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CLUE

Community-led Lyulin Urban Empowerment for mitigating the Heat Island effect

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ABOUT US

GROUP 5:

- Elena Olmos (UA)
- Konstantin Bochev (SU)
- Martina Aleksieva (SU)
- Sergio Santos (UCP)
- Weronika Głodek (USil)

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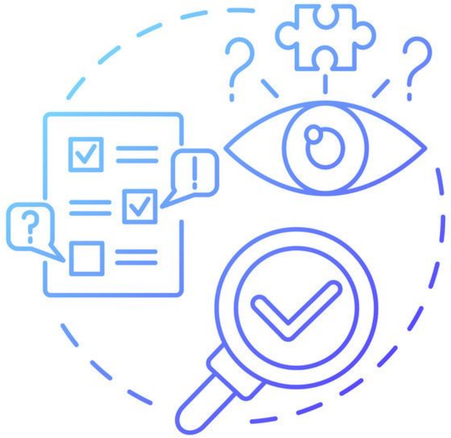

1. PROBLEM IDENTIFICATION

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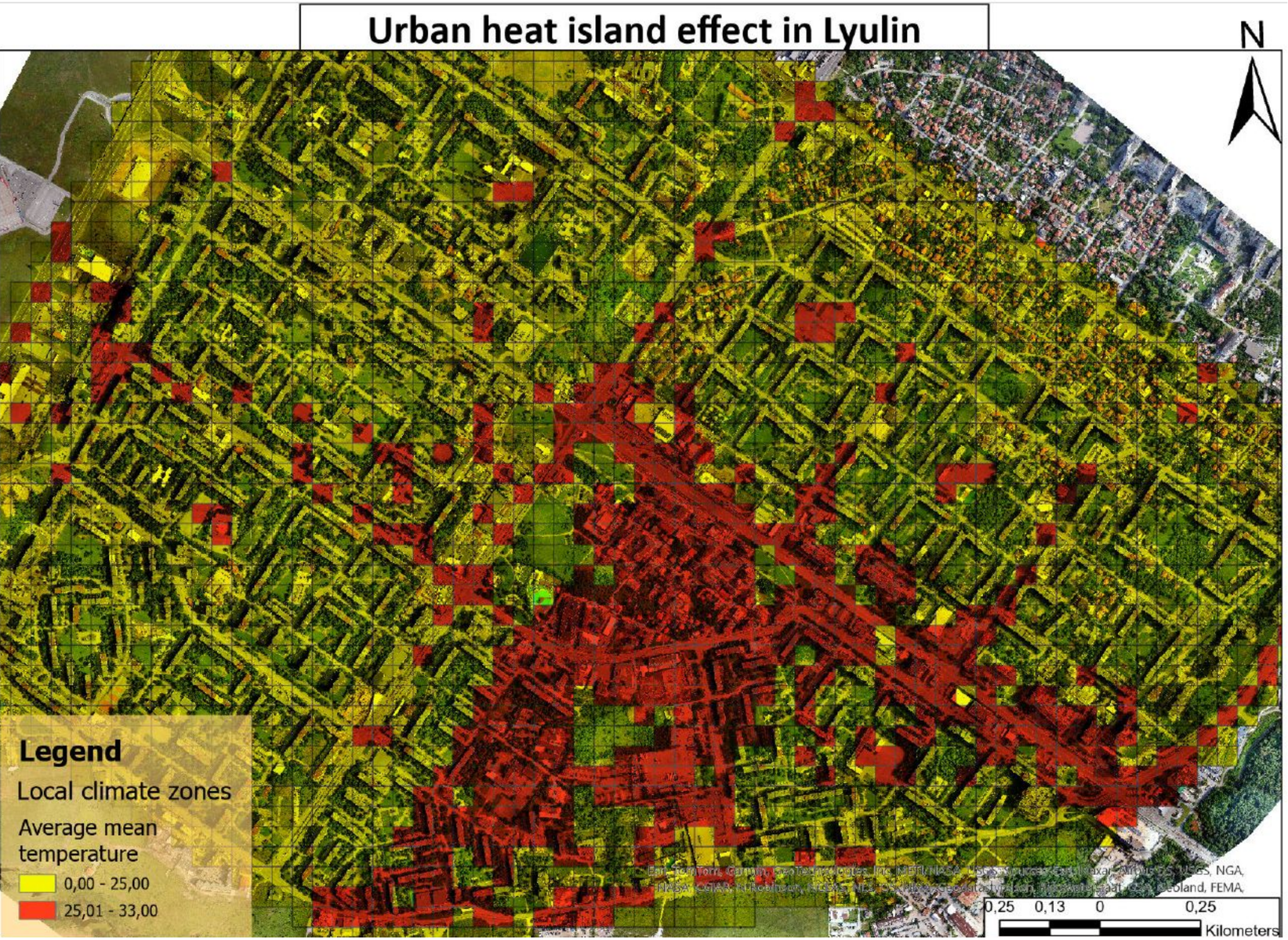
1.1. INTRODUCTION TO THE PROBLEM



Urban Heat Island (UHI)

- Positive temperature differences between the city and its surroundings, they usually reach their maximum a few hours after sunset

Strong UHI effect in Lyulin

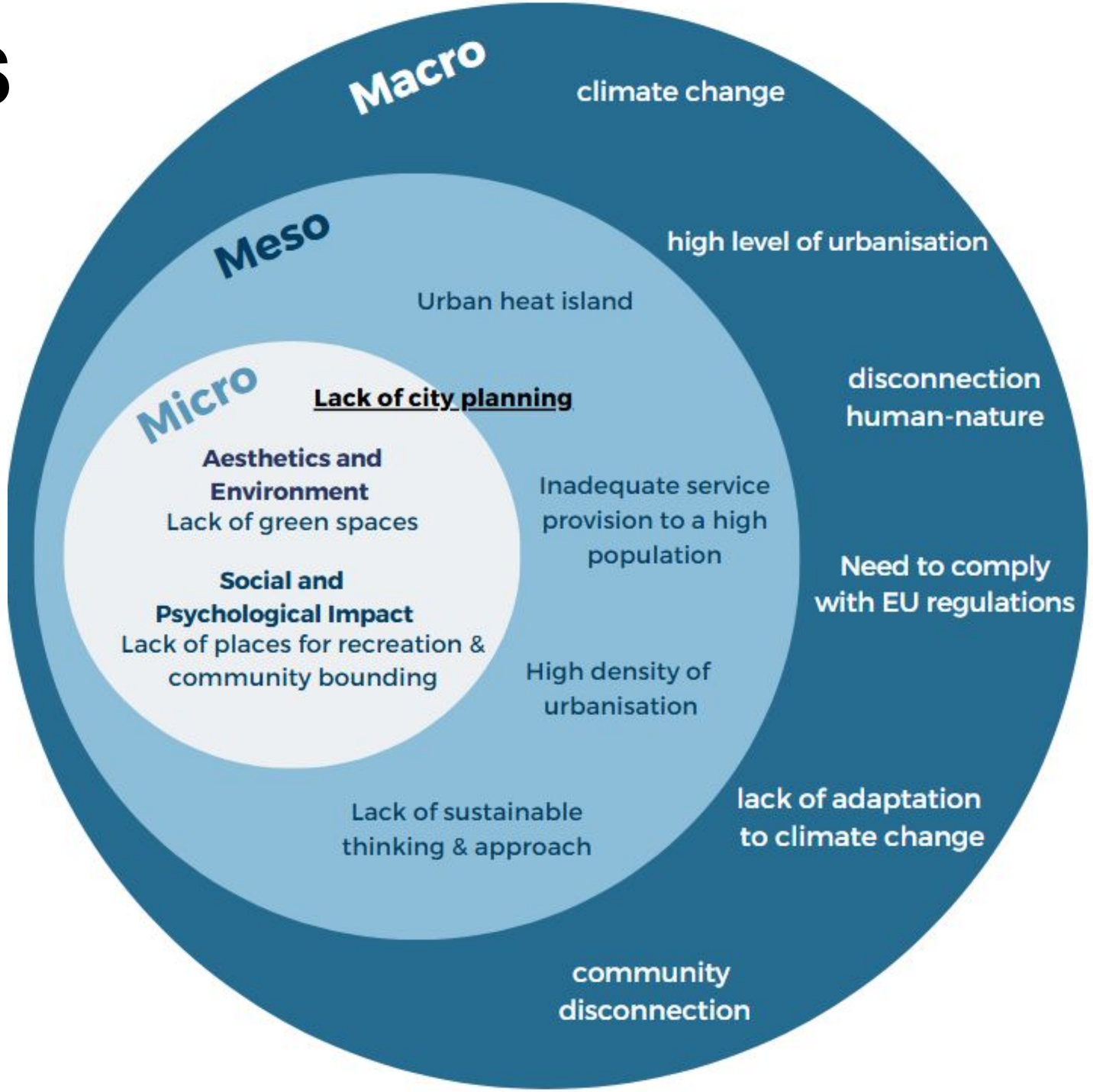
- **Lack of green urban infrastructure** to **mitigate** the l**ocal microclimate** and help with the UHI effect

1.2. NEED ANALYSIS

MACRO

MESO

MICRO



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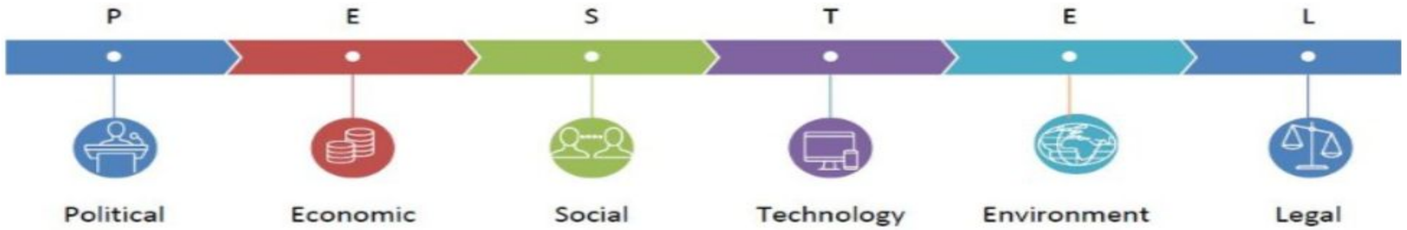
1.2. NEED ANALYSIS

MACRO



Economic -

Sofia (41 billion BGN), Plovdiv (5.3 billion BGN), Varna (4.4 billion BGN), Burgas (2.3 billion BGN), Ruse (1.7 billion BGN)

Technology- recent development in the country - fast improving (solar panels, water circularity, green walls, etc.)

Social -

- ❏ Human-nature & human-human disconnection
- ❏ Health
- ❏ 75% of Europeans living in urban areas
- ❏ 75% for Bulgaria

Political & Legal -

- ❏ EU Framework for NBS
- ❏ Bulgarian Resilience and Recovery Plan

C5.I1: Integrating the ecosystem approach into and applying nature-based solutions to the protection of Natura 2000 sites

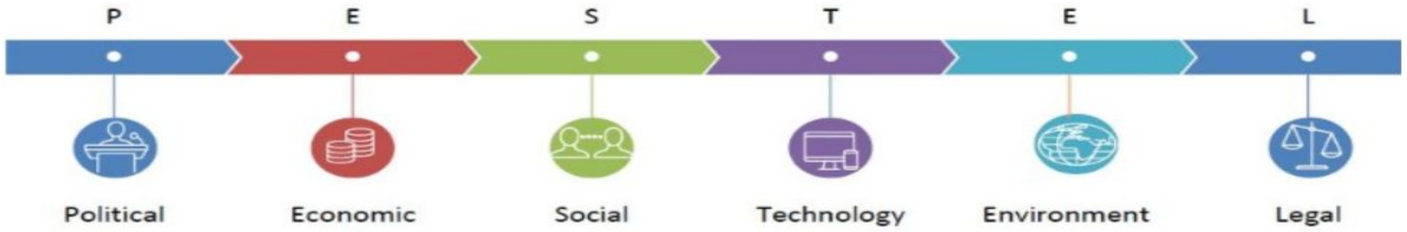
- ❏ The National Long-Term Renovation Strategy for the Building Stock (2020–2050)

Environment:

- ❏ 60% of the EU territory is urban or peri-urban
- ❏ Climate change - need of mitigation & adaptation
- ❏ 78% of the population in EU countries would experience a summer UHI effect greater than 1° C, and 20% more than 2°C

1.2. NEED ANALYSIS

MESO



Economic -

- ❏ Limited financial incentives for private owners to invest in sustainability.

Social -

- ❏ Weak community structures & limited civic engagement hinder co-creation of green spaces.
- ❏ Lack of awareness about UHI effects NBS

Political & Legal -

- ❏ Properties are privately owned - limits municipal intervention.
- ❏ Coordination gaps between municipal units (e.g., urban planning, environment).
- ❏ Weak enforcement of existing green infrastructure policies at the local level.
- ❏ INNOAIR project

- ❏ **Technology-** Emerging solutions (e.g. permeable pavements) are known, but not mainstreamed at the district level.
- ❏ Lack of technical capacity for NBS implementation in older housing structures.

Environment:

- ❏ High building density with low vegetation coverage intensifies UHI.
- ❏ Absence of ecological corridors or green buffer zones within the district.

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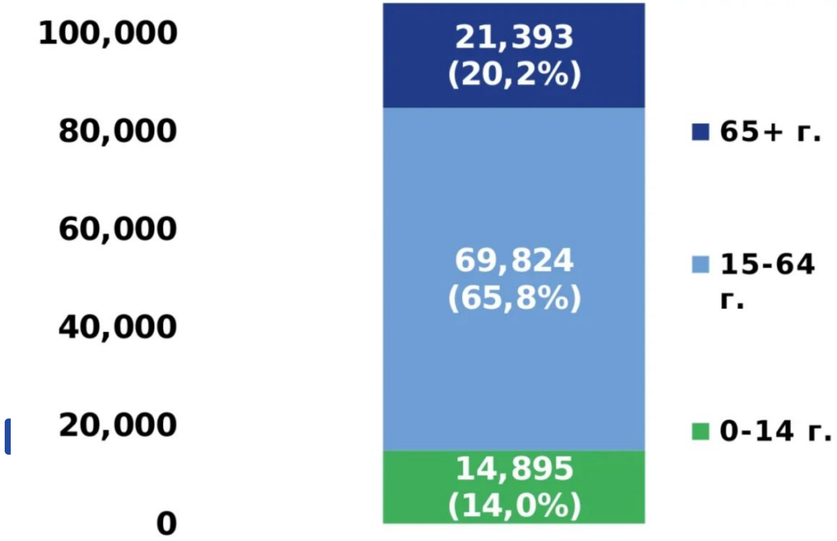
1.2. NEED ANALYSIS

MICRO → **LYULIN**

Characteristics:

- Located in the northwestern part of Sofia Municipality.
- Largest residential area in Bulgaria.
- Large-panel constructions (about 70%), typical for Eastern European cities with a predominance of high-rise residential buildings (over six stories).

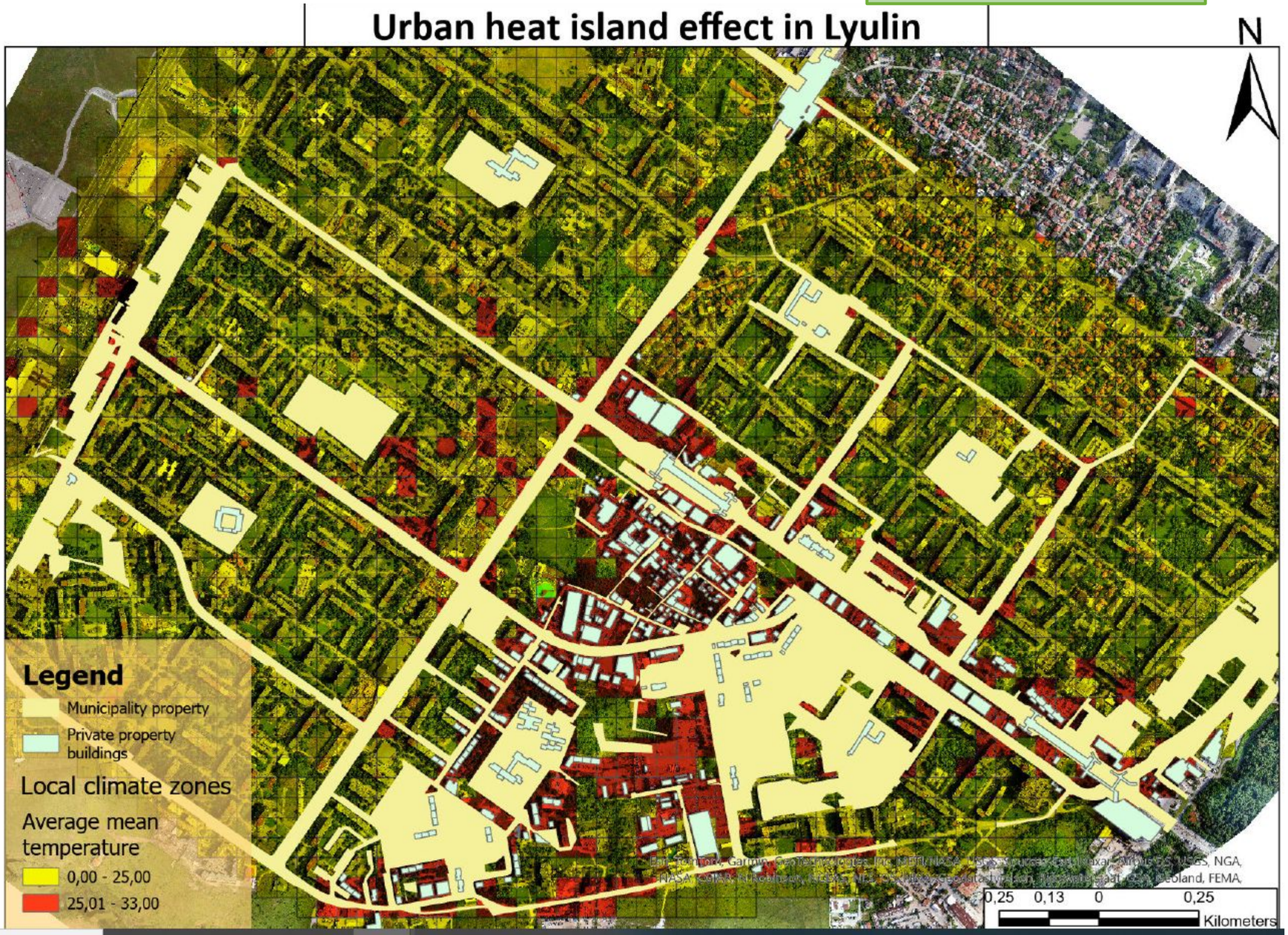


Demographics:

- Neighbourhood with the largest working-age population

1.2. NEED ANALYSIS

MICRO ➡ **LYULIN**



Most common type of build up areas in Lyulin:

- compact combination of tall buildings with predominantly low vegetation and scattered trees.

1.2. NEED ANALYSIS

MICRO → LYULIN

CHALLENGES THAT NEED TO BE COVERED

- Urban Heat Island (UHI) Effect
- Type of construction 4
- Parkings and dark concrete used in streets 1
- Lack of green spaces 3
- Lack of spaces for community bounding 2 5
  (e.g. playgrounds in good conditions, benches, etc.)

Need for more recreational and urban garden spaces to help with maintaining the local microclimate and the UHI.

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2. DESIGN SOLUTION

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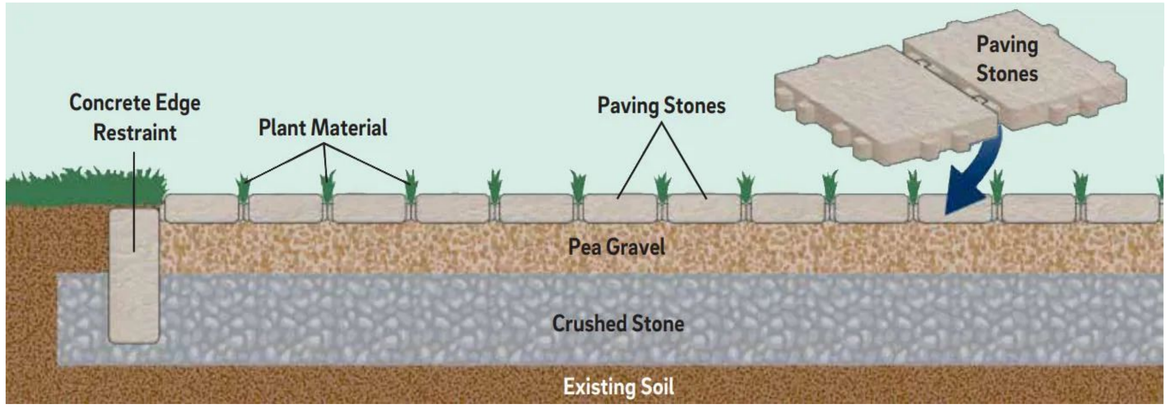
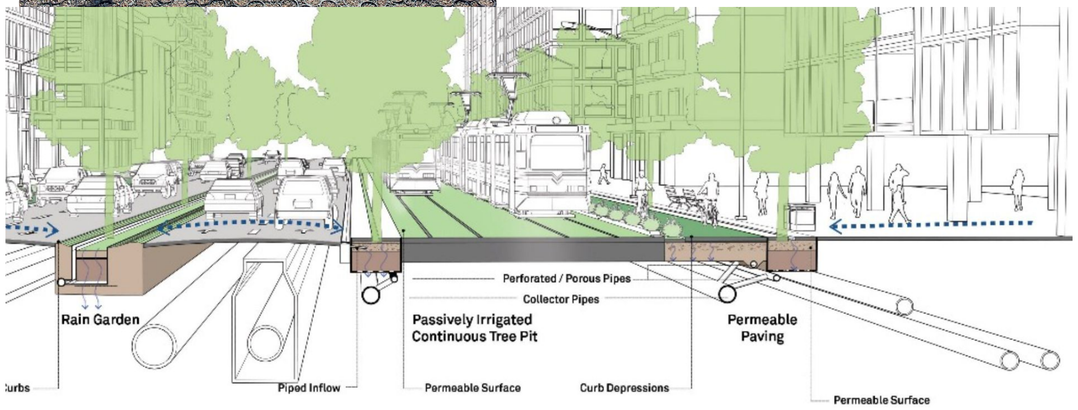
2.1. NBS PROPOSED & CASE STUDIES

1 PERMEABLE PAVEMENT



CASE 1: Barcelona Superblocks



2 URBAN GARDENS

CASE 2: Berlin Prinzessinnengarten

🌍 Barcelona Superblocks - Permeable Pavement Case Study

Urban Heat Island Mitigation through Integrated Green Infrastructure

📍 Barcelona, Spain • 🏗️ 2016-2030 • 💰 €37.8M Investment

⚠️ Problem Identification

- **Urban Heat Island:** Dense Eixample district with high temperatures
- **Traffic Congestion:** Car-dominated streets, poor air quality
- **Lack of Green Space:** Limited public areas and biodiversity
- **Noise Pollution:** High noise levels affecting residents

500K+

Population Density

💡 Design Solution

- **Superblocks:** Reorganize urban blocks to limit traffic
- **Permeable Pavements:** In pedestrian areas and plazas
- **Green Corridors:** 21 green axes connecting neighborhoods
- **Community Co-design:** Residents choose space usage

€70-100/m²

Permeable Pavement Cost

- **2016:** Poblenou pilot
- **2022:** Eixample launch
- **2030:** Full completion

📈 Expected Impact

-2.5°C

Surface Temperature Reduction

+50%

Pedestrian Flow Increase

- **Social Cohesion:** +74% family permanence in public spaces
- **Biodiversity:** Enhanced urban habitat creation
- **Funding Sources:** Municipal + Regional + EU ERDF
- **Stakeholders:** Urban Ecology Agency, NGOs, Citizens

✅ Replicable Model for Lyulin

🌱 Berlin Prinzessinnengarten - Urban Gardening Case Study

Modular Community Gardens in Dense Urban Districts

📍 Berlin, Germany • 🏗️ 2009-ongoing • 💰 €12K-20K Initial Investment

Problem Identification

- **Vacant Wasteland:** Former industrial lot in dense Kreuzberg district
- **Lack of Green Space:** Limited access to nature in urban environment
- **Social Disconnection:** Residents isolated, no community gathering spaces
- **Urban Heat:** Paved surfaces contributing to microclimate issues

Dense
Kreuzberg District

Design Solution

- **Modular Design:** Relocatable raised planting beds on paved surface
- **Water Capture:** Composting stations and rainwater collection
- **Education Hub:** Sustainable practices workshops and learning
- **Community-Led:** Open to all citizens, volunteer-driven

€12K-20K
Initial Setup Cost

- **2009:** NGO initiation
- **3-4 months:** Setup time
- **Ongoing:** Seasonal maintenance

Expected Impact

Cooler
Microclimate (Shade & Lower Temps)

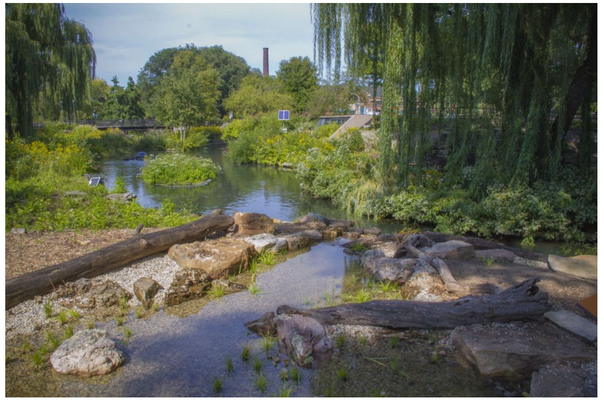
- **Community Building:** Strong sense of neighborhood connection
- **Education Impact:** Sustainable practices knowledge transfer
- **Funding:** Donations + Berlin Senate + Crowdfunding
- **Stakeholders:** NGO Nomadisch Grün + Volunteers + Schools

🎯 Adaptations for Lyulin

- Reclaimed materials (pallets, crates)
- Water barrels with mesh filters
- QR codes for mobile learning
- 1-day removable/reinstallable
- Schools + seniors as caretakers

2.1. NBS PROPOSED & CASE STUDIES

3 CONSTRUCTED WETLAND



CASE 3: Wageningen, Netherlands – "De Nieuwe Kanaal"

4 SUSTAINABLE BUILDINGS

CASE 4: Vila Nova de Gaia

5 RECREATIONAL AREAS RENOVATION

🟢 Case Study 3: Wageningen, Netherlands – "De Nieuwe Kanaal"

📌 Problem Identified

🌊 **Urban Challenge:**
Former industrial zone near city outskirts with frequent flash flooding

📍 **Location: Wageningen, Netherlands - Municipal land**

🌡️ **Issues: Flash flooding due to sealed surfaces + Summer overheating in asphalt-heavy areas**

👥 **Social: Social disuse of municipal land**

Similar to Lyulin: Municipal parking lots with drainage issues and underutilized spaces that could serve community needs.

🛠️ Design Solution

💧 **Wetlands + Community Infrastructure:**
Removal of ~60% of parking surfaces + Installation of shallow constructed wetlands using native aquatic plants

💰 **€110,000 Total Cost Breakdown:**
- Wetland beds: €35,000
- Excavation & regrading: €30,000
- Pergola & paths: €20,000
- Monitoring: €5,000

⏱️ **Time: 5-6 months total (2 for removal & grading, 3-4 for wetland installation + facilities)**

🎯 **Key Lessons for Lyulin:**
- Don't need to remove all parking — just strategically placed segments
- Hybrid space: wetland + pergola = cooling + community presence
- Simple earthworks + native plants create powerful results
- Cost-effective if you re-use municipal land

📊 Expected Impact

🌡️ **Environmental:**
25% drop in local surface temps during heatwaves + Zero local flooding events in 5 years post-intervention

👥 **Social: Used daily by >150 residents + Walking paths & benches + Community pergola**

💚 **Funding: INTERREG Europe (EU regional development fund) + Municipality of Wageningen**

🏛️ **Stakeholders: Wageningen Municipality + Local ecologists + Community organisations + Wageningen University**

🎯 **Implementation for Lyulin:**
- Involve technical schools or universities for design
- Small community pergola built with local carpenters
- Native aquatic plants (low maintenance)
- Strategic parking removal (not complete elimination)

📊 **Source: Wageningen Climate Adaptation Portal, INTERREG Green Infrastructure Report – 2021**

📍 Case Study 4: Vila d'Este, Vila Nova de Gaia, Portugal – Urban Regeneration

📌 Problem Identified

🏘️ **Urban Challenge:**
Poor urban planning from the 1980s in degraded housing blocks

📍 **Location: Vila Nova de Gaia, Portugal - High density (17,000 residents)**

🌡️ **Issues: Lack of green space, social equipment, and urban connectivity**

👥 **Social: Serious social issues: marginalisation, unemployment, isolation**

Similar to Lyulin: Similar population (15k-20k), peripheral neighborhood with social stigmas, strong municipal role needed for regeneration.

🛠️ Design Solution

🏗️ **Full-scale Urban Regeneration:**
Renovation of façades, roofs, windows, and public space + Creation of community spaces

💰 **€20M Total Investment:**
- Phase 1 (2008-2011): €10M (Edifices + public spaces)
- Phase 2 (2012-...): €10M (Extended to more blocks)
- FEDER (EU): 80% funding (=€16M EU total)

⏱️ **Timeline: Multi-phase approach over 4+ years**

🏛️ **Leadership: Municipality of Gaia + GAIURB (urbanism company)**

🎯 **Key Elements for Lyulin:**
- Schools, pools, playgrounds, green corridors
- Social support hubs: youth, women, employment
- Social inclusion programmes tied to physical interventions
- Community involvement through local associations and surveys

📊 Expected Impact

🌟 **Physical + Social Transformation:**
Physical transformation of degraded area + New pride and sense of community

👥 **Social: Access to social and sports facilities + Decrease in school dropout, youth delinquency and isolation**

💚 **Funding: FEDER (EU) 80% + Municipality of Gaia 20%**

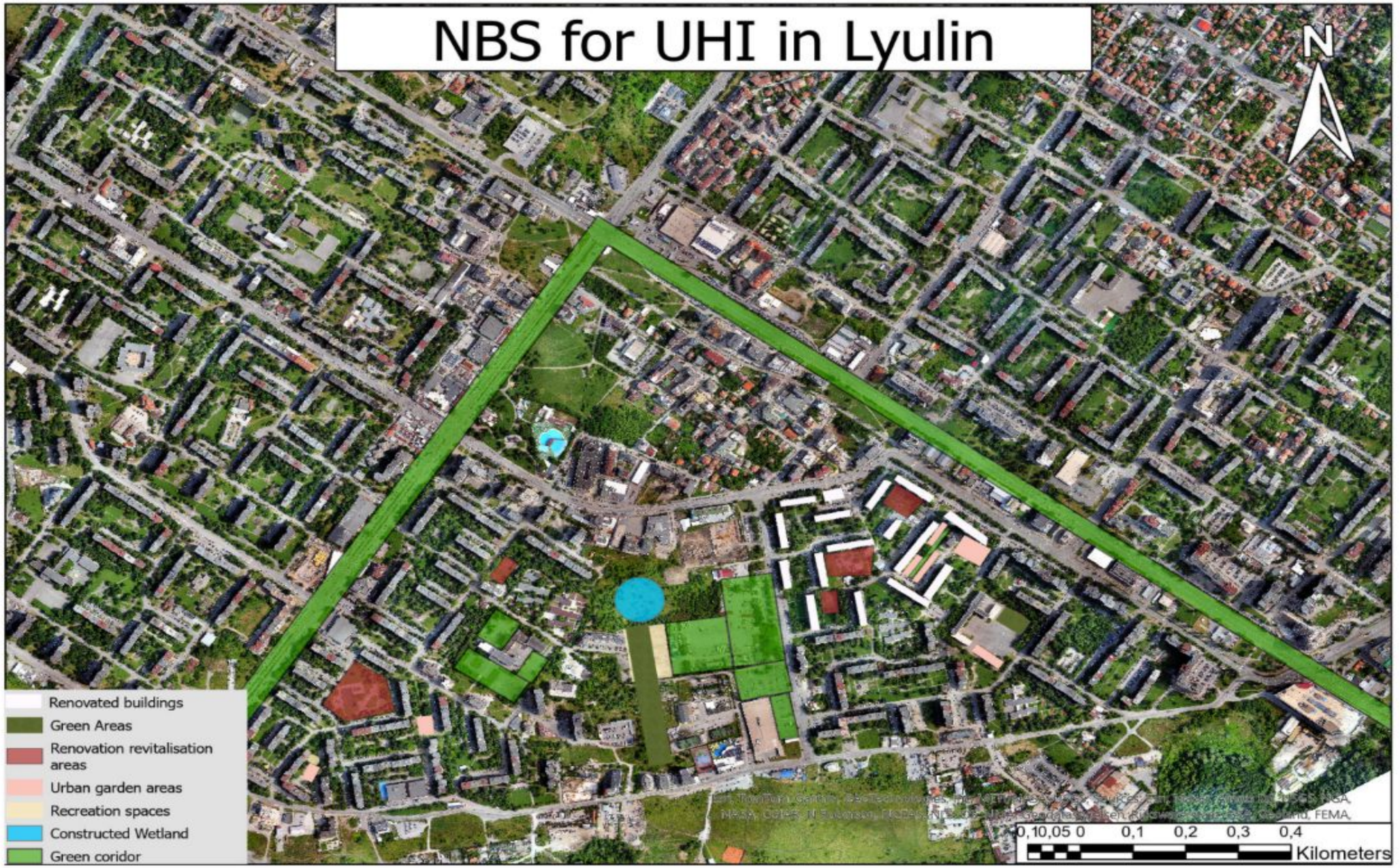
🏛️ **Partners: University of Porto (FEUP) + Local NGOs + National funds**

🎯 **Implementation Strategy for Lyulin:**
- Strong municipal leadership essential
- Partnership with local associations and university
- Phased approach allows gradual transformation
- Mix of physical renovation with social cohesion programs
- EU funding opportunities (similar to FEDER)

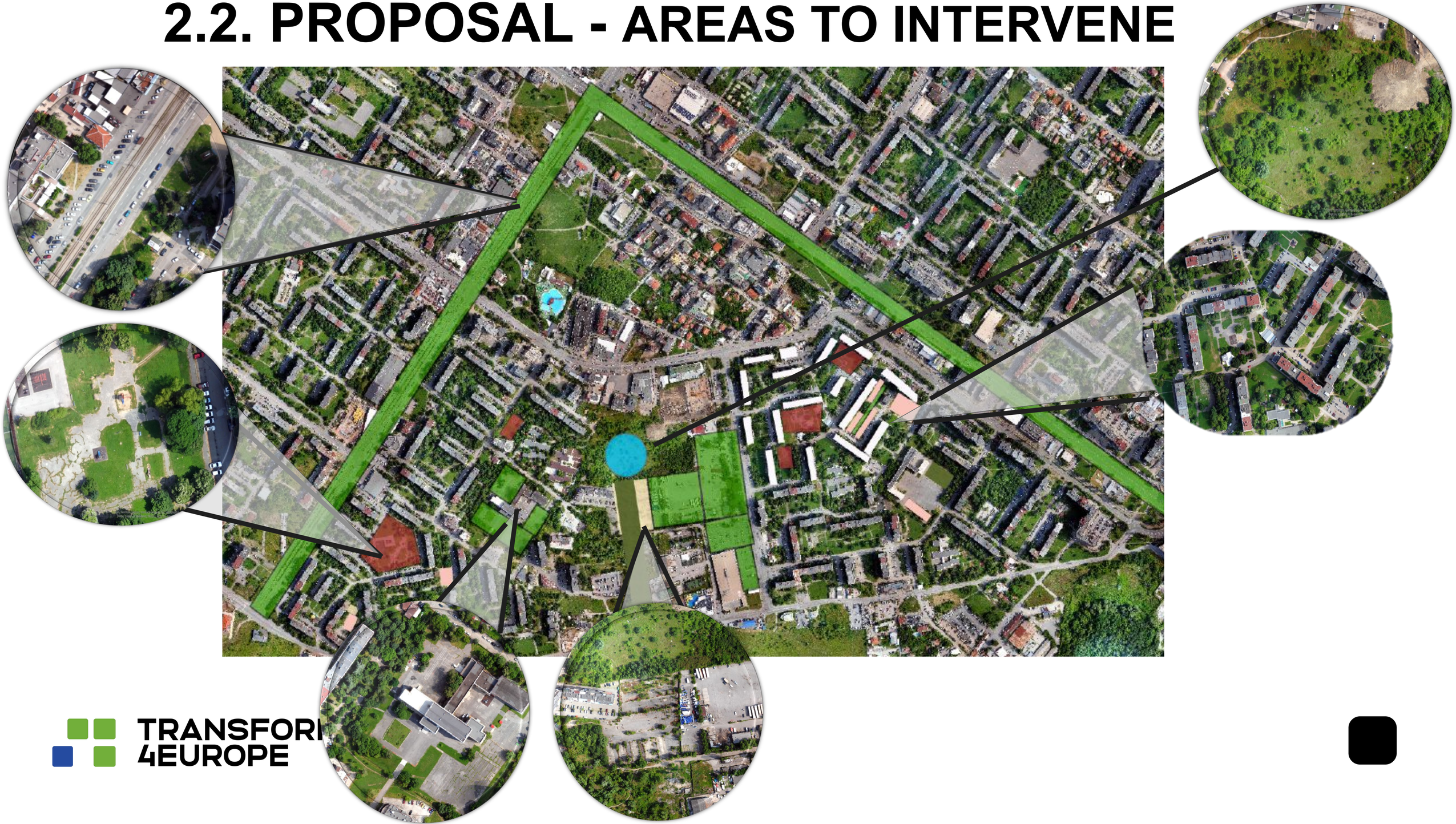
📊 **Source: GAIURB Official Documentation, Municipality of Vila Nova de Gaia**

2.2. PROPOSAL - AREAS TO INTERVENE

INTEGRAL INTERVENTION



2.2. PROPOSAL - AREAS TO INTERVENE



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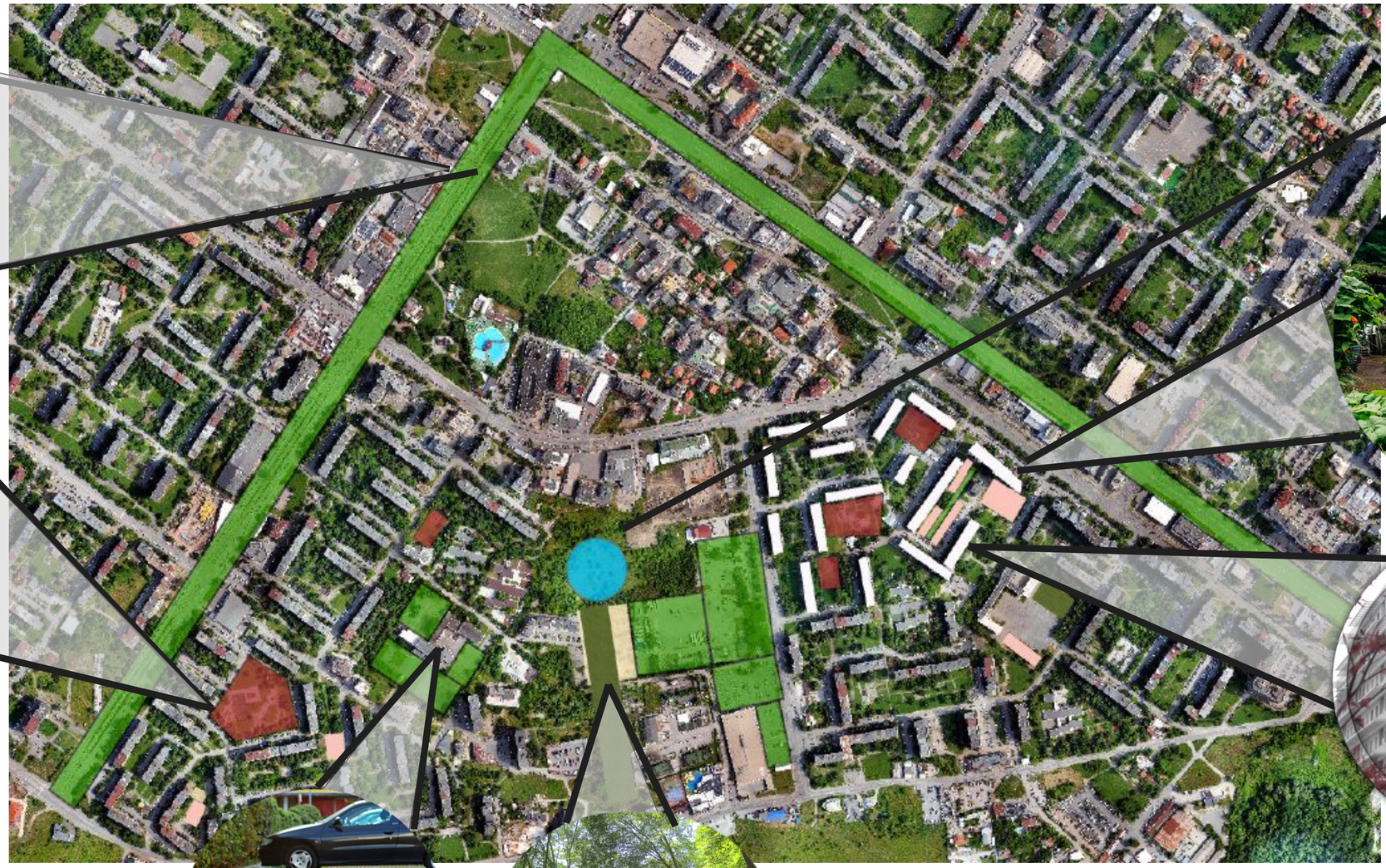
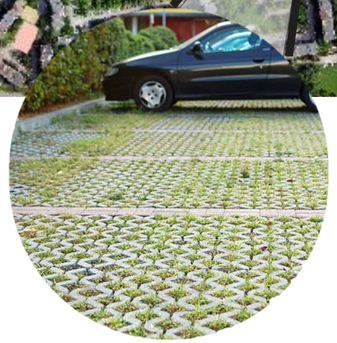
2.2. PROPOSAL - CLUE





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2.2. PROPOSAL - CLUE

SCALABILITY

NBS	ADVANTAGES	SCALABILITY POTENTIAL
PERMEABLE PAVEMENT	• Scaled from parking lots to large urban roads. • Modular design allows for easy expansion in new developments or existing infrastructure	Widely scalable in urban planning, as it can be integrated into streets, walkways, and parking areas.
CONSTRUCTED WETLANDS	• Designed for small-scale applications to large-scale • Multiple benefits: UHI, rainwater retention, community bounding, aesthetic, etc.	Highly scalable in water treatment and stormwater management, adaptable from urban parks to regional water management projects.
URBAN GARDENS	• Highly adaptable & scaled from small community plots to large urban greening projects or city-wide green spaces.	Very scalable with proper planning, contributing to urban biodiversity, food production, and community well-being at various scales.
BUILDING GREEN RENOVATION	• It can be applied to individual buildings or scaled across entire neighbourhoods or cities through policy and incentives	Highly scalable, especially when supported by regulatory frameworks, financial incentives, and awareness campaigns, leading to widespread sustainable urban development
REVITALISATION RECREATIONAL AREAS	• Highly adaptable. It can range from small neighbourhood upgrades to large-scale urban regeneration projects. • Revitalized recreational areas can significantly enhance urban liveability, promote health, & foster social cohesion	Very scalable, especially when integrated into city-wide urban development plans, often supported by public funding, grants, or community-led initiatives.

2.2. PROPOSAL - CLUE

Temporariness vs permanence

NBS	PERMANENCY	MAINTENANCE
PERMEABLE PAVEMENT	• Generally considered a **permanent** infrastructure asset. When properly installed, it can last 15-30 years or more with regular maintenance.	Requires periodic cleaning and repairs to maintain permeability and structural integrity.
CONSTRUCTED WETLANDS	• Designed as **long-term, durable systems** for water treatment or stormwater management. With proper management, they can last decades.	Needs ongoing upkeep to prevent clogging, invasive species, and to ensure ecological health.
URBAN GARDENS	• Can be **permanent** if integrated into city planning and maintained over time.	Requires constant engagement from the community to ensure sustainability.
BUILDING GREEN RENOVATION	• Usually **permanent** modifications to existing buildings, especially if structural or technical upgrades are involved.	Can last 20-50 years, but some systems may require replacement or upgrades over time.
REVITALISATION RECREATIONAL AREAS	• When properly designed and maintained, revitalised recreational areas can be **permanent fixtures** of urban landscapes	Some projects may be **temporary** or phased, especially **if funding is limited** or maintenance & community engagement is not enhanced.

2.2. PROPOSAL - CLUE

Approximate cost: 2.8 M €

Cost & Funding

Funding:

EU funding

- European Regional Development Fund (Bulgarian Operational Programme ¨Regions in Growth¨);
- LIFE Programme;
- Horizon Europe programme.

National funding

- Operational Programme ¨ Environment ¨;
- Municipal Directory Funds;
- Beautiful Bulgaria Programme for Building Renovation (Красива България)

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2.2. PROPOSAL - CLUE

Community Engagement

- **PARTICIPATORY PLANNING AND CO-DESIGN**
  Invite local tenants to co-design green infrastructure during the revitalization process
- **EDUCATION AND AWARENESS CAMPAIGNS**
  e.g. pilot projects & educational tours: sponge cities
- **CAPACITY BUILDING AND SKILL DEVELOPMENT**
  Cooperation with educational centres (schools, high schools)
- **GREEN VOLUNTEERING PROGRAMME**
  Interactive online platform that enables others track the progress of revitalisation as well as report any problems
- **PARTNERSHIPS AND COLLABORATIONS**
- **ENSURING ACCESSIBILITY AND INCLUSIVITY**
  Engage diverse community groups to ensure inclusive participation.
- **MONITORING, FEEDBACK AND ADAPTATION**

Foster a sense of community & ensure sustainability & resilience

SWOT

Strengths

S

- Potential for **job creation** in green sectors (construction, landscaping, etc.);
- Capital city status – attracts **investment**, **NGOs**, and **local business** opportunities

Weaknesses

W

- **High-rise, dense housing** structure limits space for NBS
- Most properties in Sofia are privately owned, limiting the municipality's ability to initiate green infrastructure projects.

Opportunities

O

- **Green transformation** may attract **private investors** in housing and innovation
- EU and national **funding programs** available for nature-based solutions

Threats

T

- **Public resistance or apathy** toward participation in revitalization efforts
- Potential **bureaucratic delays** & complexity in public procurement & construction permits

3. IMPLEMENTATION STRATEGY

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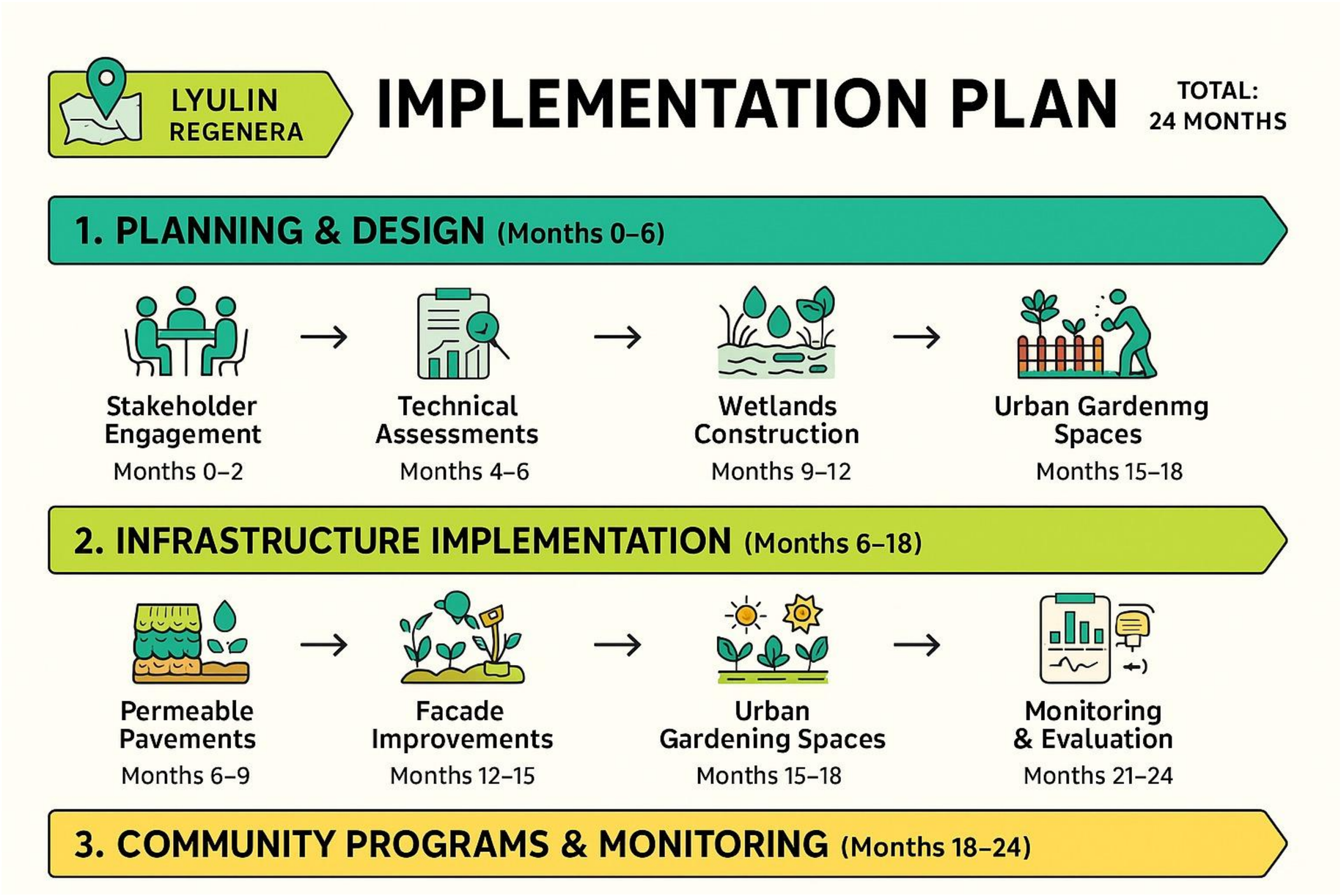
3.1. BASIC TIMELINE, RESOURCES & ROLES



LYULIN REGENERA

LYULIN REGENERA STAKEHOLDER INVOLVEMENT

Stakeholder Power Matrix

MANAGE CLOSELY

Sofia Municipality

SCENAGE CLOSELY

- Sofia Municipality
- Lyulin District Admin

REEP SATISFIED

MONITOR

- Media & Academia
- Prisate Contractors

Communication Strategy

Multi-Channel Approach:

- Ouarterly newslatters (Bulgarian + Turdish)
- Community notice boards
- Social media groups

Key Milestones:

Month 6: All permits aproved

Month 12: 50% infrastructure complete

Month 24: Full operation finished

Community Engagement

Participatory Planning

- **Green Skills Training**
  50 residents triained
- **Employment Opportunites**
  50 % local hiring priority

Capacity Building

Universities NGOs Schools Businesses

Expected Benefits

NGOs Schools Business Garden Centers

Roles & Responsibilities

✓ 150+ residents in planning

For Residents | For

Quality of Life
50 residents tromebetter air quality, access to green spaces

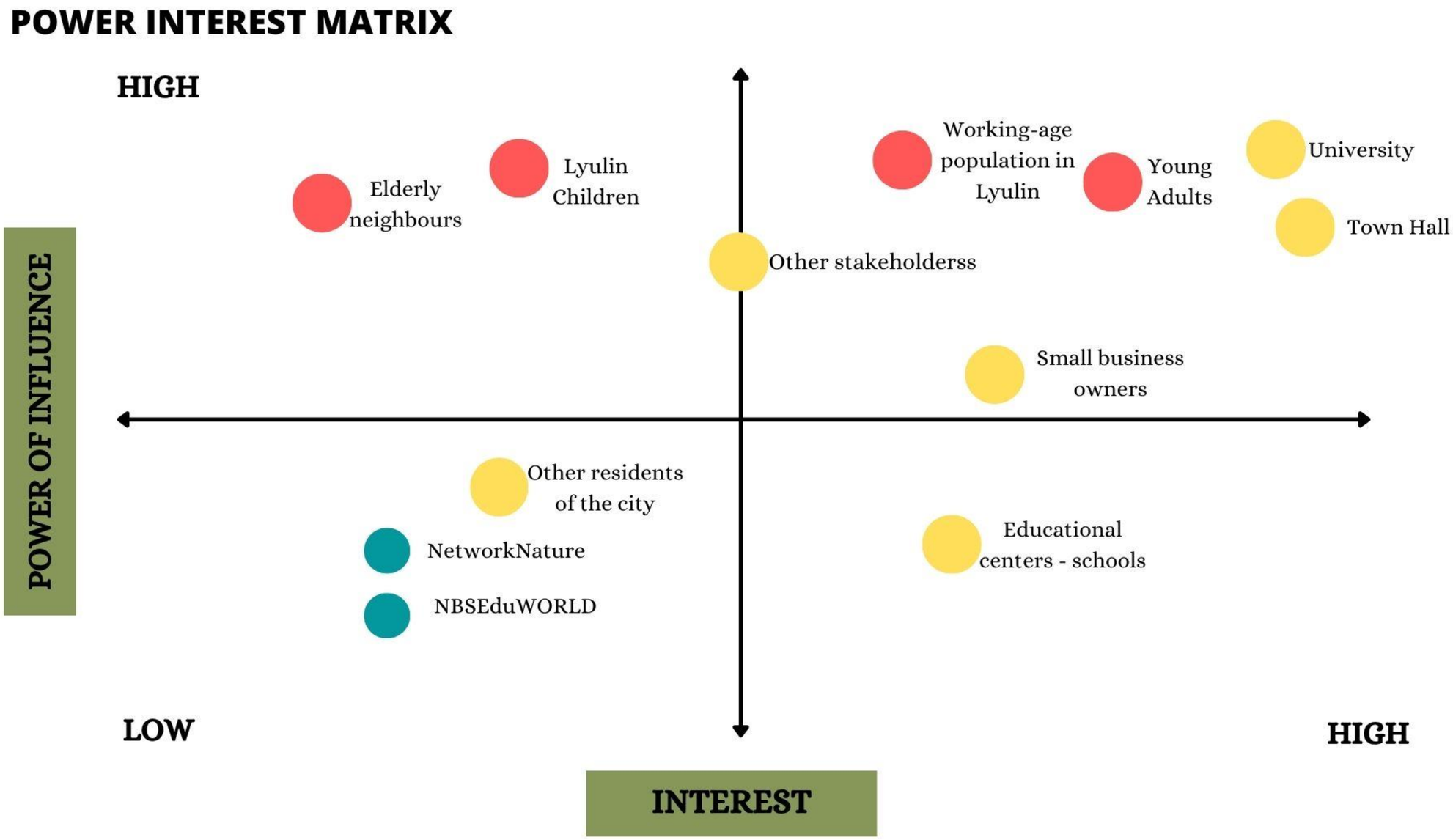
Community Cohesion
Shared spaces, collaborative activities, social connections

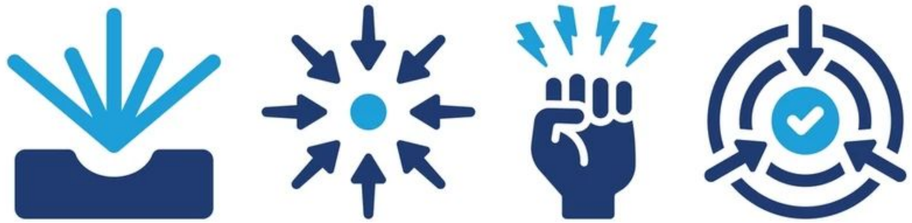
Economic Opportunities
Local employment, skill development, social enterprise

Success Metrics

- ☐ 150+ residents in planning
- ☐ 25 % temperature reduction
- ☐ 15 permanent green jobs
- ☐ Zero flooding events

3.2. INVOLVEMENT OF STAKEHOLDERS & CITIZENS





4. EXPECTED IMPACT

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4.1. REDUCE CLIMATE RISK & LOCAL RESILIENCE IMPROVEMENT

NBS	CLIMATE RISK REDUCTION	COMMUNITY RESILIENCE
PERMEABLE PAVEMENT	• Lowers surface temperatures by reflecting sunlight and allowing water infiltration, which cools the urban environment.	Reduces heat stress during heatwaves, decreasing health risks and infrastructure strain caused by extreme heat.
CONSTRUCTED WETLANDS	• Evaporative cooling from water surfaces and vegetation helps lower ambient temperatures.	Provides natural cooling and moisture regulation, reducing the impact of heatwaves and drought conditions.
URBAN GARDENS	• Vegetation provides shade and cools the air through transpiration, directly reducing local temperatures.	Enhances community capacity to adapt to heatwaves, improves mental health, and promotes social cohesion.
BUILDING GREEN RENOVATION	• Green roofs and reflective surfaces decrease heat absorption by buildings, reducing indoor and surrounding air temperatures.	Improves building resilience to temperature extremes, reduces cooling energy demand, lessening strain on energy grids in heat events.
REVITALISATION RECREATIONAL AREAS	• Green, shaded spaces lower ambient temperatures and combat urban heat islands.	Supports community well-being and social cohesion, providing safe, cool spaces during heatwaves and other climate stresses.

4.1. REDUCE CLIMATE RISK & LOCAL RESILIENCE IMPROVEMENT

CO-BENEFITS

- **Environmental Benefits:** Reduced air pollution, enhanced biodiversity, and improved local microclimates.
- **Health Benefits:** Lower incidence of heat-related illnesses, better air quality, and mental health improvements from access to natural spaces.
- **Economic Benefits:** Decreased energy costs for cooling, increased property values, and reduced healthcare costs related to heat stress.
- **Social Benefits:** Increased community engagement, improved quality of urban life, and enhanced capacity to withstand climate extremes.
- **Climate Mitigation:** Reduced greenhouse gas emissions through lower energy consumption for cooling and decreased urban heat-related emissions.

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5. CONCLUSIONS

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THANK YOU!
Благодаря!
Obrigado!
Dziękuję!
Gracias & Gràcies!

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