

Flood risks in Ukraine in 2024

Area-based assessment for Halytska hromada

March 2024 | Ukraine

Introduction

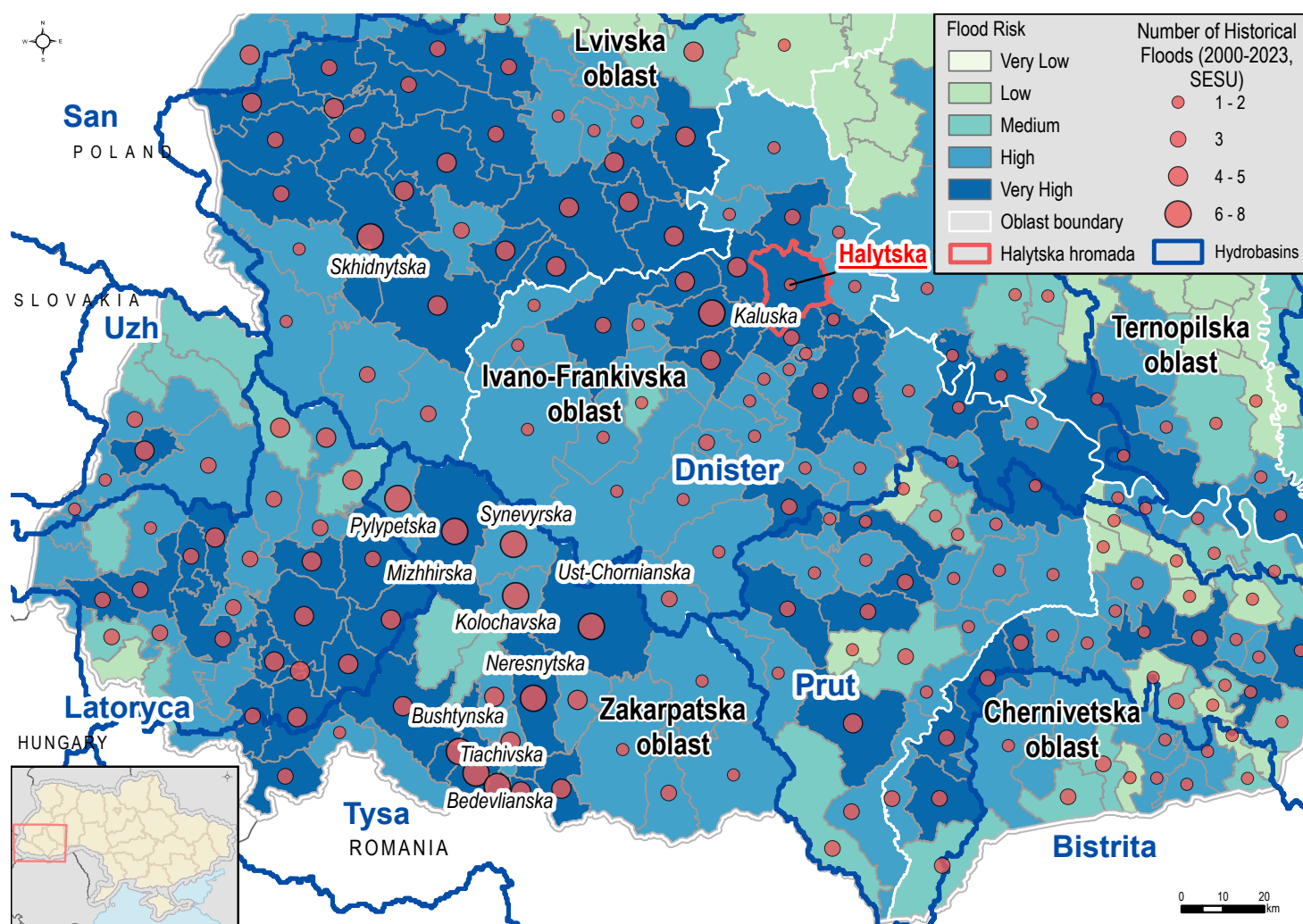
Halytska hromada (district) is part of the Ivano-Frankivska oblast. Consisting of one city, Halych, and 25 smaller settlements, it had an estimated pre-war population of 19,475 as of January 2022.¹ Halytska is located at the foot of the Carpathian Mountains in Western Ukraine and is intersected by three rivers: the transboundary Dniester, which runs through Halych city, as well as the smaller Lommysia and Lukva.

The hromada's position by the Carpathian Mountains leaves it highly exposed to a series of natural hazards, being particularly susceptible to flooding due to its geomorphological and hydrometeorological characteristics (e.g. land cover, elevation, rain duration). These factors have resulted in two catastrophic flood events in 2008 and 2020, and it is likely that major floods will reoccur in the future. REACH's 2024 Ukraine Nationwide Flood Risk Assessment found that hromadas in the Carpathian region have higher flood susceptibility levels when compared to the rest of the areas under the control of the Government of Ukraine (GoU) as of 20 November 2023.² Halytska ranked as the hromada with the highest flood risk level in Ukraine.

People in the Carpathian region are highly susceptible to flooding due to a combination of their proximity to flood-prone areas and the presence of vulnerable populations who may face challenges dealing with the impacts of flooding due to inherent or socioeconomic characteristics.

The ongoing full-scale Russian invasion has exacerbated people's vulnerability to flood events. Generally, armed conflicts add an extra layer of complexity to natural hazard risk, leading to situations of double vulnerability, where the impacts of conflict and natural hazards can potentially exacerbate each other.³ The invasion caused massive displacement of the population to West Ukraine and Halytska hosts around 3,000 internally displaced persons (IDPs), representing about 16% of the hromada's population, as of September 2023.⁴ There is evidence from previous REACH assessments in Ukraine that security threats associated with the war, the presence of substantial IDP populations, and decreased tax revenues associated with a slowdown in economic activity, impact local authorities' prioritisation of services and expenditure,⁵ with consequences for portfolios considered to be of lower priority, such as planning for natural hazards.

Calculating the flood risk level⁶ of Halytska was the first step to obtaining a comprehensive understanding of the flood risk profile of the hromada. This report delves further by assessing flood risk management capacities at the institutional and individual levels, firstly, to understand the hromada's resilience to future flood events; and, secondly, to identify opportunities for strengthening area-specific flood risk management capacities in the context of conflict.



Map 1. Flood risk levels in the Ukrainian Carpathian Mountains region with Halytska highlighted.

Key findings

- **In the 2024 Ukraine Nationwide Flood Risk Assessment,⁷ Halytska ranked as the hromada with the highest flood risk level in Ukraine** due to a very high susceptibility to flooding and the significant presence of vulnerable populations, mainly IDPs displaced by the full-scale war starting in February 2022, living close to flood-prone areas. While Halytska's geography leaves it naturally susceptible to flooding, a convergence of human-made factors is exacerbating flood risks in the area, including compromised riverbank infrastructure, deforestation in the Carpathian Mountains, and climate change-induced heavy precipitation.
- The **full-scale invasion has exacerbated existing challenges for flood risk management in the hromada**, resulting in the reprioritisation of budgets towards national security and defence, and the loss of key personnel in local authorities and relevant agencies, diminishing human resources and technical expertise. Gaps in Halytska's flood management infrastructure reportedly include inadequate drainage systems and incomplete flood protection measures, compounded by challenges around land use planning and the need to scale up monitoring of flood-prone areas, highlighting systemic challenges in mitigating flood risk.
- At the institutional level, challenges reportedly include a **lack of response equipment, outdated hazard monitoring systems, and inadequate emergency response plans**. Results of the household surveys indicated a **lack of flood risk awareness among the general population**, affecting the risk preparedness level.
- **Initiatives to enhance flood risk management in Halytska** include the establishment of rapid response groups, evacuation plans, awareness rising for the general population, and early warning systems (EWS).

Objective and data utilisation

The objective of this area-based assessment (ABA) is to support government and humanitarian actors in the development of flood preparedness, response and recovery strategies adapted to the context of the ongoing conflict in Ukraine. It achieves this by:

- Assessing the compounding impacts of conflict on flood vulnerabilities and local risk management capacities at the household and institutional levels.
- Identifying modalities for strengthening local flood resilience within the context of the conflict, drawing upon best practices and lessons learned from previous experiences.

The assessment's focus on a specific geography ensures the operational relevance of the findings in terms of integrating conflict-sensitive disaster risk management (DRM) measures into humanitarian and recovery programming in Halytska. This information can be leveraged by various stakeholders involved in flood risk reduction, including government authorities, humanitarian actors, emergency responders, and donors.

Methodology

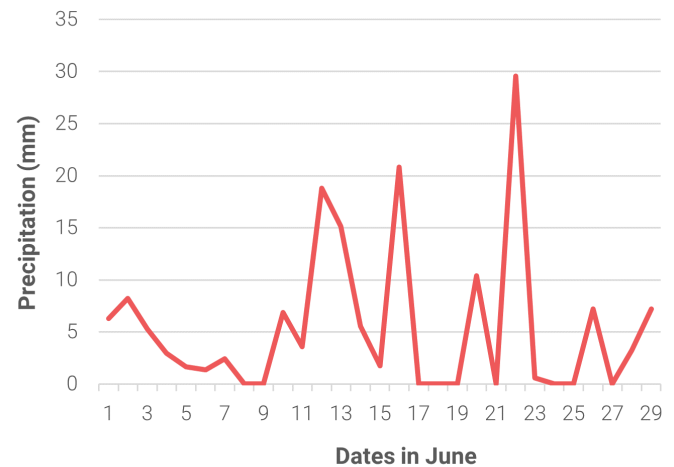
This ABA covers the totality of the Halytska hromada. Based on a standardized flood assessment approach,⁸ which has been adapted to the local context, it leverages secondary data analysis and qualitative insights from expert consultations. The flood assessment approach allowed for the ranking of hromadas against a Flood Risk Index (FRI): a composite indicator sensitive to both the likelihood of flooding and the potential human impact of flood events in a given area. The 2024 Nationwide Flood Risk Assessment identified Halytska as the hromada with the highest FRI, resulting in its selection for this ABA.⁹

Primary data collection was then conducted, comprising eight key informant (KI) interviews with expert personnel from the local authorities and other institutional actors, and 24 interviews with households (HHs) located in flood-prone areas to capture community perspectives. Refer to the methodology note in the Annex for further details on the FRI calculation.

Flooding in Halytska

In June 2020, Western Ukraine suffered its most catastrophic flooding in the last 50 years. The 2020 floods impacted 277 settlements and around 30,000 people,¹⁰ resulting in an estimated total damage of USD 345,000 million.¹¹ Ivano-Frankivska oblast was the most affected oblast with 202 impacted settlements and 6,653 damaged houses, that is 84% of the total number of houses.¹² The floods were caused by intense rainfall, 200 to 400 mm in two weeks, causing the rivers to rise by three meters.¹³ Alongside high precipitation levels, flood severity was compounded by the poor condition of riverbanks and embankments, sedimentation and clogging of the riverbed, and deforestation upstream.¹⁴

High flood levels experienced by a local resident
"In 2020, if you look at my house, the water level was
60 cm from the ground."
- KI from Halychvodokanal



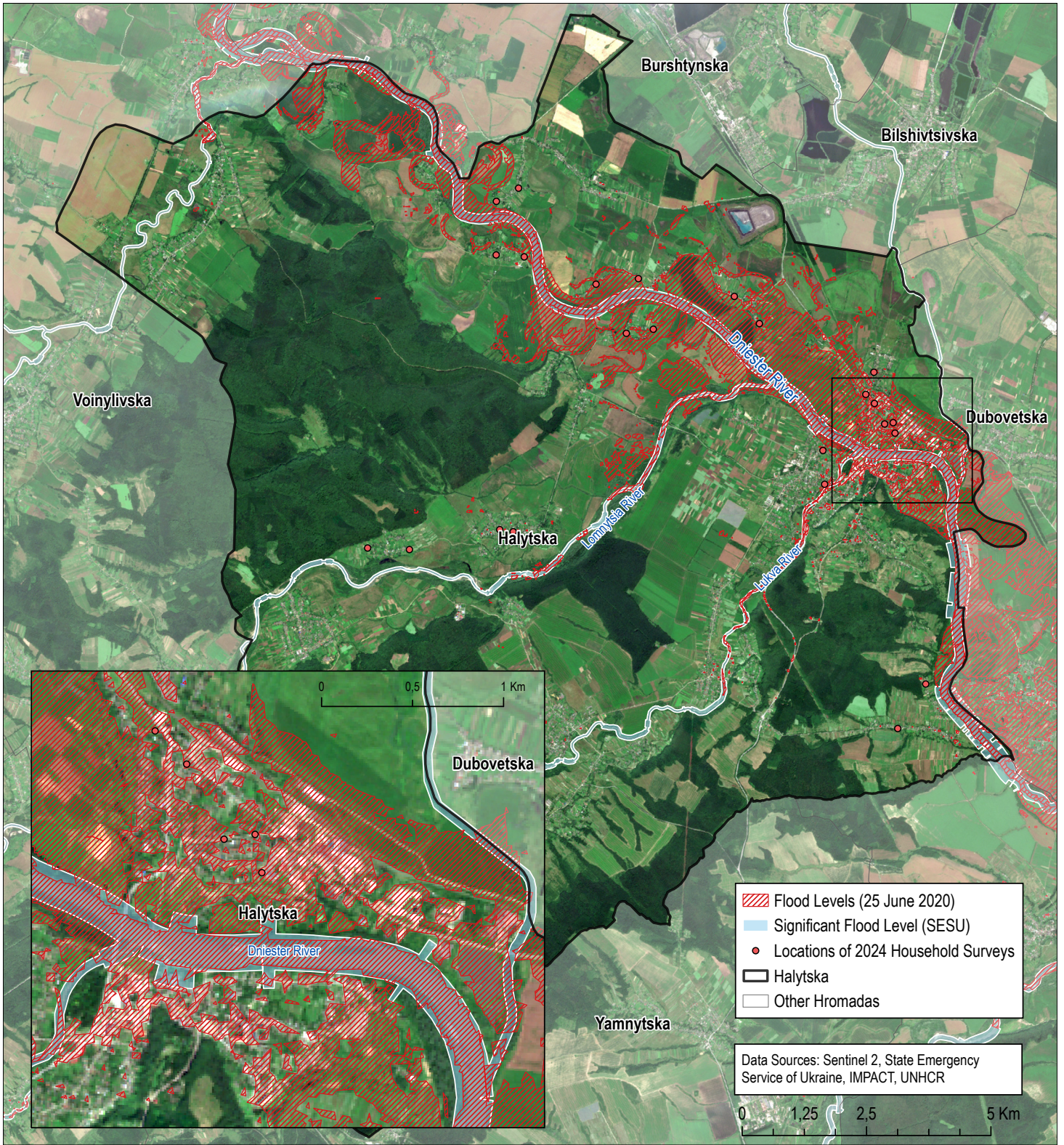
Graph 1. Daily rainfall in Halytska, June 2020.¹⁵

Halytska's high exposure to flooding results from multiple factors. Expert local KIs and almost all HHs identified that the main environmental-related flood drivers in Halytska are climate conditions and deforestation. For instance, human-made climate change disturbs the precipitation patterns in Ukraine, bringing increased variability and intensified extreme weather events. The World Bank's climate projections forecast seasonal precipitation change for Ukraine's Carpathian region with an increase during the wettest season (March-May), a period of re-occurring floods, snowmelt, and river level rise. A 4.2% increase in precipitation for 2020-2039 and a 5.2% increase for 2040-2059 are anticipated in the most likely scenario.¹⁶

"Nowadays, the level of rainfall of two days exceeds
the traditional monthly precipitation levels."
- KI from the Dniester Water Resources Agency



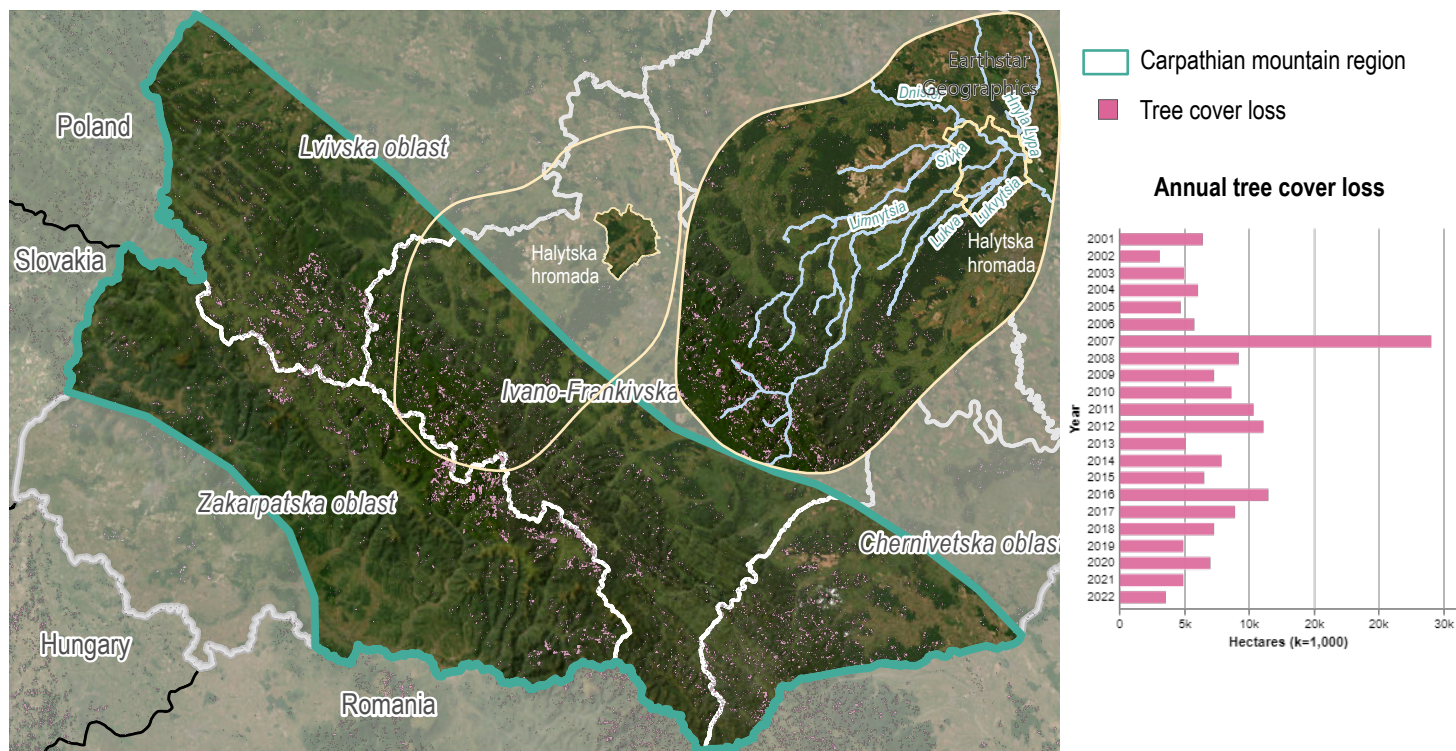
Image 1. Photo of flooded houses during the 2020 Western Ukraine floods. Source: IFRC.¹⁷



Map 2. Flood levels experienced on 25 June 2020 in Halytska.

Deforestation can lead to increased flooding by reducing the natural barriers that absorb and slow down rainfall, such as trees and vegetation. This can result in faster runoff and reduced water absorption, leading to higher peak flows and more frequent flooding downstream.¹⁸ Deforestation in the Carpathian Mountains heavily impacts the flood scale and speed in Halytska due to its location downstream. Between 2001 and 2022 the Ukrainian Carpathians lost 170 kha of tree coverage, equivalent to a 10% decrease since 2000, and it seems that deforestation trends are going to continue.¹⁹ Since the beginning

of the full-scale invasion, environmental protection in Ukraine has been deprioritised. For example, a few months after the invasion started, international sanctions were imposed on the timber trade from the Russian Federation (the world’s largest exporter of softwood in 2019). Such sanctions created a supply shortage on the international market, causing producers in other countries to increase production to meet the demand. Ukraine lifted a regulation prohibiting logging in protected forests (including forests in the Carpathians), looking to increase exports and direct earning towards the defence budget.²⁰



Map 3. Tree cover loss in the Carpathian Mountains. Data source: Global Forest Watch.²¹

Flood management in Halytska

Flooding was perceived by KIs as the main natural hazard affecting the hromada. This perception is understandable considering that all interviewed HHs have suffered from flooding at least once in the last 10 years, and more than half experienced flood water levels between 30 and 200 cm in the last flood event. In addition to the existing exposure and pre-existing flood management capacities in Halytska, the full-scale invasion has exacerbated difficulties for DRM. KIs identified significant war-related challenges, including a **lack of funding and personnel**. Currently, government spending prioritizes national security and defence, often neglecting other critical areas such as DRM. Furthermore, the dwindling personnel in local authorities, resulting from military conscription and emigration, not only diminishes human resources but also technical expertise, making it challenging to fill essential roles and perform detailed tasks effectively.

“The number of professional workers has decreased. Many people have gone abroad or are currently mobilized.”
 - KI from the City Council

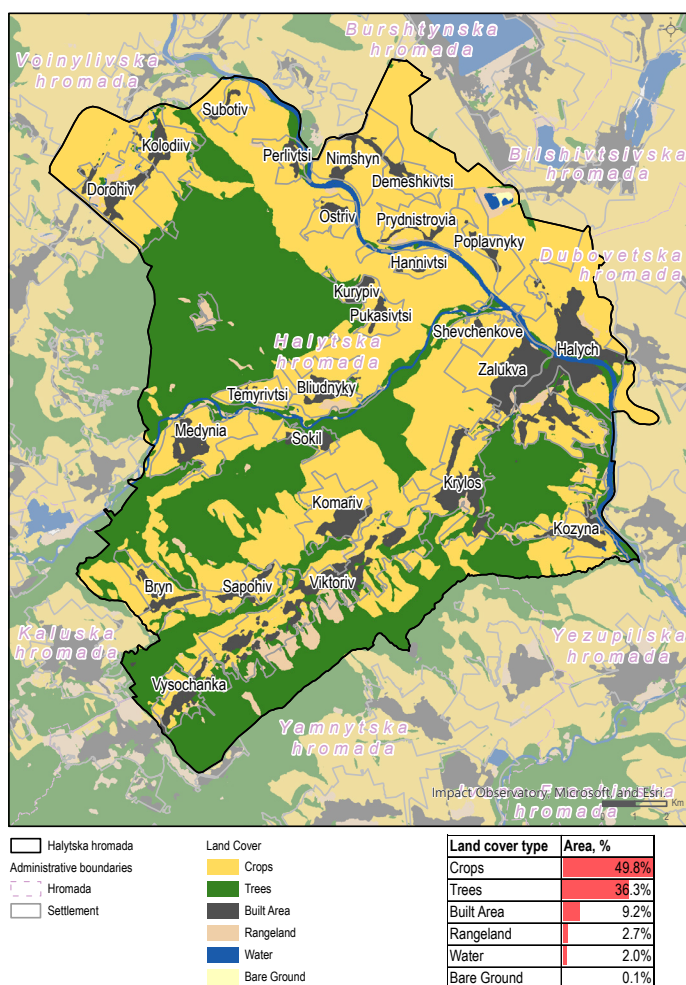
Also, the hromada’s **water management infrastructure seems to be inadequate and outdated**. KIs mentioned that basic water systems such as drainage and water treatment facilities are not present across the entire urban area, while flood protection systems (e.g. river canals and embankments) are not fully completed. It is crucial to strengthen water protection in the river for the hromada to be better prepared for the next flood season; however, the lack of funding for DRM and inadequate personnel pose additional obstacles to achieving this critical goal.

“There is no drainage system and treatment facilities cannot cope. It is necessary to allocate funds to solve this issue.”
 - KI from the City Hospital

“In 2008, a riverbank protection was built, but only 200 meters, which is not enough to fully protect against flooding.”
 - KI from Halychvodokanal

KIs reported **challenges with land use planning** management and the capacity of local authorities to enforce such regulations. The reduction in personnel and loss of technical skills associated with the war reportedly hampers the periodical monitoring of water protection zones, exacerbating flood risk levels due to ineffective land use practices.²² Additionally, one KI stated that flood risk maps have not been updated using the 2020 flooding as a reference event in determining new flood-prone areas. Map 2 further illustrates the issues of land use planning by showing that the main urban area of the city is built in flood-prone areas. Furthermore, Map 4 reveals that the regions adjacent to water bodies have a significant presence of agricultural and urban areas, replacing natural green areas.

An additional problem related to land use planning is the fact that Halytska’s main urban area is intersected by the Dniester River and there are only two bridges connecting either side. KIs reported that during emergencies, this lack of connectivity in the city poses a threat to rapid and efficient response, impeding timely evacuation and transportation of response equipment and materials.



Map 4. Halytska's land cover. Data source: Sentinel-2.²³

*"It is impossible to fully protect the hromada due to the inability to connect the left bank of the Dniester River to the right bank."; "Lands are difficult to control, people build and do whatever they want."
- KI from the Dniester Water Resources Agency*

Another challenge identified relates to the state of **flood risk management capacities and resources**. At the institutional level (authorities responsible for flood risk management), KIs reported a lack of response equipment (e.g. emergency vehicles, water pumps), outdated hazard and weather monitoring systems for effective EWS, insufficient emergency response plans and emergency coordination issues. Any reduction in budgets for non-defence activities would limit the hromada's ability to replace emergency response equipment and monitoring systems, thereby undermining flood preparedness for future events. Also, while half of the KIs recognised that the response coordination is sufficient, some suggested that relevant agencies, such as the State Emergency Service of Ukraine, would benefit from **enhanced response coordination** between the local and national levels, through improved communication, information sharing, and capacity building exercises and drills. One KI suggested organizing exercises not only with emergency responders and personnel from the local authorities, but also with the population to enhance emergency response capacities at the individual level, thereby strengthening HHs' preparedness and resilience to disasters.

*"Insufficient number of pumping stations for pumping water from houses, basements, and agricultural land. There were not enough wetsuits to carry out rescue operations."
- KI from State Emergency Service of Ukraine (SESU)*

Nevertheless, institutional KIs reported some progress towards the **implementation of various measures aimed at improving flood risk management** in Halytska. Building inspections, establishment of rapid response groups, development of evacuation plans, designation of flood shelters and provisions, and training for personnel are among the measures taken by local authorities to enhance flood risk management.

Moreover, the majority of KIs confirmed the presence of evacuation routes and gathering points in case of emergencies within the hromada. Most KIs also mentioned the existence of equipment for flood response, even if it was noted that the available resources are insufficient. Lastly, the local authorities use EWS (e.g. sirens) to alert the population about possible upcoming floods, in combination with social media messages and posts with useful information on the website of the City Council.

*"Response groups of 2-3 designated people have been established; we keep pumps ready."
- KI from Halychvodokanal*

*"Every year we inspect facilities for the passage of ice drift and flood water."
- KI from the Dniester Water Resources Agency*

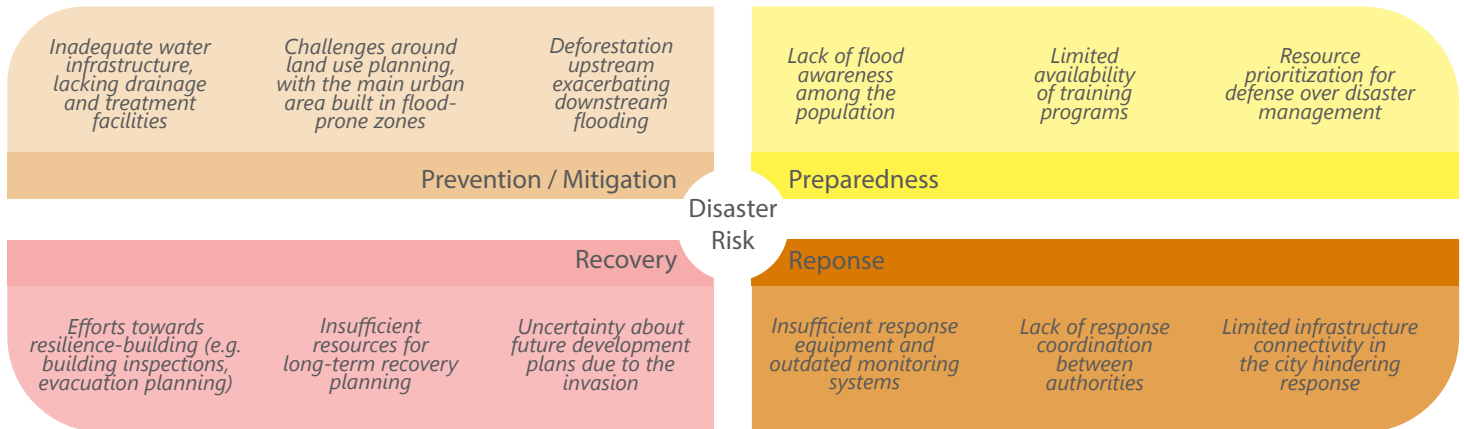
At the individual level, KIs reported that there is a **lack of flood risk awareness** among the general population. More than half of the HHs reported that they are not taking measures to prepare for future flooding, while the majority attributed their preparedness issues to financial constraints caused by the full-scale invasion. Additionally, despite the availability of training for flood preparedness in the hromada reported by KIs, only two HHs knew about them, and none participated.

*"We are preparing to evacuate the population in an organized manner by school buses and receive them on school premises."
- KI from the Department of Education*

*"We also inform using cars with loudspeakers."
- KI from the City Council*

Summary of DRM capacities

The following graph summarizes Halytska’s flood risk management capacities:



Graph 2. Summary of Halytska’s flood risk management capacities.²⁴

Conclusion

This ABA for Halytska highlights the intricate set of obstacles confronting the hromada in tackling flood risk and the compounding effects of the full-scale Russian invasion. The ongoing war is likely accelerating deforestation, undermining institutional capacities as a result of reduced personnel in key agencies, and forcing local authorities to prioritise defence and security at the expense of other portfolios such as DRM. The need to effectively communicate risks to the community is made all the important by the presence of a large IDP population in the area, many of whom have come from regions in East Ukraine where flood risks are generally lower. The assessment revealed vulnerabilities at both institutional and individual levels, including inadequate water management infrastructure, poor land use planning, and a lack of flood risk awareness among the general population.

Despite these challenges, there are efforts underway to improve flood management, including the establishment of rapid response groups, evacuation plans, and the utilization of EWS. Overall, addressing these challenges will require a coordinated effort between the community, local and national government authorities, humanitarian actors, emergency responders, and donors to strengthen flood resilience, enhance coordination, and bolster preparedness efforts in the face of both natural hazards and conflict-related disruptions.

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ABOUT REACH

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References and notes

- 1 Statistics Ukraine, **Number of Present Population of Ukraine, as of January 1 2022**.
- 2 REACH, **Flood Risks in Ukraine in 2024 - Nationwide assessment and conflict-sensitive disaster risk management approaches**, February 2024.
- 3 ODI, **Disaster risk reduction in conflict contexts - An agenda for action**, September, 2019.
- 4 IOM, **Ukraine - Area baseline assessment (Raion level) - Round 2**, September 2023 . The assessment presented data at the raion level. REACH directly requested in November 2023 the data for the hromada level.
- 5 REACH, **Rapid economic assessment - Vinnytsia oblast**, June 2023.
- 6 Flood risk levels are determined through the definition of the Flood Risk Index (FRI) which is calculated using a combination of hazard exposure, people's susceptibility, and lack of coping capacities (LOCC).
- 7 REACH, **Flood Risks in Ukraine in 2024 - Nationwide assessment and conflict-sensitive disaster risk management approaches**, February 2024.
- 8 REACH, **Central African Republic flood susceptibility and risk - Analysis methodology**, June 2020.
- 9 REACH, **Flood Risks in Ukraine in 2024 - Nationwide assessment and conflict-sensitive disaster risk management approaches**, February 2024.
- 10 IFRC, **Ukraine Floods: Emergency Plan of Action (EPoA) MDRUA010**, July 2020.
- 11 AON, **Global catastrophe recap**, August 2020.
- 12 IFRC, **Ukraine Floods: Emergency Plan of Action (EPoA) MDRUA010**, July 2020.
- 13 Copernicus, **The Copernicus Emergency Management Service forecasts and monitors flood in West-Ukraine and Romania - EMS information bulletin number 127**, July 2020.
- 14 BBC, **Ukraine floods: Why climate change and logging are blamed**, July 2020.
- 15 Data sources: Funk, C., Peterson, P., Landsfeld, M., Pedreros, D., Verdin, J., Shukla, S., Husak, G., Rowland, J., Harrison, L., Hoell, A., & Michaelsen, J., **The climate hazards infrared precipitation with stations-a new environmental record for monitoring extremes**, February 2024; **Google Earth Engine**, March 2024.
- 16 World Bank, **Ukraine - Extreme precipitation events**.
- 17 IFRC, **Ukraine Floods: Emergency Plan of Action (EPoA) MDRUA010**, July 2020.
- 18 European Environment Agency, **Water-retention potential of Europe's forests - A European overview to support natural water-retention measures**, September 2015.
- 19 Global Forest Watch, **Dashboard - Carpathian region, Ukraine**, March 2024.
- 20 Financial Times, **Ukraine war hits global timber trade and adds to risks for forests**, June 2022.
- 21 Global Forest Watch, **Dashboard - Carpathian region, Ukraine**, March 2024.
- 22 Water protection zones refer to designated areas along water bodies that are regulated and managed to minimize flood risk and protect surrounding communities and infrastructure from water-related hazards.
- 23 Sentinel-2, **10m land use/land cover time series of the world**, September 2023.
- 24 UNDRR, **Disaster risk reduction terminology - Prevention**: Activities and measures to avoid existing and new disaster risks. **Mitigation**: The lessening or minimizing of the adverse impacts of a hazardous event. **Preparedness**: The knowledge and capacities developed by governments, response and recovery organizations, communities and individuals to effectively anticipate, respond to and recover from the impacts of likely, imminent or current disasters. **Response**: Actions taken directly before, during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected. **Recovery**: The restoring or improving of livelihoods and health, as well as economic, physical, social, cultural and environmental assets, systems and activities, of a disaster-affected community or society.
- 25 GIS Geography, **Choropleth maps - A guide to data classification**, October 2023.
- 26 REACH, **Central African Republic flood susceptibility and risk - Analysis methodology**, June 2020.
- 27 European Commission, **LISFLOOD static and parameter maps for GloFAS**, March 2023.

Annex - Methodology note

The calculation of riverine flood risk level across Ukraine employed various open geospatial datasets available both globally and nationally. While some of them were ready to use, others were used for extraction of necessary indicators, or had to be geo-coded to be suitable for processing in GIS. In general, flood risk is defined as the combination of hazard exposure (susceptibility) and vulnerability, while the latter is composed by people's general susceptibility and lack of coping capacities (LOCC). All the indicators used for estimating risk level were first aggregated at the hromada level by calculating the mean values for each of them. The indicators were then converted to relative values using the scale from 1 (lowest) to 5 (highest) by applying the "Jenks natural breaks optimization" algorithm.²⁵ The geographic scope of the analysis included 1,318 hromadas under control of the GoU as of November 2023, within 23 oblasts of Ukraine, excluding Luhanska and the Autonomous Republic of Crimea.

For estimation of the hazard exposure component, a standardised set of indicators have been used from similar assessments conducted by REACH in different national contexts.²⁶ However, to account for local environmental settings and triangulate results, three additional indicators were added for calculation of the flood hazard exposure. They included granular national data on recent historical floodings (2000-2023), length of river courses with significant risk (probability) of flooding officially defined by the State Emergency Services of Ukraine (SESU) in the Flood Risk Management Plans adopted in October 2022, and global data set on probable water levels for 100-year flood event developed by European Commission's Joint Research Centre (JRC).²⁷ Thus, the hazard exposure component was defined as a sum of the four mentioned above indicators with equal weights for each.

Vulnerability includes both people's susceptibility to be impacted by flooding and their LOCC, which might be decreased due to the protracted conflict. For each of the two components, four indicators were used. People's susceptibility component was the weighted sum of indicators such as numbers of IDPs in each hromadas, shares of older and younger population per hromada, and mean distance from settlements within hromada to flood-prone river courses. For the first three indicators, the weight was set at 0.5, while for the latter it was assigned as 1.

The LOCC component entailed the availability of water-regulating facilities to mitigate flood risks, density of war-related incidents, area contamination by explosive remnants of war (ERW) and incidents to hazardous facilities recorded from February 2022 to October 2023, provided by REACH's partner Zoi Environment Network under their joint Hazardous Events Monitoring Initiative. Since the primary focus of the assessment was flooding, for all indicators besides the first one, a weight of 0.5 was used and the weighted sum calculated similarly as for the susceptibility component.

Finally, all three components of flood risk were overlaid to calculate the hromada's "Flood Risk Index" (FRI) using the following formula.

$$\text{FRI} = \text{Hazard} \times \frac{(\text{Susceptibility} + \text{LOCC})}{2}$$

FRI values were then classified in five classes (from 'Very Low' to 'Very High') to rank hromadas accordingly.

In conjunction with the comprehensive FRI calculation, **eight key informant (KI) interviews**, expert personnel from various local authorities, and **24 household (HH) interviews** were conducted, aiming to obtain information at the institutional and individual levels. These interviews helped to enrich and contextualise the interpretation of FRI results and understand further the flood risk management capacities of the hromada.