CASE STUDY 4.2

THE POWER OF OPEN-SOURCE SATELLITE INVESTIGATIONS TO IDENTIFY ENVIRONMENTAL DAMAGE IN SYRIA

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The application of remote sensing combined with open-source investigations (OSINT) to identify and monitor environmental damage during armed conflicts has seen massive growth in recent years. From identifying the impacts of makeshift oil refining in Syria and Iraq,[101] to revealing the targeting of water infrastructure and the shelling of chemical factories in eastern Ukraine,[102] a combination of social media reports and satellite images have become instrumental in locating environmental risks and threats to human health in near real-time.

Vast amounts of environmental data are now openly available and aggregated through cloud-based services such as Google Earth Engine (GEE) or the Microsoft Planetary Computer. These services host petabytes of analysis-ready satellite imagery and are able to perform large AI-driven computations in seconds. Leveraging such platforms enables detailed monitoring of environmental damage in conflict zones that would be otherwise unfeasible.

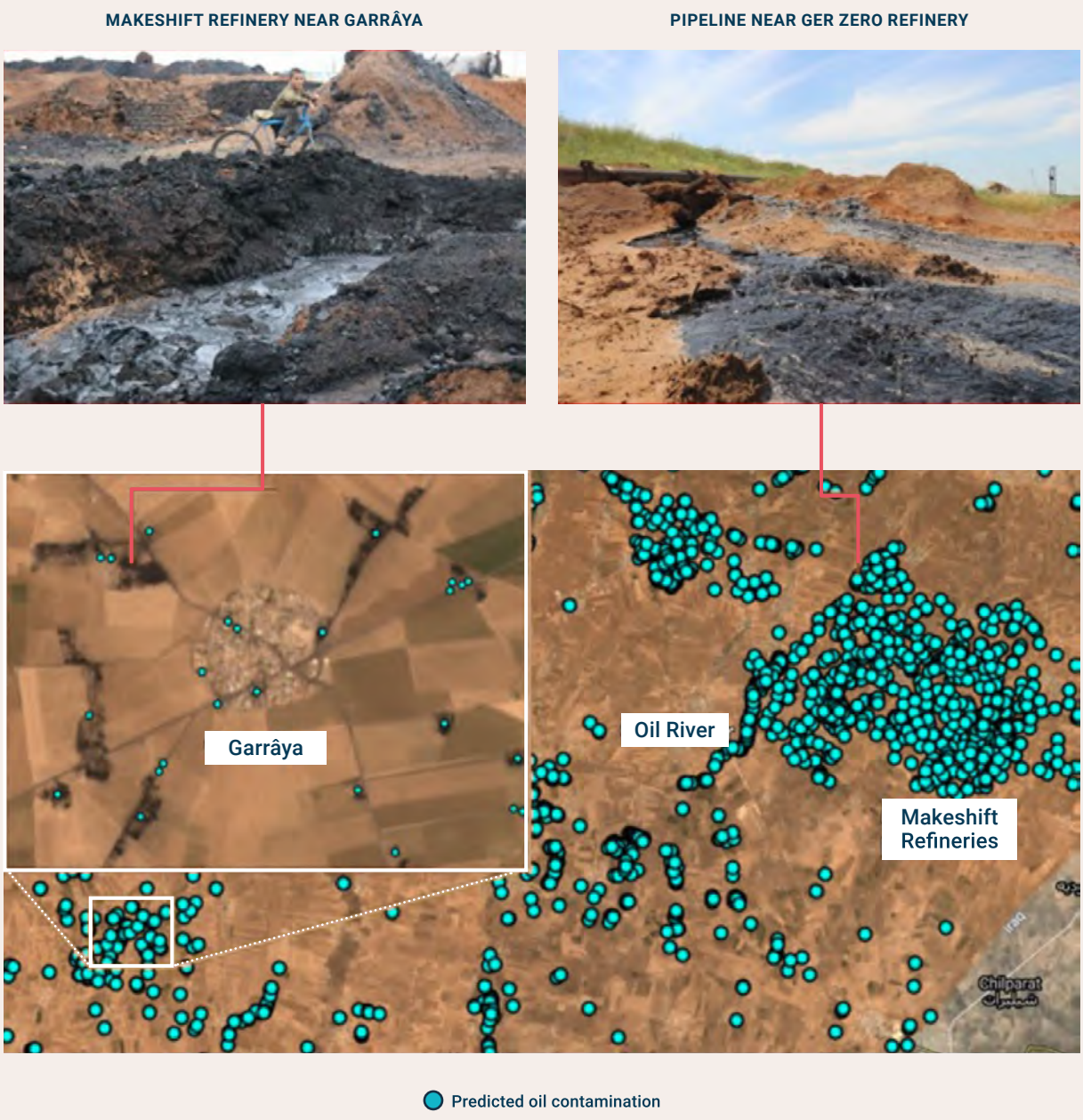
For example, the environmental toll from the destruction of Syria's oil industry is massive, ranging from bombed refineries and oil storage sites to air pollution and leakages into the soil and rivers.[103] Through fieldwork undertaken by PAX, a limited number of oil spills were confirmed on the ground. Photos taken at a refinery south of Gir Zero village (FIGURE 4.3) showed vast swaths of land contaminated by oil, which were clearly visible in multispectral satellite imagery of the area. These confirmed spills were used to train a machine-learning algorithm in GEE, which enables it to distinguish the unique spectral profile of oil from other types of land cover.

Once trained, the algorithm can be applied to thousands of square kilometers to identify areas that display a similar spectral profile. Despite being trained on a limited number of spills, the algorithm accurately identified other oil spills that were verified during fieldwork, including rivers of oil near the villages of Kharab Abu Ghaleb and Tall Maszhan, and leaks from makeshift refineries near Garrâya.

This method helped to identify hundreds of potential oil spills across northeastern Syria. An interactive map of predicted oil contamination was created to allow users to see the number of unique locations and total area of predicted oil spills within a user-defined area.[104] It is worth noting that not all locations identified by the algorithm are confirmed oil spills, and there are likely many false positives. The cause of the oil spill can also be difficult to identify. It is therefore essential to complement AI-based analysis with ground-truthing and field-based validation.

Environmental degradation linked to oil pollution has caused grievances and health concerns among affected communities in northeastern Syria. The rapid assessment of oil contamination hotspots is crucial to start clean-up, remediation, and restoration programmes as part of the peacebuilding and reconciliation process.

FIGURE 4.3: SITES OF OIL CONTAMINATION WERE IDENTIFIED USING MACHINE LEARNING IN SYRIA.



Source: PAX 2021.