



**UKRAINE**

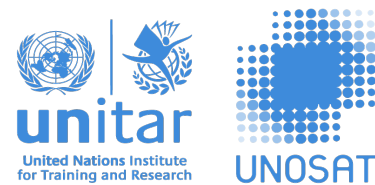
**Residential building damage assessment  
Izyum, Kharkivska oblast, February-August 2022**



**Funded by:**



**Partners:**



Cover images: World-View 3 satellite image (Maxar Technologies) of residential buildings after damage in Izium City (Kharkivska oblast, Ukraine) acquired on 29 August 2022.

**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.



# UKRAINE – Iziium residential damage assessment

## Iziium, Kharkivska oblast, February-August 2022

### Context

Since the start of the Russian invasion on the 24th of February 2022, Iziium City (48,000 inhabitants), a settlement in the south-eastern part of Kharkivska oblast, has suffered numerous damages to facilities and infrastructure. The most intensive destructions were caused during on-the-ground battles in March.<sup>1</sup>

Ukraine regained control over Iziium City in the beginning of September 2022.<sup>2</sup> Local authorities reported that **80% of local buildings were damaged**.<sup>3</sup> Such damage to utilities and infrastructure might indicate challenges to sustain heating supply in the city during the approaching winter.<sup>4</sup> Any damage to apartments and apartment blocks is likely to further expose residents to harsh weather conditions.

To support the humanitarian response, IMPACT Initiatives has conducted a residential damage analysis to estimate the number of affected residents in Iziium City. The analysis is based on recent high-resolution satellite imagery (acquired on 29 August, 2022) and follows a similar approach as the one used for the Irpin City damage assessment conducted in July 2022.<sup>5</sup>

### Methodology

This factsheet presents the estimated number of people who have been affected by damages to residential structures, based on remote sensing analysis conducted by UNOSAT with data from the end of July 2022.

It should be noted that, while remote sensing data (i.e., satellite imagery) can be used to estimate the degree of structural damage, light damage (e.g., broken windows) cannot be detected.<sup>a</sup> The absence of up-to-date information on the number of people who were living in buildings with detected damage directly prior to the impact also limits the precision of the estimates.

a More advanced methods to assess and triangulate damage (e.g., drone surveys and 3-dimensional surface modeling) could not be employed for this assessment due to the prohibition of civil drone flights in areas in the vicinity of hostilities.



However, due to prohibition of civil drone flights in areas in vicinity of hostilities, **high-resolution satellite imagery was the only available source** of data to estimate residential damage in Iziium.

The identification of residential buildings and their subsequent classification into single-household apartments and multi-apartment buildings is based on visual inspection of buildings marked as damaged by UNOSAT, using pre and post-damage high-resolution imagery acquired by World-View satellite, and Google Street View mode in Google Earth.

Information on the number on the apartment units in the multi-apartment buildings was determined on the basis of an analysis of Google StreetView software, based on images from Maxar, during which the number of floors and entrances were counted for estimations. For each unique combination of those floors and entrances a distinct number of apartments was assigned to the building.

The total number of apartments was multiplied by the average number of household members in Kharkivska oblast (2.38 people, according to 2021 data from the State Statistics Services of Ukraine).<sup>6</sup> As such, each apartment unit was assumed to have 2.38 people, regardless of the size of the apartment.

Every residential building labeled by UNOSAT as damaged or possibly damaged was considered as a damaged building, with affected residents, in this analysis. The same rule was applied to the multi-apartment buildings, meaning that also apartment buildings with damage to only a part of the structure were considered as damaged buildings.

In the absence of official and available information on neighbourhood divisions and other spatial subunits in Iziium, REACH used satellite imagery, city development plans, and street networks data extracted from OpenStreetMaps to draw neighbourhood demarcations (10 in total).

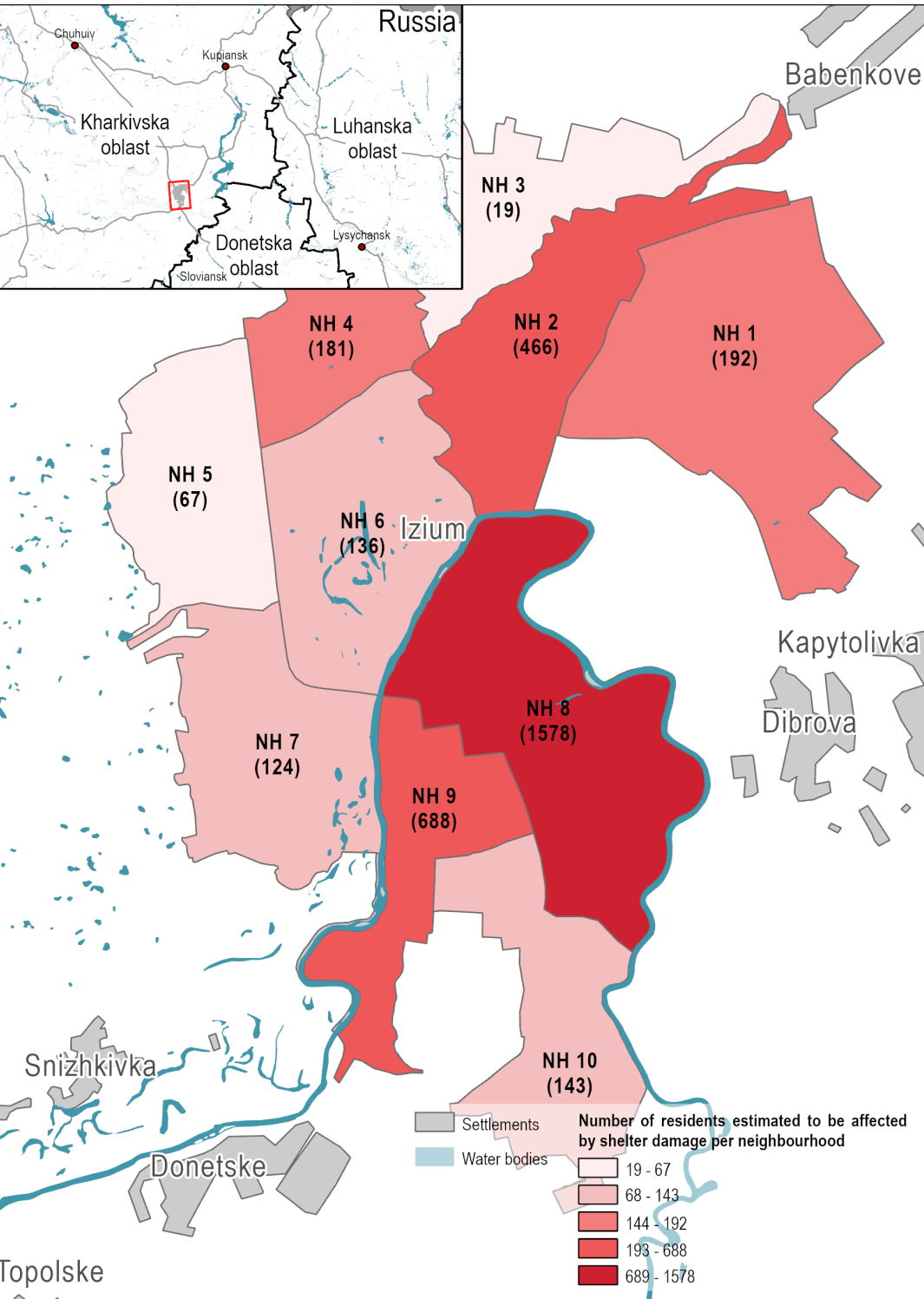
**Image 1 and 2: Examples of detected damage to residential buildings in Iziium based on satellite imagery. Red circles depict single-household apartments and apartment buildings with detected damage. The first image shows a built-up area near the city centre, the second image shows the outskirts of Iziium.**



### Key Findings

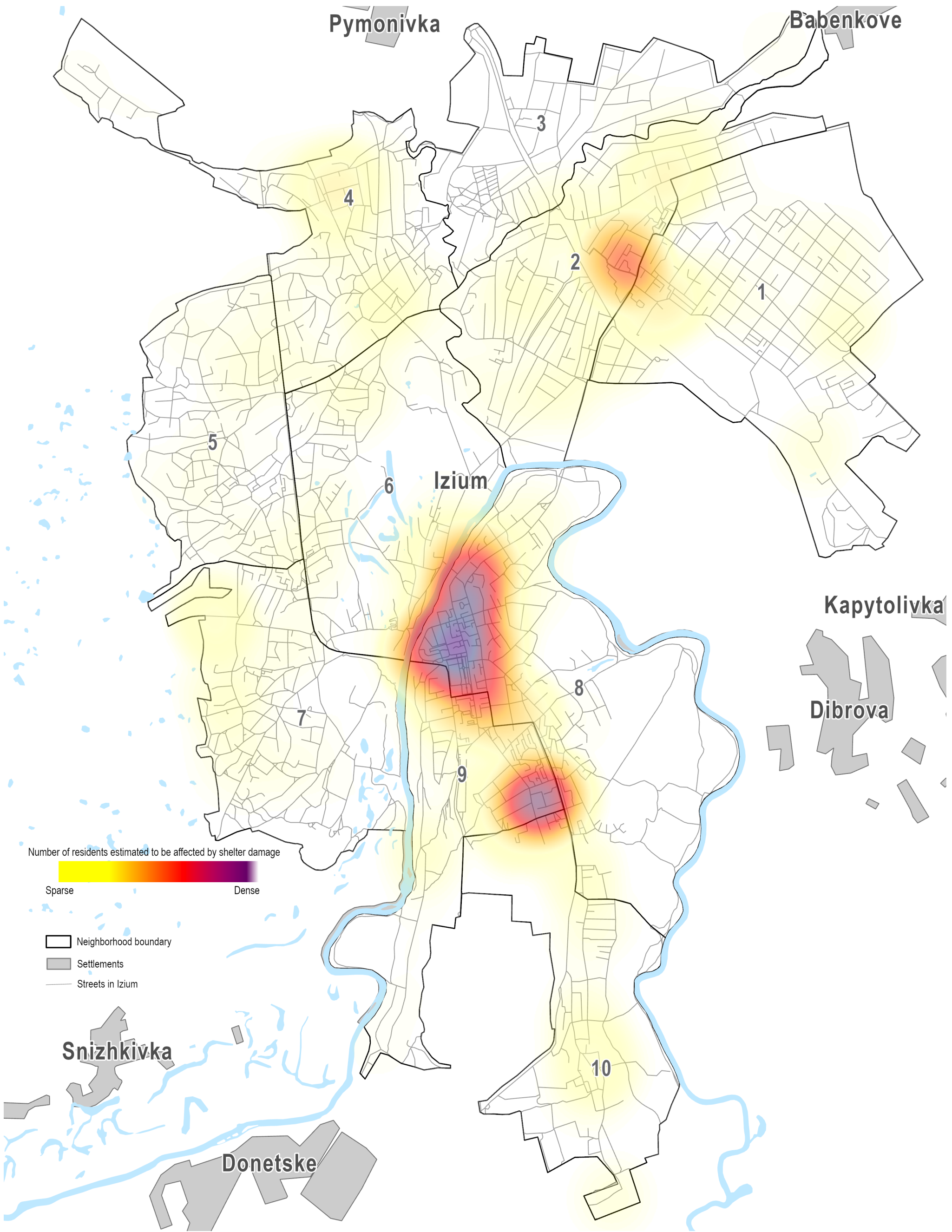
In total, visible damage was detected for **43 apartment buildings and 512 apartments**; an estimated 3,596 residents were likely affected by the detected shelter damage. **More than half** of detected destructions are revealed in **neighbourhoods 8 and 9**, which are located in southern part of Iziium City. This geographic concentration might be due to the fact that this specific area was subjected to intensive on-the-ground battles and shelling in March-April.

The image below depicts the estimated number of individuals affected by detected damage to residential buildings.





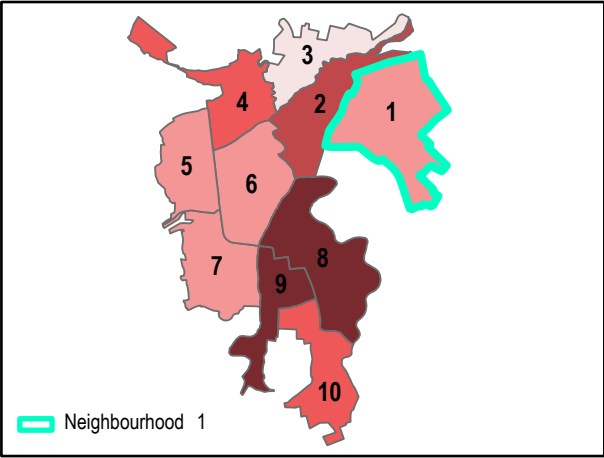
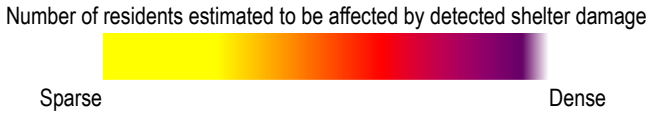
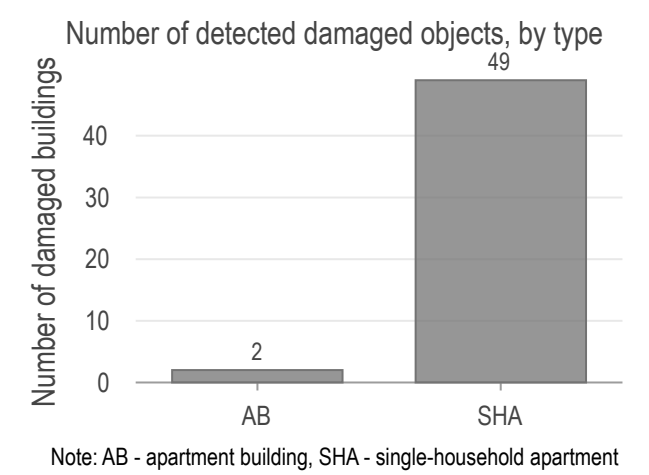
**UKRAINE – Iziium residential damage assessment**  
**Damage density map**



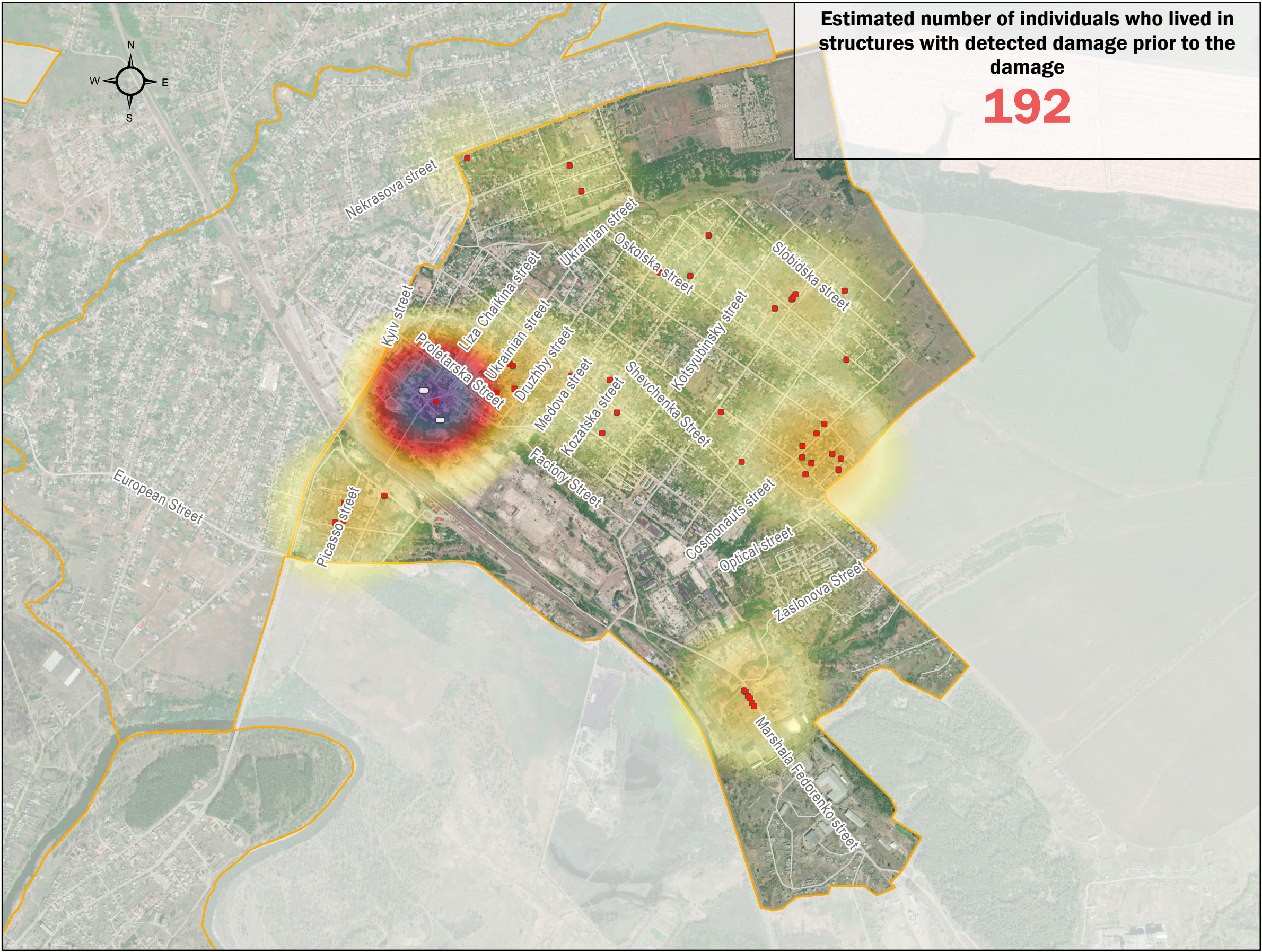


# UKRAINE – Iziium residential damage assessment

## Neighbourhood 1

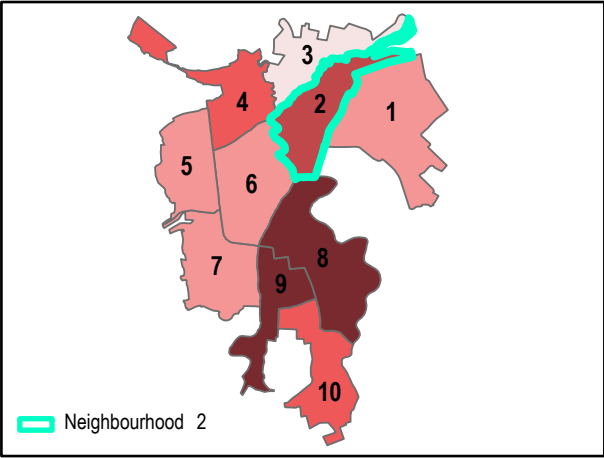
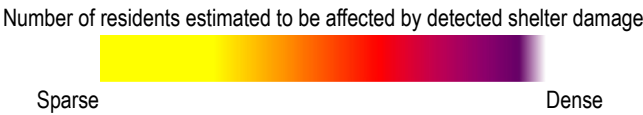
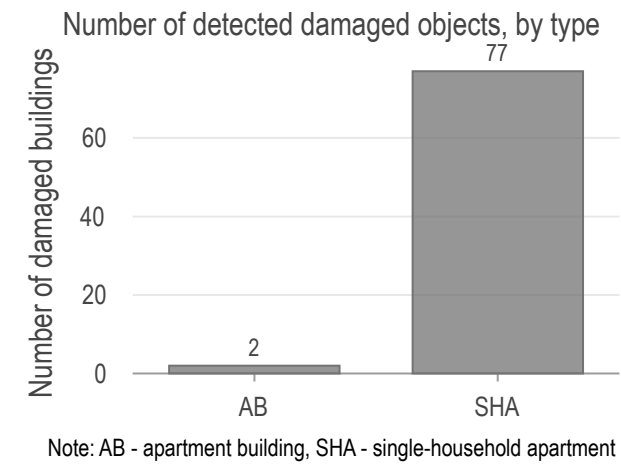


- Apartment building
- Single-household apartment
- ▭ Neighbourhood boundary





**UKRAINE – Iziium residential damage assessment**  
**Neighbourhood 2**



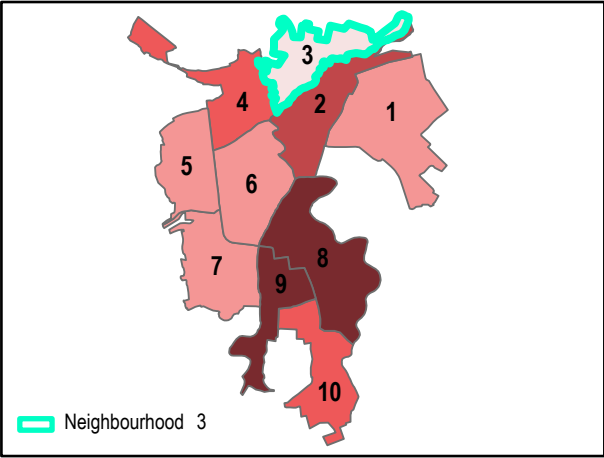
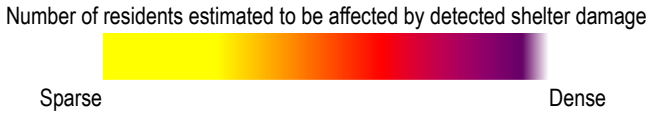
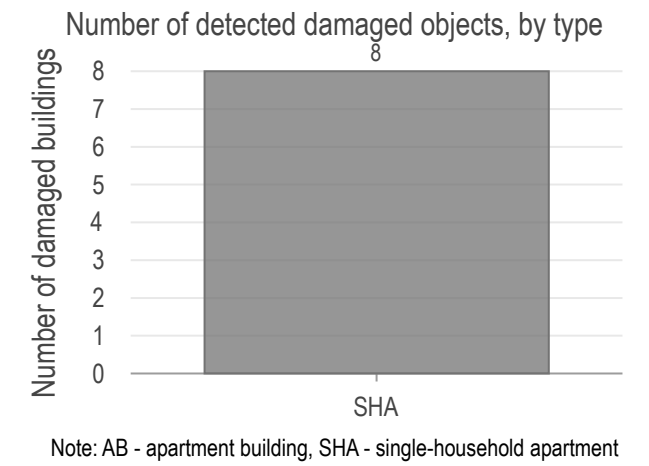
- Apartment building
- Single-household apartment
- ▭ Neighbourhood boundary



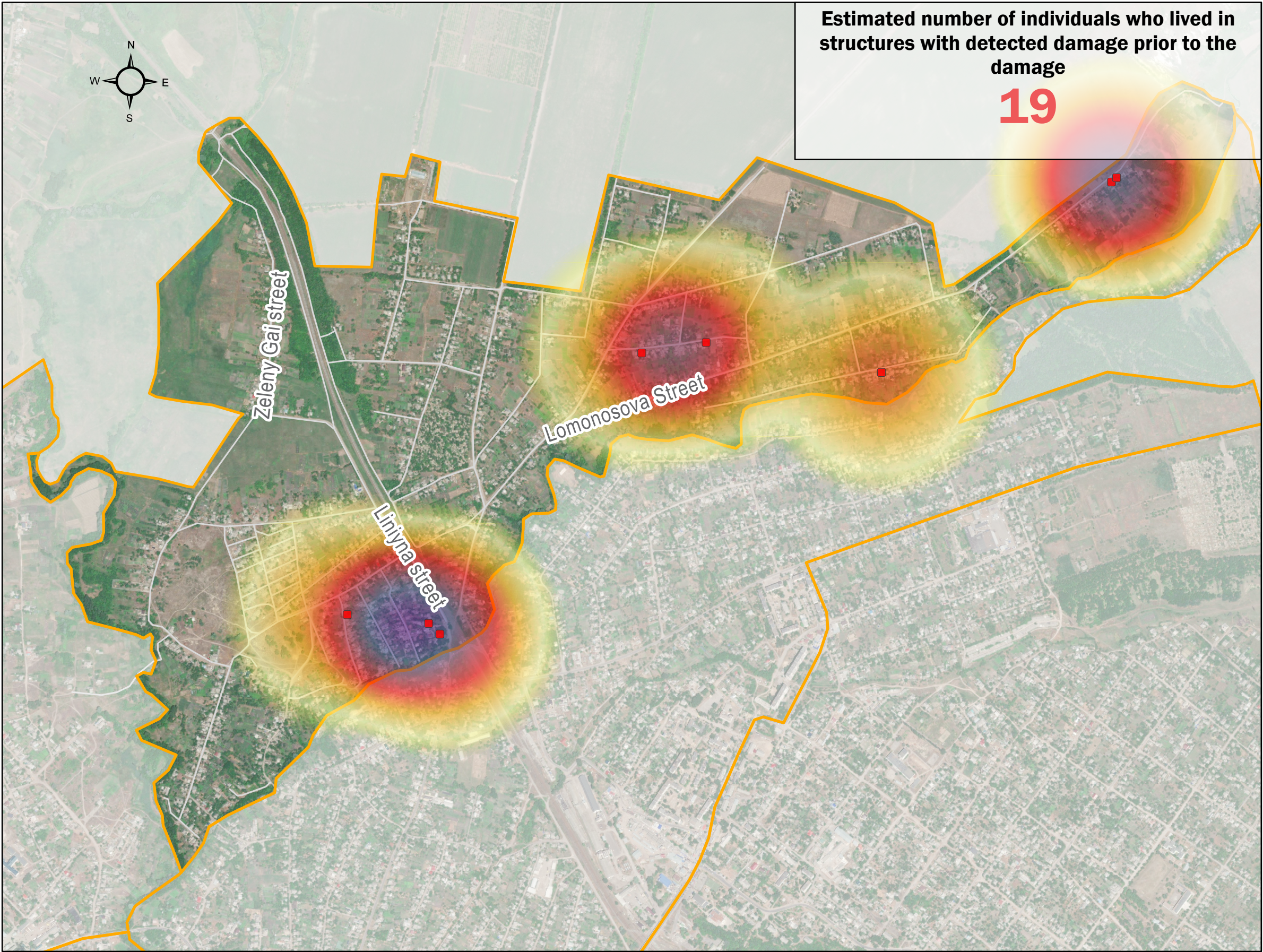


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Neighbourhood 3

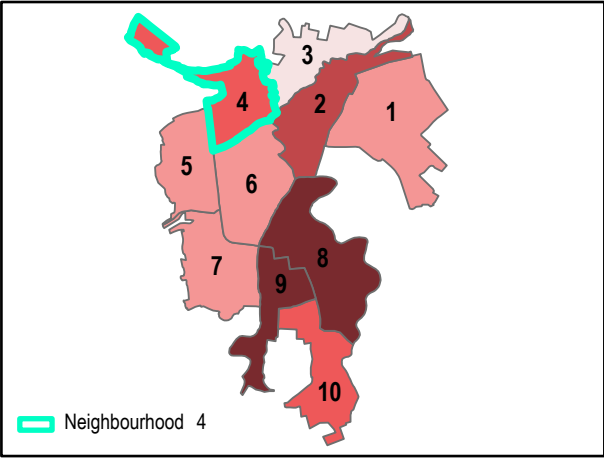
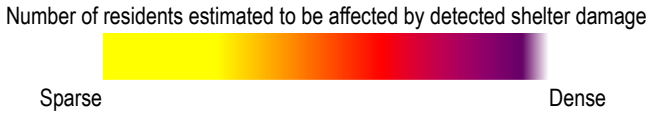
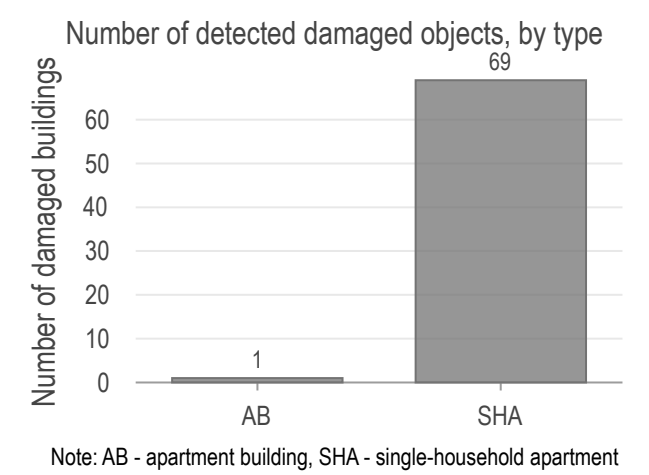


- Apartment building
- Single-household apartment
- Neighbourhood boundary

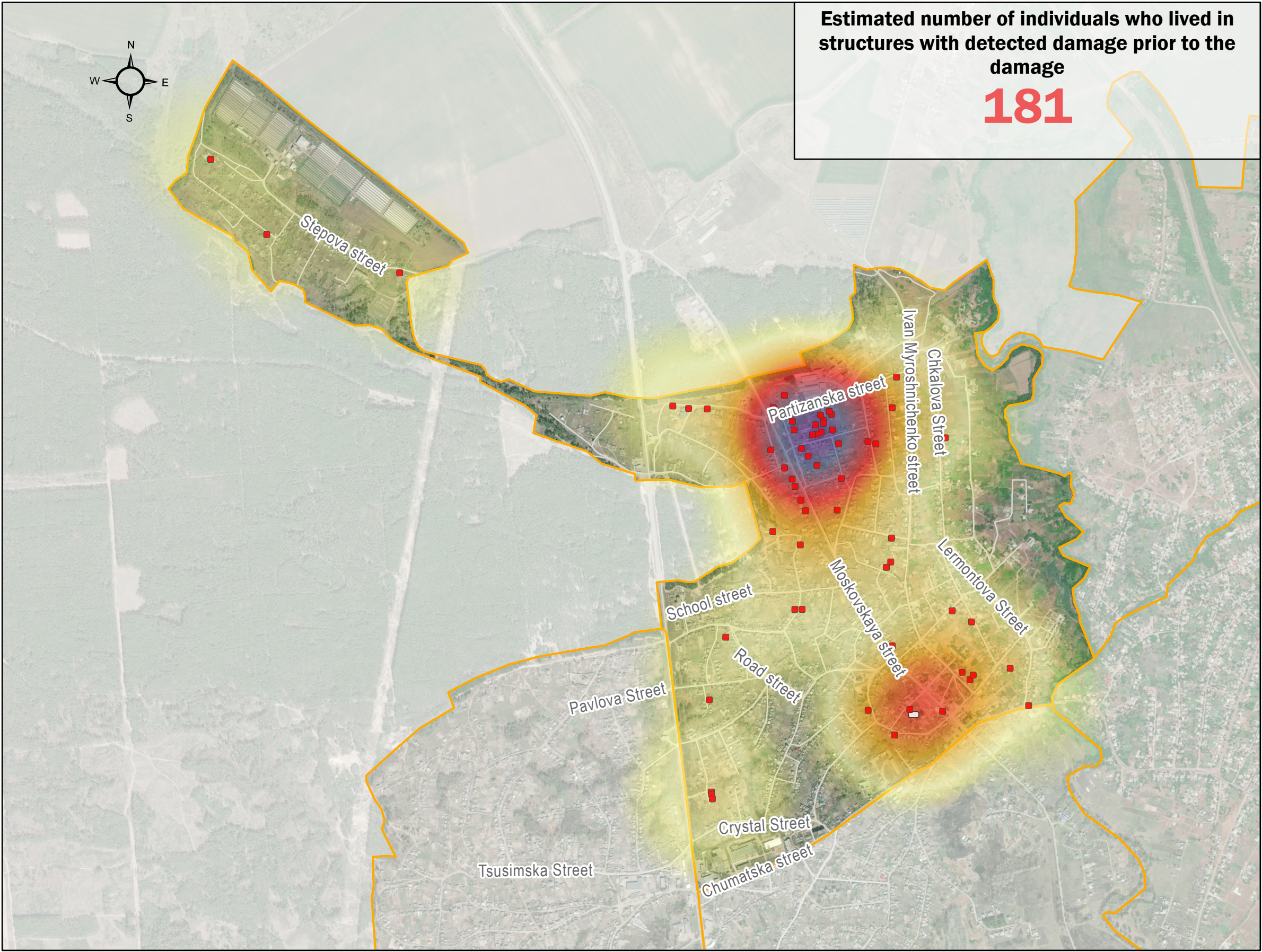




**UKRAINE – Iziium residential damage assessment**  
**Neighbourhood 4**

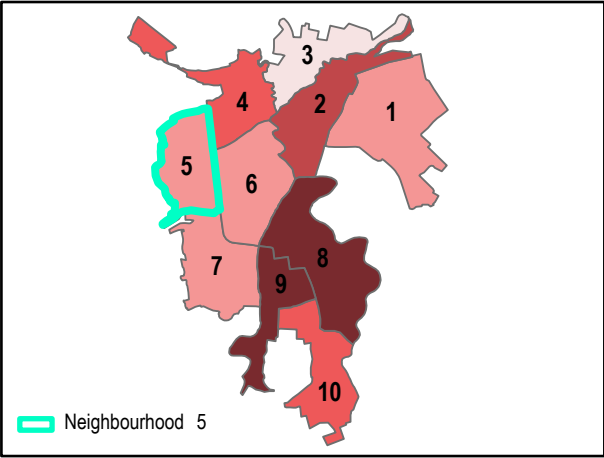
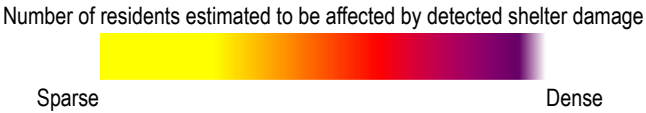
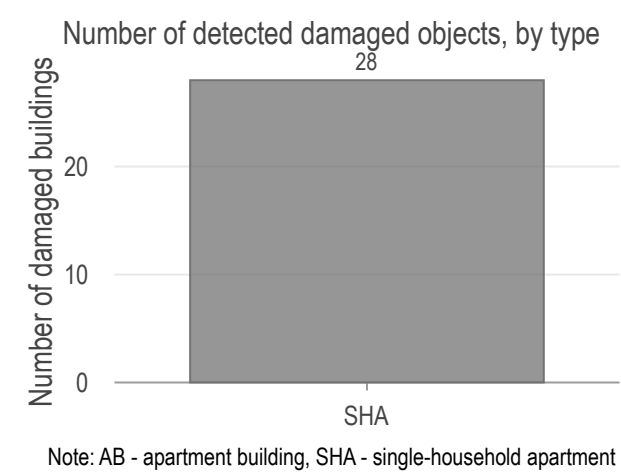


- Apartment building
- Single-household apartment
- ▭ Neighbourhood boundary

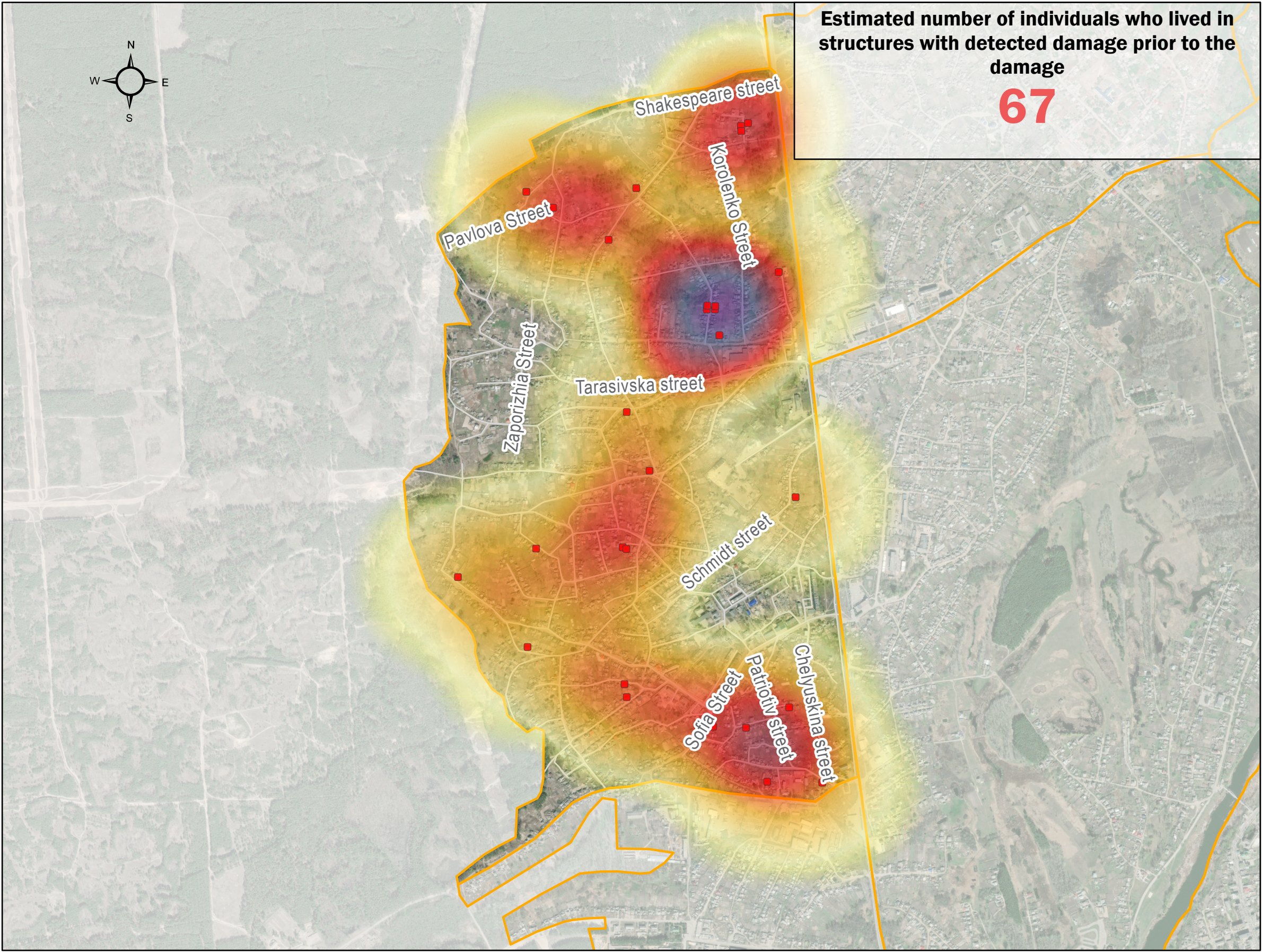




**UKRAINE – Iziium residential damage assessment**  
**Neighbourhood 5**



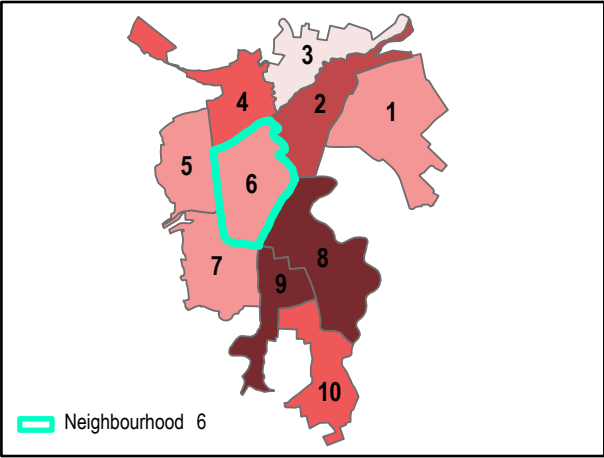
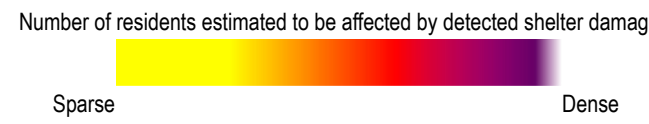
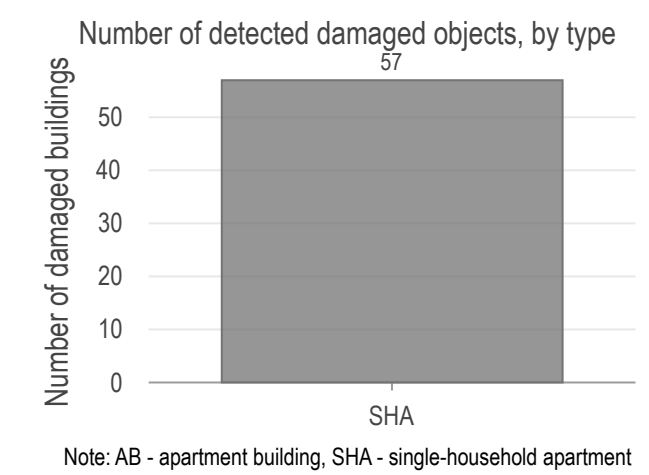
- Apartment building
- Single-household apartment
- ▭ Neighbourhood boundary



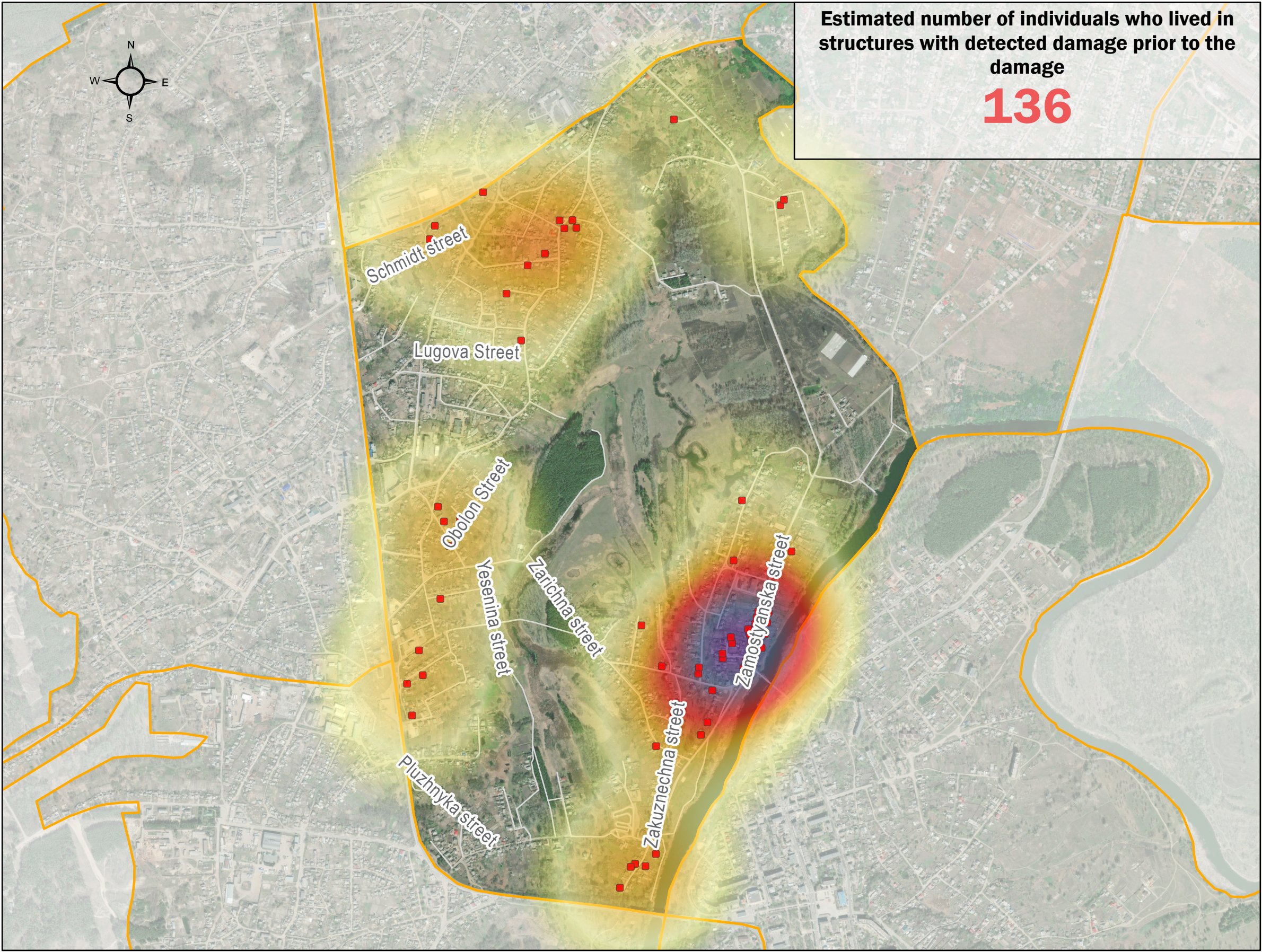


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Neighbourhood 6

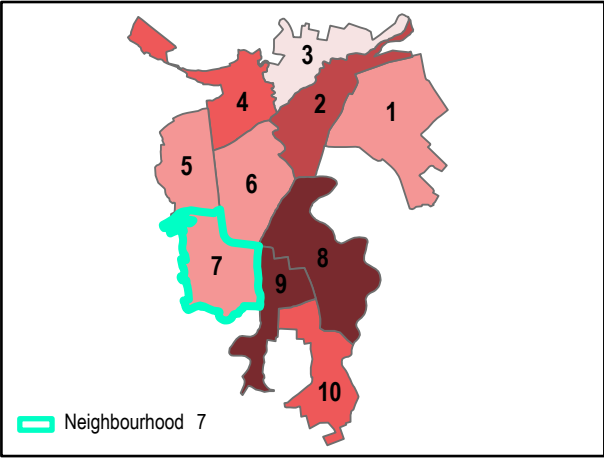
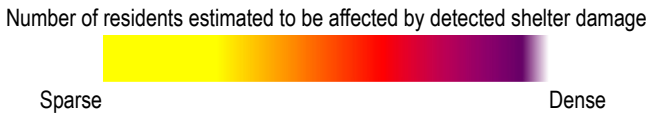
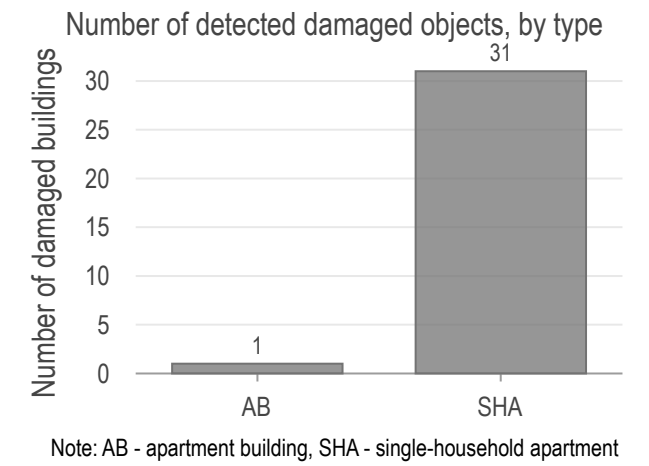


- Apartment building
- Single-household apartment
- ▭ Neighbourhood boundary

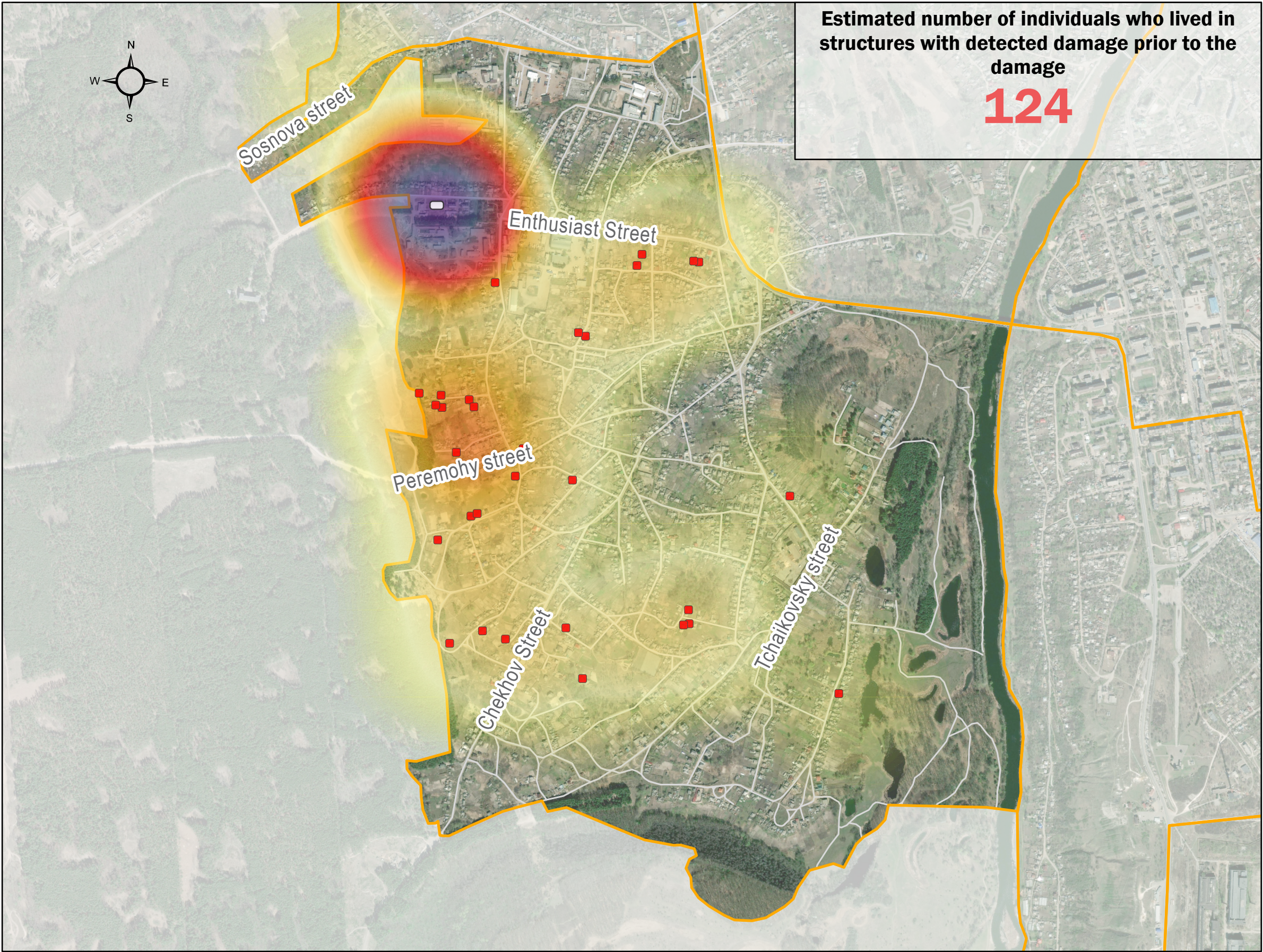




**UKRAINE – Iziium residential damage assessment**  
**Neighbourhood 7**



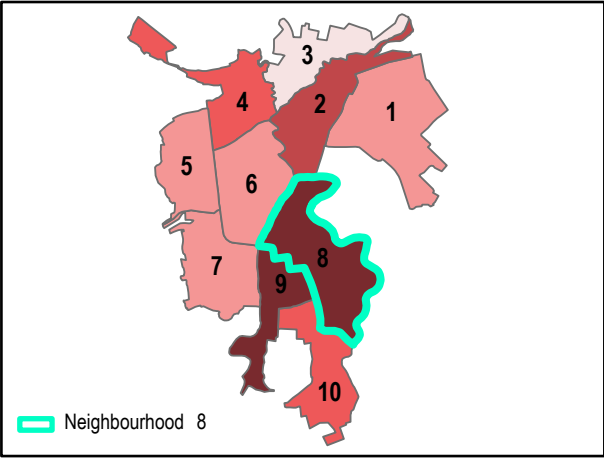
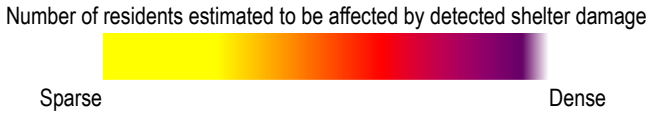
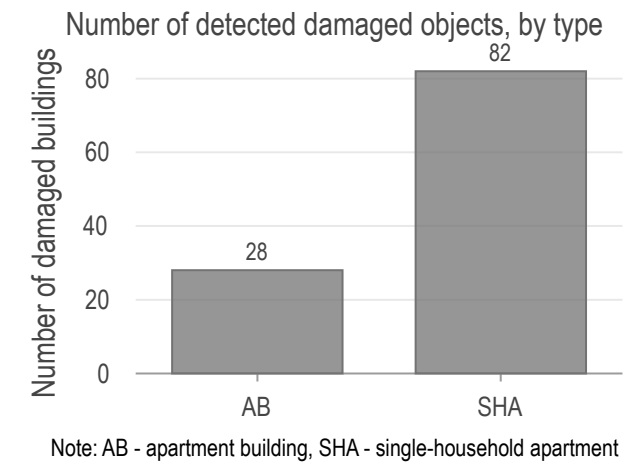
- Apartment building
- Single-household apartment
- ▭ Neighbourhood boundary



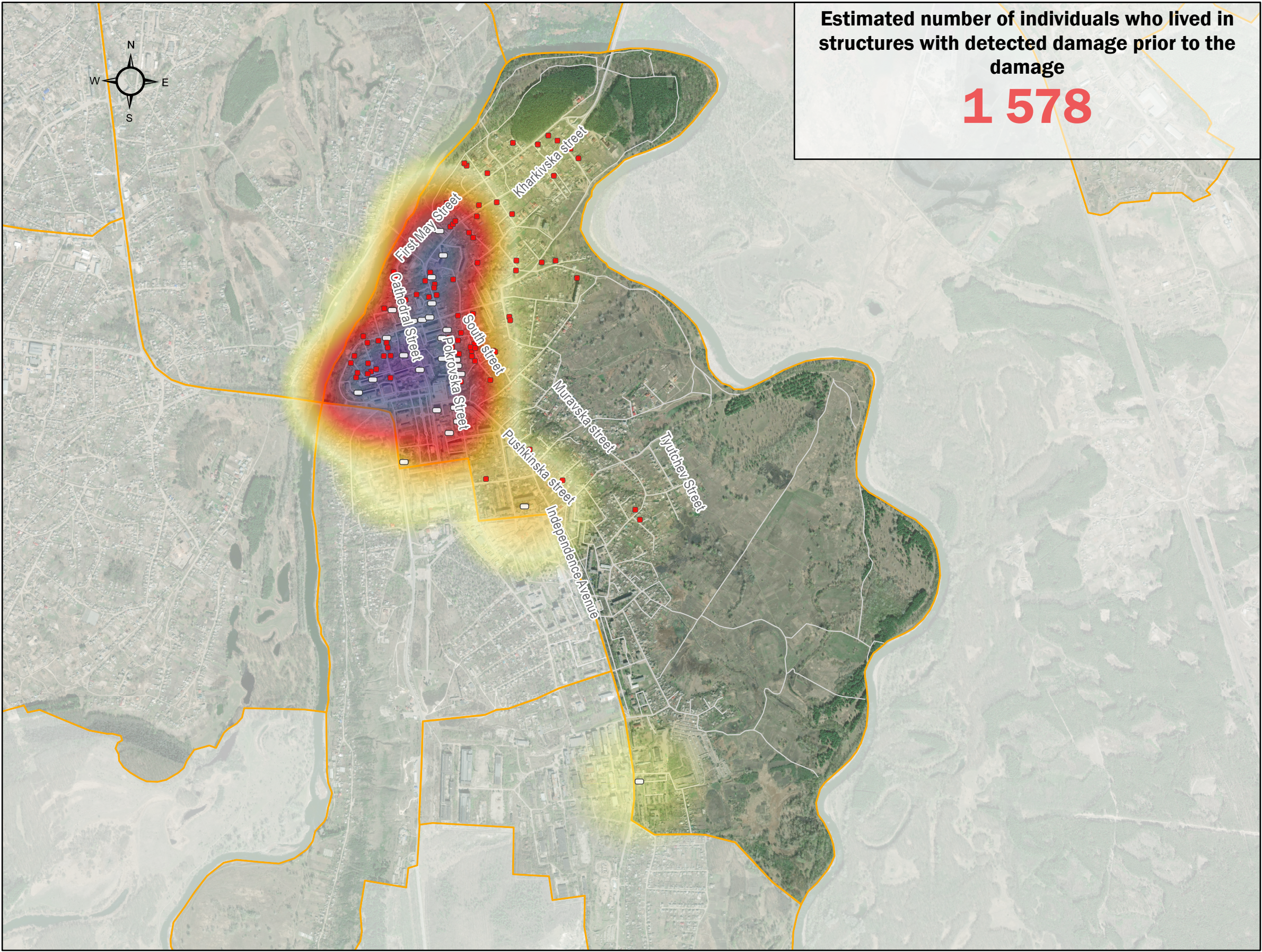


# UKRAINE – Iziium residential damage assessment

## Neighbourhood 8



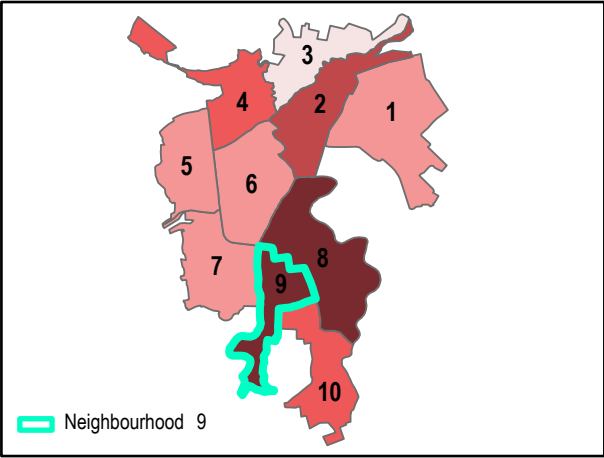
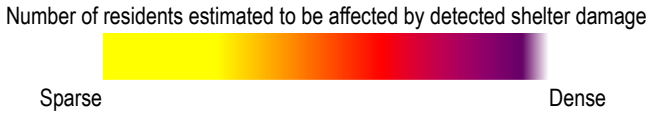
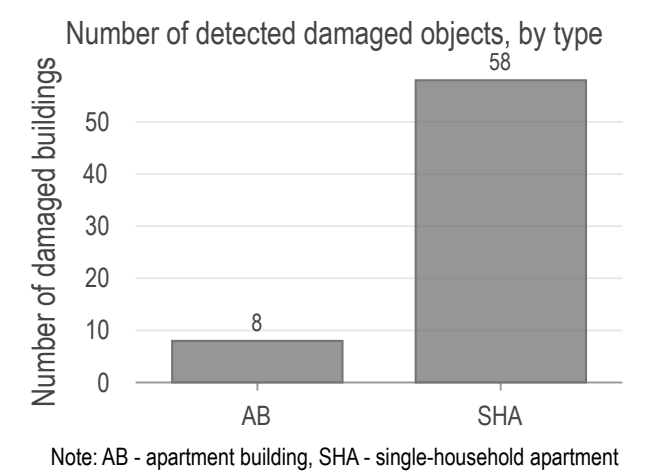
- Apartment building
- Single-household apartment
- ▭ Neighbourhood boundary



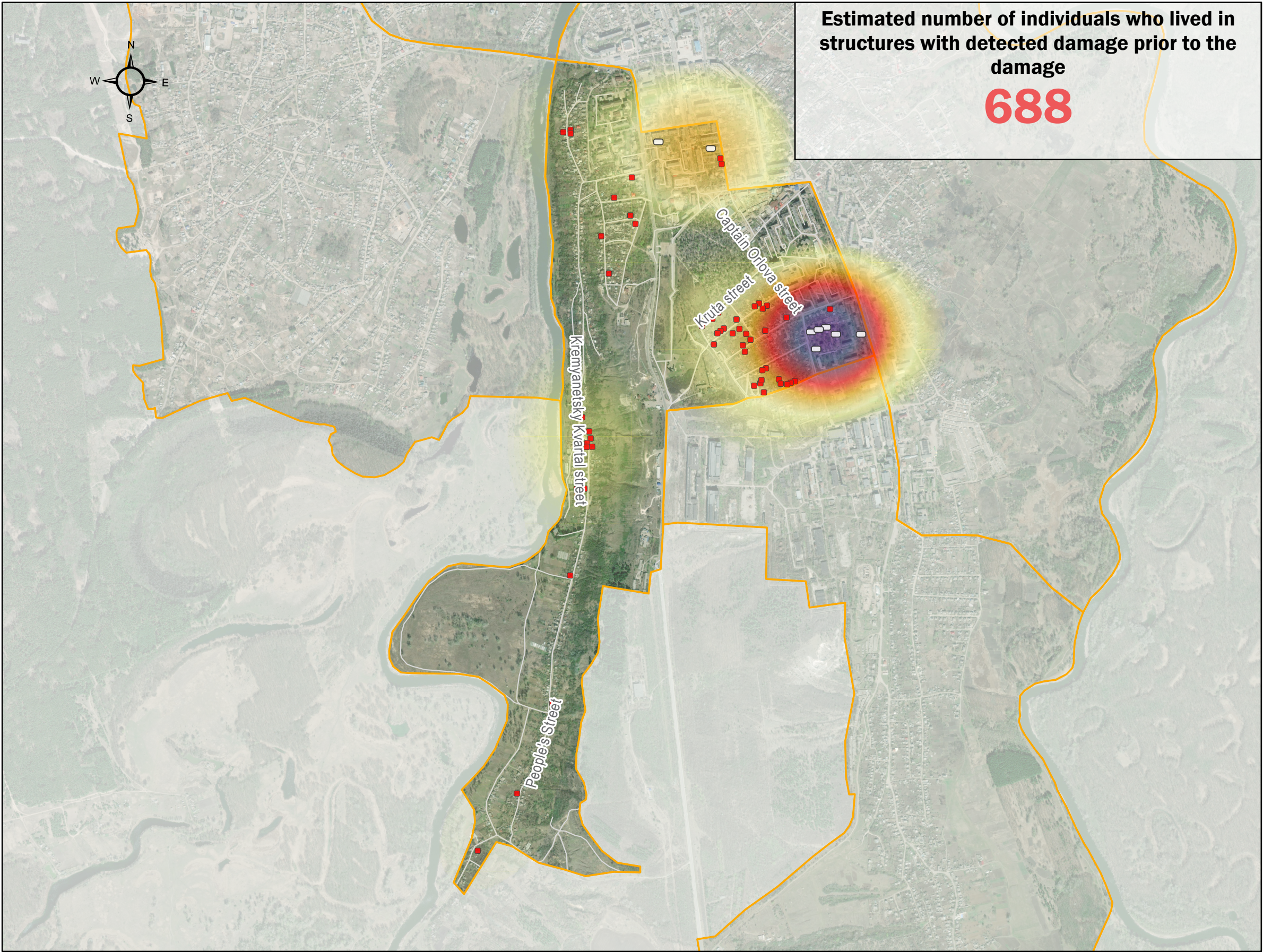


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Neighbourhood 9



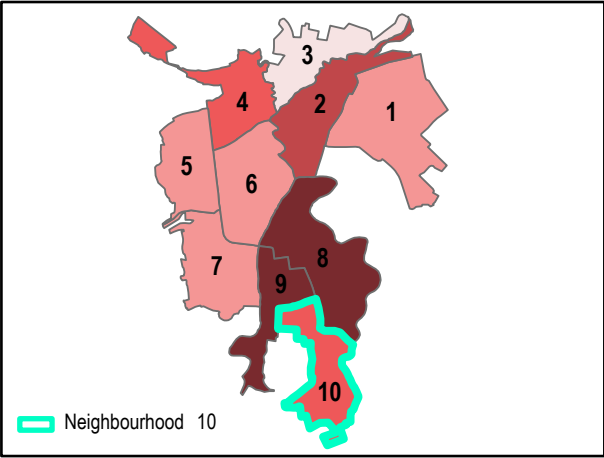
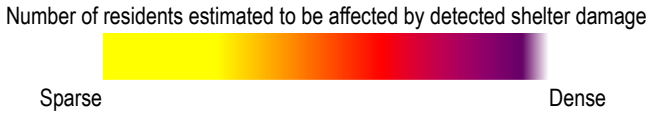
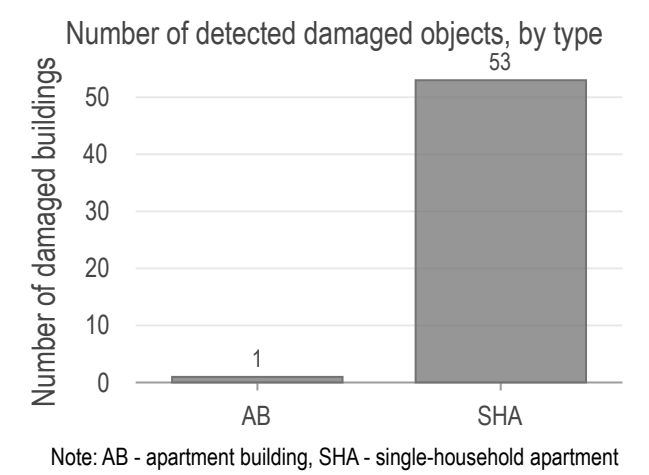
- Apartment building
- Single-household apartment
- Neighbourhood boundary



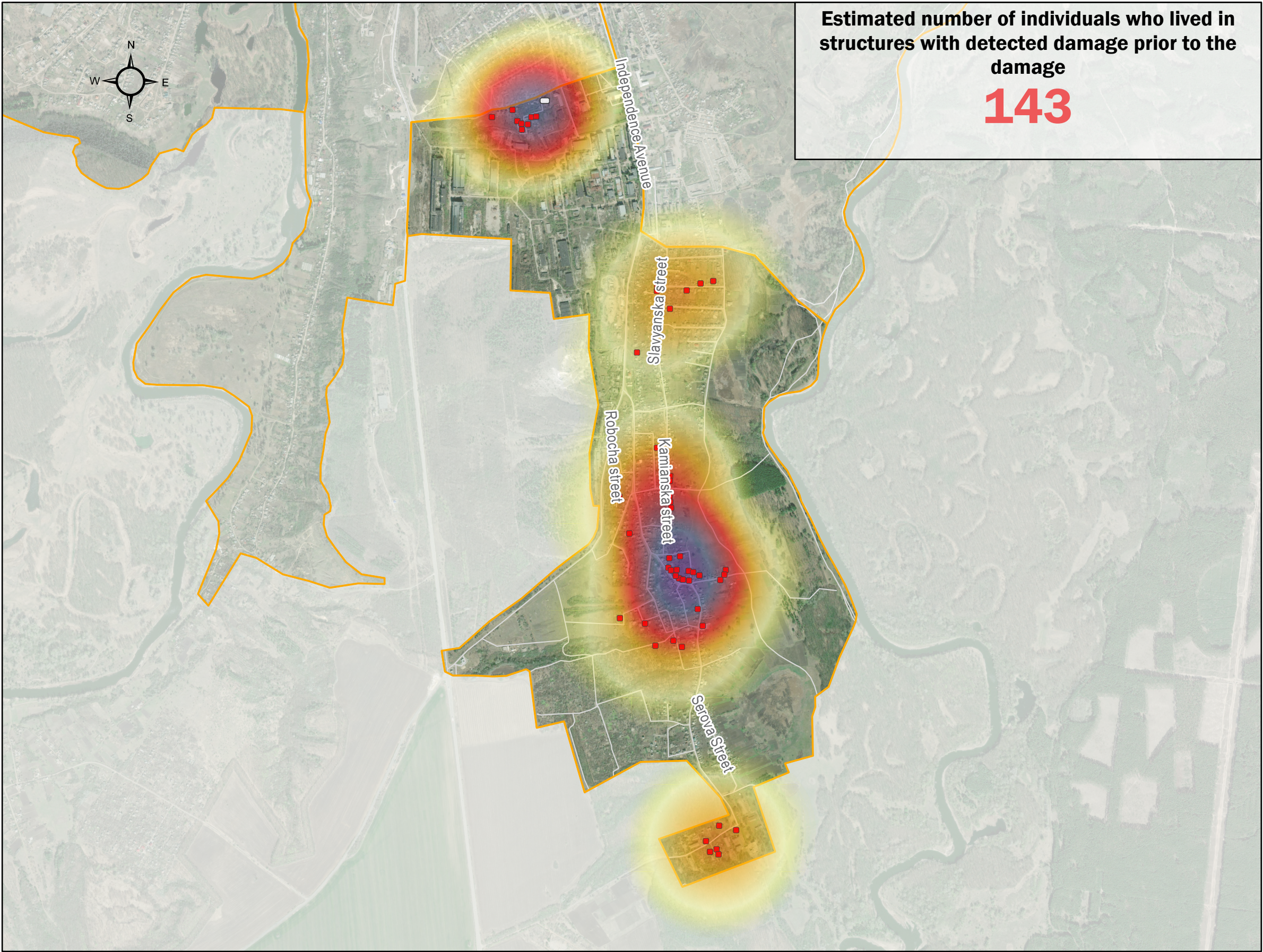


# UKRAINE – Iziium residential damage assessment

## Neighbourhood 10



- Apartment building
- Single-household apartment
- Neighbourhood boundary





# Reference List

- 1 Amnesty International, **Ukraine: Beleguared town of Izium at breaking point after constant attack from Russian forces - new testimony**, 16 March 2022
- 2 Australian Broadcasting Company (ABC) News, **Ukraine town of Izium liberated from Russians shows scale of destruction**, 14 September 2022
- 3 Novoe Vremia, **Izyum 80% destroyed by Russian invaders, at least 1,000 civilians killed**, 14 September 2022
- 4 Reuters, **'It's survival': Fear lingers in the ruins of Ukraine's liberated Izium**, 14 September 2022
- 5 REACH, **Irpın Residential Damage Analysis**, July 2022
- 6 **State Statistics Service in Kharkivska Oblast**, January 2022



