundreds of affected families are forced to leave behind their property to flee the threat of Israeli aggression. The situation is disrupting business, healthcare, education, decent livelihood and mobility at both local and national levels. White Phosphorus munitions are therefore contributing to a destabilizing regional social and economic wellbeing.<sup>35</sup>

## **COMPENSATION ON THE INTERNATIONAL SCENE**

Various liability and compensation mechanisms have been established to assess the legal, political, economic and scientific implications of war on the natural environment.<sup>36</sup>

The UN Framework Convention on Climate Change (UNFCCC) does not oblige countries to report their military Greenhouse Gas (GHG) emissions. In 2022, COP 27 witnessed a turning point with the evoking of conflict emissions.<sup>37</sup> Debates were fueled by estimates showing that 100 million tons of CO<sub>2</sub> were emitted in the first seven months of the Russian invasion of Ukraine.<sup>38</sup>

With global military expenditure for 2022 placed at around 2.24 trillion USD, many lobbied in favor of forcing armies to compensate for negative environmental externalities. The same approach should be applied in the case of South Lebanon.<sup>39 40 41</sup>

## **DECONTAMINATION AND RECOVERY**

There have been several attempts to restore ecosystems, extract WP from sediments, and decontaminate territories.<sup>42</sup> Comprehensive recovery measures from WP are yet to be developed, but some case studies offer insights on the complexity of the process.

### **AGENT ORANGE IN VIETNAM**

The U.S. military's use of Agent Orange during the Vietnam War to defoliate landscapes, continues to have harmful effects on nature and people.<sup>43</sup>

The U.S. government allocated to date \$400 million for the environmental remediation of Agent Orange.<sup>44</sup> Landfills are used to dispose of moderately contaminated soil and sediments. Severely contaminated soil is treated with thermal conductive heating, where polluted material is heated at 335° Celsius to deactivate toxic compounds.<sup>45</sup> In parallel, initiatives were launched to support the affected communities and provide healthcare services to those suffering from the long-term medical complications of agent orange.

### **WHITE PHOSPHOROUS IN THE USA**

Eagle River Flats, a salt marsh estuary in Alaska, was declared a highly toxic site after years of WP munition testing by the US military.<sup>46</sup> The efforts to clean up Eagle River Flats by pumping ponds and drying the sediments lasted from 1982 to 2006.<sup>47</sup>

### **WHITE PHOSPHORUS IN UKRAINE**

In 2022, Russia deployed WP munitions against Ukraine, causing extensive contamination of soil, water, agricultural fields and forests.<sup>48</sup>

Ukraine is currently investigating the environmental damage caused by the war to demand compensation. Data is being collected by researchers with the support of local communities. Initial findings show that land plots will require a recultivation strategy, while water bodies will need decontamination to meet sanitary standards.<sup>49</sup>

## **RECOMMENDATIONS**

Through a combination of mitigation and recovery measures, local authorities can reduce, to a certain extent, the long-lasting effects of WP munition on communities. These measures include:

### **I-RISK MITIGATION**

#### **ESTABLISHING EARLY WARNING SYSTEMS [LOCAL/NATIONAL]**

Early Warning Systems (EWS) can contribute to limiting the impact of WP on human health and property. Real-time alerts allow citizens to protect themselves through evacuating or sheltering.

The success of such measures would require a comprehensive training program to mainstream its use. Early Warning Systems must also be linked to first response teams in order to mobilize the appropriate resources and localize the threats. EWS include a combination of communication mediums allowing for instant access to information and fast dissemination of alerts. These include hotlines, phone messages and online platforms where individuals at risk access emergency safety information.

#### **RAISING AWARENESS ON THE DANGERS OF WP [LOCAL/NATIONAL]**

Local communities need to be made aware of the significant and long-term impact of WP. Appropriate protection measures and services to safeguard their wellbeing need to be mainstreamed.

School interventions, social media communication and advocacy campaigns can turn citizens into stewards. Threatened communities can be trained to identify the threat of WP and contact the appropriate authorities for support. These campaigns should also include businesses, farmers and any stakeholder who might be exposed to the long-term consequences of WP.

#### **CRAFTING A TRAINED AND RESOURCEFUL RESPONSE [LOCAL/NATIONAL]**

The chemical complexity of WP requires specialized training and resources for first responders, especially during conflicts.

Emergency crews must be trained in the careful handling of WP residue. Appropriate extinction tactics for WP-generated fires, and the dangers associated with related injuries need to be promoted amongst responding personnel. They must also be equipped with the proper Personal Protective Equipment (PPE) as well as effective extinguishing substances.

Medical crews operating in regional hospitals should be empowered to properly manage the harm from these munitions. They should be trained to properly identify, treat and protect from WP injuries. Trainings needs to highlight the risk of delayed/repeated ignition and toxic residue. Specialized care should include mental health support to accompany victims in their psychological recovery.

#### **MOBILIZING THE INTERNATIONAL COMMUNITY [INTERNATIONAL]**

The use of WP in warfare by any party should be meticulously documented, studied and used as evidence. The government, with civil society organizations, should lead efforts to ban the employment of such weapons. With the help of international organizations and worldwide experts, Lebanese officials must strongly condemn parties that deploy WP against civilians and the natural environment. These global coalitions should relentlessly lobby better restrictions by calling for the reexamination of Protocol III of the CCW and adopt a broader stance on the issue.

### **II-RECOVERY**

#### **DEVELOPING DECONTAMINATION STRATEGIES [LOCAL/NATIONAL]**

National and local governments need to implement comprehensive decontamination strategies. Chemical residues from conflicts, including WP, should be documented and treated at the earliest. Special care should be given to ensuring the safety of agricultural products, soil and water connected to ecosystems and human livelihood.



Lessons learnt from decontamination projects executed in different contexts can provide clarity on how to treat affected areas. Nevertheless, additional and localized research efforts must be dedicated to advance universal knowledge on the topic. These efforts should also focus on increasing the efficiency of decontamination projects. Nature-based solutions can offer means to recover natural habitats at smaller costs and faster pace.

Once these plans are formulated, local and scientific communities need to be included as partners. Local governments should also be empowered with financial and intellectual resources to implement them.

### **ESTABLISHING SPECIALIZED CARE CENTERS AND COMMUNITIES OF PRACTICE [LOCAL/NATIONAL]**

Governmental and developmental institutions should support regional medical facilities with funding and material resources. Hospitals should provide comprehensive recovery to victims of WP attacks who require long-term rehabilitation and medication. Regional centers of excellence and specialized care units can consolidate acquired expertise and lead much needed research on best practices.

Specialized care must be accessible to the most vulnerable groups, and their staff constantly informed of new advances in the field. Communities of practice on national, regional and international scales should emerge to share the acquired knowledge and raise awareness on WP's impact on human health. These care centers must also be connected to organizations who can provide livelihood support for WP victims.

### **ADVOCATING FOR RECOVERY COMPENSATION [INTERNATIONAL]**

The Lebanese government must pursue compensation for conflict emissions and environmental degradation caused by foreign states on national territories. Relevant ministries should quantify the impact of WP munitions launched by the IDF. The findings should be used to demand financial compensation for the resulting health, societal, economic and environmental damage. In parallel, Lebanese legal experts should stay up to date with emerging frameworks and summits, such as the loss and damage fund and Conference of the Parties (COP). These avenues should be used to establish precedents and mainstream the ability to pursue compensation for environmental damage during conflict.

## **CONCLUSION**

Lebanon is suffering from the repeated use of WP ammunition by the IDF. The deployment of WP munitions in conflicts will remain a critical concern, on all legal, social and environmental levels, until their impact is addressed. Ecosystems exposed to such substances must be quickly treated in order to avoid risks on food safety, water security and public health.

This threat calls for a national action plan to assess and manage the consequences of WP shelling by the IDF in South Lebanon. Such plans should rely on a combination of risk mitigation and sustainable recovery with the help of local communities and scientific evidence. The international community should actively support the implementation of these plans while joining the coalition to restrict the use of WP in conflicts.

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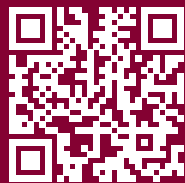
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