

An aerial photograph of a residential neighborhood in Izium city, Kharkivska Oblast, Ukraine. The image shows a grid of streets with numerous houses and buildings. Many of the buildings appear damaged, with some showing signs of destruction or being partially destroyed. The roofs of many houses are visible, and some are missing or damaged. The overall scene suggests a significant impact on the residential infrastructure.

Assessment of damage to residential infrastructure in Izium city, Kharkivska Oblast

January 2024 | Ukraine

Funded by:



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ACTED

UADAMAGE
MONITORING PLATFORM

Cover image: Pléiades Neo 3 satellite image (Airbus) of residential buildings after damage in Izium City (Kharkivska oblast, Ukraine) acquired on 19 December 2023.

ABOUT REACH:

REACH is a leading humanitarian initiative providing granular data, timely information and in-depth analysis from contexts of crisis, disaster and displacement. The work of REACH directly feeds into aid response and decision-making by providing accessible and precise information on the humanitarian situation of crisis-affected populations.

Created in 2010, REACH is a joint initiative of IMPACT Initiatives, ACTED and the United Nations Operational Satellite Applications Programme (UNOSAT). REACH activities are conducted in support and within the framework of inter-agency coordination mechanisms at field and global levels to enabling more efficient aid planning and response.

ASSESSMENT OF DAMAGE TO RESIDENTIAL INFRASTRUCTURE IN IZIUM CITY, KHARKIVSKA OBLAST

January 2024 | UKRAINE

This situation overview presents the findings of an assessment of conflict-induced damage to residential infrastructure in Iziium City conducted by REACH. This city of regional significance was selected for this assessment based on the extent and severity of damage it has incurred since the onset of Russia's invasion of Ukraine in February 2022.

Despite continued insecurity and ongoing humanitarian needs, Iziium has seen the return of many of its displaced residents, highlighting the need for early and long-term recovery efforts to ensure population's access to housing, utilities, essential services and livelihoods. This assessment aims to support data-driven humanitarian and recovery programming through a detailed understanding of damage to housing infrastructure.

CONTEXT

Iziium is a city of regional significance located in the southeast of Kharkiv Oblast, with a population estimated at 45,884¹ prior to Russia's invasion of Ukraine in February 2022. Following its capture by the Armed Forces of the Russian Federation on 7 March 2022, Iziium became the second-largest city to return under the control of the Government of Ukraine on 10 September 2022². During this period under Russian occupation, intense military activities – including artillery bombardments, airstrikes and ground fighting – resulted in widespread destruction of infrastructure and the displacement of almost two-thirds of the city's population. In 2023, following the cessation of active hostilities and de-occupation, the city saw a notable population influx, with 5,000 to 7,000 individuals returning to their homes. The city remains subject to insecurity and occasional shelling due to its proximity to the front line.

The predominant architectural style in Iziium is characterized by multi-storey panel buildings and single household buildings, reflecting the city's development and expansion during the 20th century, influenced by its role as a transportation hub.

This geo-spatial damage assessment is complemented by a qualitative damage impact analysis to promote a detailed understanding of localised damage impacts, to reflect the lived experience of affected populations, and facilitate the integration of community voices in the recovery process. Damage impact analyses are based on key informant interviews with representatives of local authorities and civil society organisations, as well as focus group discussions and participatory mapping with impacted residents. REACH also produced an assessment of damage to critical infrastructure in Iziium, accessible upon request. Datasets are also available for bi-lateral sharing upon request: impact.ukraine@impact-initiatives.org

KEY FINDINGS



Overall, 652 residential buildings were identified as damaged in Iziium City. This includes 592 single-family houses and 60 multi-storey buildings.



Among identified damaged residential buildings, 37% suffered moderate damage, 25% severe damage, 23% were completely destroyed, and 15% were under repair at the time of analysis. Of the single-family homes, 35% showed moderate damage, 26% severe damage, 24% were destroyed, and 15% were under repair. Of the multi-storey buildings, 55% have suffered moderate damage, 19% severe damage, 12% were destroyed, and 14% were under repair.



The city centre of Iziium, along with its western area (parts 3 and 5), exhibits the highest density of residential damage. Significant destruction is also present in the South and South-East (parts 6 and 7), with more than 20 buildings identified as destroyed in each part.

Extensive damage to housing infrastructure impacts living conditions, hinders access to essential services, and disrupts livelihoods. Further influx of returnees could exacerbate these challenges, especially for vulnerable groups.

METHODOLOGY OVERVIEW

The analysis is based on remote sensing of high-resolution satellite imagery acquired on 08 September and 19 December 2022 from Airbus³ (Pléiades Neo 3 and Pléiades Neo 4 satellites with 30cm spatial resolution). REACH partnered with UADamage for AI-assisted damage detection.⁴ Results were subsequently verified through visual inspection, whereby each building was reviewed to confirm damage, determine its severity, and exclude non-residential structures.

This assessment distinguishes between single-household and multi-storey buildings. The city was subdivided in a 7-section grid to allow damage visualisation (click on the areas on the overview map below to access detailed maps). Damage severity was assigned to each building upon the below categorisation:

Moderate damage: Noticeable but non-critical damage building, preserving its overall structural soundness (i.e.: non-structural roof damage such as small holes).

Severe damage: Substantial damage possibly compromising the building's structural integrity (i.e. major portions of the roof or walls have collapsed or are critically compromised)

Destroyed: Building structural framework is critically compromised or completely failed, likely irreparably (i.e. the roof, walls, or floors have either entirely collapsed or are on the brink of collapse).

This study uses the most suitable satellite images available, chosen for their quality and clarity, as required by REACH standards. Despite dating from December 2022, they remain relevant for this assessment due to most of infrastructure damage having occurred before December 2022. REACH also used more recent imagery from Planet Labs to verify buildings and enhance the assessment's accuracy.

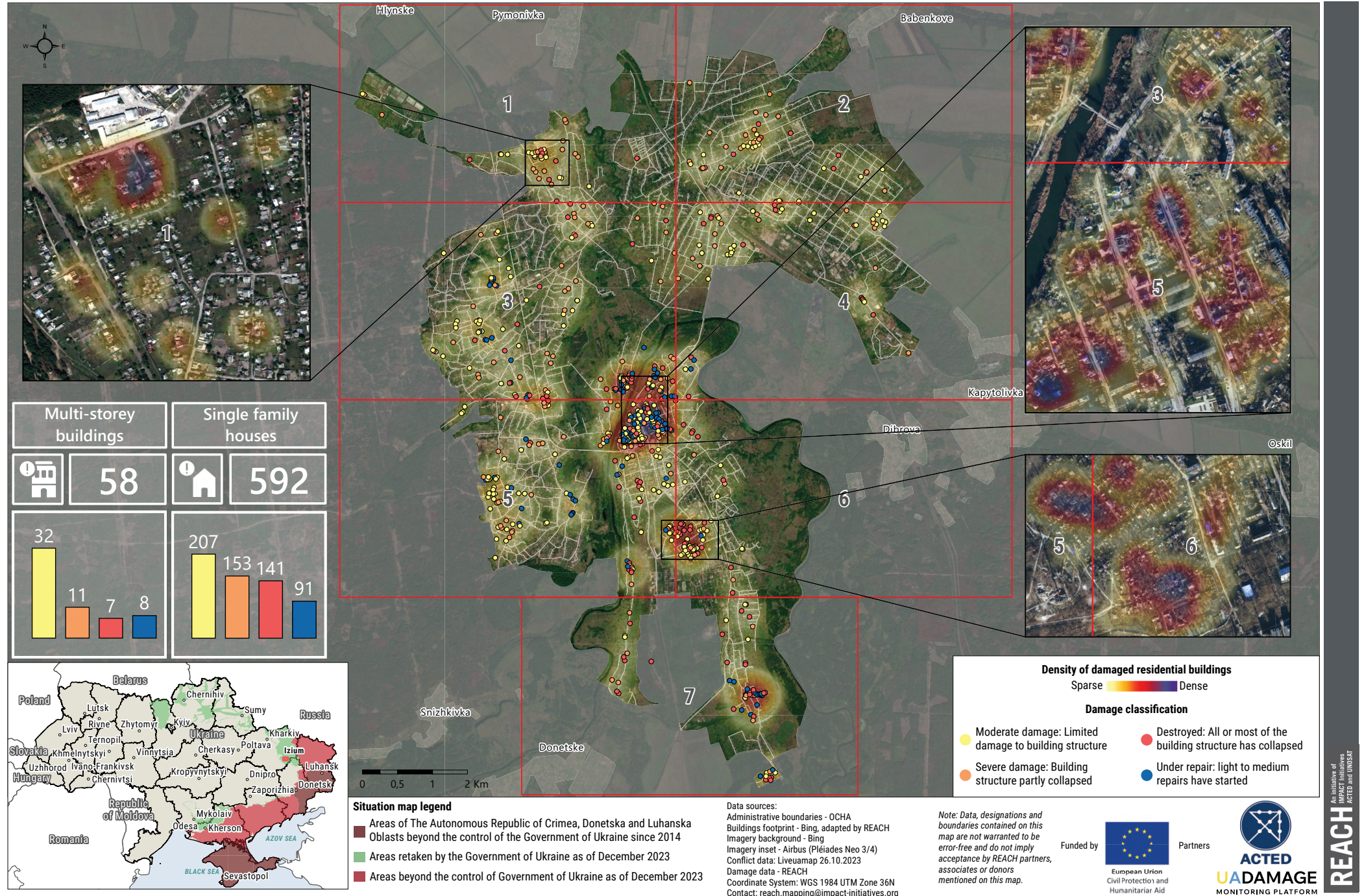
Remote sensing-based damage assessments can provide preliminary indications on required repair and reconstruction efforts ahead of detailed field assessments. Findings are limited by remote sensing methods, which are often not able to detect light damage (i.e.: broken windows). More severe damage in an area can also serve as an indicator of the presence of lighter damage types within the same vicinity.



Images 1: Damage to residential buildings in Iziom (destroyed). Source: Pléiades Neo 3 satellite image (Airbus)

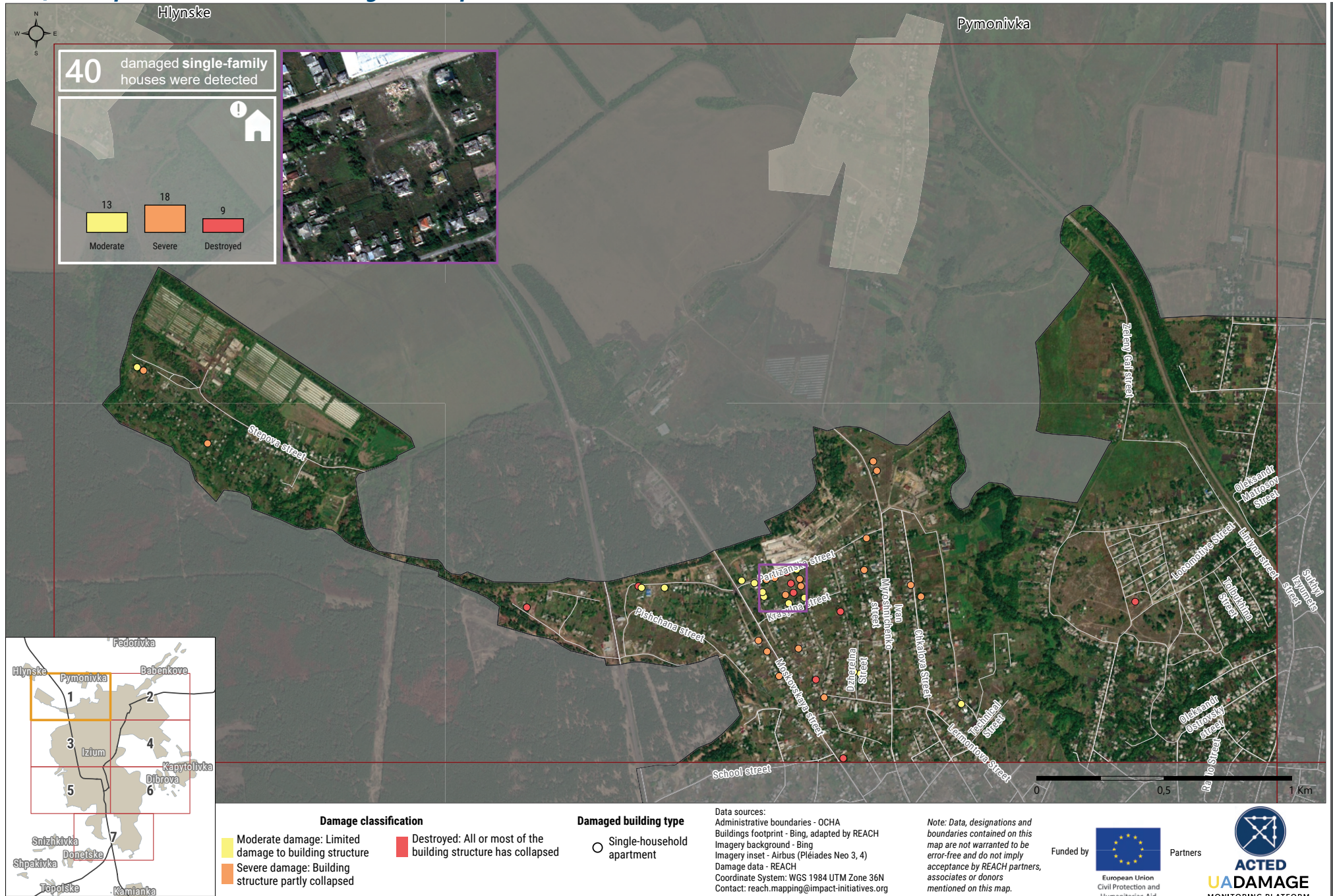
UKRAINE - IZIUM, KHARKIVSKA OBLAST

Conflict-impacted residential buildings, 08 September 2022 and 19 December 2022*

For humanitarian purposes only
Production date : 25 January 2024

UKRAINE - IZIUM, KHARKIVSKA OBLAST, part 1

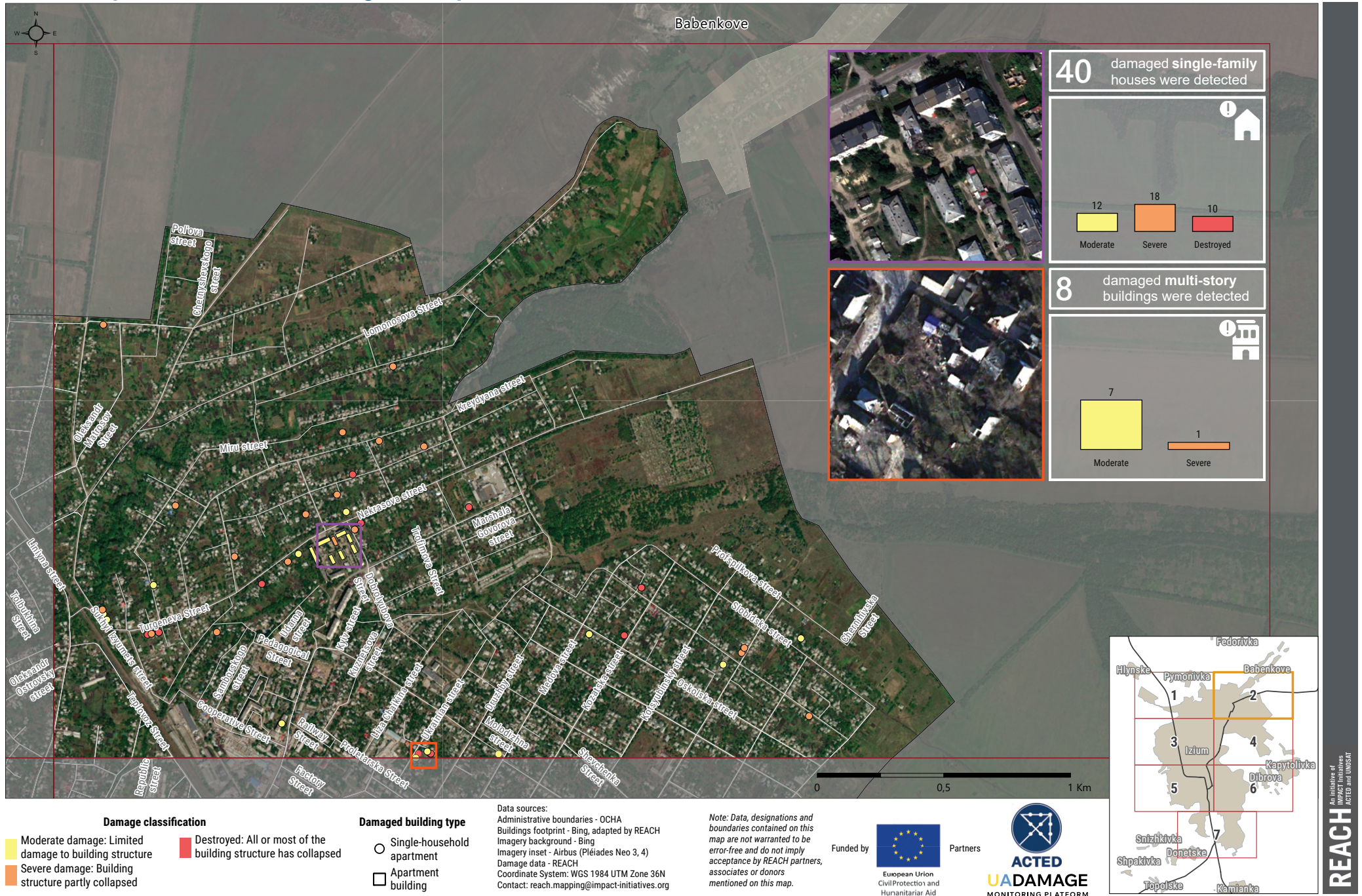
Conflict-impacted residential buildings - 08 September 2022

For humanitarian purposes only
Production date : 25 January 2024

UKRAINE - IZIUM, KHARKIVSKA OBLAST, part 2

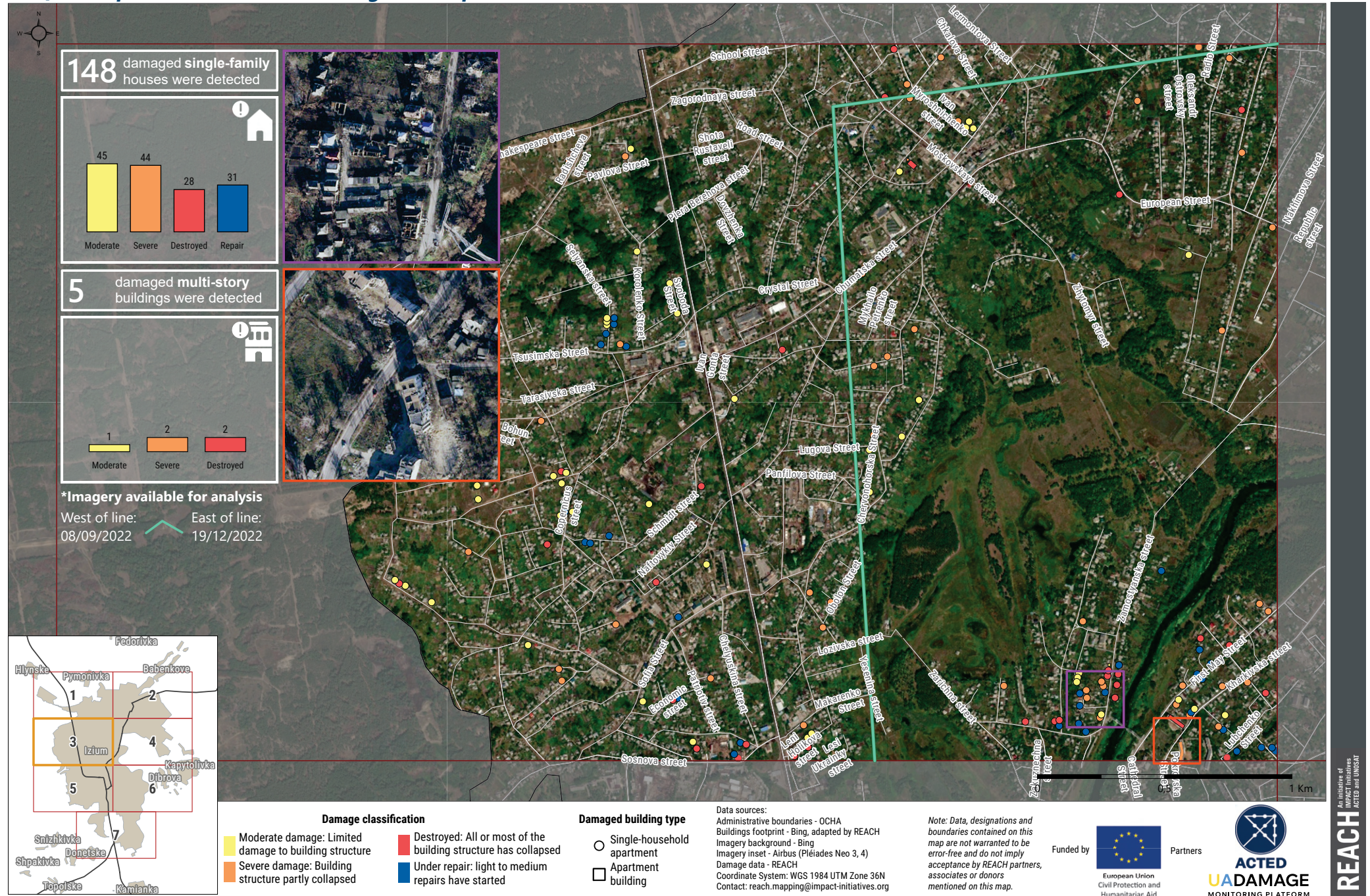
Conflict-impacted residential buildings - 08 September 2022

For humanitarian purposes only
Production date : 25 January 2024



UKRAINE - IZIUM, KHARKIVSKA OBLAST, part 3

Conflict-impacted residential buildings - 08 September 2022 and 19 December 2022*

For humanitarian purposes only
Production date : 25 January 2024

UKRAINE - IZIUM, KHARKIVSKA OBLAST, part 4

Conflict-impacted residential buildings - 19 December 2022

For humanitarian purposes only
Production date : 25 January 2024



Damage classification

- Moderate damage: Limited damage to building structure
- Severe damage: Building structure partly collapsed
- Destroyed: All or most of the building structure has collapsed
- Under repair: light to medium repairs have started

Damaged building type

- Single-household apartment

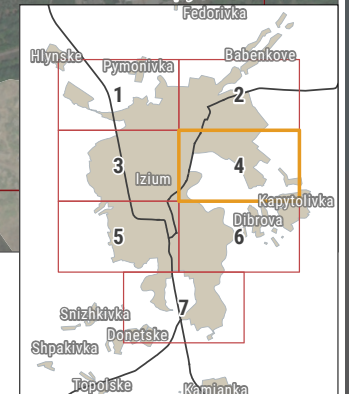
Data sources:
Administrative boundaries - OCHA
Buildings footprint - Bing, adapted by REACH
Imagery background - Bing
Imagery inset - Airbus (Pleiades Neo 3, 4)
Damage data - REACH
Coordinate System: WGS 1984 UTM Zone 36N
Contact: reach.mapping@impact-initiatives.org

Note: Data, designations and boundaries contained on this map are not warranted to be error-free and do not imply acceptance by REACH partners, associates or donors mentioned on this map.

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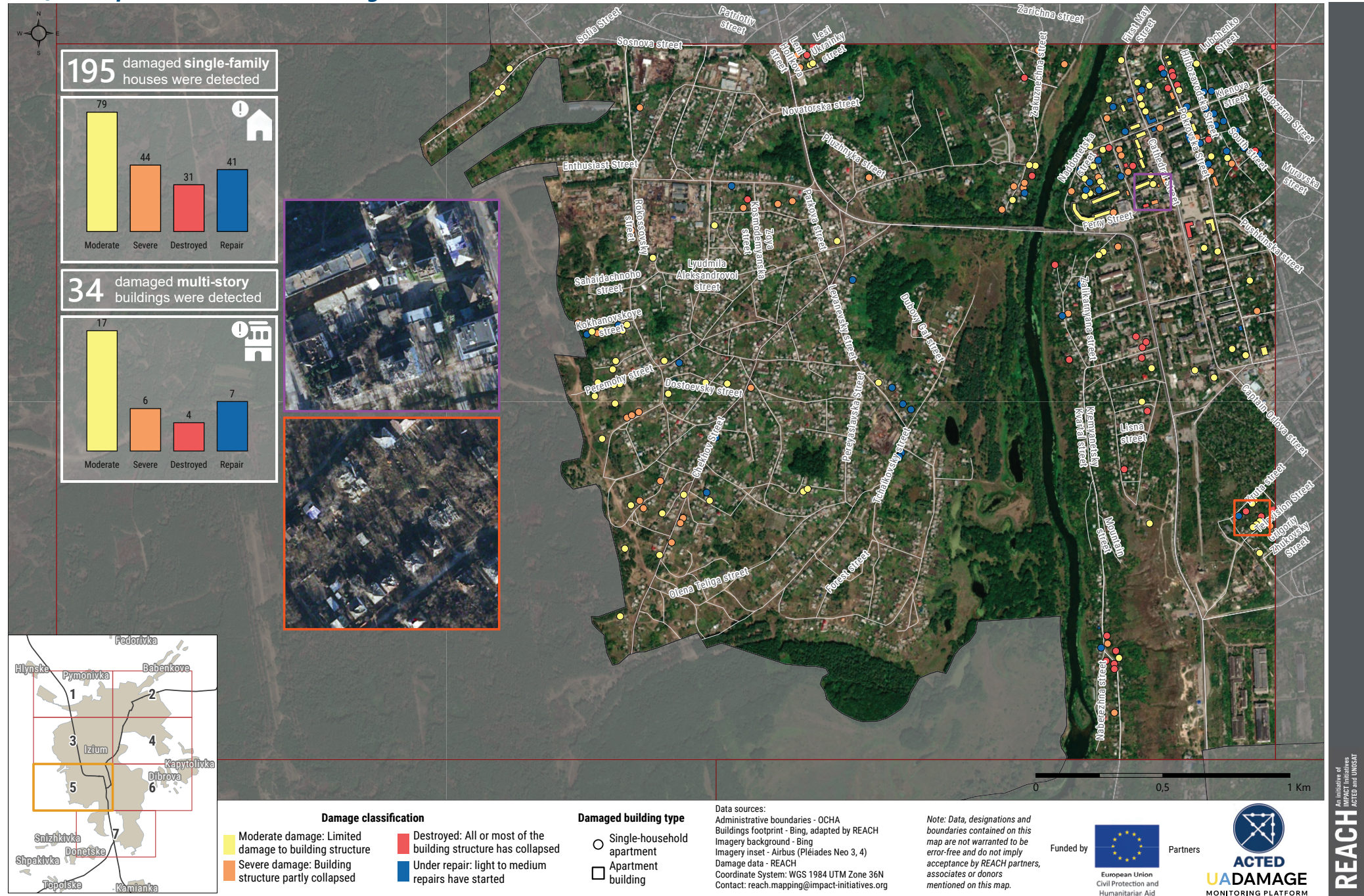


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UKRAINE - IZIUM, KHARKIVSKA OBLAST, part 5

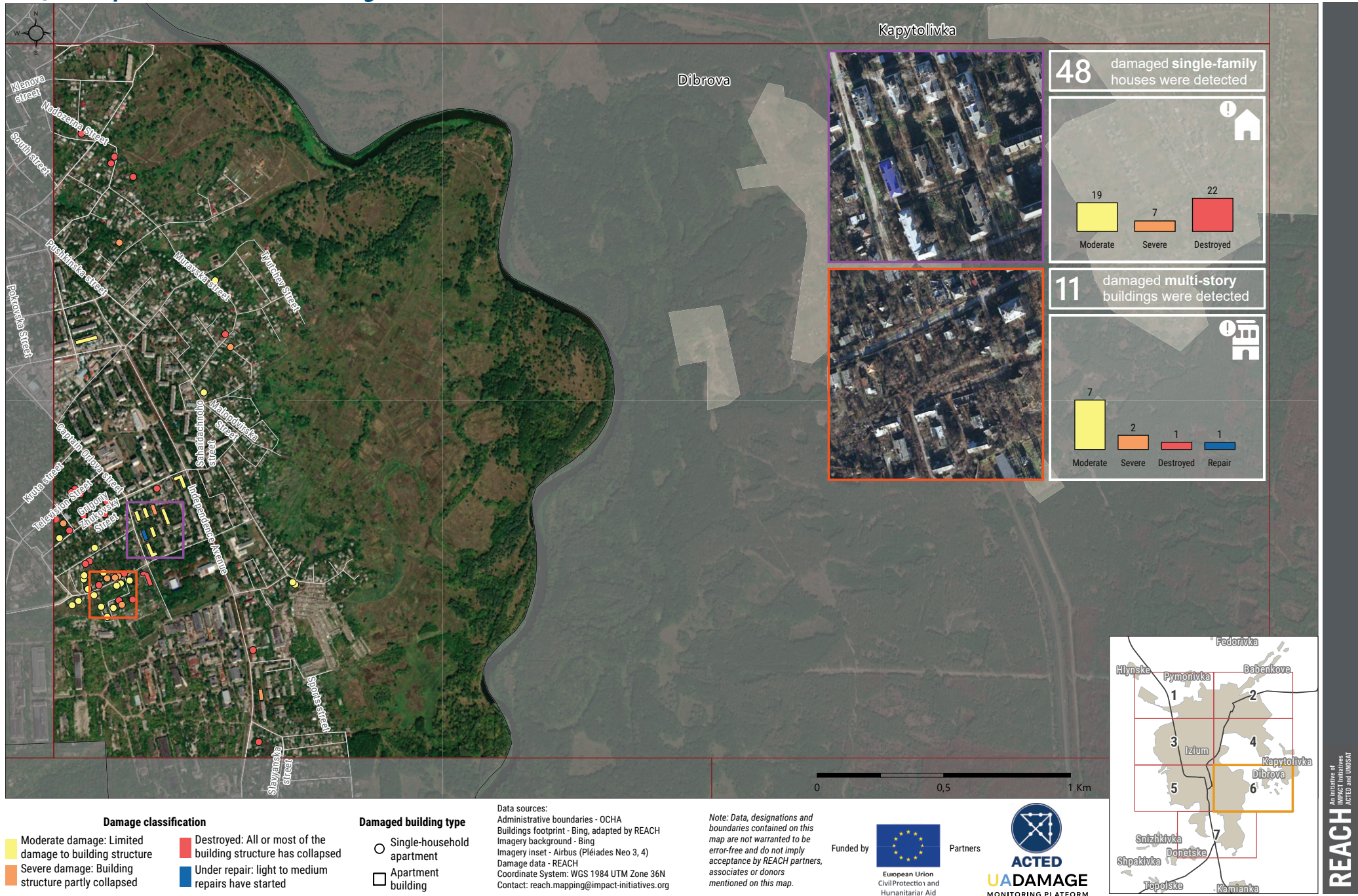
Conflict-impacted residential buildings - 19 December 2022

For humanitarian purposes only
Production date : 25 January 2024

UKRAINE - IZIUM, KHARKIVSKA OBLAST, part 6

Conflict-impacted residential buildings - 19 December 2022

For humanitarian purposes only
Production date : 25 January 2024



UKRAINE - IZIUM, KHARKIVSKA OBLAST, part 7

Conflict-impacted residential buildings - 19 December 2022

For humanitarian purposes only
Production date : 25 January 2024



Damage classification

- Moderate damage: Limited damage to building structure
- Severe damage: Building structure partly collapsed
- Destroyed: All or most of the building structure has collapsed
- Under repair: light to medium repairs have started

Damaged building type

- Single-household apartment

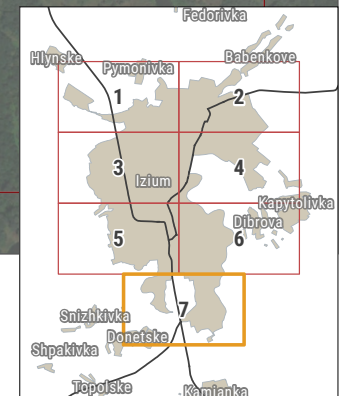
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ENDNOTES

1. STATISTICS UKRAINE, Number of Present Population of Ukraine as on January 1, 2021. http://db.ukrcensus.gov.ua/PXWEB2007/ukr/publ_new1/2021/zb_chuselnist%202021.pdf
2. Suspilne, Direction — Iziium: chronicle of the occupation. <https://suspilne.media/280275-napramok-izum-hronika-okupacii-ta-boiv-za-misto/>
3. The Pléiades Neo satellites. <https://www.airbus.com/en/space/earth-observation/earth-observation-portfolio/pleiades-neo>
4. UADamage artificial intelligence neural networks. <https://www.uadamage.com/>

