Conflict-driven environmental and health risks in Mykolaivska Oblast

Area-based assessment

February 2022 - June 2023

Contents

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The Hazardous Events Monitoring Initiative

Rationale

Ukraine is heavily industrialised (metallurgy, mining, machinery, chemical and petro-chemical, energy generation, etc.)

Many industrial facilities are directly impacted by hostilities (damaged, destroyed, dismantled, etc.), leading to the release of hazardous substances into the environment, with negative consequences on human health, productive natural assets and ecosystems.

Event- and facility-specific information is crucial to address immediate and long-term environmental and health risks.
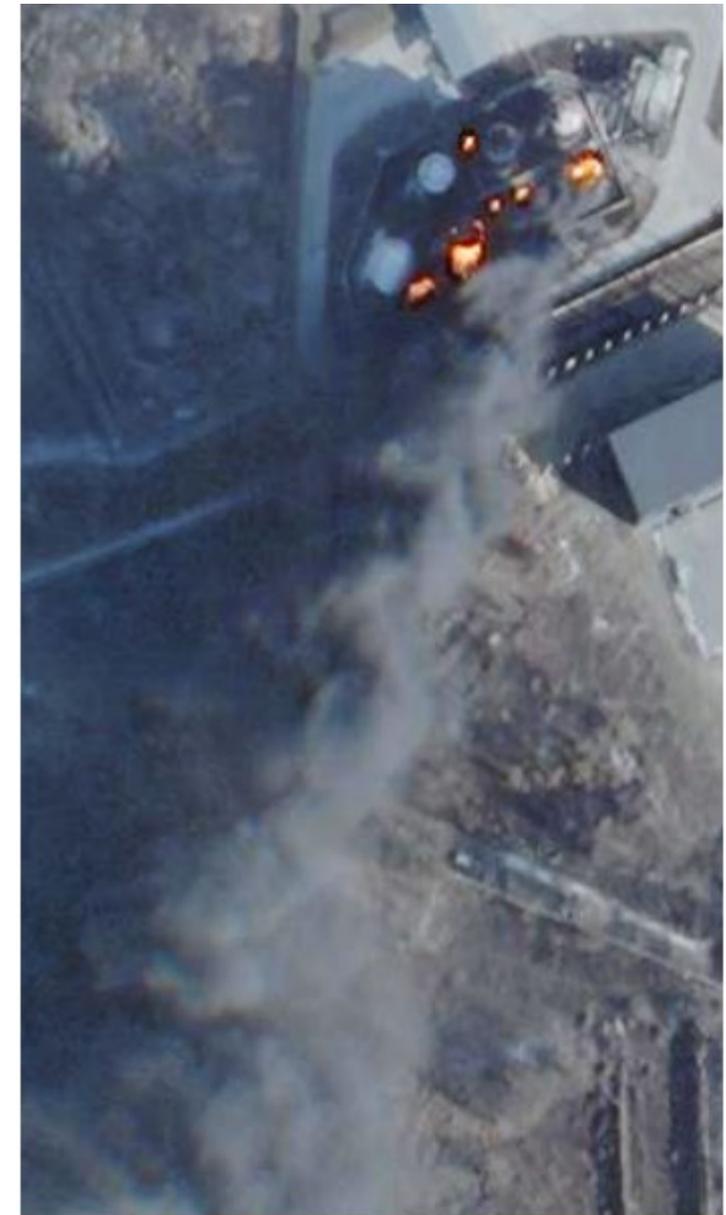
Infrastructure and transport facility in Kyivska oblast, damaged in March 2022 and containing kerosene.

REACH's Hazardous Events Monitoring Initiative

4 facilities affected by conflict in Volynska oblast

Objective

Inform humanitarian and early recovery actions that address the impacts of conflict-related incidences to hazardous industrial infrastructure on the environment, human health and livelihoods.

Methodology

- Media monitoring
- Secondary data review
- Primary data collection & analysis
- Remote sensing (satellite imagery)
- Environment modelling
- Flash Environmental Assessment Tool (FEAT)

Data utilization

Local authorities

Gain a localized understanding of hazardous events' impacts on people and the environment, to develop adapted impact mitigation and recovery measures.

Operational actors (SESU)

Develop emergency response and evacuation plans adapted to identified risks to ensure rapid response to hazardous events.

Environmental NGOs

Develop targeted interventions for environmental restoration, advocate for resources, support affected communities with nature-based livelihoods.

International humanitarian community

Coordinate and prioritize interventions, focusing on the most urgent environmental, health, and livelihoods-related needs.

Local humanitarian NGOs

Tailor localized response efforts addressing specific environmental, health, and livelihood challenges in affected communities.

Donors

Strategic allocation of funds to key areas such as ecosystem restoration, healthcare, and sustainable economic recovery.

The data informing REACH's Hazardous Events Monitoring Initiative is considered sensitive, and therefore not publicly available.

Upon request, **REACH can bi-laterally share reports, datasets and customized maps** with humanitarian and recovery actors.

Please contact us at…

impact.ukraine@impact-initiatives.org

Facility Type

- Agriculture and food production
- Chemical production
- Forestry
- General manufacturing
- Infrastructure and transport
- Mining
- Power
- Small and medium enterprises
- Transport interfaces

Population Density (2020)

Low — High

- Hromadas boundaries within 30 km of the front line
- Oblasts boundaries
- Front line
- Water bodies

Areas beyond the control of the Government of Ukraine (as of 23 October 2023)

Areas_of_control	Unique_F	Date_of_firs	Date_of_lat	Number_of	Number_	Name_UKR	Name_EN	Facility_Type (Zoi)	Facility_Type_Matrix (Zc
government-controlled	1	28/05/2022	17/09/2022	4	3	Слов'янська ТЕС	Slovyansk Thermal Power Pl	Thermal power	Thermal power generati F
non-government-controlled	12	19/03/2022	15/08/2022	34	32	Вуглегірська ТЕС	Vuhlehirsk Thermal Power F	Thermal power	Thermal power generati F
government-controlled	15	05/04/2022	15/06/2023	5	5	Торецький фенольний завод	Toretsk Phenol Plant	Chemical and coke-chem	Production of basic chem
non-government-controlled	17	03/03/2022	13/07/2022	11	6	Маріупольський металургійн	Ilyich Iron and Steel Works	Metallurgy and metal prc	Pig iron, steel, and ferro G
government-controlled	18	13/03/2022	20/10/2023	81	79	Авдіївський коксохімічний зає	Avdiivka Coke and Chemical	Chemical and coke-chem	Production of basic chem
non-government-controlled	20	19/03/2022	21/03/2023	3	0	Шахта ім. О. О. Скочинського	O.O. Skochynskyi Mine	Mining	Coal mining and process
non-government-controlled	50	03/03/2022	26/05/2023	47	44	Металургійний комбінат «Аз	Azovstal Metallurgical Plant	Metallurgy and metal prc	Pig iron, steel, and ferro G
government-controlled	64	08/09/2022	31/10/2023	22	21	Курахівська ТЕС	Kurakhove Thermal Power F	Thermal power	Thermal power generati F
government-controlled	68	29/05/2022	21/10/2023	3	2	Шахта «Торецька»	Toretska Mine	Mining	Coal mining and process
non-government-controlled	76	18/04/2022	18/04/2022	1	1	Бахмутський аграрний союз	Bakhmut Agricultural Union	Agriculture	Livestock and poultry far A
government-controlled	100	03/06/2022	03/06/2022	1	1	Красногорівський вогнетривн	Krasnohorivka Refractory Pl	Construction	Construction materials a P
non-government-controlled	108	02/03/2022	02/03/2022	2	1	Єнакіївський металургійний зі	Yenakiieve Iron and Steel W	Metallurgy and metal prc	Pig iron, steel, and ferro G
non-government-controlled	111	29/05/2022	29/05/2022	1	1	Донецьккокс	Donetskcoke		
non-government-controlled	114	01/03/2022	14/07/2022	22	19	Сєверодонецьке об'єднання «	Severodonetsk Association	Chemical and coke-chem	Production of basic chem
non-government-controlled	115	02/03/2022	02/03/2022	1	1	Стахановський завод феросп	Stakhanov Ferroalloy Plant	Metallurgy and metal prc	Pig iron, steel, and ferro G
non-government-controlled	120	21/02/2022	23/02/2022	3	3	Луганська ТЕС	Luhansk Thermal Power Pla	Thermal power	Thermal power generati F
non-government-controlled	127	15/06/2022	30/06/2022	2	2	Лисичанський содовий завод	Lysychansk Soda Plant	Chemical and coke-chem	Basic inorganic chemical
non-government-controlled	139	02/03/2022	13/03/2022	3	3	Попаснянський вагоноремонт	Popasnyansky Wagon Repai	Machine building	Machinery manufacturin
non-government-controlled	142	18/03/2022	21/04/2022	2	1	Завод «Азовмаш»	Azovmash Factory	Machine building	Machinery manufacturin
non-government-controlled	149	22/03/2022	14/08/2022	21	21	Лисичанський нафтоперероб	Lysychansk Oil Refinery	Chemical and coke-chem	Petroleum refining and p
non-government-controlled	159	28/02/2022	01/03/2023	2	2	Стахановський вагонобудівни	Stakhanov Wagon-Building	Machine building	Machinery manufacturin
non-government-controlled	176	05/03/2022	05/03/2022	1	1	Шахта ім. Д. Ф. Мельникова	D.F. Melnykov Mine	Mining	Coal mining and process
government-controlled	182	27/03/2022	19/08/2022	7	6	Новокраматорський машиноб	Novokramatorsky Machine E	Machine building	Machinery manufacturin
non-government-controlled	186	05/04/2022	11/05/2022	3	3	НВП «Зоря»	Zorya Scientific and Product	Chemical and coke-chem	Explosives manufacturin
government-controlled	206	14/03/2022	10/03/2023	6	1	Карлівська фільтрувальна ста	Karlivka water treatment pl	Water and waste water	Drinking water supply G
government-controlled	208	24/04/2022	24/04/2022	1	1	Насосна станція III підйому ка	Pumping station III of the Si	Water and waste water	Drinking water supply G
non-government-controlled	212	24/04/2022	24/04/2022	1	0	Насосна станція I підйому Пів	Pumping station I of the Sou	Water and waste water	Drinking water supply G
non-government-controlled	307	09/03/2022	01/04/2022	2	2	Шахта «Золоте»	Zolote Mine	Mining	Coal mining and process
non-government-controlled	311	24/02/2022	06/06/2023	20	13	Каховська ГЕС імені П. С. Неп	Kakhovka Hydropower Plant	Hydropower	Hydropower generation F

Report thumbnails:

- Hazardous Events Monitoring Initiative — **Conflict-affected Industrial Facilities in Ukraine** — Assessment of environmental contamination and health risks — Nationwide situation overview (February – December 2022) — May 2023 | Ukraine — REACH
- Hazardous Events Monitoring Initiative — **Conflict-driven environmental and health risks in Kherson region** — Area-Based Assessment — August 2023 | Ukraine — REACH
- Hazardous Events Monitoring Initiative — **Conflict-driven environmental and health risks in Mykolaivska Oblast** — In-depth area-based assessment (February 2022 - June 2023) — August 2023 | Ukraine — REACH
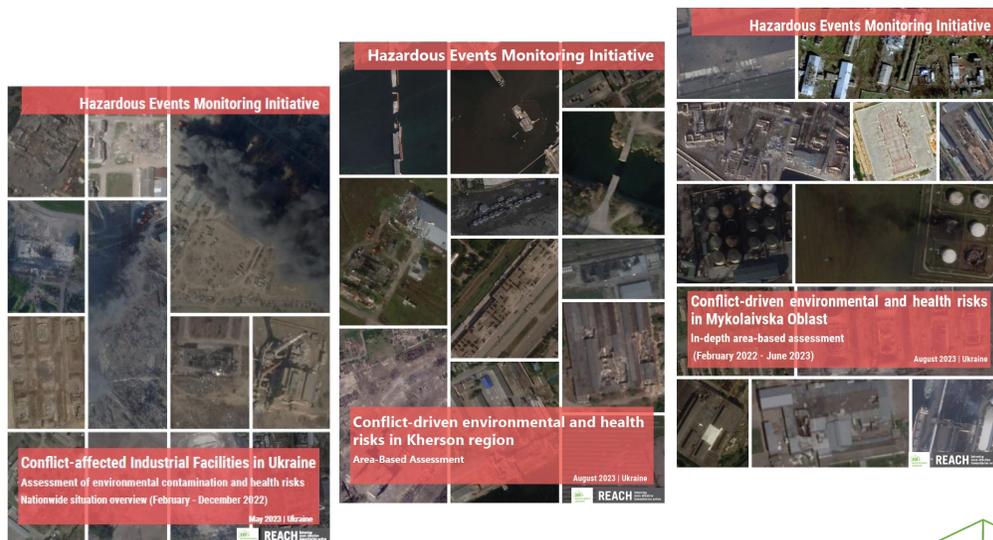
02

Background & key findings

Background

🏭 **Mykolaiv Oblast serves as a key industrial hub in Ukraine**, playing a crucial role in the country's industrial sector.

✳️ **The region experienced active conflict** from February to early April 2022, followed by **persistent shelling** until mid-November 2022.

⚠️ The combination of long-standing industrial pollution and recent conflict-related damage to industrial facilities in Mykolaiv **poses significant risks to human health, local livelihoods, and the ecological balance** of the Dnipro River and the Black Sea.

This presentation is part of an in-depth assessment of environmental and public health impacts emanating from conflict-related hazardous incidents in Mykolaiv District since 24 February 2022

Conflict-related incident at a petroleum storage facility in Mykolaiv Oblast.

Methodology

01

Media monitoring

Baseline data derived from Zoï Environment Network's Ecodozor.org, which consolidates multiple sources to monitor Ukraine's war-induced environmental impact, cataloging disruptions to infrastructure and utilities from public and authority reports, with expert analysis and satellite verification, categorizing and geo-locating incidents in a continuously updated database since 24 February 2022.

02

Remote sensing

When relevant, identified conflict-affected facilities were visually inspected using Planet Labs' high-resolution satellite imagery to confirm damage, assess its severity, and identify traces of environmental contamination. While facility damage can be used as a proxy to assess contamination, it is not always possible to confidently infer a causal relationship between damage and contamination.

03

Primary data

16 key informant (KI) interviews with representatives of local authorities (4), local environmental experts (3), conflict-impacted entreprises (4) and residents (5). Insights from key informants were triangulated with secondary data, remote sensing and FEAT analysis to develop a holistic understanding of local impacts.

04

Flash Environmental Assessment Tool

Helps to identify existing or potential acute environmental impacts that pose a threat to humans, human life-support functions and ecosystems, following sudden-onset natural disasters and conflicts.

Key findings

From February 2022 to June 2023, **59 conflict-related events at hazardous industrial facilities were recorded across 27 settlements** of Mykolaivska oblast, with potential large-scale impacts on the environment, human health and livelihoods.

A third of incidents occurred at port infrastructure near the Dnipro River, suggesting **high levels of pollution to water resources and potential public health impacts** due to toxic chemicals.

The most common hazardous substances found in affected industrial facilities **are nitric acid, organophosphate, pesticide, isopropyl alcohol, ammonia, ammonium nitrate, oils and solvents, diesel, kerosene, and liquified petroleum gas (LPG)**. These substances can cause both immediate and long-term environmental and health consequences, highlighting the importance of local responders' awareness regarding substance-specific impacts and mitigation measures.

On 6 June 2023, the Kakhovka Dam breach resulted in the **flooding of an area including Novopetrivsky Plavni landscape reserves, the Pischany peninsula, and the Ivano-Kepine botanical reserve**, with potential long-lasting impacts on ecosystems.

Key findings

Key informants highlighted complex and multifaceted impacts of conflict-driven environmental damage in Mykolaiv region, including:

- **Disruptions to water supply for households and businesses**
- **Disruptions to transportation networks**
- **Air and soil contamination**
- **Overall decrease in living standards and psychological stress**
- **Reduced access to productive natural assets due to mines and UXOs**
- **Displacement and relocation.**

Half of the KIs reported a **low awareness of contaminated areas and of their consequences,** mentioning the low availability of information enabling them to take appropriate protective measures.

Persisting **information gaps** hinder the ability of actors to build a comprehensive understanding of the potential long-term impacts of environmental damage in the Mykolaiv region, indicating a **need for ongoing monitoring of hazardous events** to mitigate impacts on human health and livelihoods.

03

Conflict-related incidents at industrial facilities

Mykolaiv Oblast and District

Population of Mykolaivska Oblast in 2020 was 1,091,800 people

Population Density (2020)
- High
- Low

Cities
- <15000
- 15000 - 65000
- 470000

- Raions
- Water objects
- Main roads
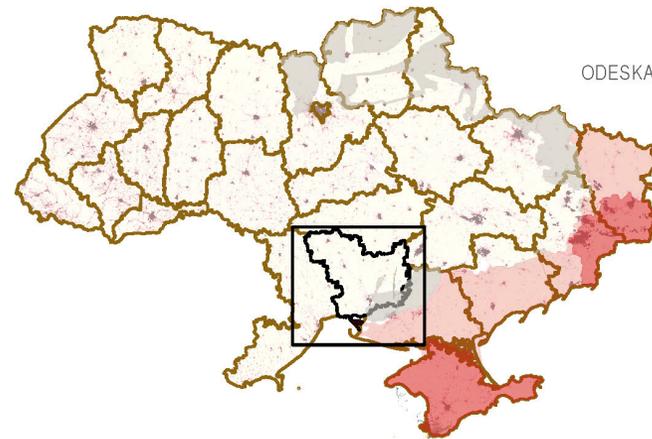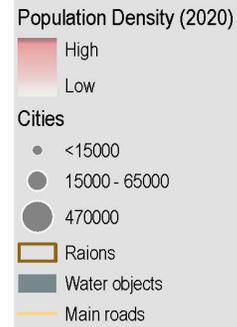
Territory of armed conflict, areas inaccessible as of 20 June 2023

Areas where the Government of Ukraine regained control as of 20 June 2023

Crimea, and area of Donetska and Luhanska oblasts beyond the control of the Government of Ukraine since 2014

Pervomaisk
Pervomaiskyi Raion
Yuzhnoukrainsk
Voznesenskyi Raion
Voznesensk
Nova Odesa
Mykolaivskyi Raion
Mykolaiv
Ochakiv
Black Sea
KIROVOHRADSKA OBLAST
Novyi Buh
DNIPROPETROVSKA OBLAST
Bashtanskyi Raion
Bashtanka
Snihurivka
KHERSONSKA OBLAST
ODESKA OBLAST

0   20   40
Km
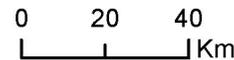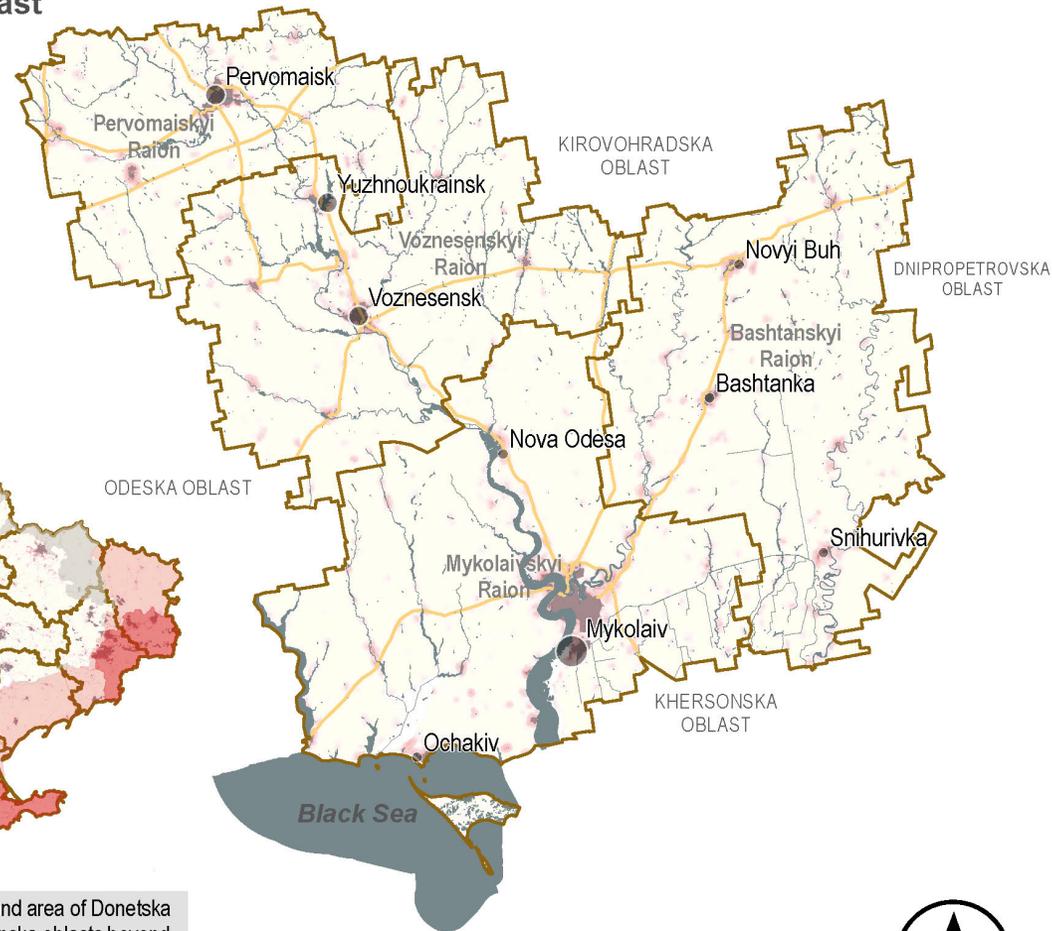
Pre-war environmental challenges in Mykolaivska Oblast

Governmental environmental protection experts identified the following environmental concerns pre-dating February 2022:

1 **Soil pollution and corrosion** caused by extensive use of pesticides by farmers and breach of soil usage legislation.

2 **Soil degradation** caused by water and wind erosion, excessive ploughing of natural sites, low quality of woodland belts.

3 **Poor quality of drinking water:** large amounts of organic substances in the water, strong smell of chlorine, lack of fresh water; disturbed ecological balance due to increase water level and flooding in the Oleksandriv reservoir; poor condition of treatment facilities; pollution and siltation of water bodies.

4 **Air pollution** due to large numbers of trucks and industrial facilities, sludge depositories, drought and frequent forest fires.

5 **Waste disposal**: accumulation of hazardous wastes leading to the deterioration of the landfill condition in Korenykha.
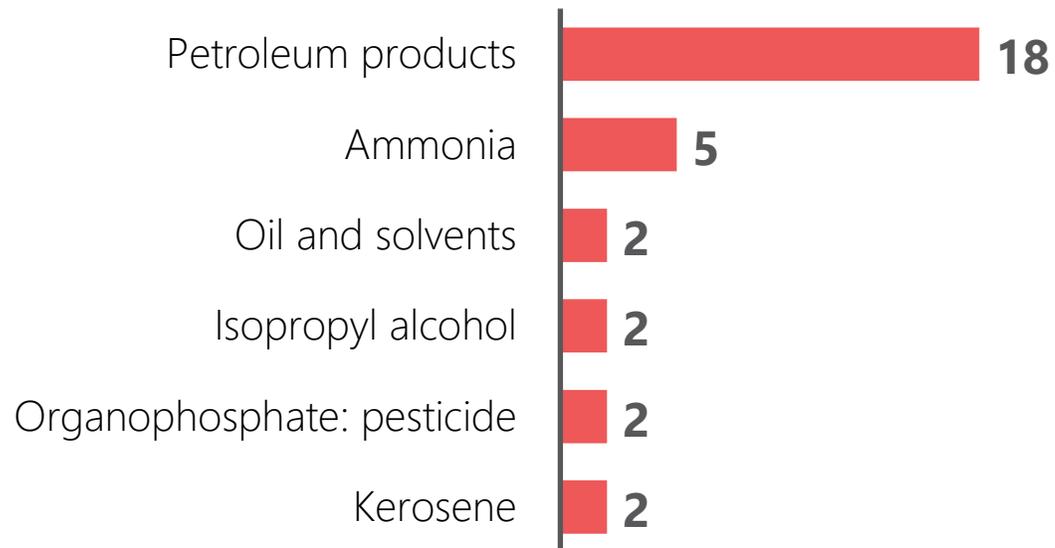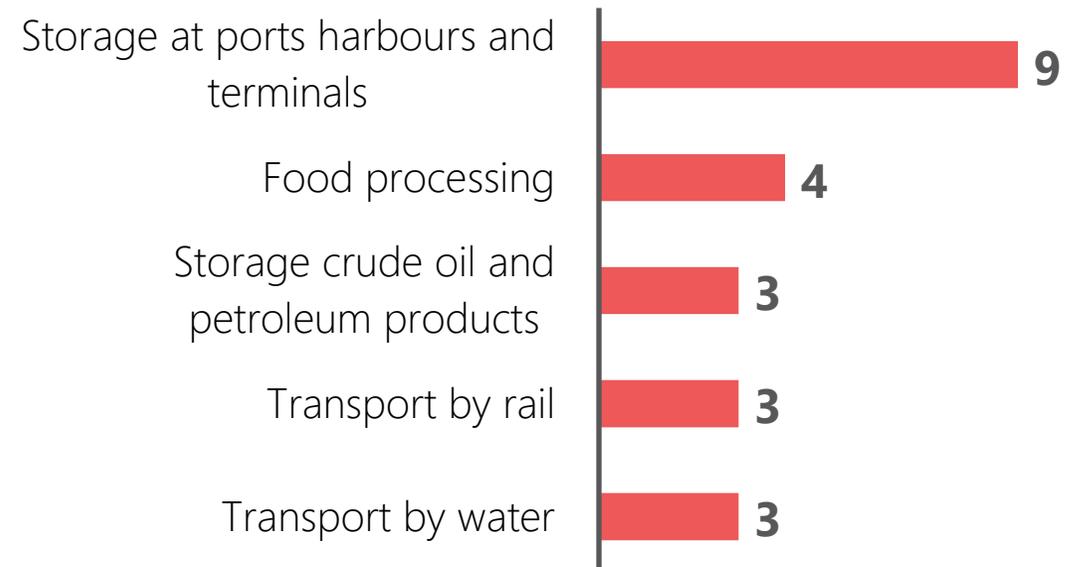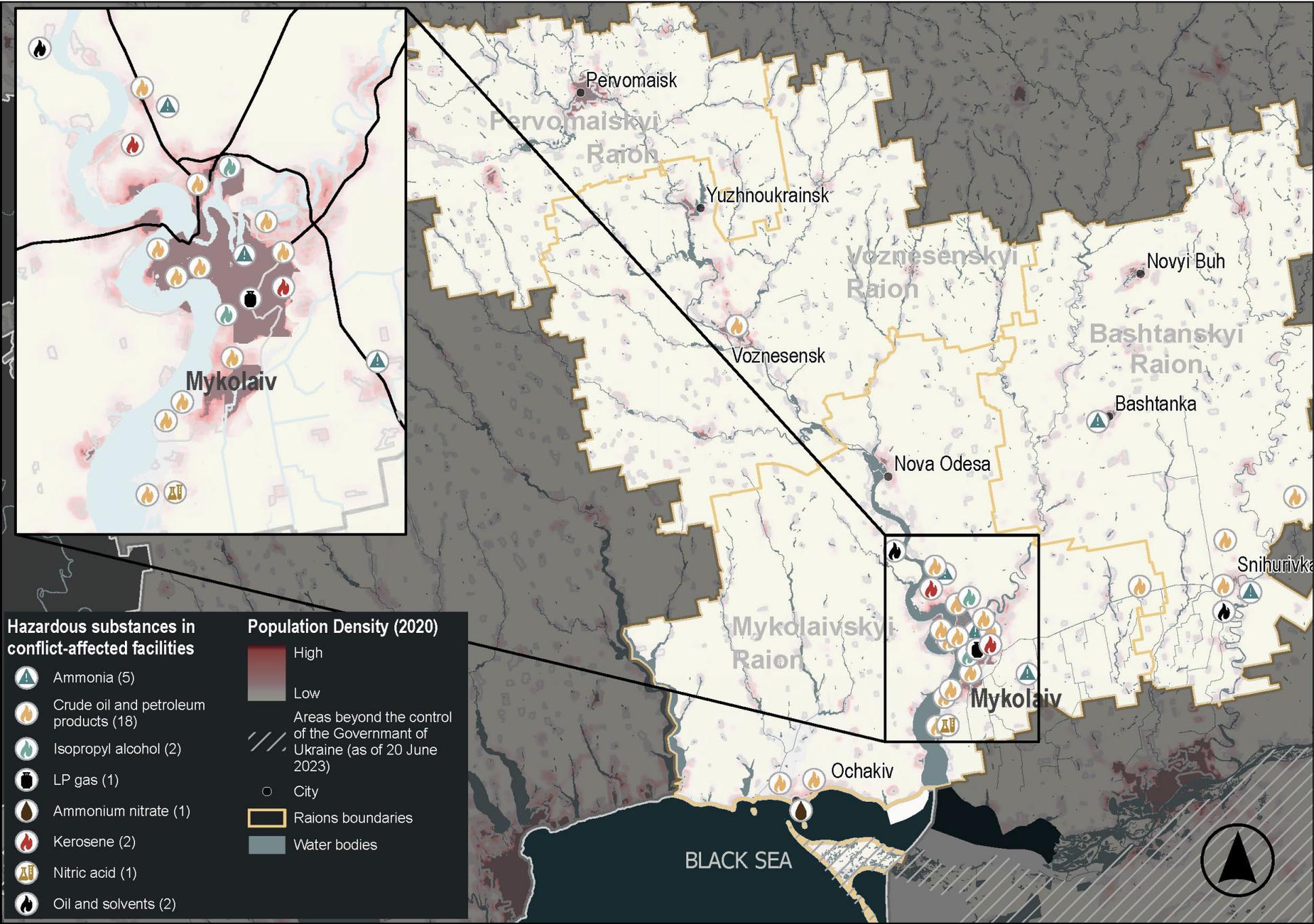
Conflict-affected industrial facilities in Mykolaivska District

Hazardous substances in conflict-affected facilities

- Ammonia (5)
- Crude oil and petroleum products (18)
- Isopropyl alcohol (2)
- LP gas (1)
- Ammonium nitrate (1)
- Kerosene (2)
- Nitric acid (1)
- Oil and solvents (2)

Population Density (2020)

High

Low

Areas beyond the control of the Government of Ukraine (as of 20 June 2023)

○ City

Raions boundaries

Water bodies

04

Conflict-driven environmental impacts in Mykolaiv region

Impacts on the atmosphere (air)

Fire at maritime port LLC Nika-tera

- Major fire that erupted on an area of 10,000 square meters on 4 June 2022.
- Assessed damage exceeds 171 million USD.

Anthropogenic forest fires

- Forests of the Balabaniv and Galitsyn tracts and estuaries burned as a result of rocket attacks.
- The impact of resulting atmospheric pollution are estimated at more than 20.5 million USD.

This incident highlights **the severe impact on air quality and the urgent need for comprehensive measures** to mitigate resulting environmental and public health repercussions.

Fire at an industrial facility in Mykolaiv on 4 June 2022

> *"I think that the substances, which were emitted into the air and that we breathed in, will have a significant impact on the health of the people who live in the neighborhood. We will see the consequences later."*
>
> **- Community KI**

Impact on water resources

Water resources were unanimously identified by KIs as the most crucial for communities, for:

1 **Irrigation systems relying** on the Ingulets and Dnipro rivers

2 **Transportation of grain on barges** across the Southern Bug River towards Mykolaiv

3 **Supporting** the needs of the **machine-building industry**

4 Providing people with **drinking water**

> *"Unfortunately, there is lack of potable water in Mykolaiv, and it is a huge problem which arose due to the war. We did not have any problems with water before."*
> **- Local Authorities KI**

CASE STUDY: Environmental impact in the Bug estuary

Environmental contamination in the Bug estuary following shelling of the vegetable oil tank LCC "Every" on 16-17 October 2022
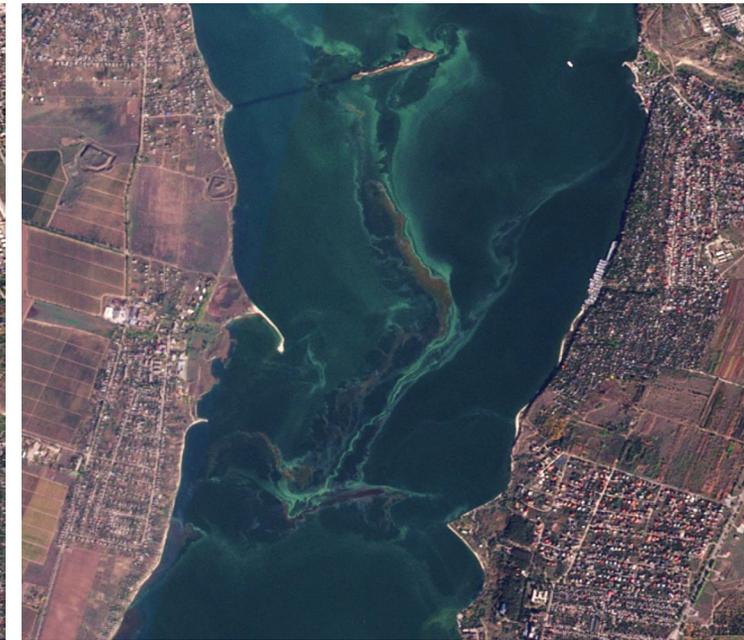
The Bug Estuary is an illustrative example of the conflict's complex and potentially **long-lasting impact on fragile ecosystems**. In October 2022, a **drone attack damaged a vegetable oil tank**. As a result:

- Large quantities of **oil were released into the estuary**
- Contaminated area reaching **3,000 square meters**
- **Fat content** in the water was found to be **5.5-15 times higher than normal**, representing a significant threat to ecosystems, including ichthyofauna and birds

Impacts on land and soils

The primary environmental impacts of the conflict on soils and land, as reported by all KIs:

- **Mined zones** encompassing lands, agricultural areas, warehouses, and fields
- **Pollution** from fragments of reinforced concrete, glass, and plastic materials
- **Soil contamination** through the leakage of petroleum products and sunflower oil
- **Combustion-related damage** to fields
- Presence of **cattle carcasses**.

These factors collectively contribute to soil degradation, including compaction and erosion of upper layers, diminishing its quality and productivity.

❞

"We cannot use our black soils and fields due to mining. Most farmers do not work because of such restrictions. Access to forests are mined, as well as the river banks. There is no access to river banks."

- Local Authorities KI

Potential risk of soil damage

- Lowest
- Moderate
- High
- Natural reserves
- Water bodies

KIROVOHRADSKA OBLAST
Pervomaisk
Yuzhnoukrainsk
DNIPROPETROVSKA OBLAST
Novyi Buh
Voznesensk
Bashtanka
Nova Odesa
ODESKA OBLAST
MYKOLAIVSKA OBLAST
Snihurivka
KHERSONSKA OBLAST
MOLDOVA
Mykolaiv
Ochakiv
BLACK SEA
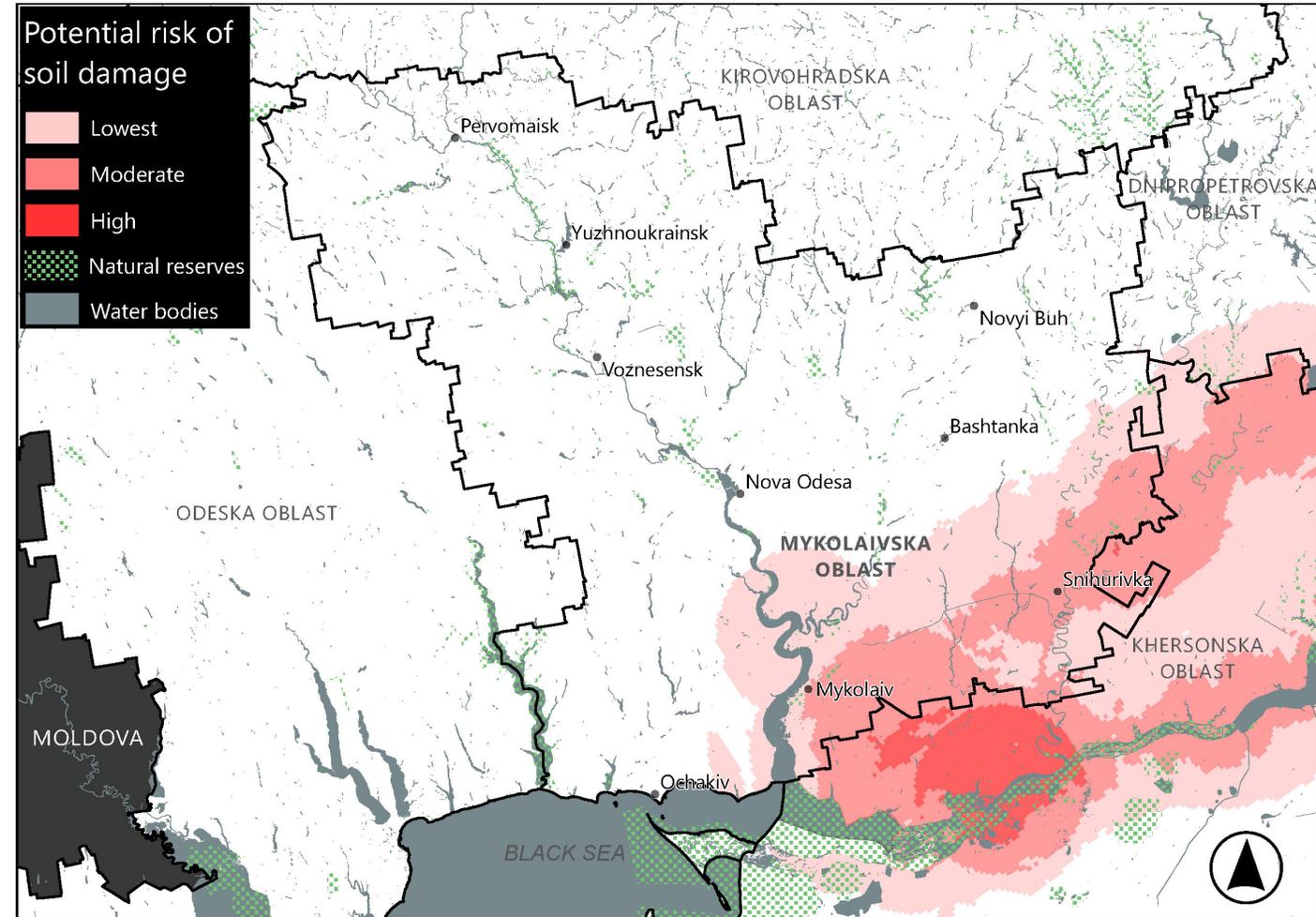
Potential risk of soil damage in Mykolaivska oblast

The severity of soil damage is determined using two indicators: **intensity of hostilities** and **proximity to the front line.**

Impacts on ecosystems and biodiversity

Key informants reported the following impacts on ecosystems and biodiversity:

1. **Mine and UXO contamination** in plantation forests **can cause harm to animals** like foxes and hares as well as **inhibit plant growth**

2. **Fires and shelling** damage forests, leading to **increased plant debris**, while **movement of military equipment disturbs ground vegetation**

3. **The accumulation of pollution in plants** impacts the overall **health of the ecosystem**

4. **Damage to nature reserves limits their recreational potential**

5. Local authority representatives noted that a **ban on hunting** in forests has led to an **increase in the population of wild animals, contributing to rabies outbreaks**

05
Case studies

Environmental impacts of the Kakhovka dam breach in the Mykolaiv region

On 6 June 2023, the breach of the Kakhovka Dam resulted in the flooding of large areas, with significant environmental consequences, including:

- The washing out of the **plant cover** and **root systems**
- **Siltation** of some areas
- Alterations in the configuration of crystalline outcrops
- **Submergence of burrows** belonging to insects and birds, including the red-billed species; and
- Accumulation of debris, such as dry bushes, dry grass, and animal remains (including rabbits, crayfish, and fish entangled in tree branches).

Direct environmental losses caused by the flood in Mykolaiv region were estimated at **1.4 million USD** by the [State Environmental Inspection of South-Western District](#) on 14 July.

Several challenges prevent a comprehensive assessment of nature reserve fund's territory:

- Some areas are under the control of the Russian Federation
- Military activities are ongoing in certain areas
- Demining operations will be needed before inspections can be carried out safely.

Afanasiivka, 9 June 2023
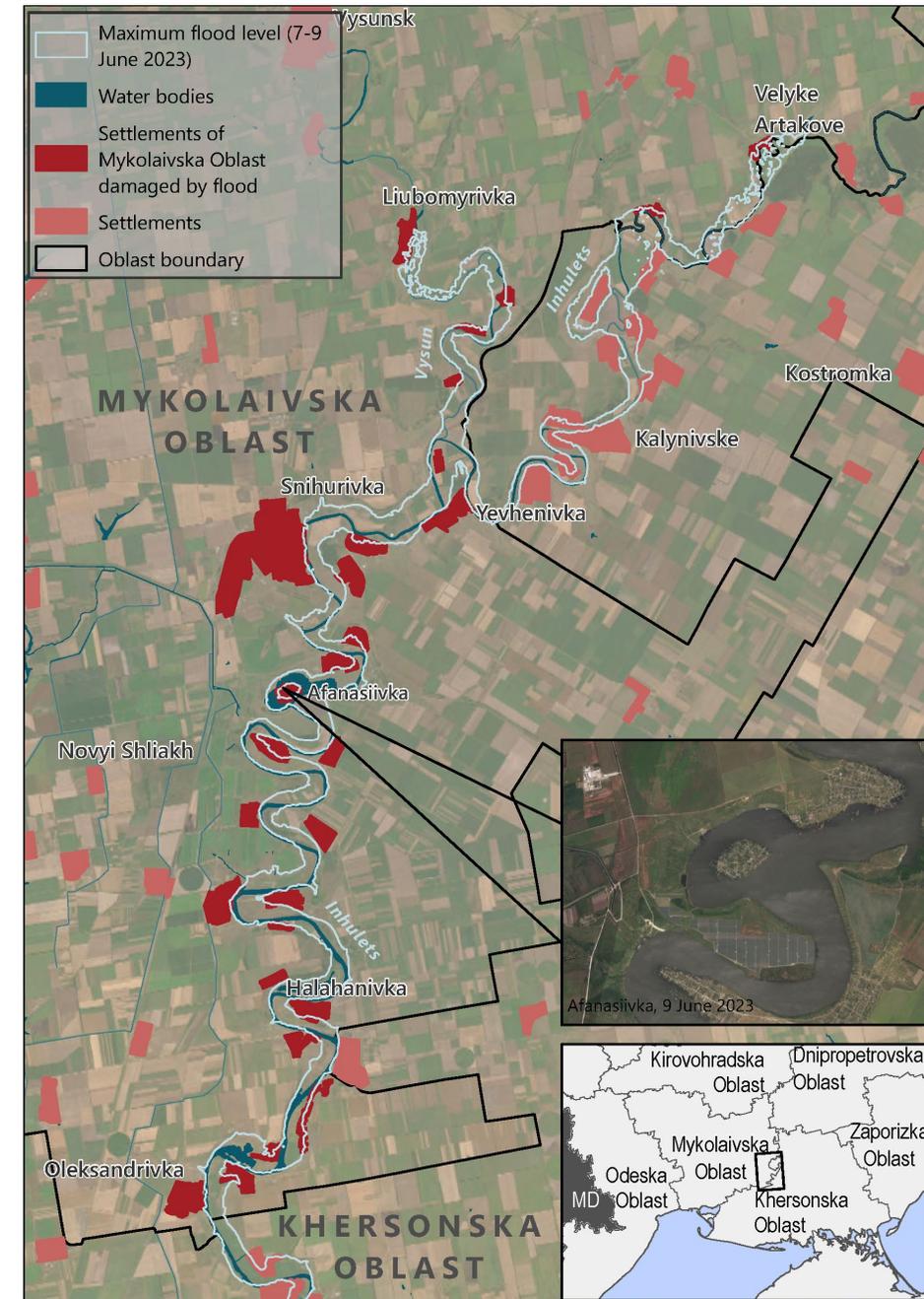
CASE STUDY: Destruction of the fuel and lubricants warehouse of the Odesa Railway Locomotive Depot in Mykolaiv City

Legend:
- Crude oil and petroleum
- Human health impact radius (5 km)
- Settlements boundaries
- Industrial buildings
- Other buildings
- Water objects
- Roads

Mykolaiv

Mykolaivske

Maxar

Health impact radius due to the damage at Odesa Railway Locomotive Depot in Mykolaiv City
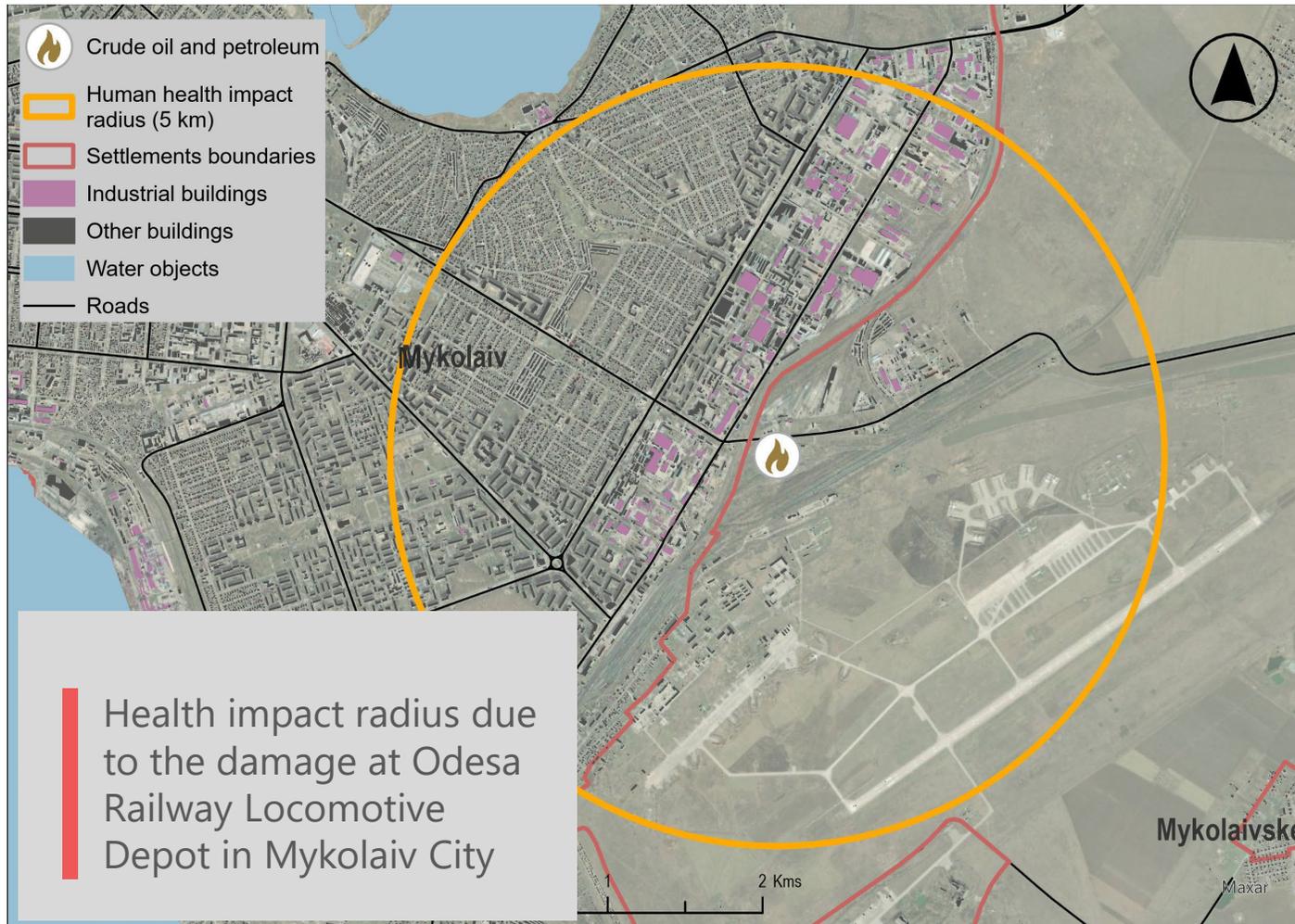
It occurred on 25 February 2022 and resulted in the **combustion of about 1,200 tons of diesel fuel**. The combustion of diesel can produce irritating, corrosive, and/or toxic gases and have acute health effects, **posing a risk to human health within a 5 km radius**. Impacts on the aquatic environment are also possible 1.3-10km downstream of the incident.

Odesa Railway Locomotive Depot in Mykolaiv City
Damaged in February 2022
Containing diesel fuel

06

Impact on community and livelihoods

Impact on community and livelihoods

Disruptions to water supply for households and businesses

Mines and UXOs pose acute threats to the life and health of people

Displacement and **relocation**

Disruptions to transportation networks, for example, the destruction of railway bridges halted grain transportation on barges across the Pivdenny Bug River in the direction of Mykolaiv

Reduced access to productive natural assets due to mines and UXOs (agricultural lands and forests, drinking water, recreational areas, water bodies and beaches, river coasts, etc.)

Overall **decrease in living standards** and **increased psychological stress** due to military operations and safety concerns

Constant artillery shelling causes **air pollution** and **soil contamination** affecting agricultural lands

07

Impact mitigation and recovery measures

Implemented response measures and public awareness

Measures so far implemented:

Demining to restore access to natural resources and industrial areas

Monitoring of atmospheric air quality

Collection and removal of demolition waste to prevent the accumulation of broken glass, plastic, and fragments of shells in the environment

When feasible, **collecting substances** released into the environment, e.g. sunflower oil in the Bug estuary.

The **most useful measures** mentioned by community member KIs included the **disposal of debris**, **fire extinguishing**, restoration of **water supply systems**, the **provision of information** on contaminated areas, and **household-level mitigation measures**. All KIs acknowledged the effective efforts of various state, community-based, and international actors to mitigate the consequences.

Half of the KIs reported a **low awareness** of contaminated areas and their consequences and mentioned a **low availability of information** allowing them to take appropriate protective measures. The main sources of information mentioned by respondents were mass and social media, followed by relatives, the State Emergency Services of Ukraine, and staff from agricultural enterprises.

Additional recovery measures needed according to local key informants

Priority measures identified by local KIs are:

- **Continued demining** of land (from mines, fragments of shells, and unexploded ordinances) and water bodies (removal of ammunition).
- **Continued collection, transportation, and disposal services for debris** (fragments of broken glass, plastic material, reinforced concrete, and burnt trees).
- Restoration of potable water supply, sewage, and water treatment infrastructure.
- **Ongoing environmental monitoring** (i.e. water quality) and in-depth assessments, including the procurement of specialised equipment (i.e. mobile laboratories for water testing); engaging the services of specialists, and ecologists.
- Restoration of natural sites.
- Measures to revive local industries (delivery of raw materials and products).
- Simplify the procedure for damage compensation and create a commission to assess the extent of damage.

Despite the urgency of addressing environmental damage to prevent irreversible impacts, some obstacles prevent the implementation of identified measures. Among those, KIs mentioned:

- Ongoing military operations and further damage caused to industrial infrastructure.
- Mines and UXOs preventing access to impacted areas.
- Limited funding, workforce and expertise to carry out systemic environmental monitoring and assessment.
- Lack of detailed information to prioritise areas for recovery.

The full report is not publicly available due to the sensitive information it contains. **REACH can share the report bi-laterally upon request** with humanitarian actors to enable the inclusion of industrial risks in sectoral programming, support operational preparedness and response, and inform recovery activities.

REACH is also able to **share extracts of its hazardous events database**, and **produce customized maps** upon request.

To know more, please contact REACH at...

impact.ukraine@impact-initiatives.org

**Hazardous Events Monitoring Initiative**

Conflict-driven environmental and health risks in Mykolaivska Oblast
In-depth area-based assessment
(February 2022 - June 2023)

August 2023 | Ukraine

zoï environment network

Thank you for your attention

✉ Please contact IMPACT
for the full report and data at
impact.ukraine@impact-initiatives.org

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REACH Informing
more effective
humanitarian action