

UKRAINE - Air pollution monitoring

Kyivska and Kharkivska oblasts, February-March, 2022

For humanitarian purposes only
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Conflict escalation in Ukraine since February 24, 2022 has already had a profound effect on industry, human well-being and environment. Ongoing hostilities directly impact the operational capacities of industrial facilities in conflict-affected areas, such as multiple fires on fuel depots in Vasylykiv, Kobtsi, and Kalynivka during the month of March. They also limit the mobility of the population, which impacts the amount and distribution of gases typically released by facilities and vehicles.

Nitrogen dioxide (NO₂) is a substance released by combustion processes, such as industrial activity and the burning of fossil fuels. Direct exposure to NO₂ can cause skin irritation and burns, including in the mucus linings of the nose, throat, and lungs. Chronic exposure to NO₂ can cause respiratory or lung diseases, and elevated levels of NO₂ can also harm vegetation, decreasing growth, and reduce crop yields. Interaction of NO₂ with water, oxygen, and other chemicals in the atmosphere can form acid rain.

Generally across Ukraine, concentrations of this gas are highest near Kyiv and Kharkiv Cities, and in the industrial east oblasts.

In the time period between February and March 2022, when the escalation began, there is a visible, general decrease of NO₂ concentrations within the Kyiv and Kharkiv City footprints. However, there is an NO₂ increase in Kyivska oblast to the west and south-west of Kyiv City (1). This is likely related to the by multiple fires on fuel depots.

For Kharkivska oblast, there is a clear decline of NO₂ concentrations within and around conflict-affected areas, including most parts of Kharkiv, while the increase was observed along the main roads. The Absorbing Aerosol Index (AAI) captured by Sentinel-5 imagery indicates the presence of UV absorbing aerosols like dust and smoke. It is useful for tracking the evolution of episodic aerosol plumes from dust outbreaks and biomass burning.

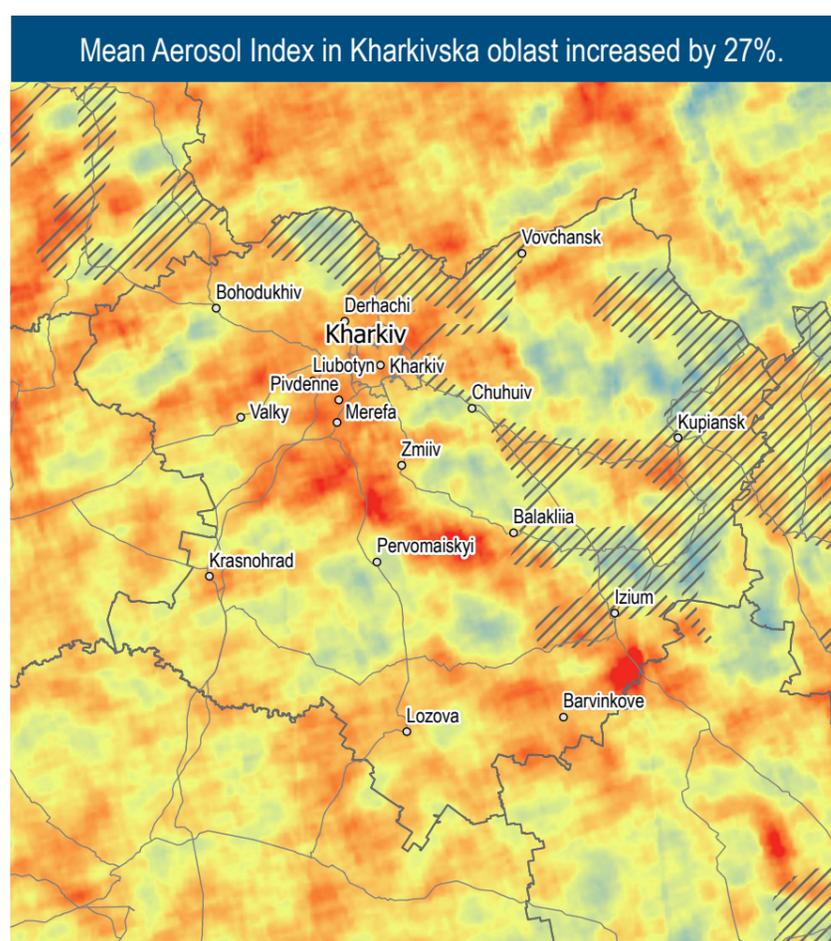
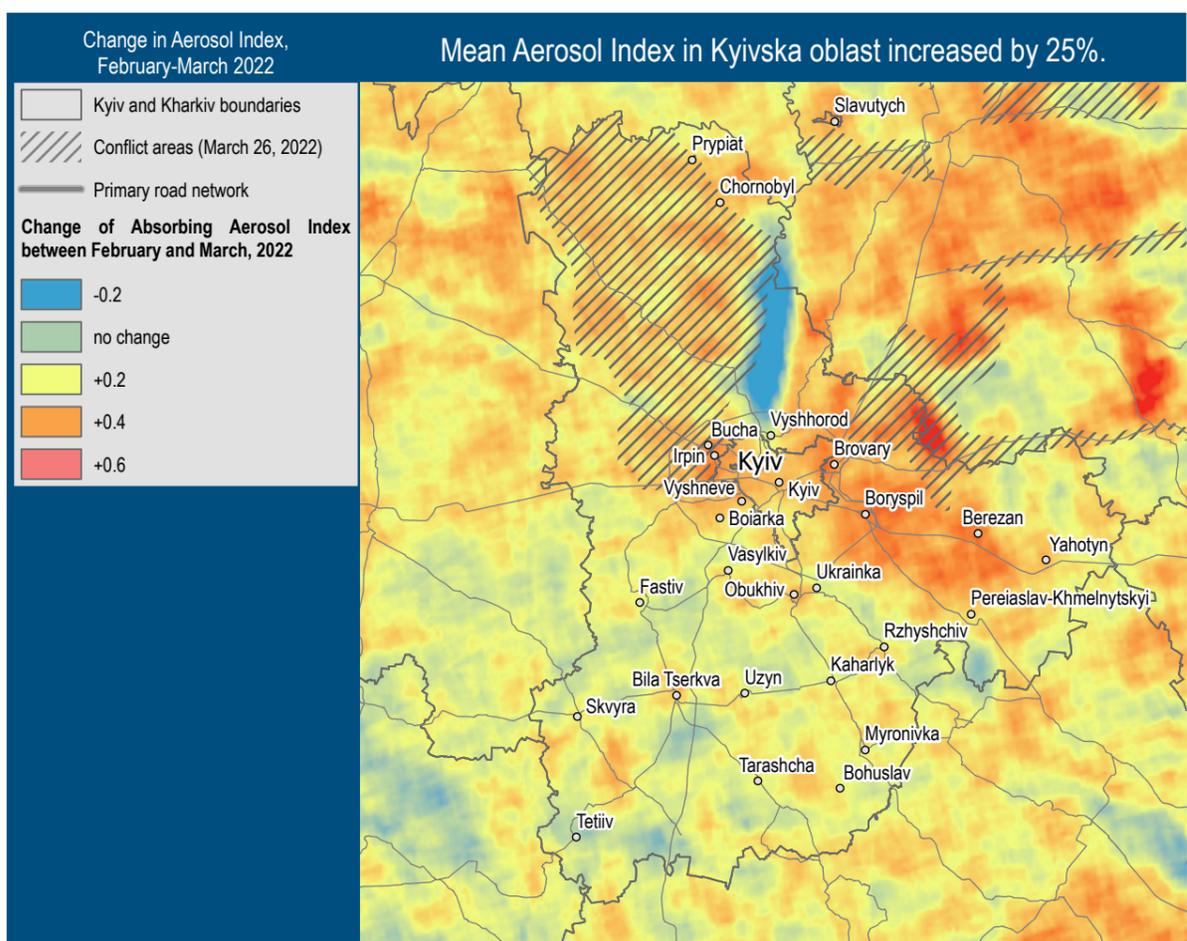
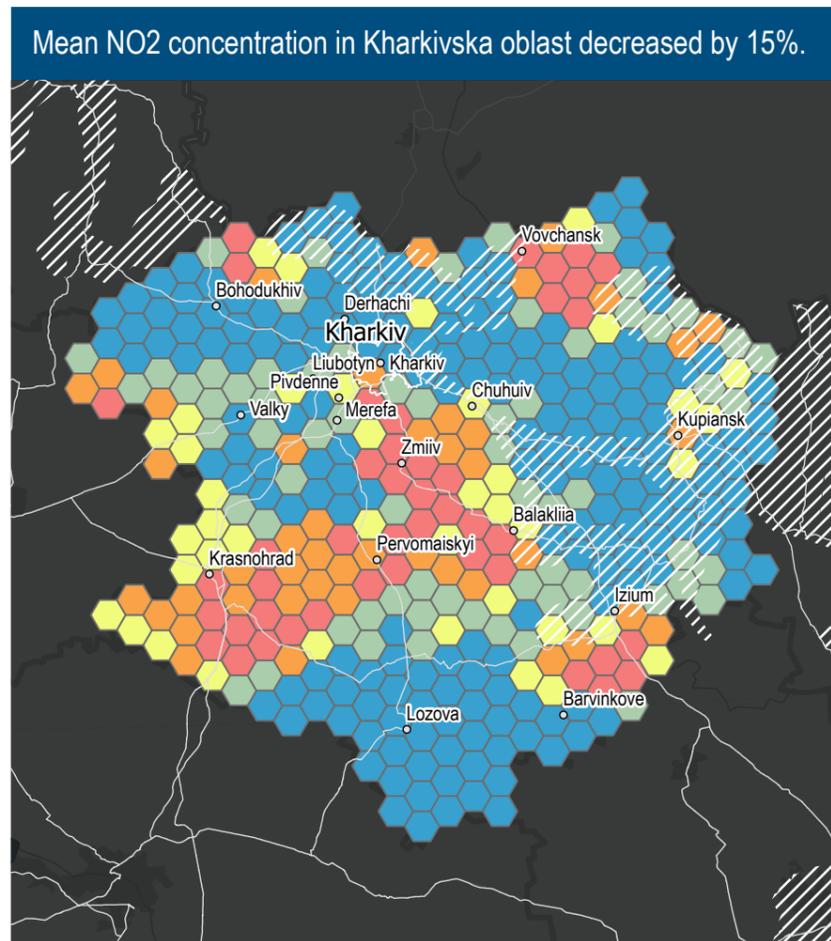
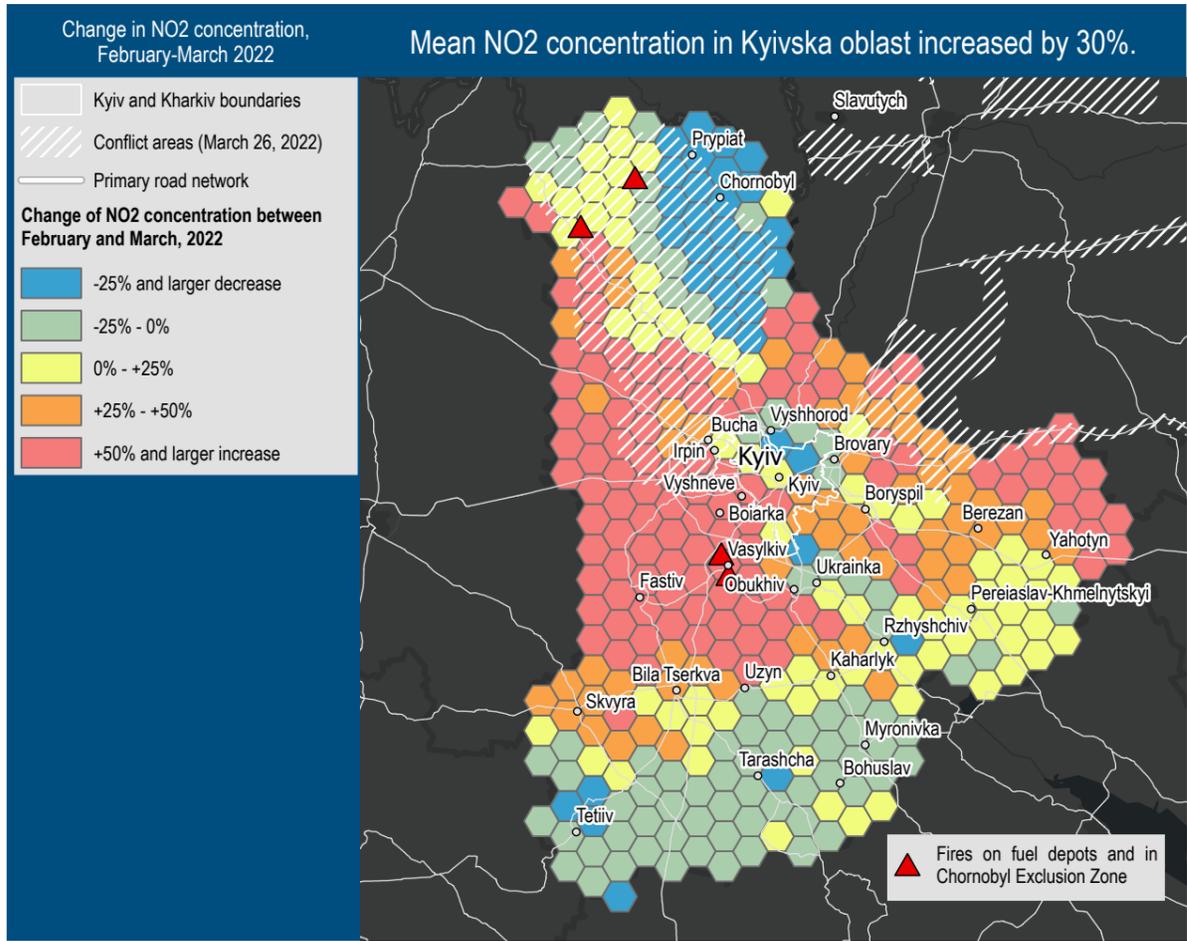
Conflict-affected areas in Kyivska oblast showed a general decrease of NO₂ pollution in areas with no conflict activity compared to February 24, except in the western part of the Chornobyl Exclusion Zone, where several wildfires occurred in the beginning of March.

Combustion processes and fires may also increase concentration of aerosol particles and dust. Particles with an effective diameter smaller than 10 μm, can enter the bronchi, while those with an effective diameter smaller than 2.5 μm can enter as far as the gas exchange region in the lungs, which can be hazardous to human health.

Mean absorbing aerosol index (AAI) values have increased over both Kyivska and Kharkivska oblasts. Higher aerosol concentrations are around Kyiv city, while in Kharkivska oblast, they are mostly located along the main pathways to the East of Ukraine (Izium city and Donetska oblast) and to Poltavska oblast to the west.

Conflict escalation in Ukraine since February 24, 2022 has already had a profound effect on industry, human well-being and environment. Ongoing hostilities directly impact the operation capacities of industrial facilities in conflict-affected areas and limit people flows. In turn it shapes the air pollution by gases typically released by plants and vehicles.

Nitrogen dioxide (NO₂) is a highly-reactive gas that is linked to industrial activity and burning of fossil fuels, and has a negative effect on human health and the environment.



1 Since July 2018, the European Space Agency Sentinel-5P satellite mission has been collecting global atmospheric data on nitrogen dioxide (NO₂), sulfur dioxide (SO₂), carbon monoxide (CO), methane (CH₄) and aerosol concentrations in the atmospheric column. The data for NO₂ is shown here, averaged over one month in February and March of 2022