

THE CARTER CENTER



Unexploded Ordnance Threatens Food Security in Syria

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About the Report

Unexploded ordnance (UXO) contamination seriously hinders Syria's recovery from civil war. The problem not only affects immediate physical safety but also undermines the nation's food security. Omnipresent UXO denies access to arable land, water sources, and infrastructure, exacerbating aid dependence. Additionally, UXO intensifies land degradation by contributing to the overcultivation of uncontaminated lands, leading to intensive farming practices that can degrade soil and deplete its nutrients. Overcultivation also depletes water resources and leads to soil erosion. All these factors further stress Syria's already weakened food production capabilities.

Scale and Scope of UXO Contamination in Syria

Although the recent decrease in large-scale conflict is encouraging, the remnants of war remain a significant impediment to Syria's food security and food system performance. Using [geospatial data](#) and specific UXO-related conflict events, we examine the ties between UXO contamination and food insecurity, spotlighting how UXO contributes to a cycle of low food production and hunger, and how humanitarian mine action could effectively foster food security.

The Carter Center [reports](#) that from December 2012 to May 2021, 972,051 explosive munitions were used across Syria, with an estimated failure rate of 10% to 30%. This implies that 100,000 to 300,000 of these ordnance pieces [remain](#) undetonated and pose a significant risk to civilians.

UXO Contamination and Syrian Agricultural Food Chains

The World Bank [notes](#) significant sector damage to agricultural food chains, with record food and fuel prices worsened by continuous conflict, natural disasters, and global crises. With an estimated 12.1 million Syrians [facing](#) food insecurity and another 2.6 million on the brink of hunger, Syria ranks sixth globally for food insecurity. Despite increased stability and reduced

conflict, UXO contamination still severely limits access to agricultural lands, water sources, and infrastructure. Consequently, the ongoing UXO problem is a critical factor in reduced production and drives Syrians deeper into hunger.

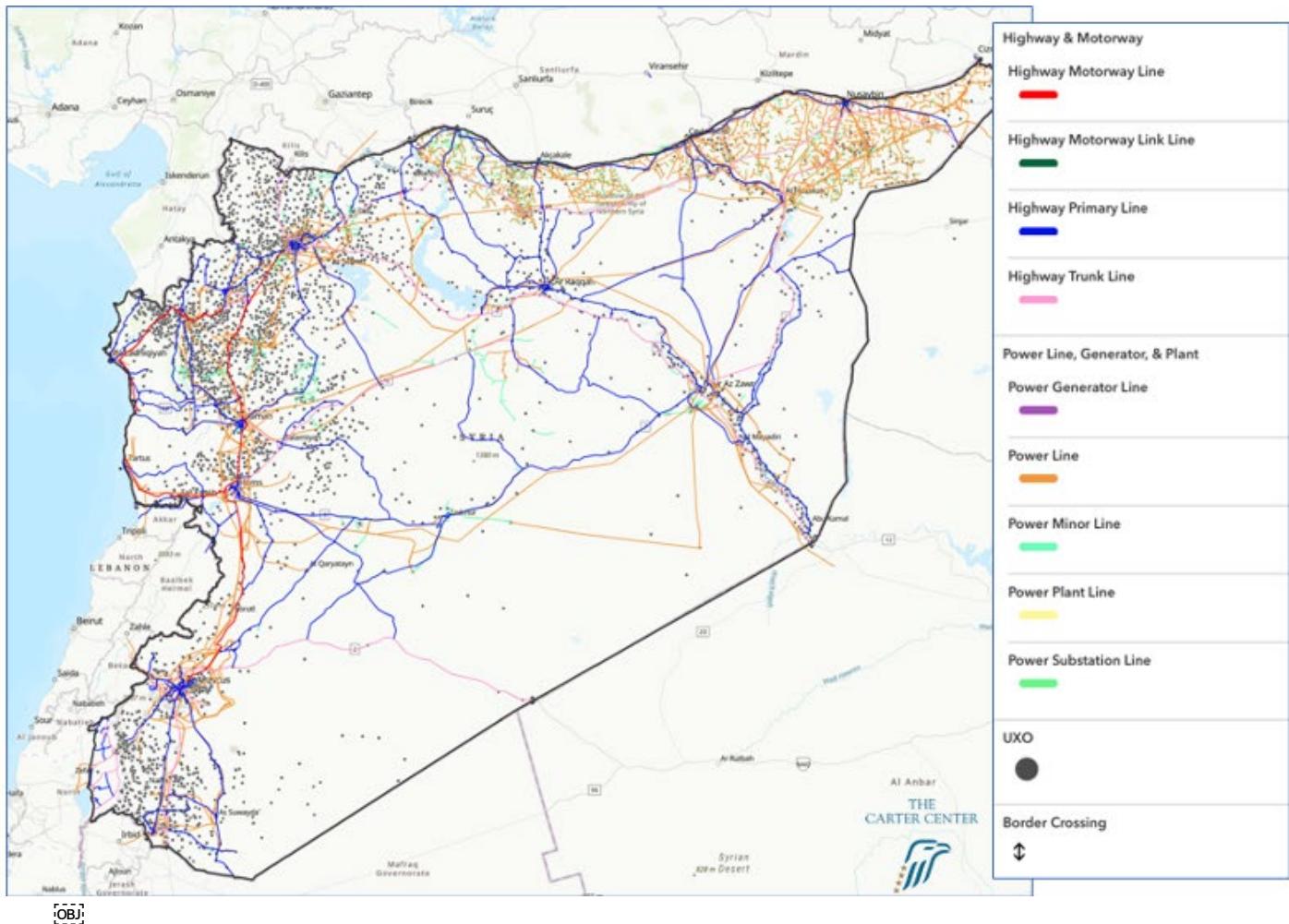


Figure 1: Syria Transportation and Power Infrastructure Compared to UXO Model¹

Figure 1 shows the striking spatial correlation between UXO and country infrastructure, particularly in the west of the country and northwest to southeast in the rich agricultural land adjacent to the Euphrates River.

¹ Figure 1 depicts Syria's transportation and power infrastructure compared to the Carter Center's UXO model. Transportation and power maps are Geojson spatial layers joined from Syria infrastructure maps from the Syrian Arab Republic Data Grid openly sourced from [Humanitarian Data Exchange](#). The [UXO model](#) leverages explosive munition events to give geographic unexploded ordnance contamination assessments.

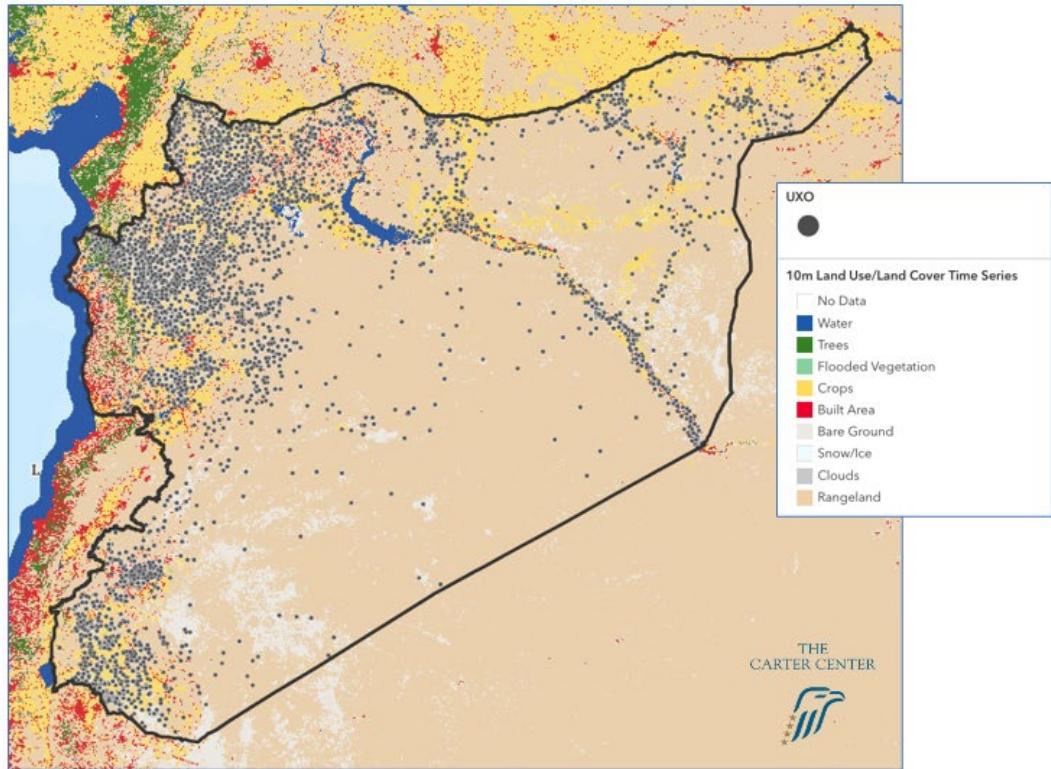


Figure 2: Syrian Land Cover and Land Use Compared to UXO Model²

Before the war, Syria was one of the Middle East's key agricultural producers, and still in 2020, agriculture [contributed](#) to roughly 33% of Syria's gross domestic product, compared to 23% in 2012. The Euphrates and Jazira regions in the northeast have the human and natural resource capacities to meet [about](#) 60% of Syria's food supply needs. Yet, the Jazira region has witnessed a serious decline in agricultural production because of conflict, with some regions [reporting](#) losses as high as 90% in critical crops, including wheat and barley. As Figure 2 shows, agricultural areas — highlighted in yellow — are saturated with UXO (marked in black), particularly in the agriculturally rich northeast region (Figure 4). Further evidence of UXO damage to Syria's food system in the northeast region is shown in land cover/land use changes in Figure 3. Over a period of eight months, a significant decrease in crop cover is evident. Figure 3 suggests that producers not only have less land to work with, but they also are forced to shift production areas to less contaminated and less fertile land.

² Figure 2 depicts Syria's [land use/land cover map](#) (LULC) for 05/26/2022 – 12/31/2022 in comparison to UXO model. UXO presence is spatially correlated with built areas, crops, water, and trees. LULC is derived from ESA Sentinel-2 imagery at 10-meter resolution and provides annual 10-meter resolution maps of Earth's land surface from 2017-2022.

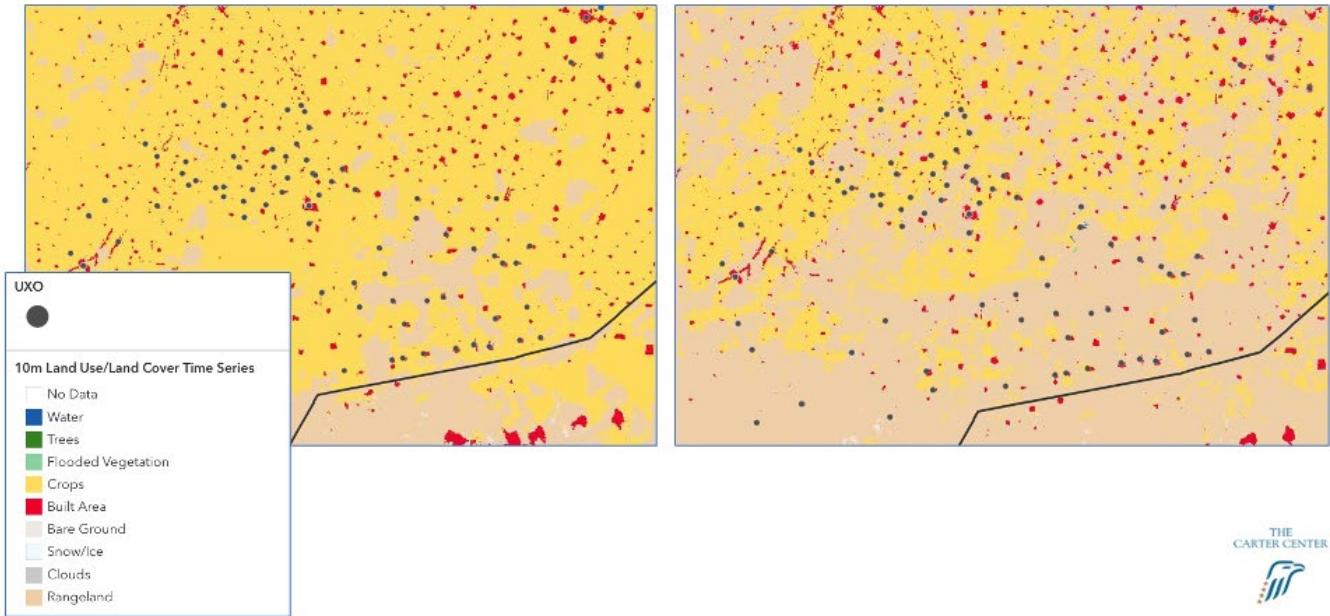


Figure 3: Land Use and Land Cover changes from 01/01/2020 - 08/07/2020 to 08/07/2020 - 03/14/2021³

Recent evidence of the fear that UXO instills in agricultural areas is highlighted in the Conflict Events Database: “On 6 January 2023, an unexploded shell from previous clashes exploded in farmlands in the vicinity of Zardana Mashehad town in Idleb countryside, killing an IDP [internally displaced person] child.”⁴

³ Figure 3 depicts changes in LULC from 01/01/2020 - 08/07/2022 to 08/07/2022 – 03/14/2021 compared to the UXO model. Again, land use/land cover is derived from ESA Sentinel-2 imagery at 10-meter resolution.

Reduction in crop cover in culmination with UXO presence is suggestive of reduced crop production. Movement in crop cover because of UXO presence shifts crop production from high-yielding areas to areas that are likely not as productive. Furthermore, UXO presence can significantly hinder a region’s food system performance by reducing crop land to work with.

⁴ The Carter Center’s Data and Analysis Team relies on reported conflict events, independent media analysis, information from partners (ACLED), and interlocutors in Syria to form a [database of conflict events in Syria](#). Conflict events can be leveraged to determine areas of control, actors, or specific types of events. In this case, the database is filtered for evidence of unexploded ordnance detonation in agriculture areas. These are two examples of many.

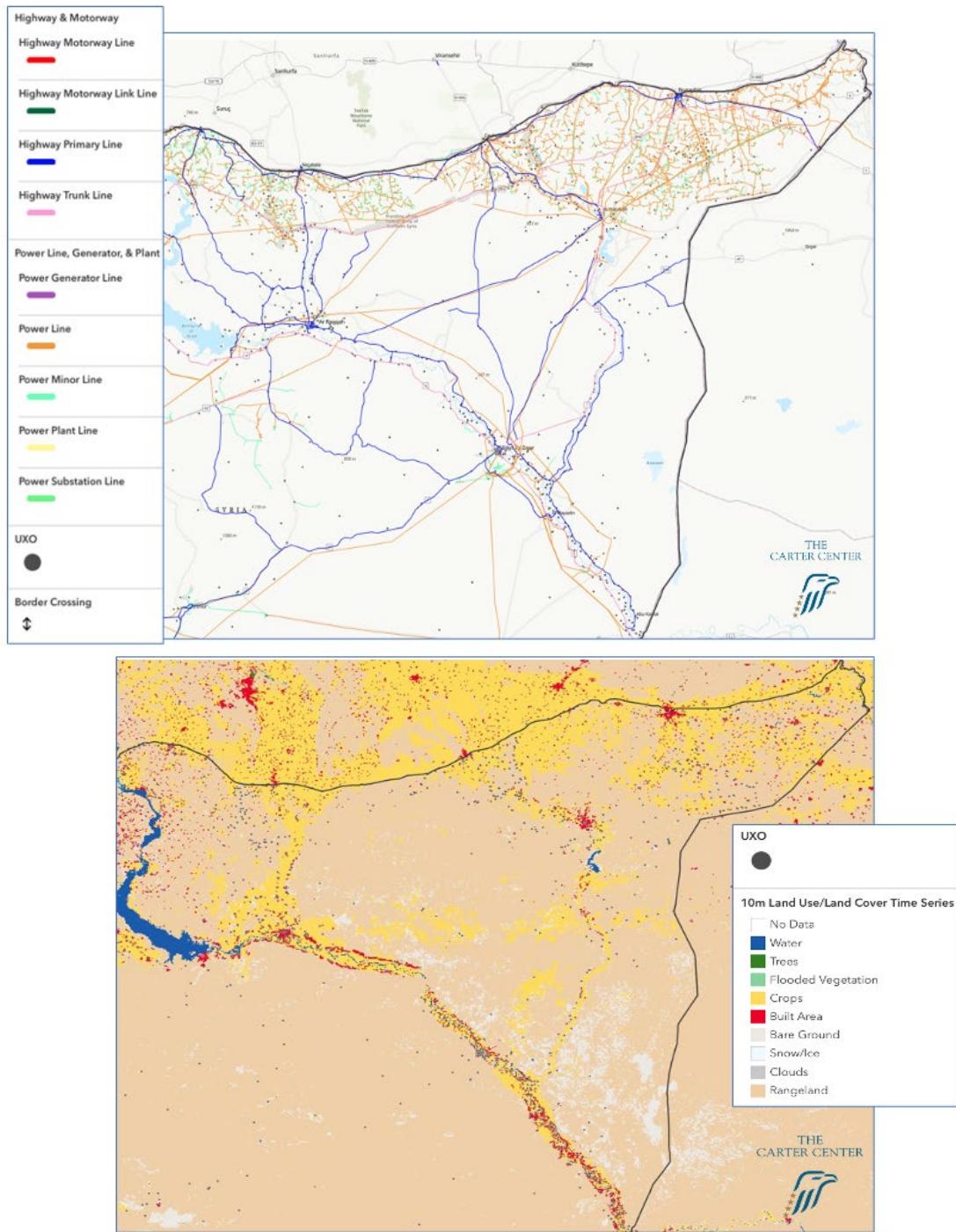


Figure 4: Northeast Syria Infrastructure and Land Use/Land Cover Compared to UXO Model⁵

⁵ Figure 4 depicts northeast Syria's infrastructure and LULC compared to the UXO model. The country-level view is telling by itself; however, examining the agriculturally rich northeast alone gives a clearer picture of UXO spatial correlation with various components of food system performance (distribution, power, crops, water).

Water Resources and Food Systems

The impact of unexploded ordnance on water resources also harms Syria's food system by damaging the agricultural irrigation system. When chemicals from dormant UXO seep into soil and water, it contaminates surrounding resources, rendering them unfit for human consumption and agricultural use. Damaged irrigation systems and contaminated water sources pose a dual threat to Syria's food security, affecting crop yields and disrupting livelihoods.

Complexities of Aid Delivery and Market Access

In addition, UXO reduces food market access, contributing to a cycle of aid dependency. UXO can limit the flow of agricultural goods and disrupt food markets, which can [lead](#) to market shortages and increased food prices. Furthermore, UXO presence on roads poses severe risks to aid convoys, restricting the delivery of essential supplies. Figure 1 and Figure 4 show the risk UXO presence poses to distribution and processing components of Syria's food system, as transportation routes and power lines are correlated to UXO presence.

UXO Clearance: A Critical First Step

In summary, UXO poses a complex and multidimensional threat to Syria's food security, from directly affecting agricultural productivity to contaminating critical water sources and disrupting food markets and aid delivery. Food security in Syria requires a holistic approach that addresses political instability, economic uncertainty, and the long-lasting effects of war, but UXO clearance is a critical preliminary step on this path. The scale of the problem of UXO in Syria is so large that no single actor can hope to address it unilaterally. Therefore, the international community and local actors must work together to mitigate the threat to human lives and livelihoods.

Acknowledgments

This report was authored by Alexander Mills, the Summer 2023 intern in the Conflict Resolution Program, with contributions from other Carter Center Staff.