TRANSFORM 4EUROPE

Co-funded by
the European Union

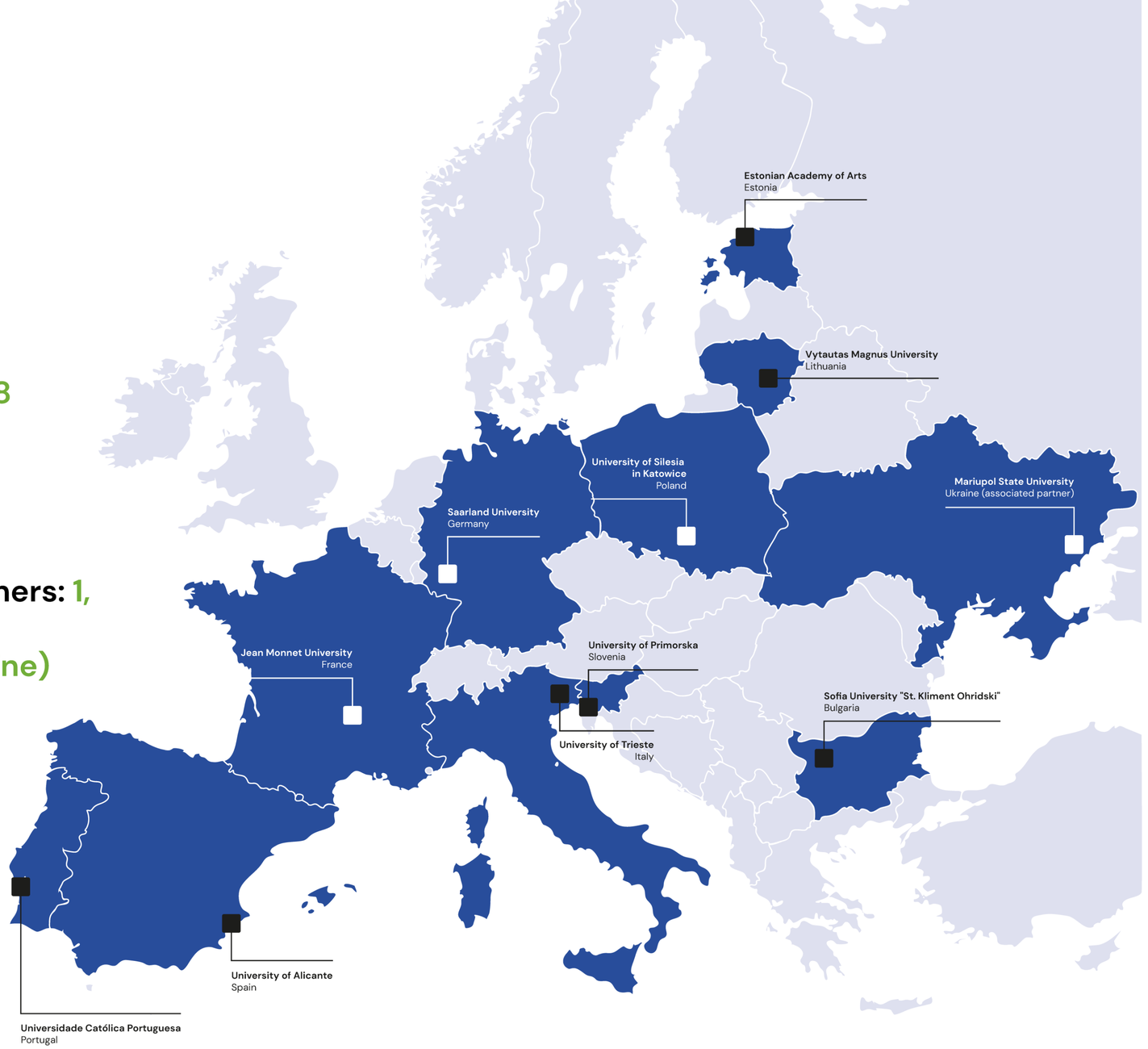
TRANSFORM 4EUROPE

Students: 149 168

Staff: 23 678

Faculties: 103

Associated partners: 1, Mariupol State University (Ukraine)



Saarland University
Germany

University of Alicante
Spain

Estonian Academy of Arts
Estonia

University of Silesia in Katowice
Poland

Sofia University "St. Kliment Ohridski"
Bulgaria

University of Trieste
Italy

Vytautas Magnus University
Lithuania

Universidade Católica Portuguesa
Portugal

University of Primorska
Slovenia

Jean Monnet University
France

Mariupol State University
Ukraine (associated partner)

TRANSFORM 4EUROPE

Co-funded by the European Union

SOFIA UNIVERSITY
ST. KLIMENT OHRIDSKI

TRANSFORMATION LAB FAIR & STAKEHOLDER CHALLENGE

Climate change and European cities:
Adaptation to Urban Heat Island Effect
and Nature-Based Solutions

02-04 June 2025

Sofia University St. Kliment Ohridski
Sofia, Bulgaria

T4EU Stakeholder challenge
02-04 June 2025 Sofia University St. Kliment Ohridski

Content:

1. Problem Identification

- Use the spatial data and field insights to pinpoint the key local climate-related problem
- Justify the importance of addressing it in the case study.

2.Design solution

- Describe a NbS or more that fits a tactical urbanism approach
- Consider scalability, temporariness vs permanence, cost, and community engagement

3.Implementation Strategy – design a short project plan

- Basic timeline, roles, and resources
- Involvement of local stakeholders and citizens

4.Expected Impact

- How the proposal reduces climate risk or improves local resilience
- Potential co-benefits: biodiversity, aesthetics, social inclusion etc.

URBAN HEAT ISLAND

LYULIN DISTRICT

NATURE BASED SOLUTION

Participants:
Kristian Georgiev(SU)
Raya Dimitrova(SU)
Elena Zarza (UA)
Abigail (USiL)
Kabilar(VMU)

TRANSFORM 4EUROPE

INTEGRATED URBAN PLANNING

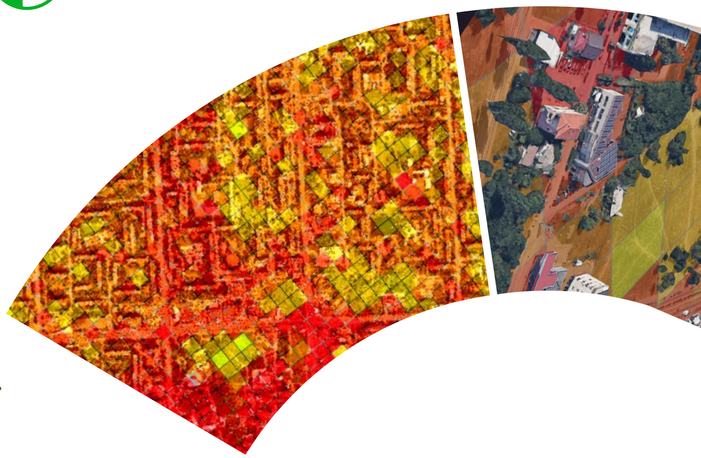
LOCAL CLIMATE

MICRO CLIMATE

UHI

GREEN INFRASTRUCTURE

ADAPTATION



TRANSFORM 4EUROPE

LYULIN GREEN INFRASTRUCTURE

Fragmentation of Green Spaces

Insufficient Green Coverage

High Degree of Urbanization

Intense Urban Heat Island Effect

Low Ecological and Social Functionality

TRANSFORM 4EUROPE

GREEN ROOFS

Enhanced Aesthetics and Urban Appeal

Climate and Biodiversity Benefits

Thermal Insulation & Energy Efficiency

TRANSFORM 4EUROPE

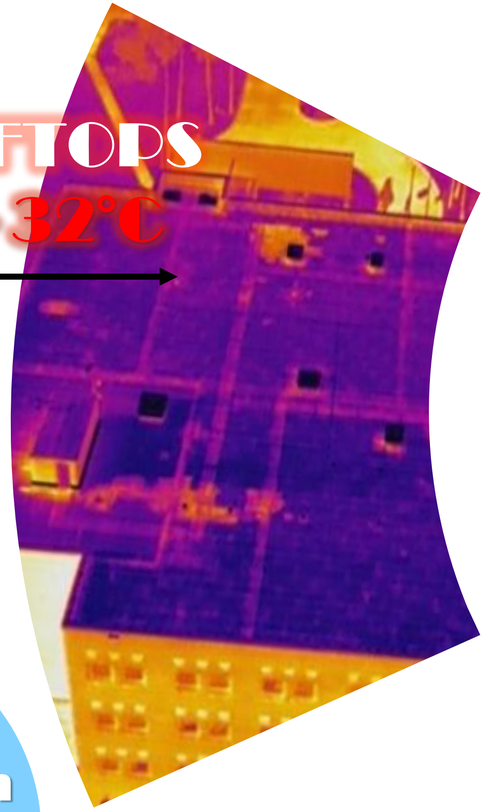
NATURE BASED SOLUTION

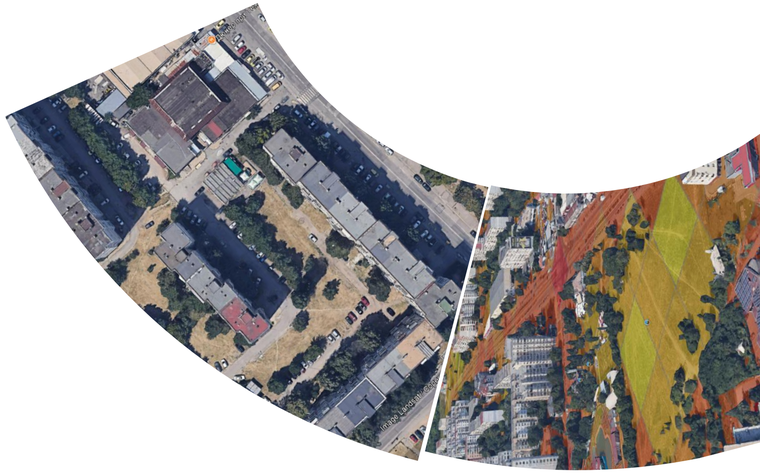
ROOFS TEMPERATURE

5 to 10 degree in temperature diffrense

GREEN AREAS
14 - 21°C

ROOFTOPS
24 - 32°C





Heat Retention Difference
40 – 80%

TRANSFORM 4EUROPE

ROOFS LOCALIZATION

DIGITALIZED ROOFTOPS

LOCAL CLIMATE ZONES

THERMAL IMAGERY (UAV)

TRANSFORM 4EUROPE

Overlay Approach

SPATIAL ANALYSIS

BUILDINGS IN HOT ZONE AREAS

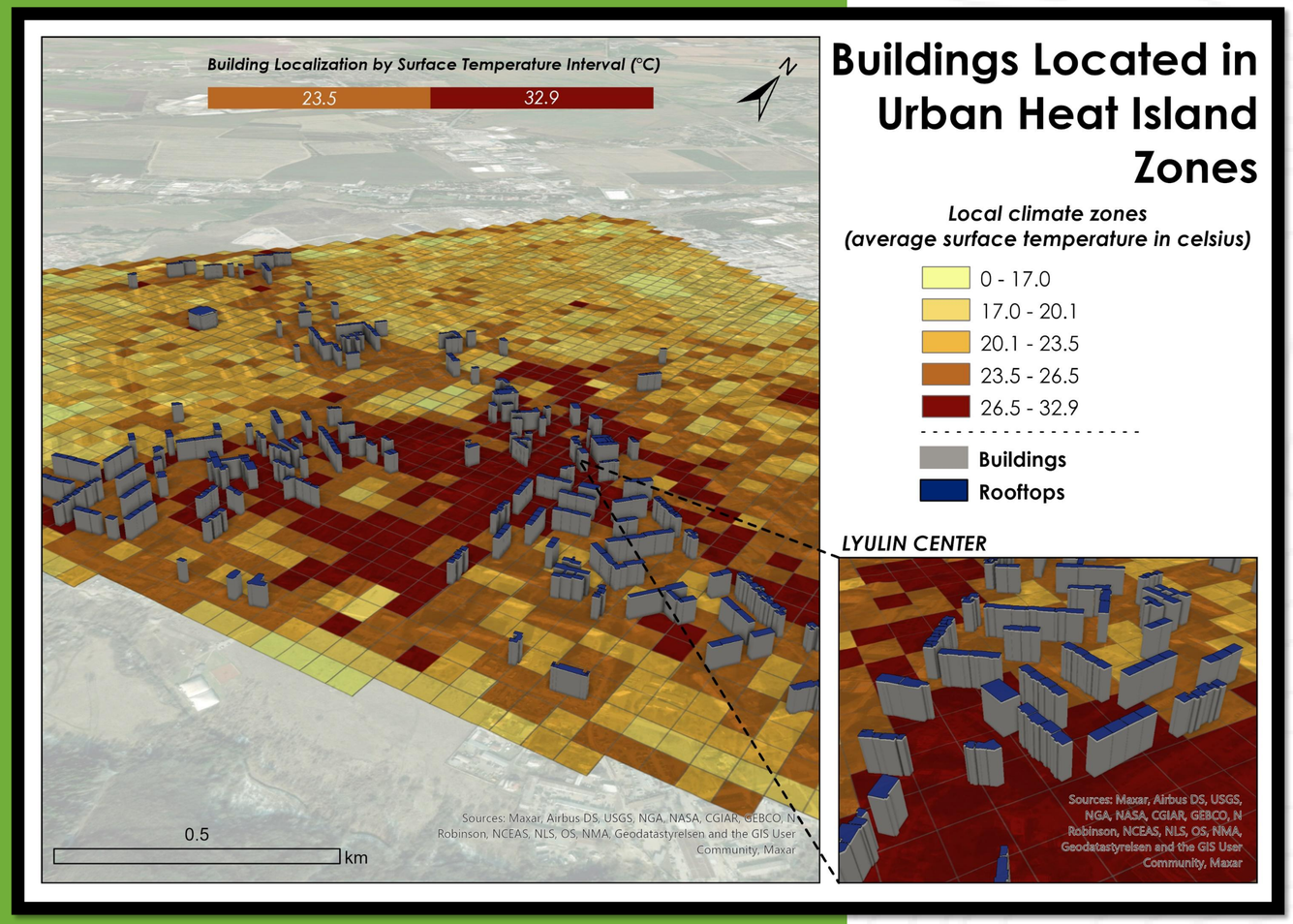
370

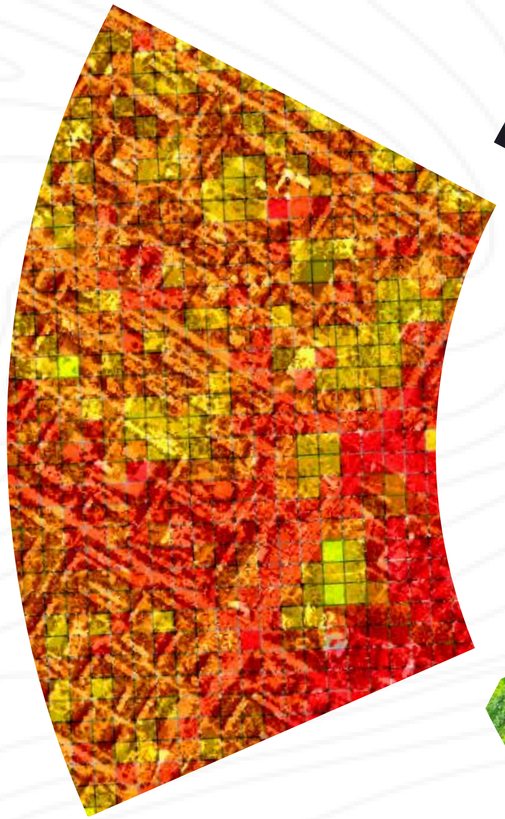
ROOFTOP AREA

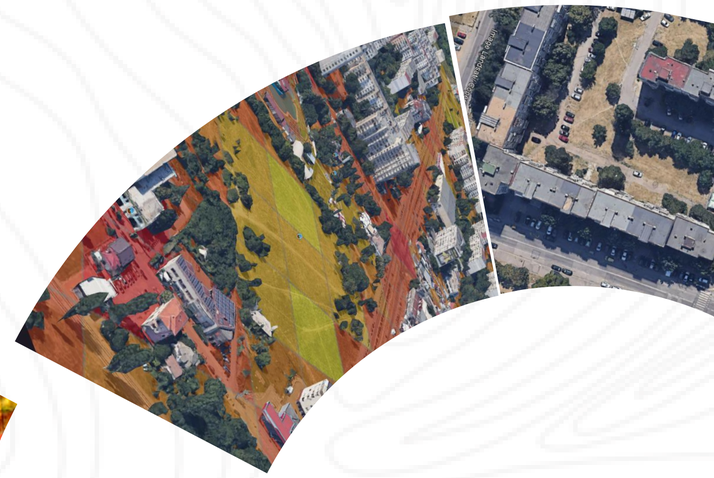
8.5Ha

TRANSFORM 4EUROPE

MAP

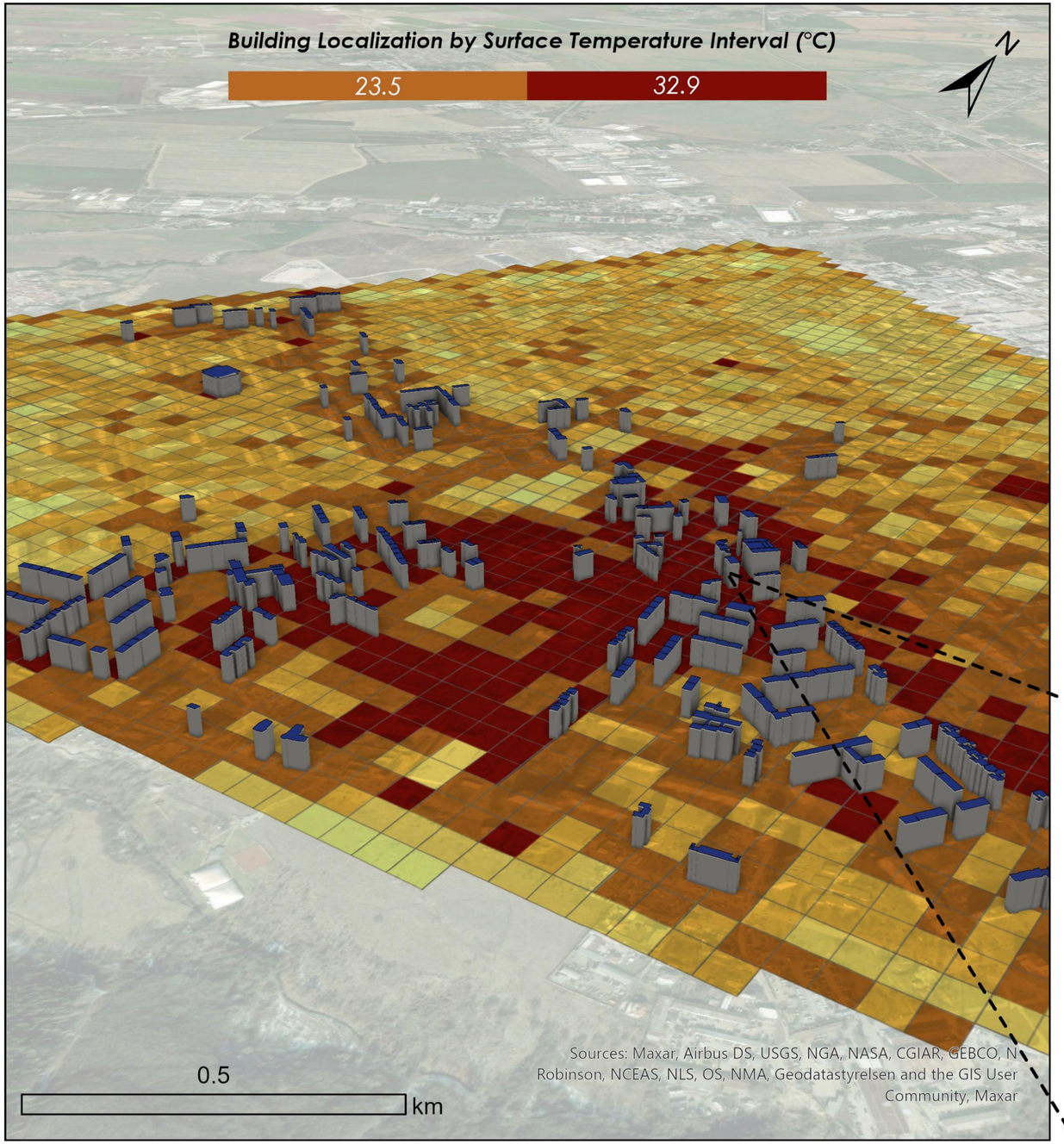






TRANSFORM 4EUROPE

Buildings Located in Urban Heat Island Zones



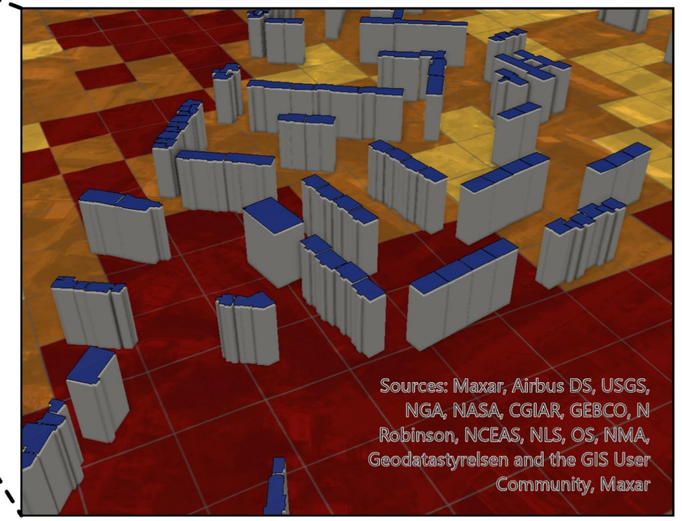
Local climate zones
(average surface temperature in celsius)

- 0 - 17.0
- 17.0 - 20.1
- 20.1 - 23.5
- 23.5 - 26.5
- 26.5 - 32.9

Buildings

Rooftops

LYULIN CENTER



PROJECT GOALS

- **Primary goal**: lowering rooftop temperatures and improving the comfort of inhabitants and environment
- **Absorbing CO_2**: capturing CO_2 with the use of plants and reducing the urban carbon footprint
- **Cooling effect**: regulating the temperature in a natural way
- **Sustainability**: developing green spaces which will reduce the urban heat island effect

TRANSFORM 4EUROPE

EXPECTED OUTCOMES & BENEFITS

- **Reduced urban heat island** effect and lowered energy consumption
- **Improved air quality**, enhanced CO_2 absorption, and increased green space.
- **Long-term cost savings** from reduced air conditioning use and rainwater management.
- **Increased community engagement** with eco-friendly urban spaces.

TRANSFORM 4EUROPE

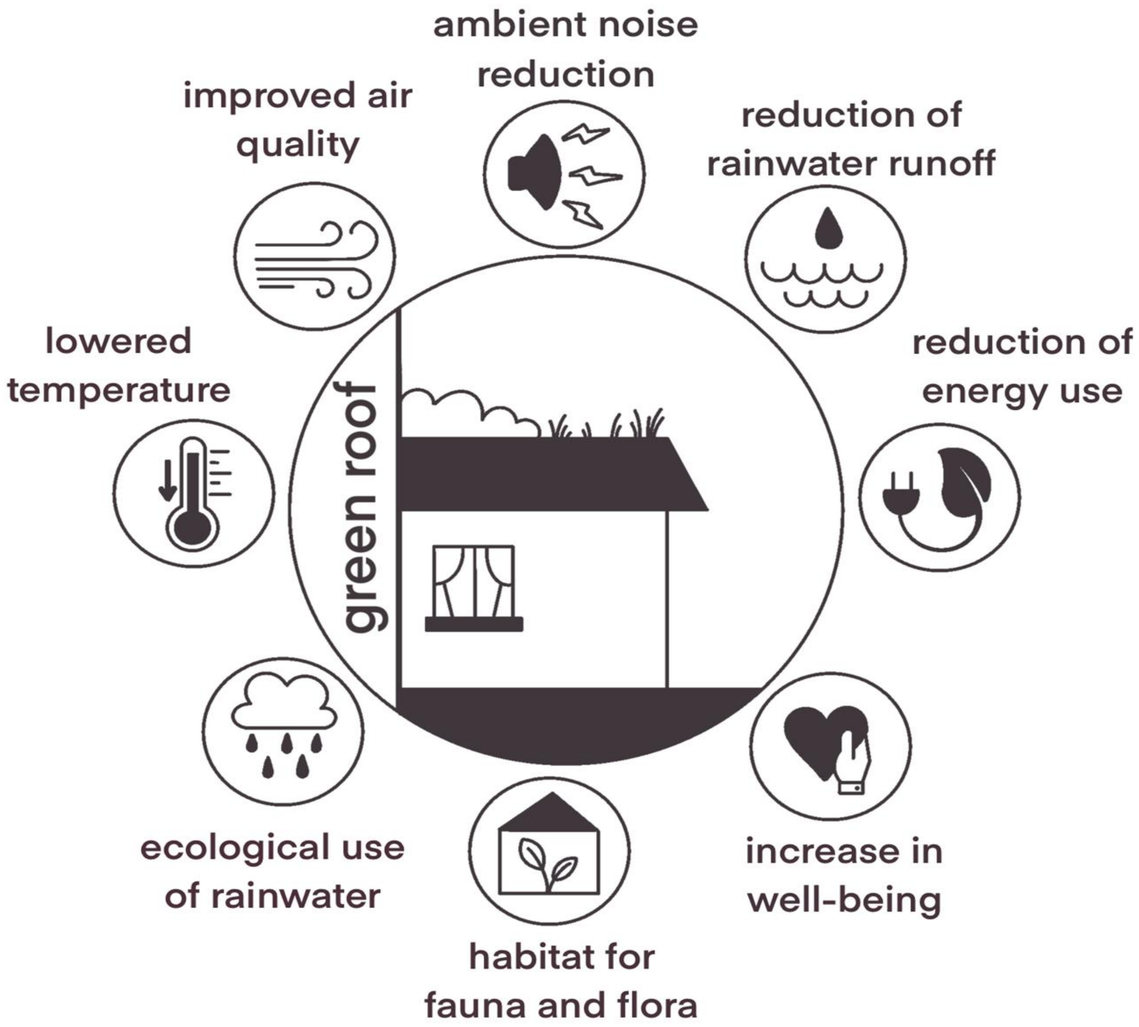
ENVIRONMENTAL AND TEMPERATURE BENEFITS OF SEDUM

CO_2 Reduction: sedum roofs can absorb 1,2—2,5 tons of CO_2 per 100 m² yearly.

Rainwater management: the sedum layer can absorb the water, reducing runoff and flood risk.

Improving air quality: green roof vegetation absorbs carbon dioxide and pollutants, leading to better air quality in metropolitan environment.

Minimising the urban heat island effect: green roofs significantly lower the roof temperature, reducing air conditioning up to 50%.



TRANSFORM 4EUROPE

PROPOSED PLANT: SEDUM

Highly effective CO_2 capture: sedum is a succulent with a high rate of carbon absorption through photosynthesis; in one year, a sedum green roof can capture up to 2,5 tons of CO_2 per 100 m².

Low maintenance: sedum requires minimal irrigation, making it perfect for Bulgarian climate; it becomes self-sufficient once established and requires minimal care after installation.

TRANSFORM 4EUROPE

WHY SEDUM?

Optimal for cooling urban areas: sedum reduces roof temperature by up to 60°C compared to traditional rooftops, helping the urban heat island effect and reducing the reliance on air conditioning.

TRANSFORM 4EUROPE

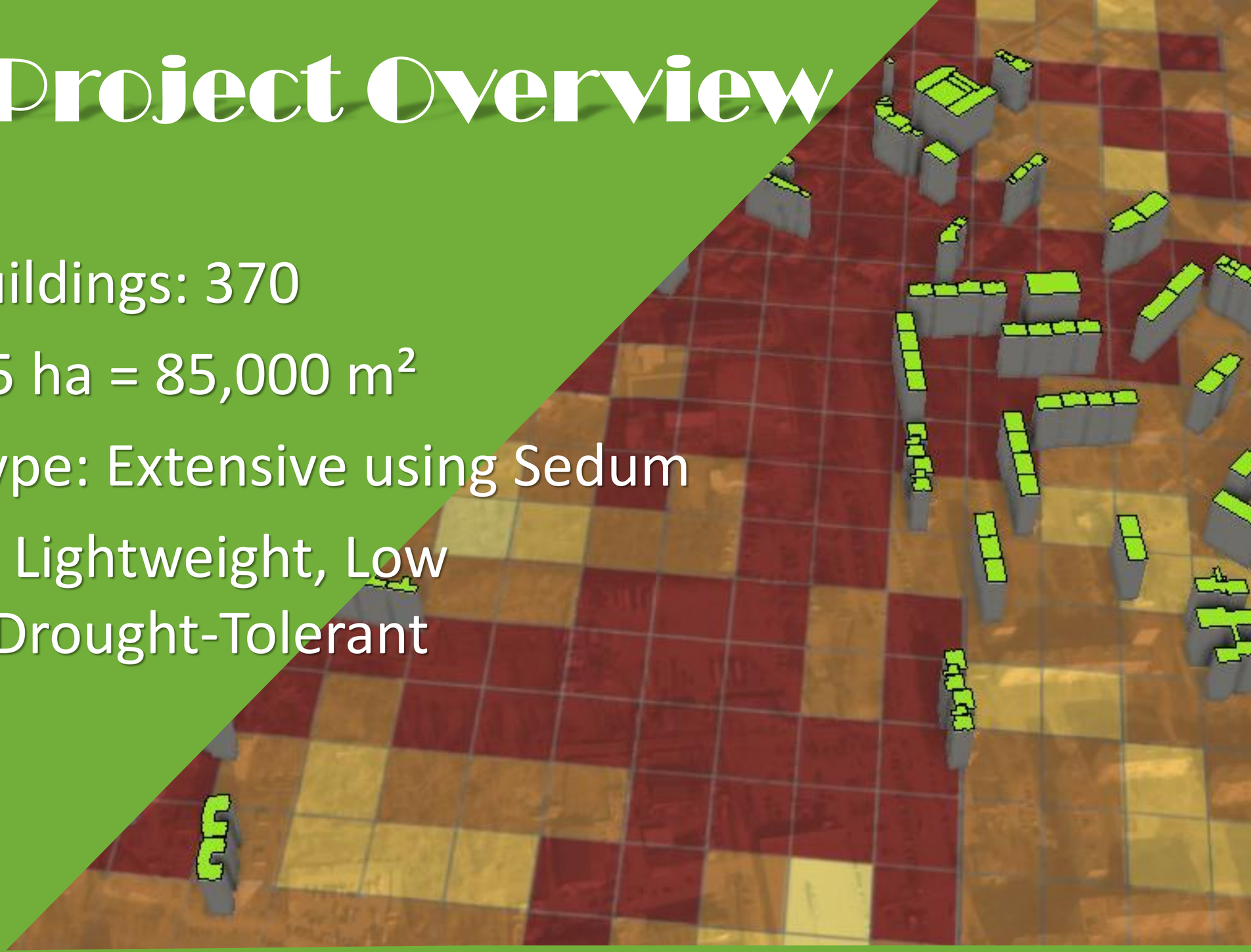
Budget Estimate for Implementing Sedum Green Roofs

370 Buildings • 8.5 Hectares • 85,000 m²

TRANSFORM 4EUROPE

Project Overview

- Number of Buildings: 370
- Total Area: 8.5 ha = 85,000 m²
- Green Roof Type: Extensive using Sedum
- Sedum Roofs: Lightweight, Low Maintenance, Drought-Tolerant



TRANSFORM 4EUROPE

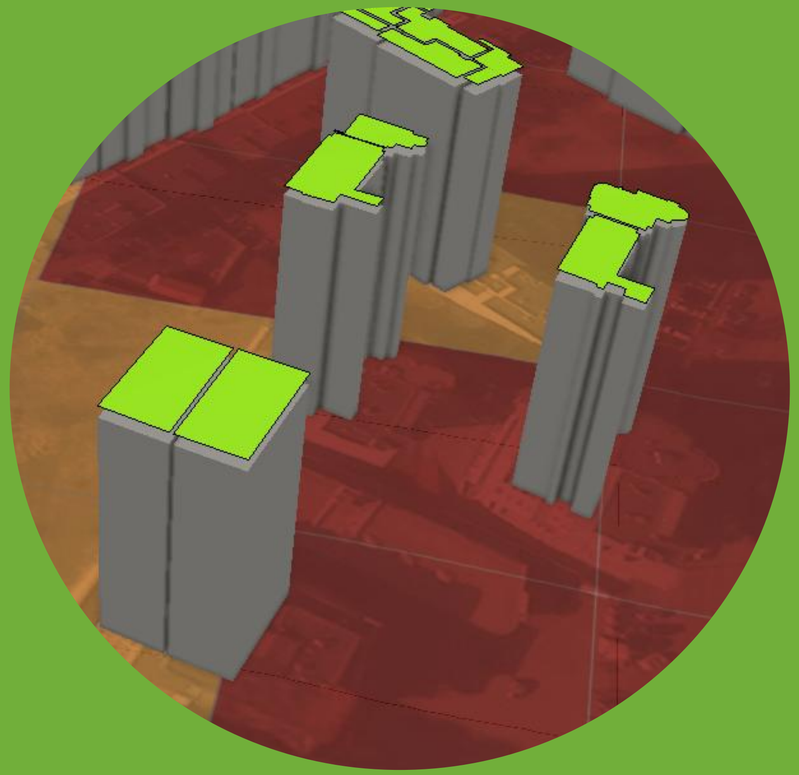
COST BREAKDOWN & BUDGET ESTIMATE

Estimated Cost per m²: €30–€55

- At €30/m² → €2.55 million
- At €35/m² → €2.975 million
- At €40/m² → €3.4 million
- At €45/m² → €3.825 million
- At €50/m² → €4.25 million
- At €55/m² → €4.675 million

TRANSFORM 4EUROPE

Per-Building Cost & Summary



- **Average Budget per Building:**
- - €6,890 (at €30/m²)
- - €12,630 (at €55/m²)

- Realistic Range in Bulgaria: €35–€45/m²
- Suggested Budget: €3M–€3.8M
- Potential EU/municipal funding options available
- The EEA and Norway Grants allocate close **to €70 million** in support to projects that aim to promote a cleaner environment, more renewable energy, green growth and tackling climate change in Bulgaria.

TRANSFORM 4EUROPE

TRANSFORM 4EUROPE

CONCLUSIONS AND FUTURE STEPS

- **Green roofs** are an essential part of **sustainable urban development**
- The proposed design will help lower temperatures, enhance biodiversity, and reduce CO_2
- Next steps: **pilot projects** in selected buildings and funding application
- Encourage **community involvement** and **awareness** about the benefits

TRANSFORM 4EUROPE

THANK YOU FOR YOUR ATTENTION!