**The Human Cost of War's Environmental Impact**

How will Syria look in ten years, and why should all the actors involved take the environment up as a serious issue? This article aims to broadly explain the links between conflict, environment and public health and it will argue that, without calculating the environmental damage and subsequent health risks in recovery and reconstruction planning, civilians will face an additional threat from a war that already cost the lives of too many.

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**Conflict Pollution and Civilian Harm: a New Approach**

The environmental damage caused by wars and conflicts, and more importantly what can be done to limit the impact of conflict-related environmental damage on civilians, has largely been absent from the broader discussions on how wars are fought. With the ongoing conflict in Syria, the impact of years of shelling and destruction brought upon the land will certainly have long-term repercussions on environment, natural resources, economic recovery and, consequently, on the livelihoods of civilians.

It feels strange to write about environmental issues in Syria while the country is burning, with hundreds of thousands killed and maimed by weapons, millions of refugees, and entire cities in rubble. It almost feels inappropriate to talk about the environment as there are so many competing humanitarian priorities for Syrian civilians.

Yet, while acknowledging these concerns, this article aims to elaborate on the paramount importance of the environment in relation to the protection of civilians during and after the conflict. Considering the dependence of people on the environment, the state of which is rapidly declining worldwide, it is no longer possible to look away.

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**Genealogy of Conflict and Environmental Impacts**

Wars can leave behind toxic footprints that can seriously affect the health and wellbeing of civilians and their communities long after the guns fall silent. In an era of rapid environmental degradation due to climate change, mass-scale urbanization, and declining quality of natural resources, the state of environment is of growing importance for communities not only health-wise but also for socio-economic opportunities and peacebuilding practices, to prevent potential conflicts over scarce resources1.

Historic cases of wars and their environmental impacts are abundant. During the Vietnam war, the widespread use of [Agent Orange](http://www.history.com/topics/vietnam-war/agent-orange), a toxic defoliant used by the United States, had a major impact on hundreds of thousands of Vietnamese civilians, causing a range of life-threatening health problems that still echo on today. The [Gulf Wars](http://postconflict.unep.ch/publications/Iraq_ESA.pdf) brought destruction on Iraq and Kuwait on many levels: Saddam Hussein’s burning of 700 Kuwaiti oil wells, the subsequent attack by Coalition forces on Iraq’s industrial infrastructure and widespread use by the U.S. of depleted uranium munitions, the draining of the Iraqi Marshes as punishment of the Marsh Arabs, and in 2003, the further destruction of industrial zones, left a trail of pollution risks for civilians. The latter scenario was worsened by the collapse of environmental governance in post-invasion Iraq, that in peacetime would regulate the safe management and disposal of hazardous substances.

Similar conflict-related pollution risks occurred in other conflicts over the last two decades. During the [Balkan conflicts](http://www.grid.unep.ch/btf/missions/august/danube.pdf) (1992-95, 1999), the [targeting of industrial sites and oil refineries](http://www.nytimes.com/1999/07/14/world/serbian-town-bombed-by-nato-fears-effects-of-toxic-chemicals.html?pagewanted=all) resulted in the contamination of drinking water sources and soils, deteriorating the livelihoods of local communities. In [Sudan](http://www.unep.org/sudan/post-conflict/), the environment has both been a driver and victim of conflict. Especially after the discovery of oil and gas reserves in 2005, conflicts were fought over gaining access to these resources. Scorched earth tactics, destruction of natural resources, waste dumping and unexploded ordnance (UXOs) have all severely impacted public health and humanitarian responses to millions of people, while lack of environmental and economic governance of oil sources are still a health issue [today](https://www.newsecuritybeat.org/2016/05/south-sudans-broken-oil-industry-hazard/).

In the [2006 Hezbollah-Israel war](http://www.unep.org/disastersandconflicts/CountryOperations/UNEPsPastActivities/Lebanon/tabid/54624/Default.aspx), widespread use of cluster-munitions, subsequent UXOs clearance problems and weapons residues, as well as the deliberate Israeli targeting of storage tanks at thermal power stations took their toll on Lebanon’s environment and natural resources. Israel’s attacks on Gaza ([2008](http://www.unep.org/conflictsanddisasters/UNEPintheRegions/CurrentActivities/Gaza/tabid/562/Default.aspx), [2012](http://www.unep.org/rso/Portals/118/Documents/NESs/ROWA/Occupied_Palestinian_Territories_NES_2012.pdf) and [2014](https://ps.boell.org/en/2015/12/03/2014-war-gaza-strip-participatory-environmental-impact-assessment)) resulted in millions of tons of rubble mixed with hazardous materials, Polychlorinated Biphenyls (PCBs) contamination and waste management problems; local Palestinian authorities as well as international organizations are still struggling to minimize civilian exposure risks in ongoing remediation work.

The aforementioned conflicts were covered widely by media due to huge oil fires, destroyed industrial sites and toxic wastelands. Yet there is more to the eye regarding environmental impacts. Chronic exposure to contaminated drinking water, soil and air , working on rubble clearance and hazardous waste can take months, years or decades to manifest itself. Even [environmental degradation](http://www.un.org/en/land-natural-resources-conflict/) due to sinking water levels, damaged agricultural lands or shrinking natural resources can take time to [trigger new violent conflicts](http://www.unep.org/newscentre/Default.aspx?DocumentID=27074&ArticleID=36161&l=en)over use and access.

**Syria’s Pre-Conflict Environmental Conditions**

The state of the environment in Syria before the war started was already [deplorable](http://www.paxforpeace.nl/stay-informed/news/amidst-the-debris-environmental-impact-of-conflict-in-syria-could-be-disastrous) due to mismanagement of water sources, increased droughts, inexistent environmental standards and regulation of Syria’s growing industrial sector, in particular the petrochemical, pharmaceutical and biotechnology sectors. This all had a serious impact on water and air pollution levels, which rose steadily prior to 2011. Moreover, the lack of a functional waste management systems to prevent soil pollution, both for household and industrial waste, but also for the growing mining industry, undermined soil and air quality.

A strong [argument](https://lb.boell.org/en/2016/08/26/perspectives-issue9-region-heating-climate-change-activism-middle-east-and-north-africa)can be made that worsening environmental conditions due to climate change were a so-called ‘threat multiplier’ for the outbreak of the conflict: droughts led to agricultural problems, which in turn sped-up urbanization and unemployment, further fostering grievances over rising living costs and inter-communal tensions over socio-economic opportunities. The jury is not out-on the cause-effects relationship of this suggested trigger, but the environment could have played a role.

**How the War Ravaged the Country**

Since the outbreak of the peaceful uprising against president al-Assad and the subsequent war, the trail of environmental destruction and consequent public health risks is difficult to estimate precisely although there have been some initial attempts. In October 2015, PAX, a Dutch NGO working on peacebuilding and humanitarian disarmament, published its [desktop study](http://www.paxforpeace.nl/stay-informed/news/amidst-the-debris-environmental-impact-of-conflict-in-syria-could-be-disastrous) on the environmental and public health impact of the conflict. The report noted four major issues as result of the conflict:

**1. The targeting and destruction of industrial facilities and critical infrastructure**

Widespread damage to these sites as well as military bases could create hotspots of contamination due to the large quantities of hazardous materials and toxic substances present at those sites; the industrial areas around Aleppo, Homs, and Damascus are of particular concern.

**2. Heavy damage to residential areas and exposure to hazardous building rubble**

With over 60% of all Syria’s residential and light industrial areas heavily damaged or destroyed, there are millions of tons of rubble, often mixed with all types of medical, household or industrial waste, asbestos and other hazardous substances; this can pose acute and long-term exposure risk to civilians living there or returning to these areas, who might suffer from toxic dust-induced respiratory problems, skin diseases and, on the long term, cancers and birth defects due to the contamination of air and drinking water with heavy metals.

**3. Contamination from military materials and weapons**

Over five years of intense use of all kinds of weapons, bombs, munitions and other explosive materials has resulted in many toxic substances and heavy metals dispersed in residential sites. Especially Do-It-Yourself munitions factories employing children, uncontrolled explosions of munitions storage sites and degrading UXOs could pose acute health risk and long-term contamination hazards for water and soil.  
 **4. Collapse of environmental governance**

The absence of professional waste management services and infrastructure could result in a range of public health risks. The piling up of waste in the streets could lead to outbreaks of communicable diseases and the creation of huge dumping sites could cause localized pollution to soil and drinking water. Moreover, the looting of industrial sites means an increased exposure to many hazardous substances and could further impact soil and air quality.

Since the publication of this report October 2015, a number of other alarming issues have surfaced. Through satellite analysis of specific sites in Deir-az-Zawr, PAX was able to demonstrate the [huge growth of makeshift-oil refineries](http://www.paxforpeace.nl/publications/all-publications/scorched-earth-and-charred-lives)at these sites. Tens of thousands of these refineries in at least 37 locations through north-eastern Syria are now in use, employing tens of thousands of civilians, including [thousands of children](http://www.climatechangenews.com/2016/09/05/thousands-of-children-working-in-isis-makeshift-oil-empire/), exposing them to toxic vapors and hazardous substances on a daily basis. These practices have also affected local agricultural lands and water sources.

Apart from the direct impact in Syria, the millions of internally displaced persons and refugees have left an [environmental footprint](https://gelr.org/2016/03/27/environmental-impacts-of-the-refugee-crisis/) in the areas where camps are set up. Countries like[Lebanon](http://www.moe.gov.lb/The-Ministry/Reports/Lebanon-Environmental-Assessment-of-the-Syrian-Con.aspx?lang=en-us), Iraq and [Jordan](http://www.toxicremnantsofwar.info/jordan-grapples-with-the-environmental-consequences-of-its-refugee-crisis/) are struggling with declining water levels and waste management in and around informal settlements and camps, where up to 120.000 people per camp can be hosted (e.g., [Jordan’s Zaatari camp](http://data.unhcr.org/syrianrefugees/settlement.php?id=176&country=107&region=77)).

**Learning from the Past**

Linking historic cases of environmental impacts and resulting public health consequences with the current conflict in Syria can provide more insight on the future of the country and the threats civilians are likely to face.

[Lessons](http://www.toxicremnantsofwar.info/conflict-rubble-a-ubiquitous-toxic-remnant-of-war/) learned from the Gaza wars, but also from health concerns among US rescue workers after 9/11 being exposed to hazardous debris and dust, point out that both civilians and rescue-workers could face long-term health effects. With the ongoing attacks on urban areas like Aleppo, Raqqa and Deir az-Zawr, more waste and debris management problems will likely occur in the next years. Tackling these concerns timely and efficiently could prevent serious health problems for civilians living in urban areas or near dumpsites.

Anticipating the reconstruction phase of Syria, there will be a huge demand for stone and cement for rebuilding the at least 60% of damaged and destroyed urban areas. This will likely mean a steep increase of mining and quarries. A [similar process](https://www.researchgate.net/publication/229884065_Environmental_impact_of_quarries_on_natural_resources_in_Lebanon) took place in Lebanon after decades of violent conflict and destruction of residential sites, resulting in hundreds of quarries, which led to severe environmental local impacts such as soil erosion and groundwater pollution. Mining sites often involve [toxic extractive waste](http://ec.europa.eu/environment/waste/mining/), such as mercury or arsenic, and they could affect air quality for [various reasons](http://web.mit.edu/12.000/www/m2016/finalwebsite/problems/mining.html), which was already a problem prior to the conflict in Syria.

Another lesson learned from previous conflicts, most notably the 2003 Iraq war, is the collapse of environmental services such as waste collection, but also the damage inflicted upon critical infrastructure such as water plants and sewage systems that resulted in the [outbreak of communicable diseases](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC524138/) in towns and cities. Even though the UNDP is already investing in the establishment of [community waste collection services](http://www.undp.org/content/undp/en/home/ourwork/ourstories/emergency-employment-yields-a-healthier-environment-in-syrians.html) in Homs, Hama and Damascus, more capacity is needed all over the country to provide sufficient means for local communities to deal with waste problems, especially in areas which will face more intense fighting. This would require setting up proper means of solid waste collection, transportation and storage facilities such as landfills.

Next up would be the oil and gas sector. On this topic, there are similarities with other oil-driven conflicts such as in the [Niger Delta](https://www.cordaid.org/en/projects/response-to-oil-theft-and-artisanal-refining) and [Sudan](https://www.newsecuritybeat.org/2016/05/south-sudans-broken-oil-industry-hazard) that can be of guidance here. As mentioned earlier, there is an enormous growth in civilian-operated makeshift oil refineries. Since the need for oil won’t drop, these practices will only continue to grow in the next years. While the US-led Coalition and Russian Air Force continue to [target professional oil refineries](https://www.newsecuritybeat.org/2016/01/fire-oil-collateral-damage-airstrikes-isis-oil-facilities/), civilians will seek alternative means to obtain refined oil.

It could also be expected that the Islamic State will start to use scorched-earth tactics. Recent examples are the [destruction of the Shaʻer gas field](https://www.bellingcat.com/news/mena/2016/09/23/isis-scorched-earth-visual-confirmation-destruction-shaer-field/) near Palmyra and [setting fire to over a dozen oil wells in al-Qayyarah](http://earthobservatory.nasa.gov/IOTD/view.php?id=88666), Iraq. With hundreds of oil wells in the Deyr az-Zawr governorate, chances are that, under pressure of losing territory, similar tactics could be employed by ISIS in Syria as well. This could have disastrous direct and long-term consequences on public health in this area, in particular for the air quality and the pollution of soil and water resources. From a socio-economic perspective, post-conflict management of oil-rich areas should be dealt with in a timely manner and should involve all local stakeholders and communities to prevent grievances over ownership, environmental health concerns and income revenues.

Iraq, in particular, bear many geological and political similarities with Syria, and can be a useful example to learn from. Only after funding was made available in 2007, the Iraqi government in cooperation with UNEP was able to start identifying environmental hotspots, rebuild national institutions, draft legislations that regulate and oversee environmental norms and implement [monitoring mechanisms](http://c/Users/Wim/AppData/Local/Temp/postconflict.unep.ch/publications/Iraq). Yet, the country is rife with environmental problems due to internal disputes between ministries over responsibilities, and is weakened by corruption and insufficient resources to tackle pressing environmental issues. All of the ongoing work is obviously severely hampered by the fight against the Islamic State that has only hastened the[destruction of natural resources](https://www.insightonconflict.org/blog/2015/03/iraqs-continuing-struggle-conflict-pollution).

**Identifying Environmental Health Priorities**

Since Syria will struggle with many competing humanitarian and socio-economic priorities during the post-conflict phase, it is imperative to identify the most persistent and acute environmental health risks as soon as possible. This entails starting to collect information on what types of environmental problems are occurring and where, and reporting this information to relevant international organizations and humanitarian programs to help inform their policies and reconstruction work. However, there is currently no overarching system or organization that collects, analyses and shares this kind of risk assessments with the broader humanitarian community.

Knowing where health risks might occur requires the timely identification of potential pollution hotspots. This information is crucial to inform direct responses through local partners or government structures or, in the aftermath of a conflict, to speed-up assistance and remediation. Monitoring environmental risks in conflicts as they unfold requires capacity and expertise, but it is becoming increasingly feasible through a range of data sources, such as social media monitoring, satellite analysis, damage assessments of [urban](http://www.unitar.org/unosat/maps/SYR)or [agricultural areas](http://www.sciencedirect.com/science/article/pii/S0306919216303219), and [citizen science](https://www.bellingcat.com/resources/how-tos/2016/01/22/using-citizen-science-to-assess-environmental-damage-in-the-syrian-conflict/).

The private and industrial sectors and other relevant actors from the [Syrian business community](http://www.syrianef.org/En/2016/02/syrian-businesspeople-map-part-ii) are key stakeholders in the recovery process as they possess a wealth of knowledge on existing industries. They will also be crucial partners in any efforts to promote environmentally sustainable solutions once the conflict comes to an end. Investments in renewable energy such as [solar power](https://www.newsdeeply.com/syria/articles/2014/11/28/with-diesel-scarce-syrians-turn-to-solar-power-as-an-emerging-energy-option) are already on the rise in Syria, as well as in [refugee camps](http://www.greentechmedia.com/articles/read/solar-power-to-light-up-syrian-refugee-camps-in-jordan). Moreover, a rethinking of industrial priorities and switching to durable energy, as well as sound water and land management could help rebuilding a better and greener Syrian economy.

However, past rebuilding efforts do not bode well: traditional reconstruction operations have seen a massive build-up of heavy industry activities to kick-start the economy, which have often caused rapid natural resources depletion and severe environmental damage, Iraq being an useful example. Furthermore, the lack of oversight on investors and regulations could well lead to the involvement of shady actors, resulting in corruption and funnelling away much needed recovery funds, similarly to what happened in Iraq and Afghanistan.

Learning from the environmental impact of past conflicts can inform the design of faster and more efficient response mechanisms for affected States and humanitarian organizations. Several approaches are already being explored by experts and UN organizations, including the UNEP/OCHA Joint Environmental Unit’s work to [mainstream the environment into humanitarian action](https://www.humanitarianresponse.info/topics/environment/document/eha-study-web-version-11) (i.e. including environmental assessments in operational planning or providing a help-desk for organizations in need of expertise).

A rich set of [tools and procedures](https://www.wilsoncenter.org/event/environmental-dimensions-sustainable-recovery-learning-post-conflict-disaster-response) for environmental assessment and recovery already exist, though these approaches are all too often fragmented or not coordinated. Establishing a structured set of tools, clear responsibilities, financial resources and a coordinating system could help to minimize civilian harm from environmental risks, provide a fast and efficient response mechanism for environmental damage and ensuring that the environment is fully integrated into recovery plans. Moreover, building strong and capable institutions, writing and implementing regulations, and investing in the identification of suspected environmental hotspots in post-conflict Syria is of paramount importance to minimize civilian risks.

**Political imperative to tackle conflict and environment**

Drawing on past conflicts and their aftermaths, this article has aimed to envision the reconstruction of a country, while dealing with a breadth of humanitarian concerns, and to assess the extent to which environmental risks deserve a priority.

The previous [post-conflict environmental impact assessments](http://www.unep.org/disastersandconflicts/) carried out by UNEP, the ongoing[legal analysis](http://legal.un.org/ilc/sessions/68/index.shtml#a6) by the International Law Committee on improving the protection of the environment in armed conflicts, the International Committee of the Red Cross[(ICRC) Nordic Pledge](http://www.toxicremnantsofwar.info/the-icrc-and-recent-developments-in-the-protection-of-the-environment-during-conflict) on armed conflict and the environment, the UN Environmental Assembly [resolution](http://www.trwn.org/unea-2-passes-most-significant-resolution-on-conflict-and-the-environment-since-1992/) on conflict and the environment and recent [recommendations](https://www.newsecuritybeat.org/2016/09/special-rapporteur-calls-action-toxic-remnants-war-protect-children) of the UN Special Rapporteur on Toxic Waste with regard to protection of children from toxic remnants of war have all contributed to highlighting various concerns on conflicts and their environmental impacts.

These developments should persuade the international community that a coordinated effort with sufficient funding and expertise by states, international humanitarian organizations and local communities is needed to build back a better and greener Syria. Past conflicts have shown us that if environmental risks aren’t dealt with in an efficient and timely matter, they will affect generations to come who have to deal with the toxic legacy of the conflict, and could even result in reoccurring violence over access to scarce natural resources.