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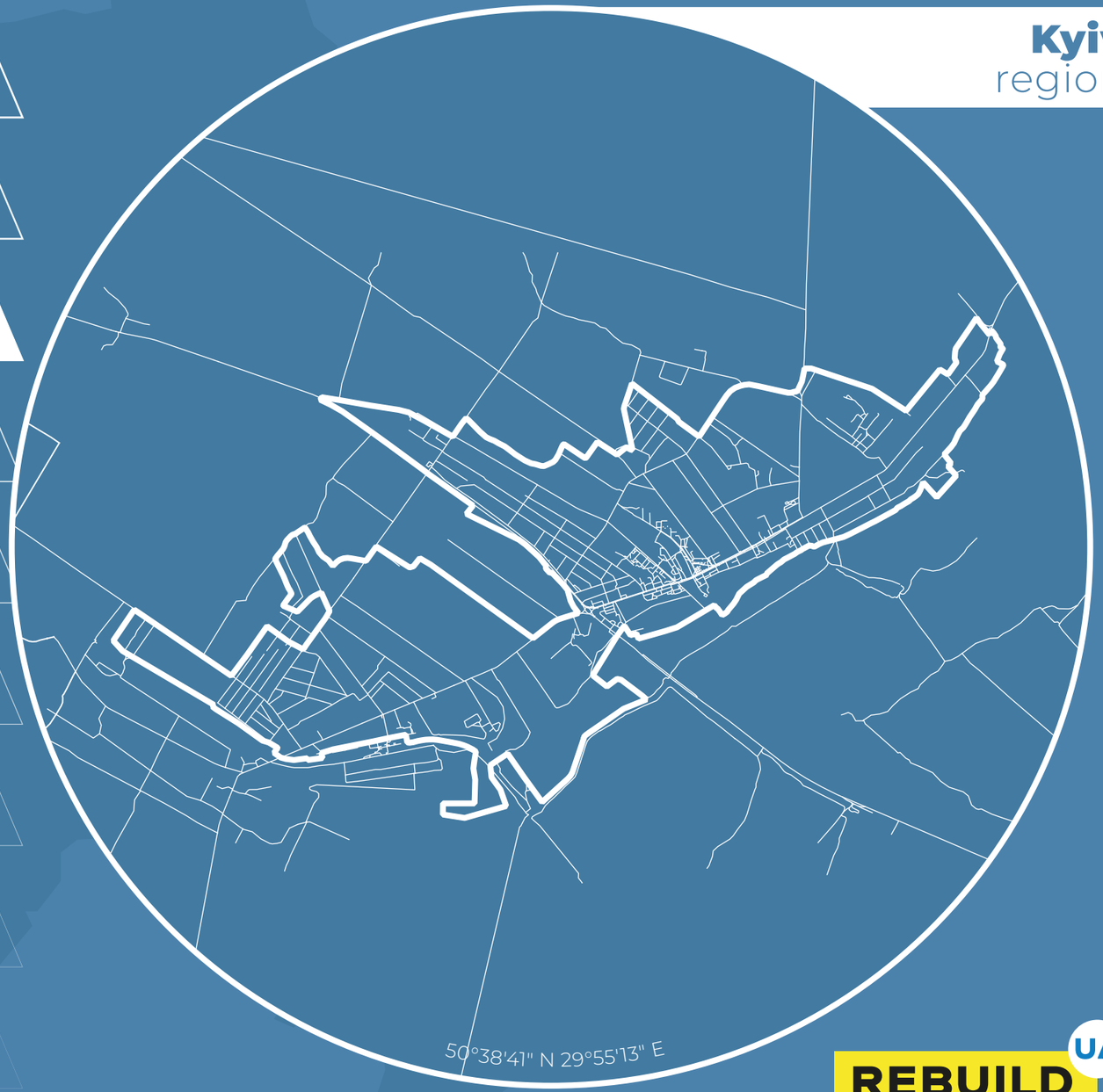
DIGITIZATION OF DESTROYED INFRASTRUCTURE



Kyiv region

REBUILD UA

ABOUT THE PROJECT

Background

The russian aggression has caused a large amount of damage and destruction in almost all regions of Ukraine — housing and infrastructure have been destroyed, and industrial facilities and local businesses shut down.

The speed and efficiency of the country's recovery processes directly depend on a competent assessment of the damage, correct budgeting and a step-by-step plan for reconstruction. A transparent assessment of damages will justify the need for funding as well as simplify the process of raising funds for recovery.

About the project

The RebuildUA project aims to digitize, analyze and demonstrate to the world the destruction of Ukraine's infrastructure. The geography of the project covers all regions of the country affected by military aggression.

The results will be made public, communicated to communities, public authorities and specialized recovery funds.

Project founders:

Drone survey and digitization of geospatial information:

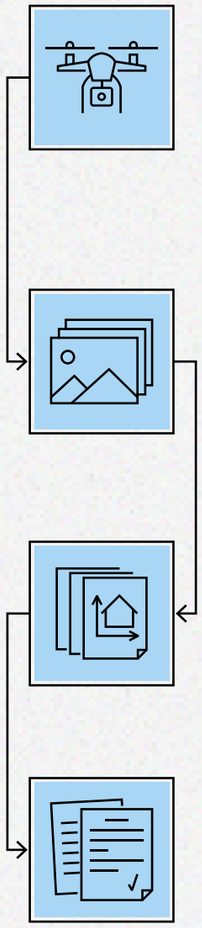
SMART Farming

Land analysis and interaction with communities:

VKURSI ZEMLI

The initiative is being financially and technically supported by the United Nations Development Programme in Ukraine.

Methodology



1. Drone photography and orthophoto creation

The use of drones allows the project team to collect detailed data on the destruction: to fly at low altitudes, and shoot buildings at different angles and from all sides.
For localities where drone shooting is not possible, we use high-resolution satellite images.

2. Collection of photos and videos

To ensure completeness of the input data, the project team captures photos and videos, as well as collects additional information from verified sources.

3. Destruction detection and data processing

Based on orthophotos, GIS specialists digitize all buildings, identify destroyed objects, classify building types, and determine levels of destruction.

4. Publication of analytical reports

Designers and content managers present the complete information in public infographic reports.

Find out more at the project website: rebuildua.net

ABOUT THE PROJECT

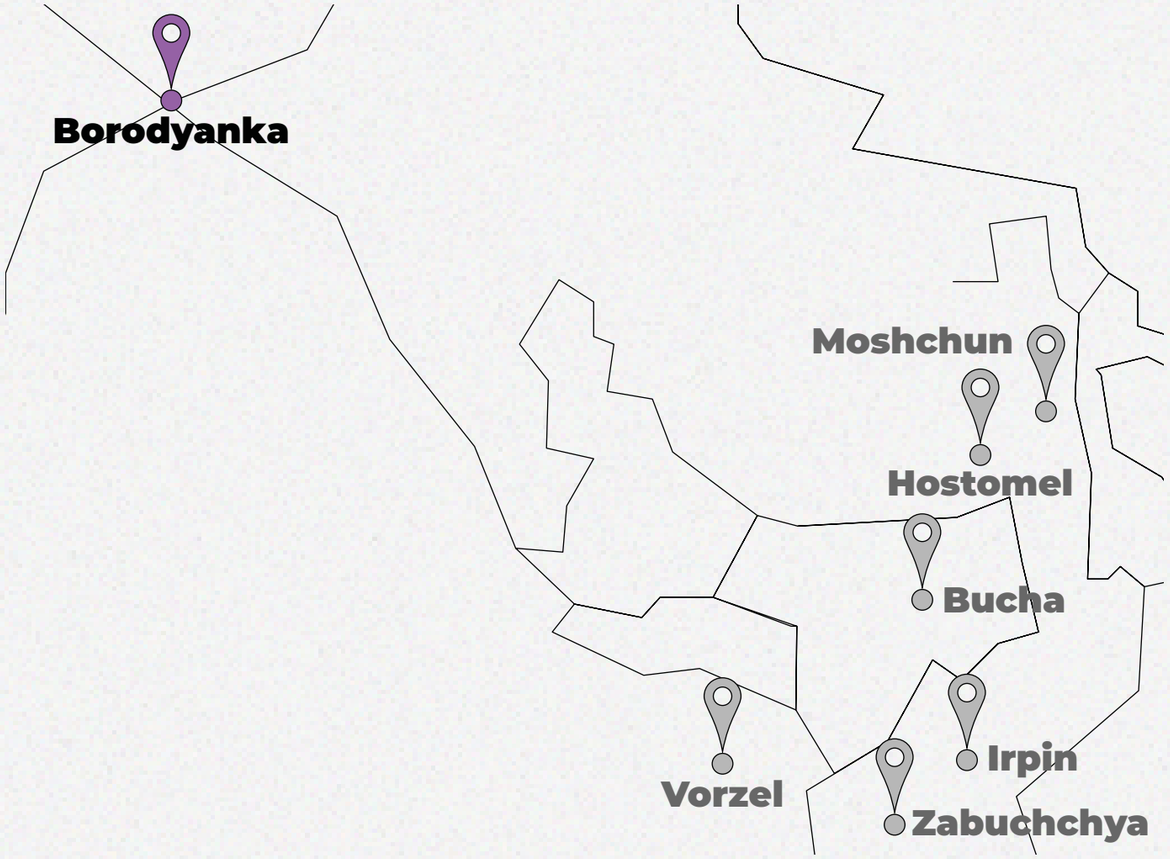
At the beginning of the russian invasion, fierce battles were fought in Borodyanka: according to eyewitnesses, russian planes fired rockets at residential buildings at low altitudes. As a result, the central street of the village turned into ruins — destroyed apartment buildings, fallen trees, and burnt cars. Bomb shelters could not save people: basements were also destroyed due to the scale of the shelling.

There are no military units, warehouses, or objects of strategic importance in Borodyanka. This fact did not prevent russian forces from destroying all the key administrative buildings and causing sufficient damage to the housing stock.

Find out more about the destruction of Borodyanka in our report.

rebuildua.net

/rebuildua.net



Region	**Kyiv**
District	**Buchanskyi**
Community	**Borodyanska**

Area
6.5 km²

Population
13,157 people

DIGITIZATION PROCESS

11 flight missions

1,513 pictures for othophoto

260 hours of data processing

13.9 Gigabytes of data

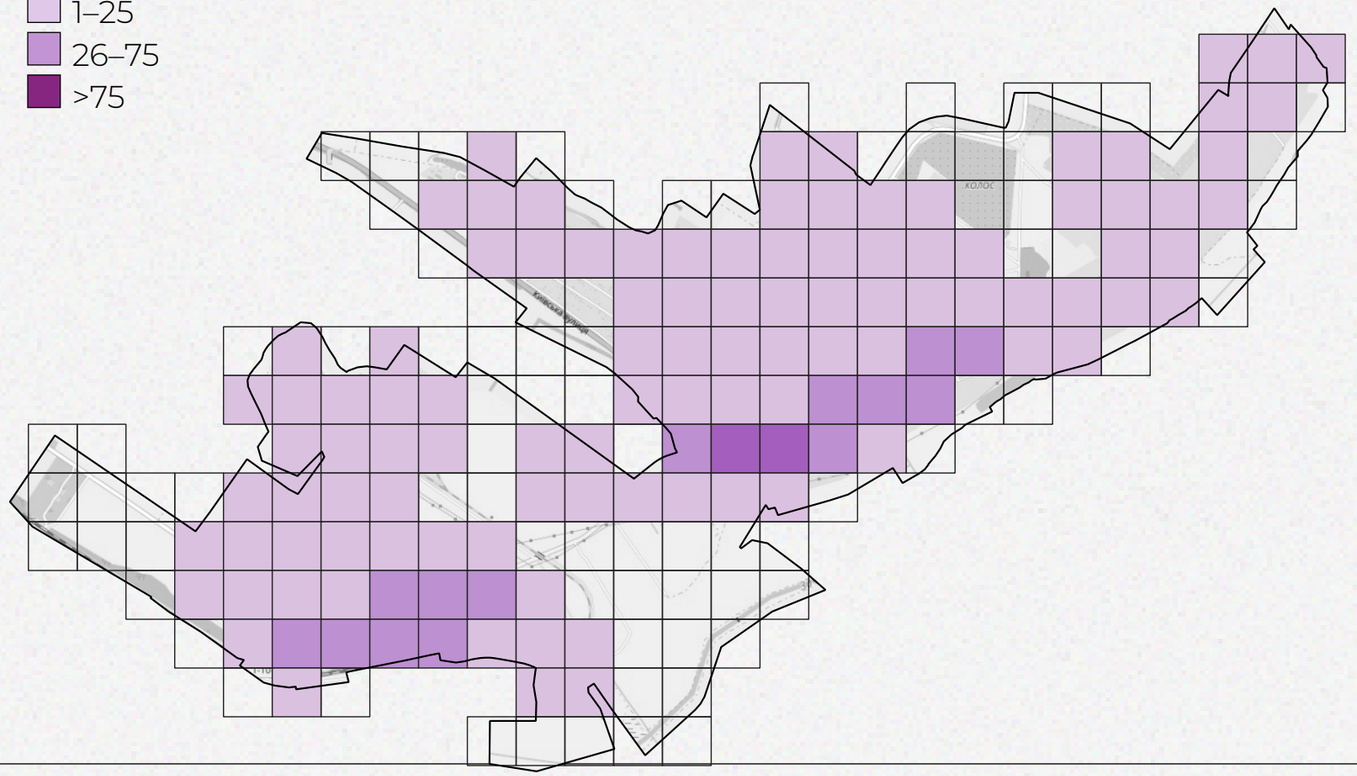
border of the locality

trajectory of drone shooting

THERMAL MAP OF DESTRUCTION

100 buildings
25 buildings

Number of destroyed buildings
0
1–25
26–75
>75



Destruction of the largest streets

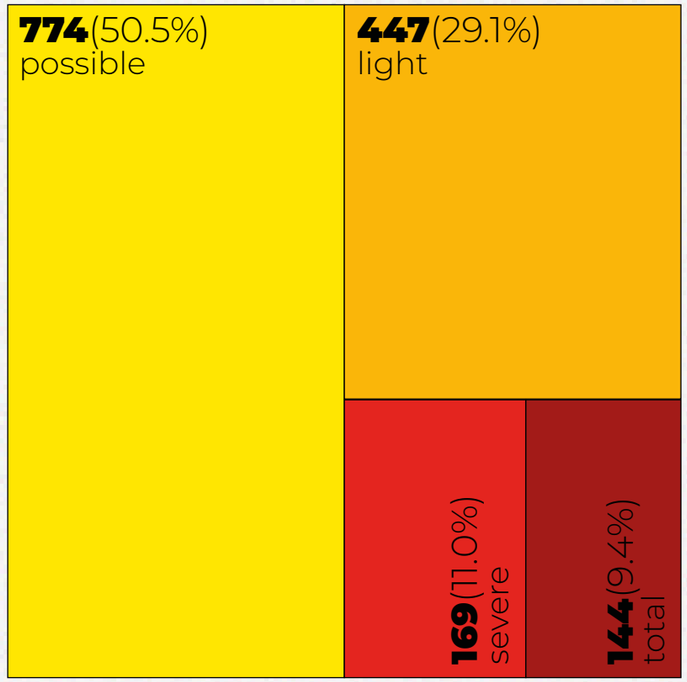
27%	**396** / 1,452	Tsentralna
12%	**107** / 872	Semashka
2%	**11** / 599	Poliova
9%	**41** / 451	Velyka
37%	**143** / 385	Vokzalna
3%	**9** / 352	Khutirska
8%	**23** / 279	Mykhailivska
13%	**36** / 275	Poshtova
37%	**96** / 259	Nabarezhna
39%	**97** / 247	Pryvokzalna

LEVELS OF DESTRUCTION

Buildings destroyed:

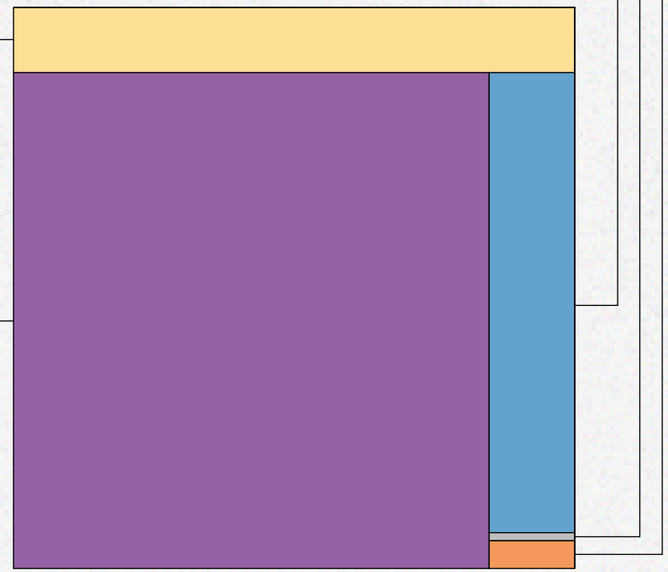
1,534 / 9,969

Level of destruction, number of buildings



TYPES OF DESTROYED OBJECTS

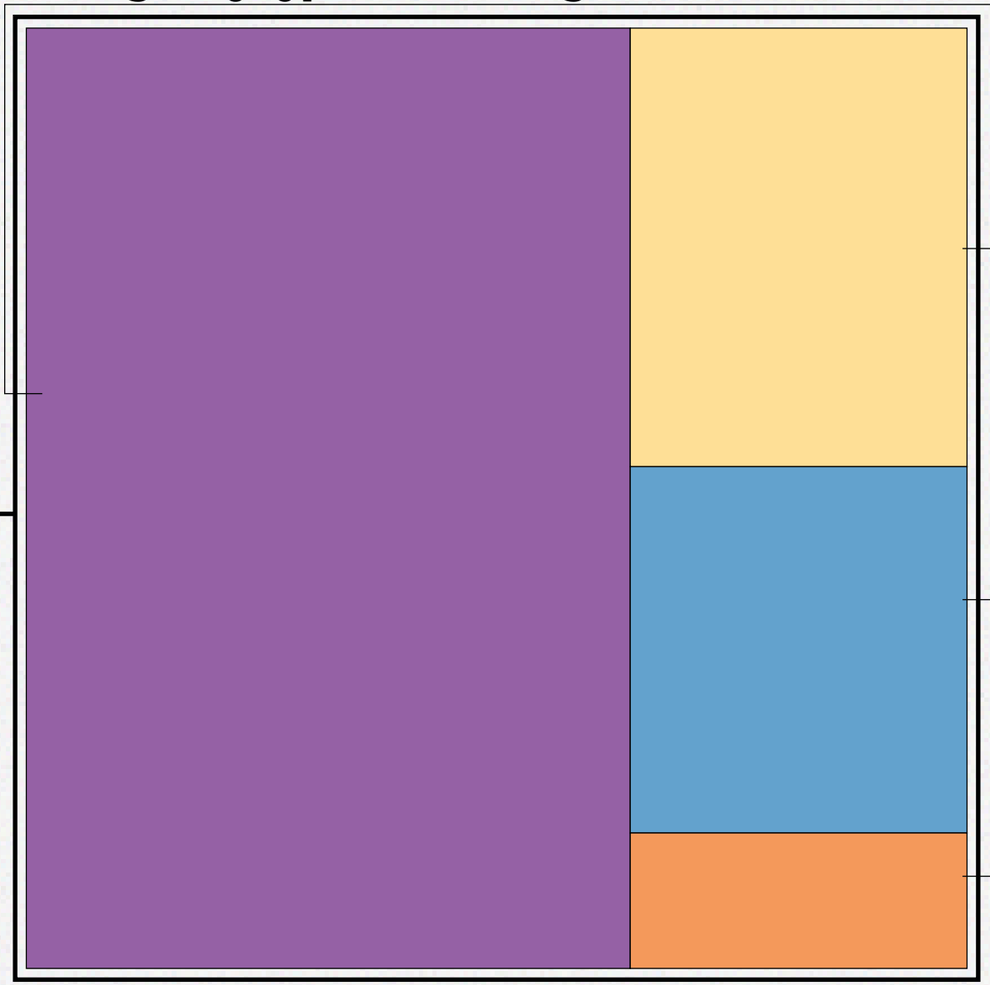
Residential buildings & outbuildings	**1,147** / 8,831
Social infrastructure	**176** / 447
Industrial buildings & construction	**198** / 647
Administrative infrastructure	**12** / 26
Other infrastructure	**1** / 18



ASSESSMENT OF DAMAGES

KSE | Institute

Damages by types of buildings



Total damages

$148.4 million

$94.98 million
Residential buildings
& outbuildings

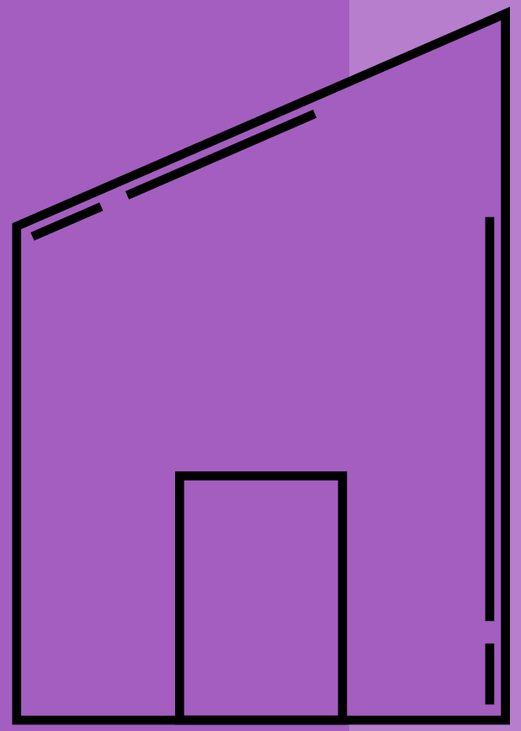
$24.36 million
Social infrastructure

$21.43 million
Industrial buildings
& construction

$7.58 million
Administrative
infrastructure

SMART Farming | VKURSI ZEMLI | TOP LEAD

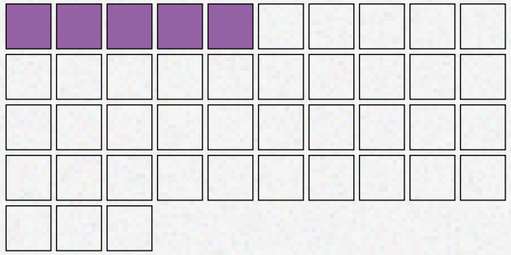
RESIDENTIAL BUILDINGS & OUTBUILDINGS



SCALE OF DESTRUCTION

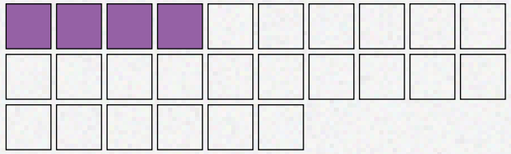
Number of destroyed buildings

Outbuildings



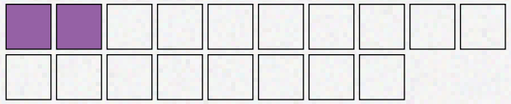
477 / 4,270

Private houses



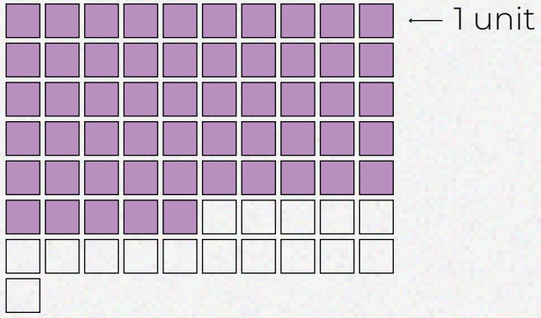
404 / 2,633

Garages & parking spaces



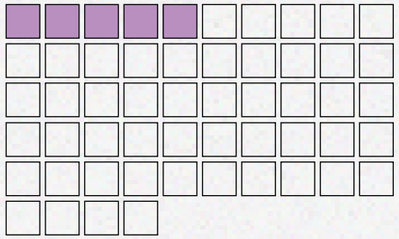
198 / 1,762

Apartment buildings



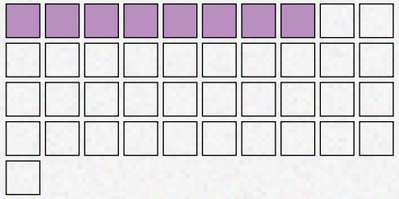
55 / 71

Greenhouses



5 / 54

Townhouses & duplexes

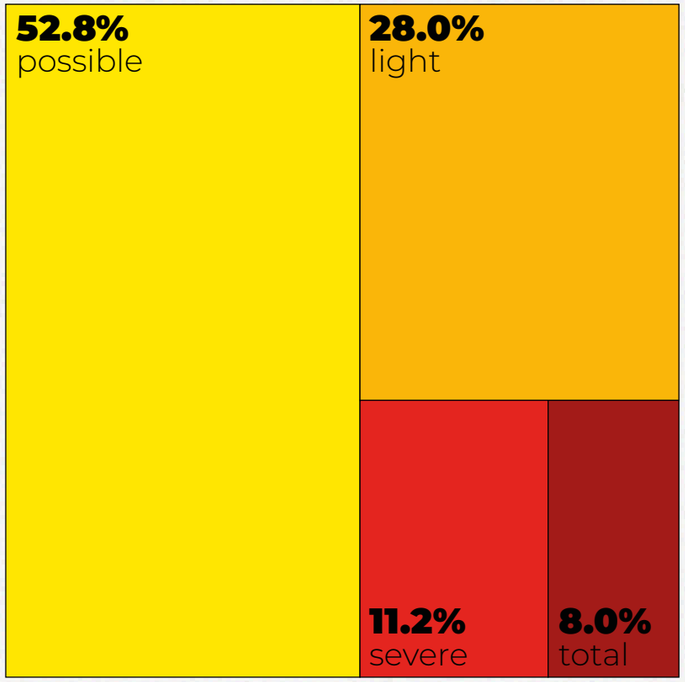


8 / 41

SCALE OF DESTRUCTION

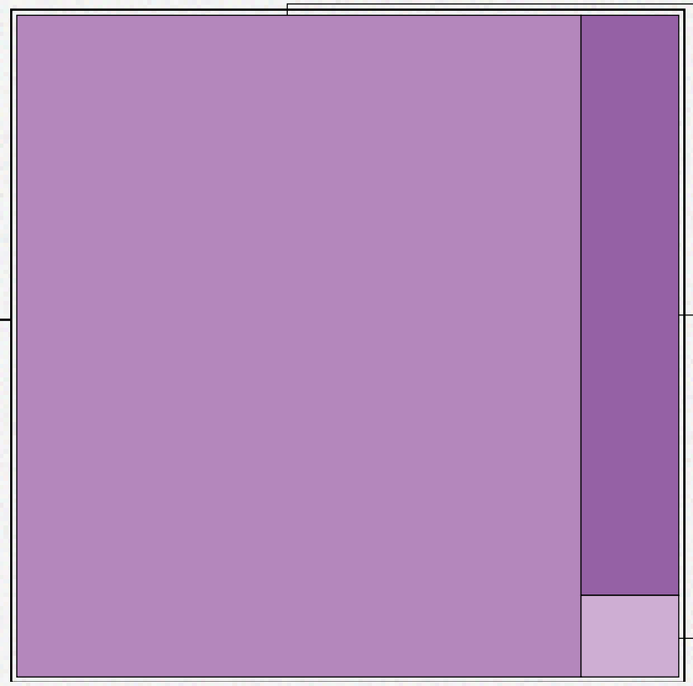
RESIDENTIAL BUILDINGS & OUTBUILDINGS

Level of destruction



Assessment of damages

Total damages
$95.0 million



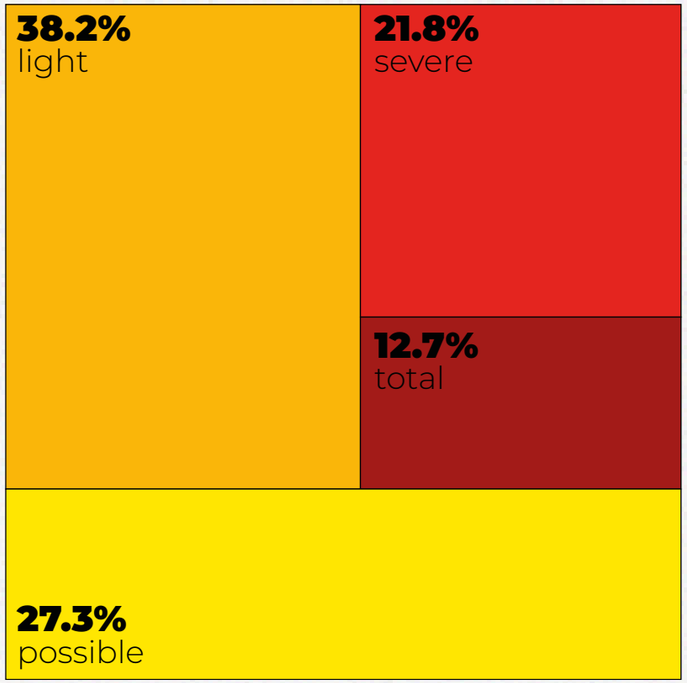
$80.68 million
Apartment buildings

$12.51 million
Private houses & townhouses

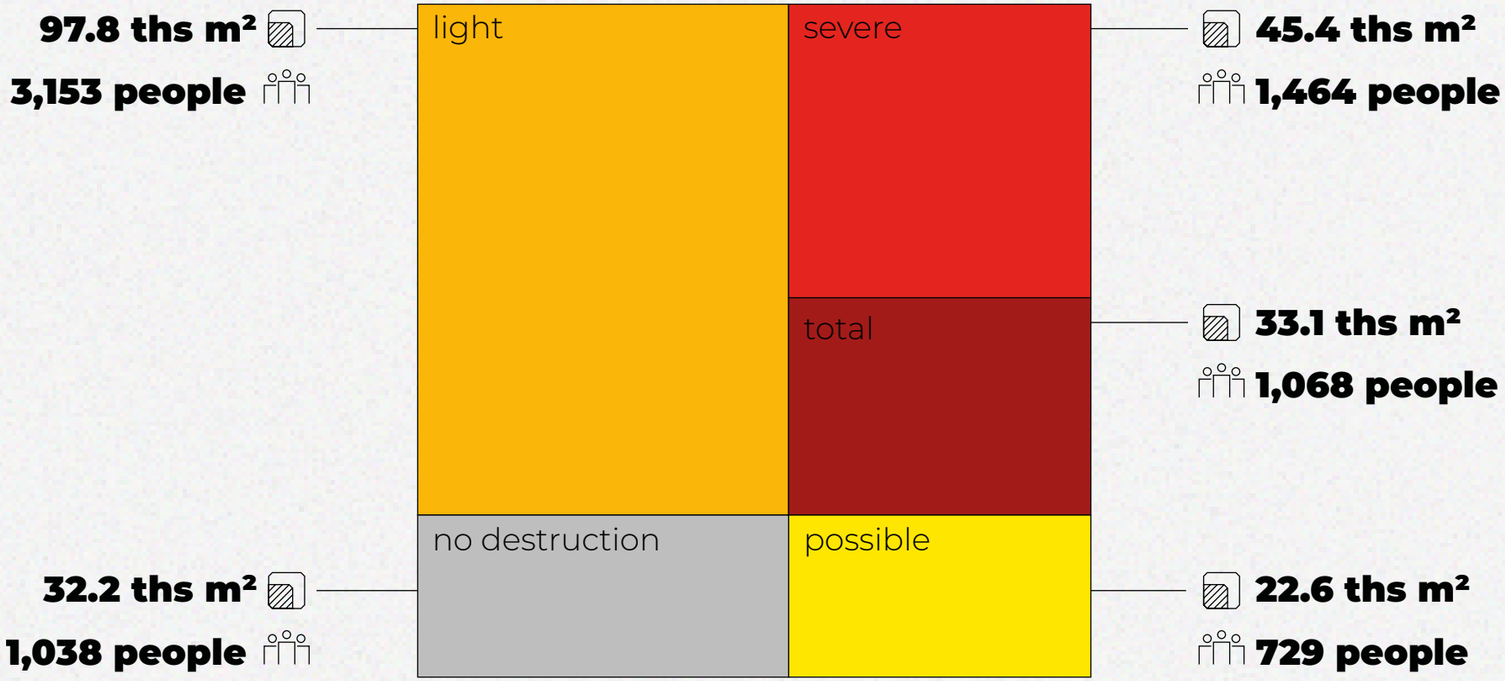
$1.79 million
Outbuildings

APARTMENT BUILDINGS

Level of destruction



The area of destruction and the number of residents who suffered damage



Total damages

$80.7 million

Total area of damage

198.8 ths m²

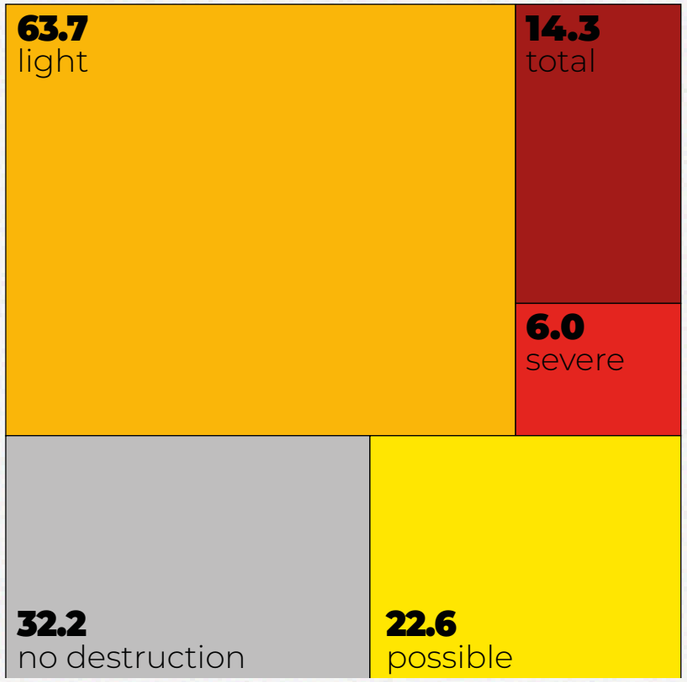
Number of residents affected

6,414

APARTMENT BUILDINGS

Typical apartment buildings (by the number of floors) and their destruction

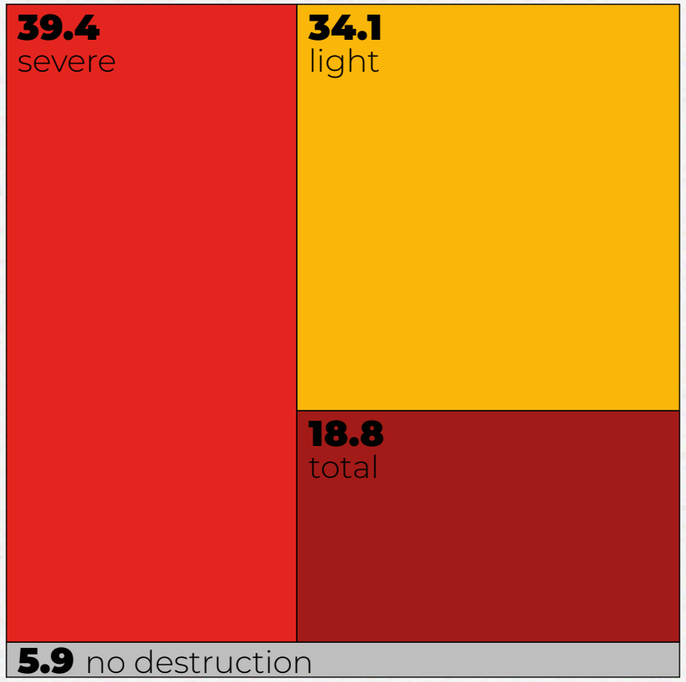
5 floors (ths m²)



Total area of damage

106.6 ths m²

6-9 floors (ths m²)



Total area of damage

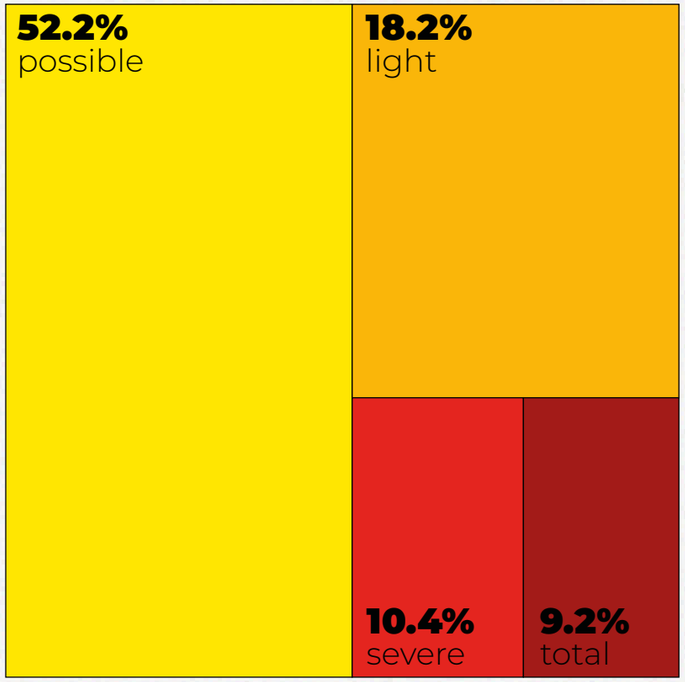
92.3 ths m²

Apartment building

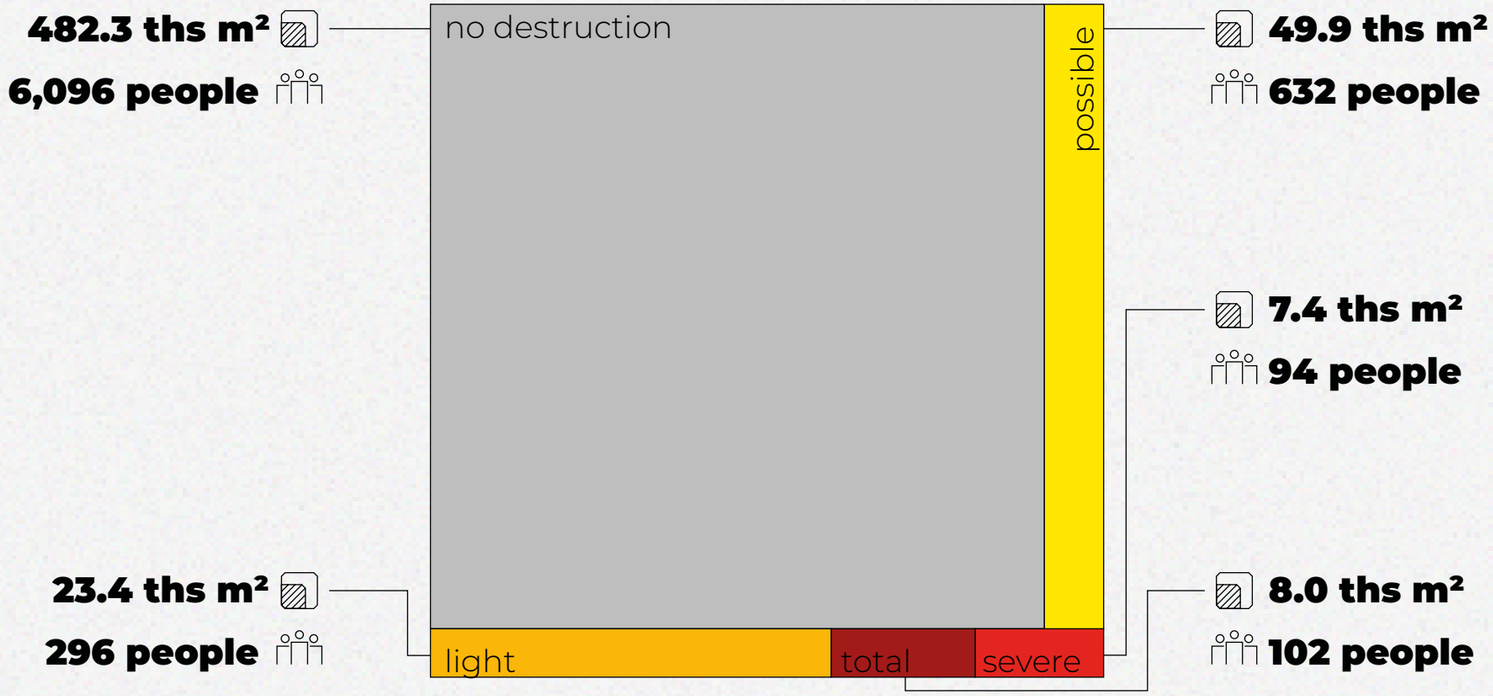
PRIVATE HOUSES & TOWNHOUSES

RESIDENTIAL BUILDINGS & OUTBUILDINGS

Level of destruction



The area of destruction and the number of residents who suffered damage



Total damages

$12.5 million

Total area of damage

88.9 ths m²

Number of residents affected

1,124

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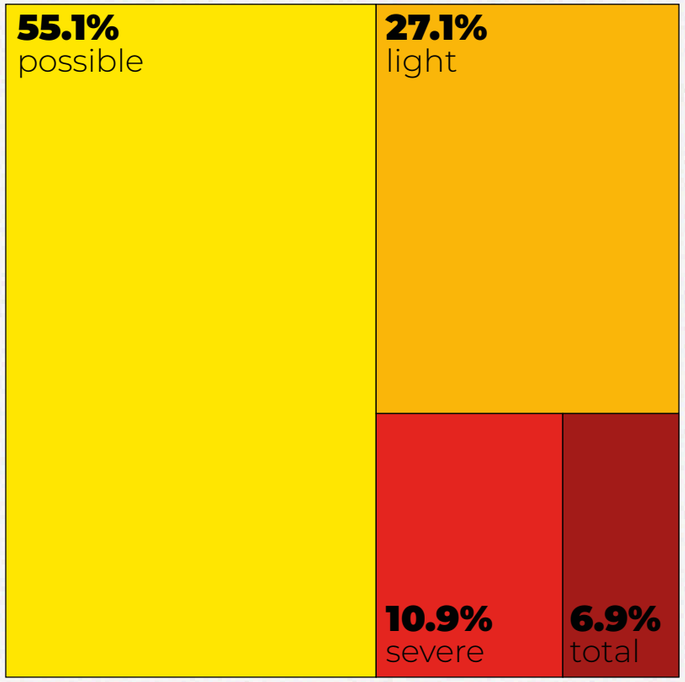
Урбанина

TOP LEAD

OUTBUILDINGS

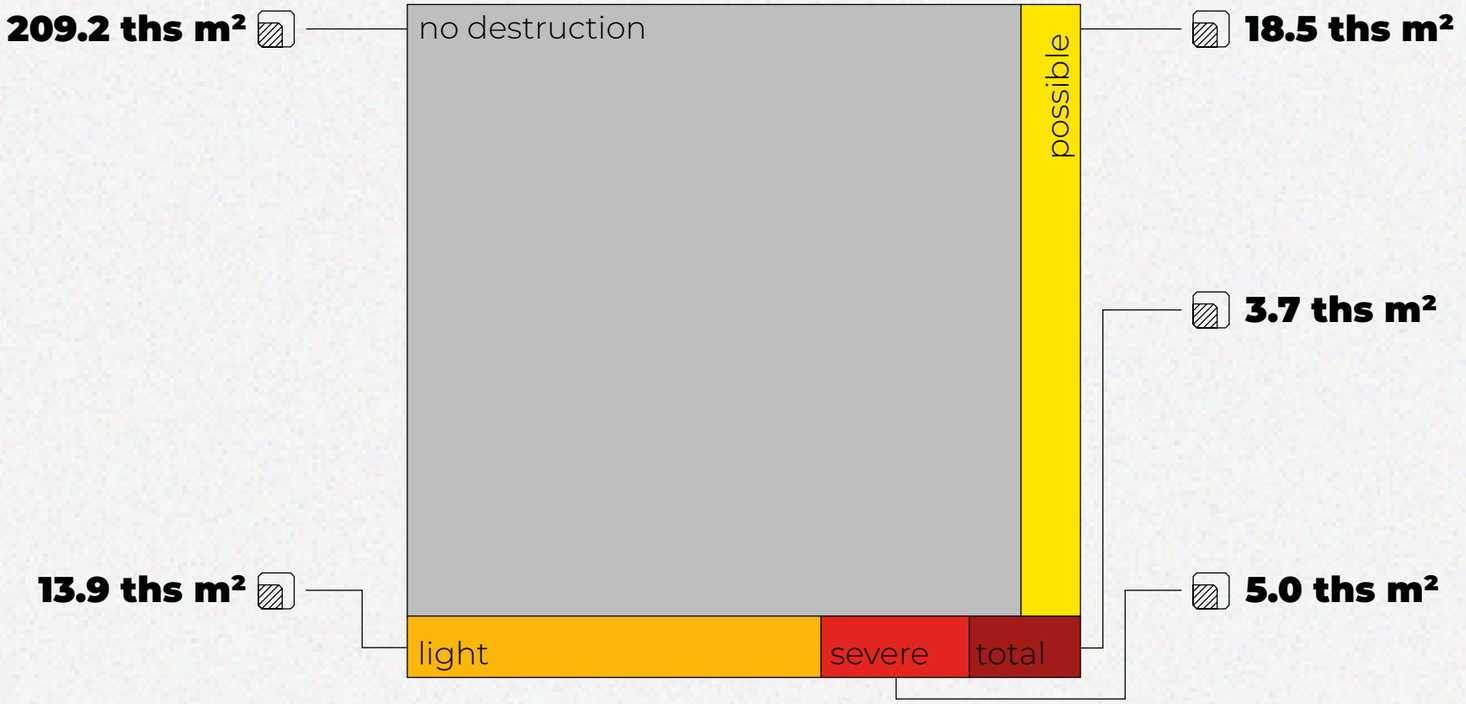
Level of destruction



Total damages

$1.8 million

Area of destruction



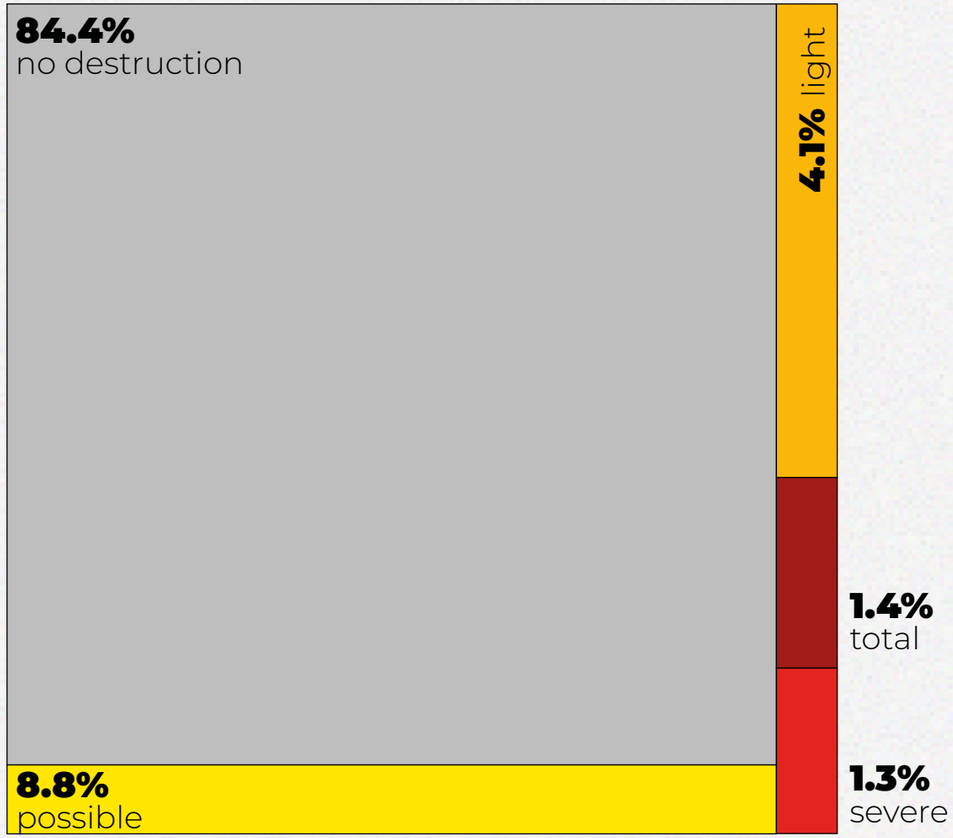
Total area of damage

41.1 ths m²

AREA OF DESTRUCTION

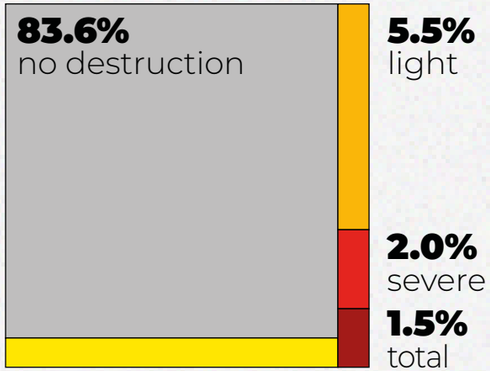
RESIDENTIAL BUILDINGS & OUTBUILDINGS

Private houses



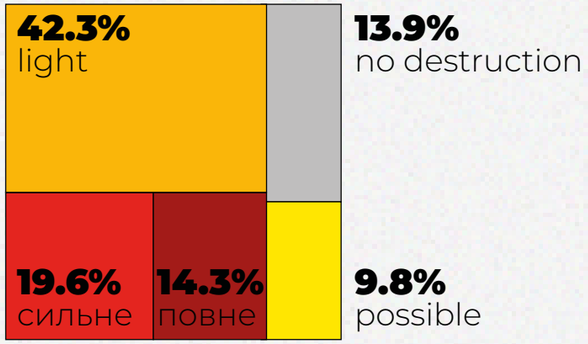
Total area of damage
88.9 ths m² / 571.2 ths m²

Outbuildings



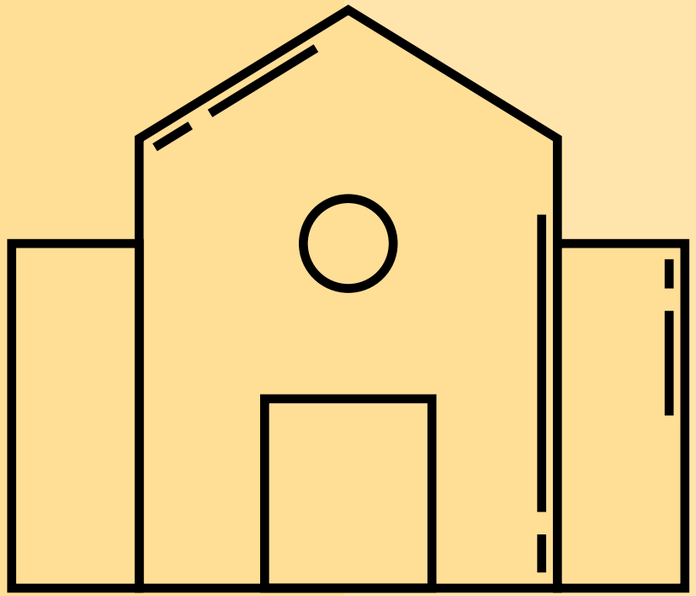
Total area of damage
41.1 ths m² / 250.3 ths m²

Apartment buildings



Total area of damage
198.8 ths m² / 231.0 ths m²

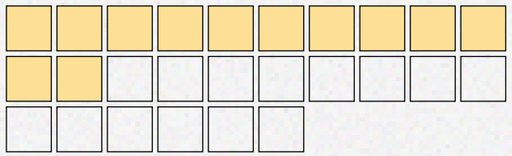
SOCIAL INFRASTRUCTURE



SCALE OF DESTRUCTION

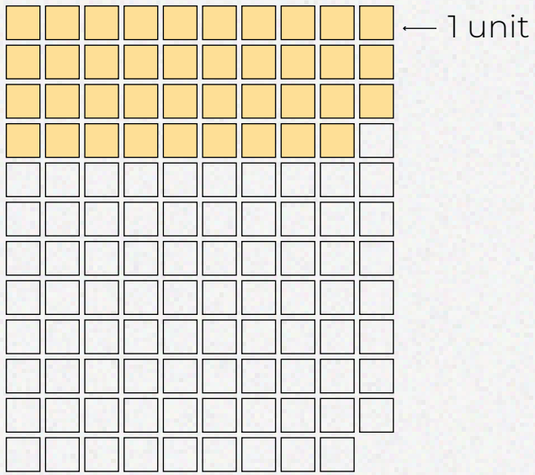
Number of destroyed buildings

Trade and commerce



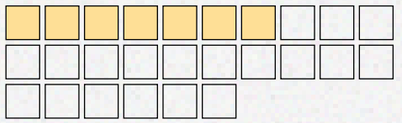
115 / 262

Buildings of general purpose



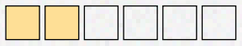
39 / 119

Healthcare institutions



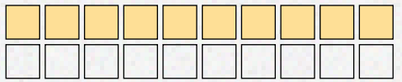
7 / 26

Offices and conference centers



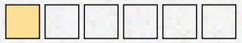
2 / 6

Educational institutions



10 / 20

Sports facilities



1 / 6

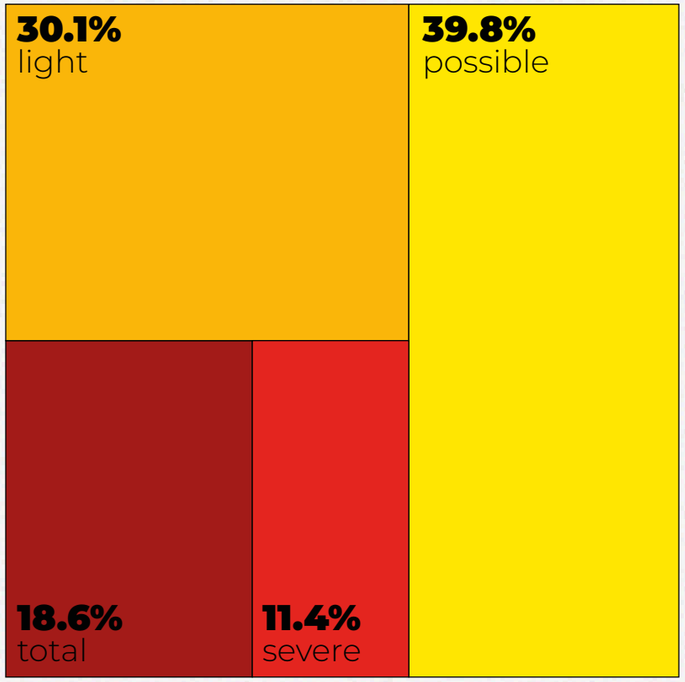
Culture and religion institutions

2 / 8

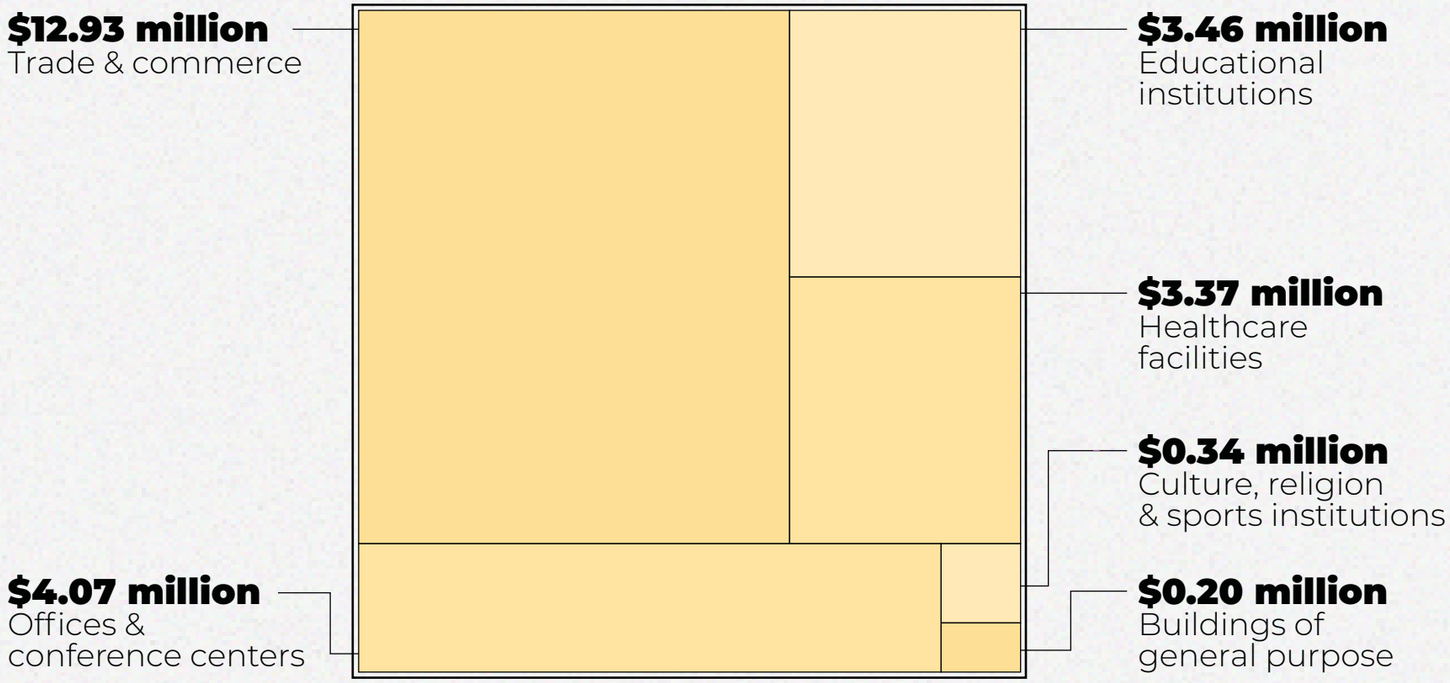
SCALE OF DESTRUCTION

SOCIAL INFRASTRUCTURE

Level of destruction



Assessment of damages



Total damages

$24.4 million

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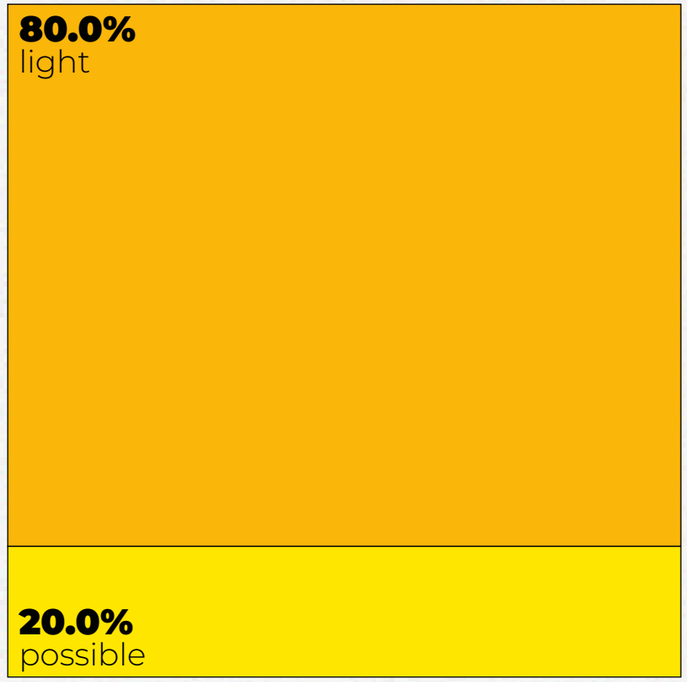
HEALTHCARE & EDUCATION

Level of destruction



Total damages

$6.8 million

Scale of destruction

Hospital (buildings)

7 / 26

University (buildings)

7 / 12

School

2 / 5

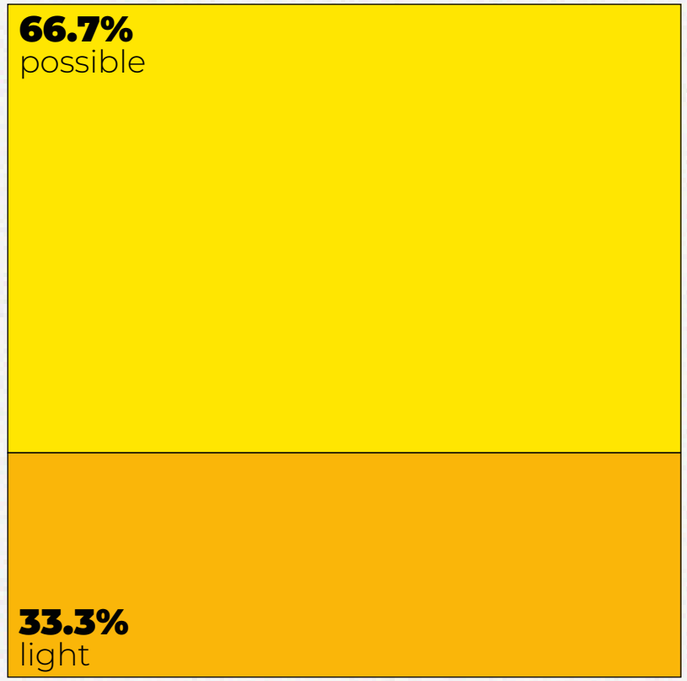
Kindergarten

1 / 3

School

SPORT, CULTURE & RELIGION

Level of destruction



Total damages

$0.3 million

Scale of destruction

Church

1 / 7

Sports facilities

1 / 6

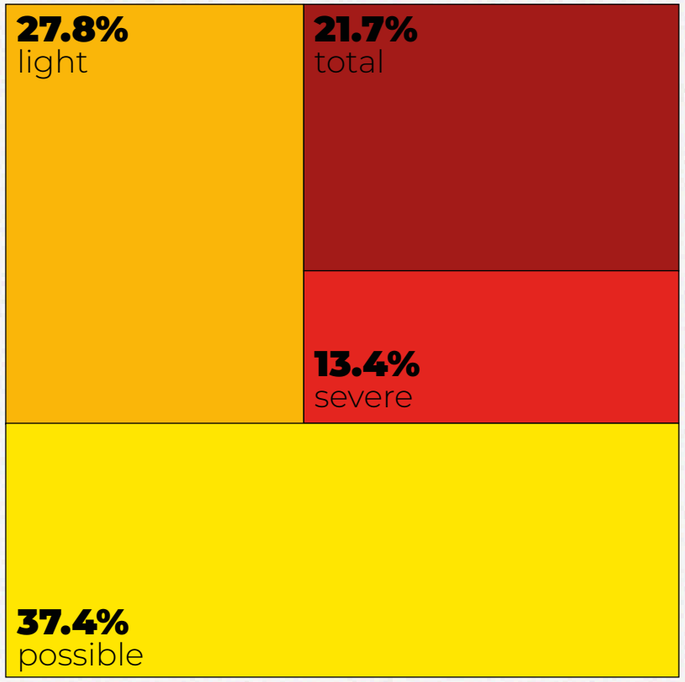
Cultural institutions

1 / 1

Palace of Culture

COMMERCIAL BUILDINGS

Level of destruction

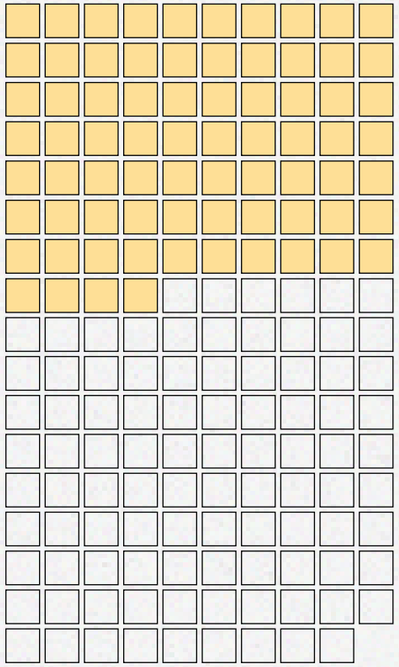


Total damages

$13.1 million

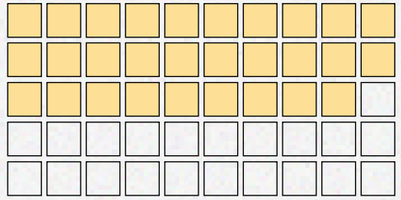
Scale of destruction

Commercial services and institutions



74 / 169

Grocery stores

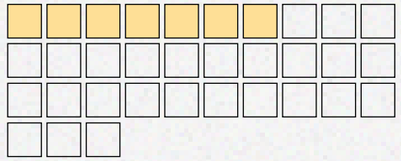


29 / 50

Cafes and restaurants

5 / 10

Trade

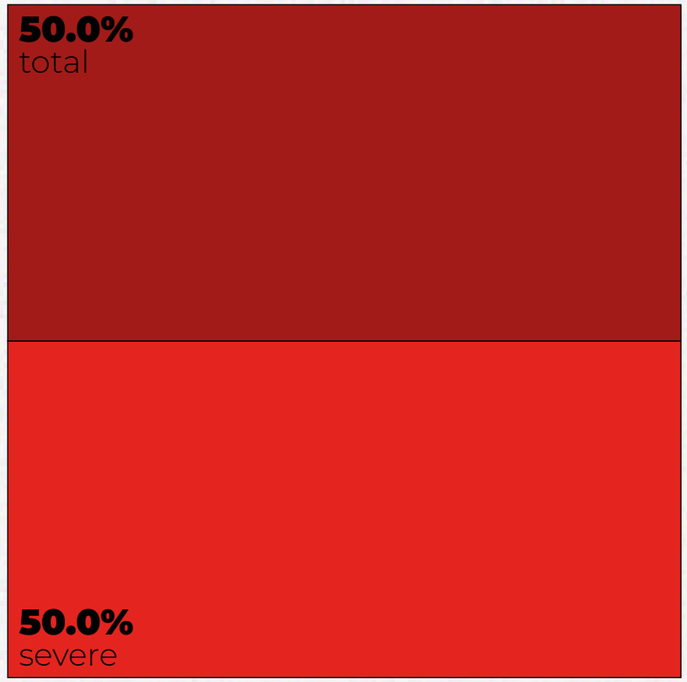


7 / 33

OFFICES & CONFERENCE CENTERS

SOCIAL INFRASTRUCTURE

Level of destruction



Total damages

$4.1 million

Scale of destruction

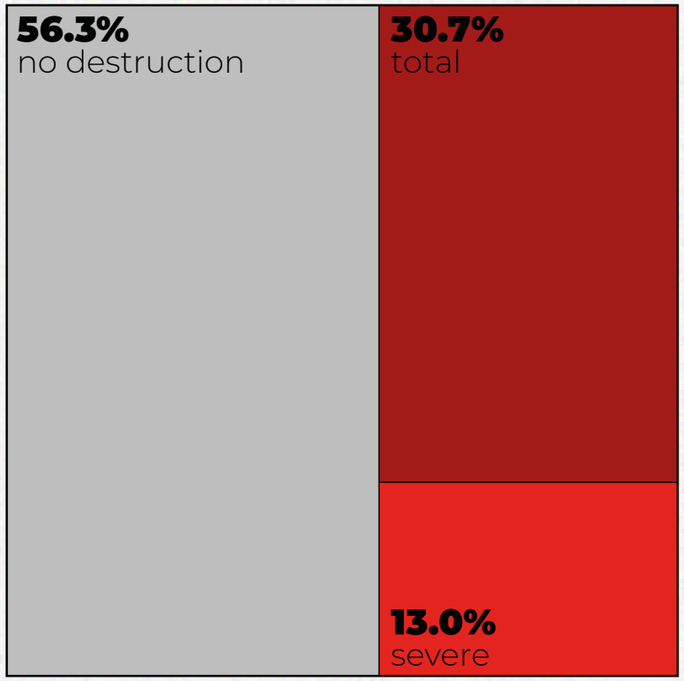
Offices

2 / 6

Lost places for work

331 / 757

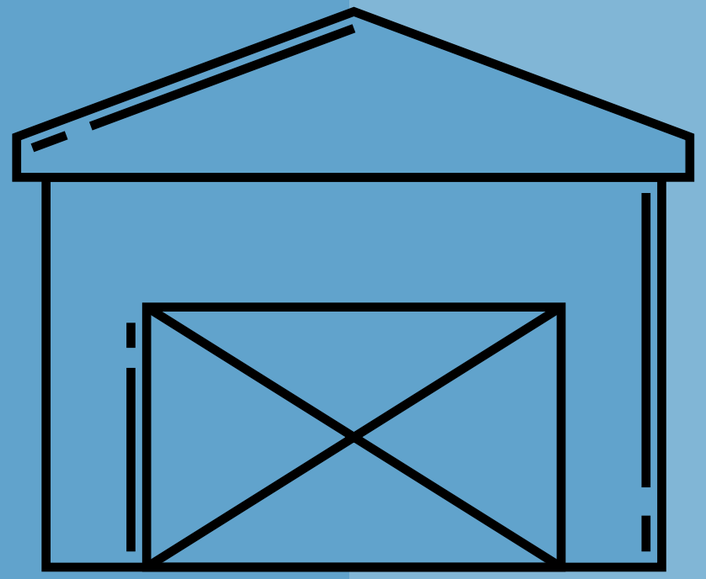
Area of destruction



Total area of damage

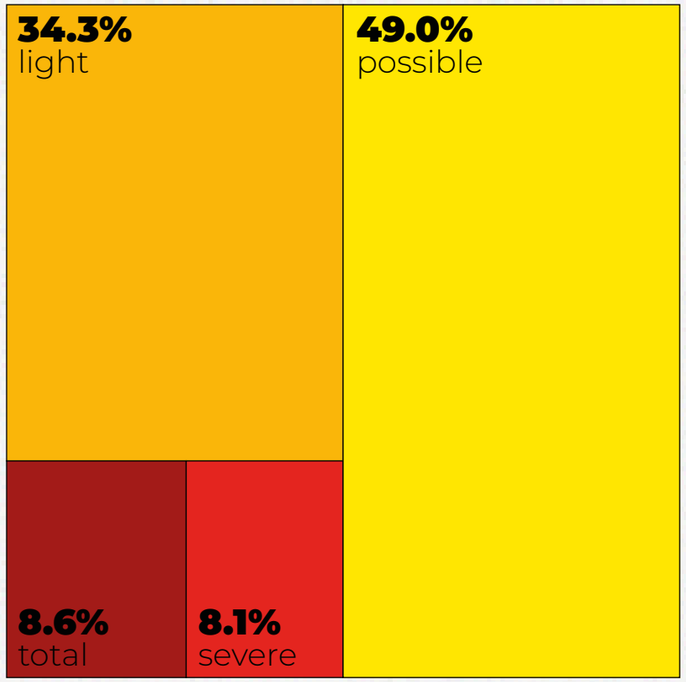
3.3 ths m²

INDUSTRIAL INFRASTRUCTURE



SCALE OF DESTRUCTION

Level of destruction

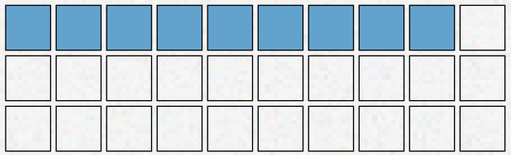


Total damages

$21.4 million

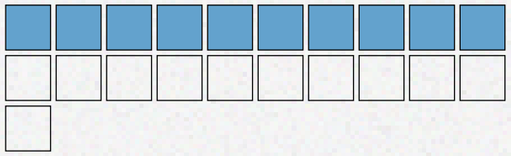
Number of destroyed buildings

Utility buildings



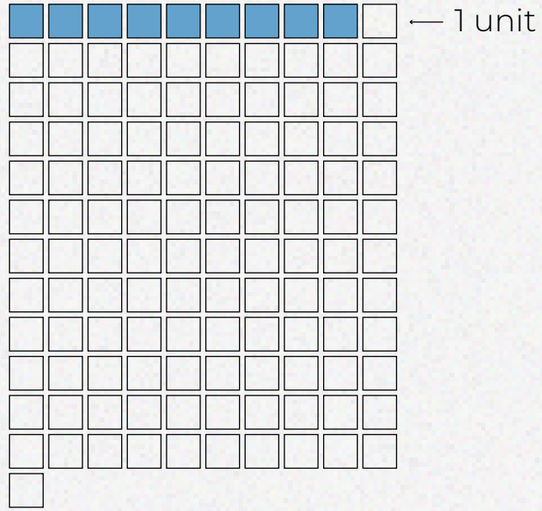
86 / 300

Industrial buildings



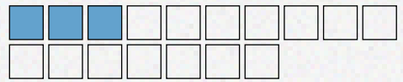
100 / 209

Construction



9 / 121

Warehouses



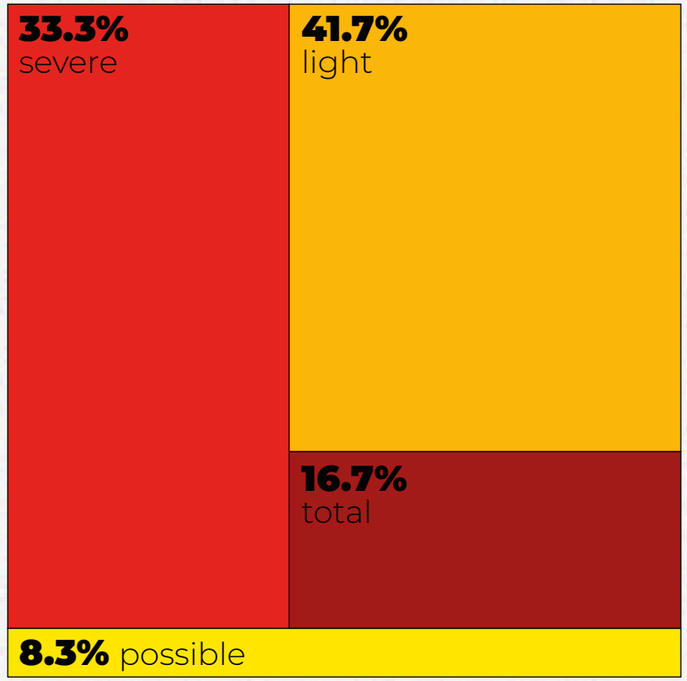
3 / 17

ADMINISTRATIVE INFRASTRUCTURE

SCALE OF DESTRUCTION

ADMINISTRATIVE INFRASTRUCTURE

Level of destruction



Total damages

$7.6 million

Scale of destruction

Government and administrative buildings

6 / 8

Fire department

2 / 5

Post office

2 / 4

Police department

1 / 1

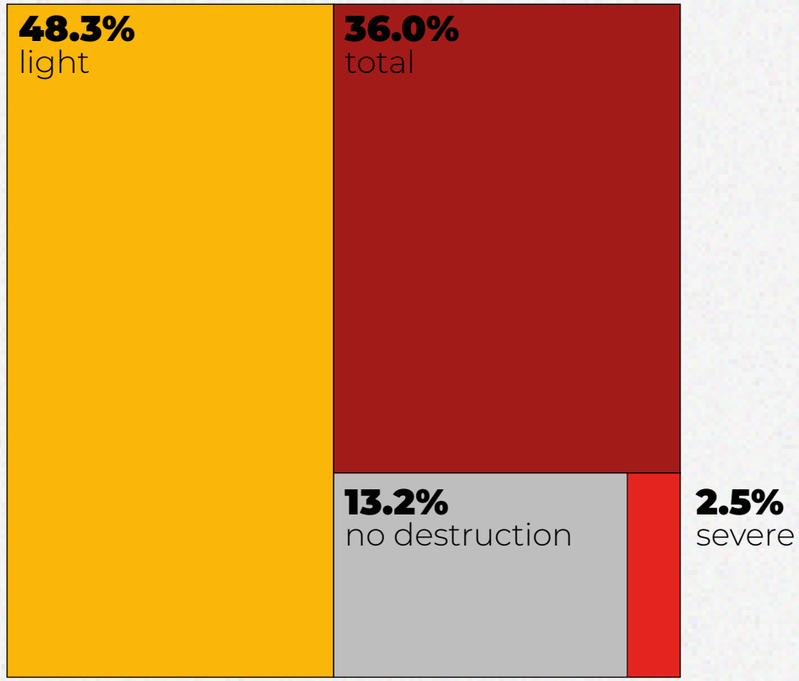
Other buildings

1 / 8

Lost places for work

848 / 976

Area of destruction



Total area of damage

8.5 ths m²

METHODOLOGIES AND ADDITIONAL INFORMATION

METHODOLOGY OF CALCULATION

KSE | Institute

1. Assumptions

The following fractions were used for calculations:

100%
of the replacement cost of total destruction

50%
of the replacement cost of severe destruction

10%
of the replacement cost of light destruction

0%
of the replacement cost of possible destruction

2. Value determination

Large objects
The assessment of large objects, in particular enterprises, is calculated individually on the basis of financial statements and other public sources regarding value information.

Medium objects
Medium facilities, in particular, social infrastructure, trade objects, and services (health, education and culture, shops, hotels, restaurants, etc.) are calculated on the basis of average cost data, taking into account the type of area (urban/rural).

Small objects
Small objects, which include residential buildings, outbuildings and garages, are calculated based on the average footage (taking into account the area and type of area) and the cost per square meter (nominal cost + cost of redecoration repairs + cost of dismantling).

* All calculations are made according to the dollar exchange rate as of January 1, 2022

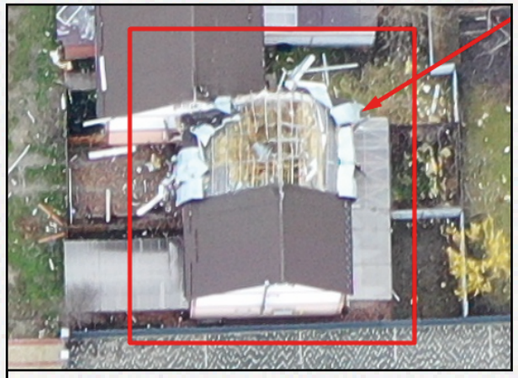
HOW WE DETERMINE LEVELS OF DESTRUCTION

Total destruction

Appointed when the original structure of the building is no longer detectable restoration is impossible, namely:

- the building is completely or significantly destroyed (> 50%);
- only part of the building collapsed to the foundation.

Severe destruction



Implies significant visible damage to the building and its structure, which includes:

- collapse of part of the roof;
- serious destruction and damage to the walls.

Light destruction

Implies minor partial damage to the building and its structure:

- minor damage to the roof,
- collapse of chimneys,
- damage to facade, decorative and removable elements,
- a large amount of debris.

Possible destruction

Intended for buildings that are difficult to interpret due to lower image quality (for example, shadow or poor resolution due to high angle of shooting).

Visual signs may include be small amounts of debris, gravel or sand around the building.

PHOTO EVIDENCE

Ukrtelecom building

Private house

Police department

Apartment building

Employment center

Private house

Social Security Administration

Commercial object

Shopping center

Apartment building

BORODIANKA THROUGH THE EYES OF BEHOLDERS

BBC reporter: Scale of destruction in Borodyanka, in Kyiv region is extraordinary

read

Ukraine: Borodyanka — liberated, but in ruins

read

”It's not the pilots' fault — they purposefully dropped bombs.” In March, the Russian occupiers launched dozens of airstrikes on Borodianka.

read

Kyiv Region: The Ministry of Defense showed the destroyed Borodianka from a drone

read

Images show destruction left in Ukraine town of Borodyanka after Russian occupation

read

Destruction in the Ukrainian town of Borodianka - BBC News

play

Dispatch: Inside Borodianka, the town with a death toll feared higher than Bucha | Ukraine

play

Borodianka residents return to destroyed homes

play

Reverend prays for victims of war in Ukraine’s Borodianka

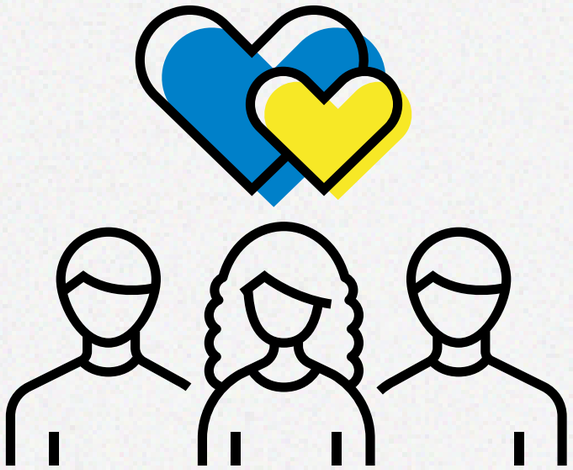
play

GRATITUDE TO VOLUNTEERS

Being a volunteer is a necessary and responsible mission, because the contribution of every citizen is important for the reconstruction of the country. The active position, engagement and tireless work of volunteers support the work of the RebuildUA project team, bringing us closer to the desired result.

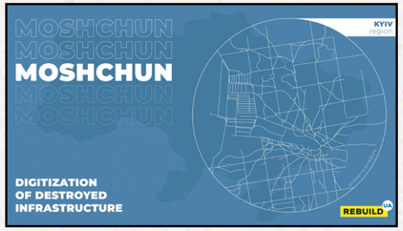
These people helped RebuildUA digitize the destruction of Borodianka:

Lida Kryshtop
Kateryna Kulyk
Maksym Lazavenko
Mariia Liashchenko
Anna Lomonos
Nazar Oliynyk
Vladyslav Poda
Serhii Ponomarenko
Mykola Skoryk
Artem Sorokin



REBUILD UA

PREVIOUS REPORTS



Moshchun,
Buchanskyi district,
Kyiv region

download

Horenka,
Buchanskyi district,
Kyiv region

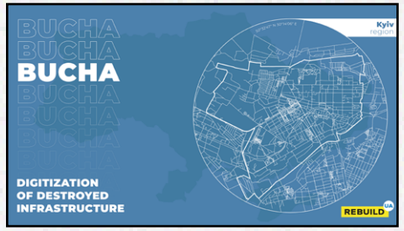
download

Ozera,
Borodianskyi district,
Kyiv region

download

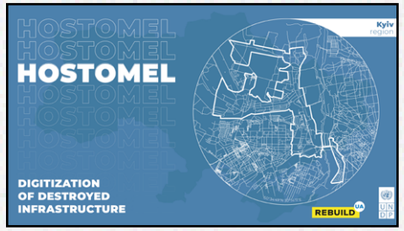
Irpin,
Buchanskyi district,
Kyiv region

download



Bucha,
Buchanskyi district,
Kyiv region

download



Hostomel,
Buchanskyi district,
Kyiv region

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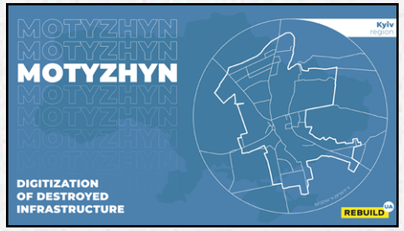
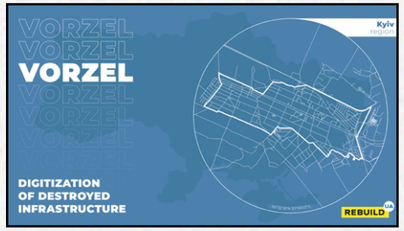


Motyzhyn,
Buchanskyi district,
Kyiv region

download



Vorzel,
Buchanskyi district,
Kyiv region

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REBUILD UA

rebuildua.net

Partners:

Assessment of losses and damages, budgeting:

KSE Institute

Financial and technical support

UNDP

Shooting of settlements

CULVER AVIATION

Digitization of geospatial information:

Урбанина

Visual style and content:

TOP LEAD

Support in cooperation with public authorities:

Centre for Economic Recovery

Cooperation & analysis of community economy, Vkursi Hromada:

Center for Innovations Development

Creation of an online map of destroyed new buildings

лун

Supported by:

ПАТРУЛЬНА ПОЛІЦІЯ

ДЕПАРТАМЕНТ МІСТОБУДУВАННЯ ТА АРХІТЕКТУРИ

ODGERS BERNDTSON

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ОТГ ВСЕУКРАЇНСЬКА АСОЦІАЦІЯ