

**jOiNEd For sUsTainability - bUilding climate REsilient
communities in WB and EU**

Integrating Green-Blue Infrastructure (GBI) for Circular & Sustainable Cities

Date: 03.07.2024

Place: Ohrid



Co-funded by the
European Union



1. SUSTAINABLE CITIES

- GOALS AND FRAMEWORKS
- NATURAL ELEMENTS IN CITIES

THEORIES

2. URBAN WATERWAYS

- DEFINITIONS AND TYPES
- BENEFITS AND CHALLENGES
- GREEN-BLUE INFRASTRUCTURE

3. CASE STUDY: TOKYO

- ECOSYSTEM SERVICES OF GBI
- GBI SUPPORTING CIRCULAR ECONOMY IN TOKYO
- CHRONO-URBANISM (15-MINUTE CITY)

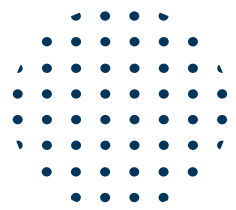
METHODS

4. SKOPJE AS A CASE

- SUSTAINABILITY GOALS FOR SKOPJE
- GOOD PUBLIC SPACE INDEX
- CHRONO-URBANISM (15-MINUTE CITY)

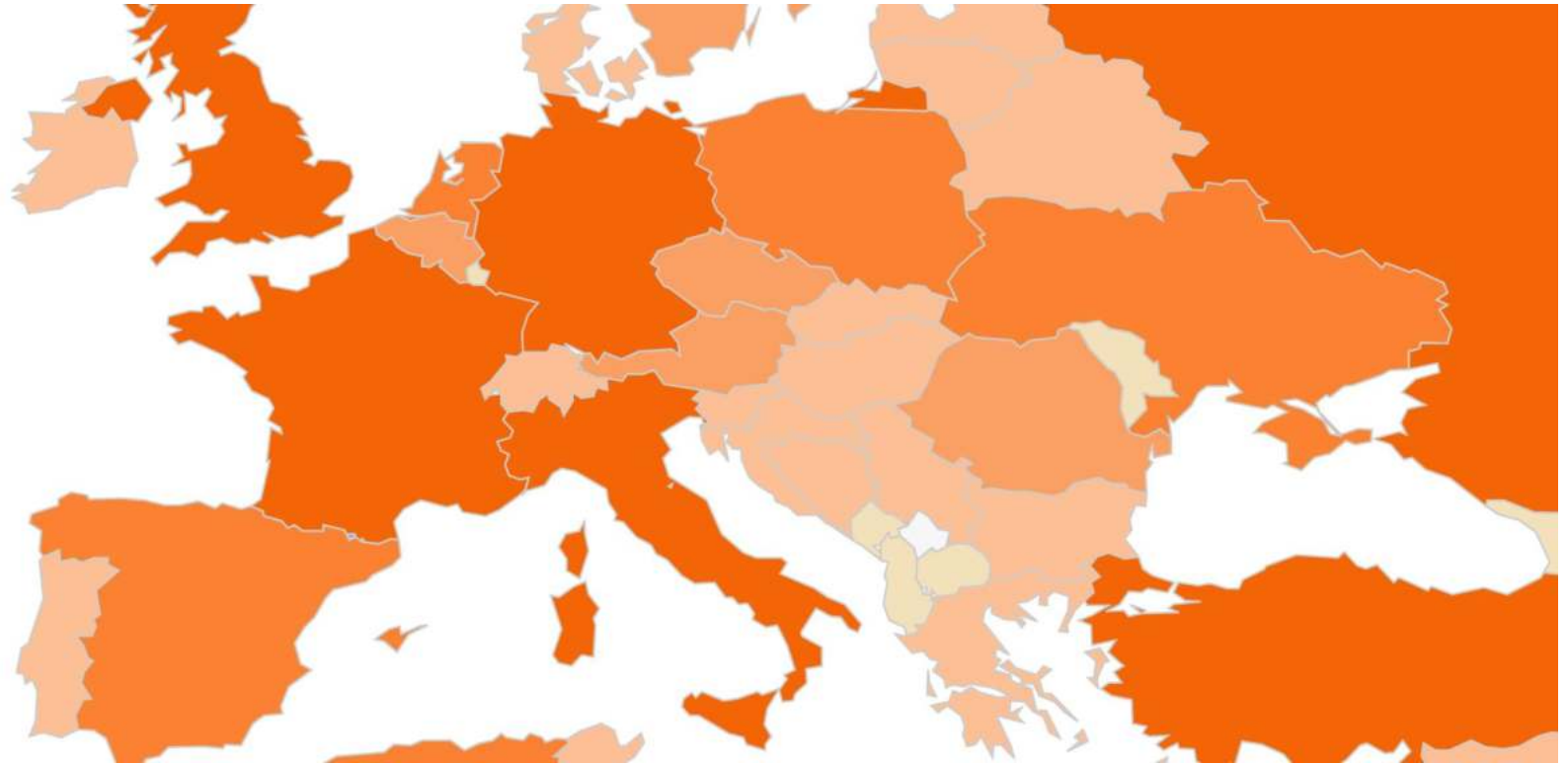
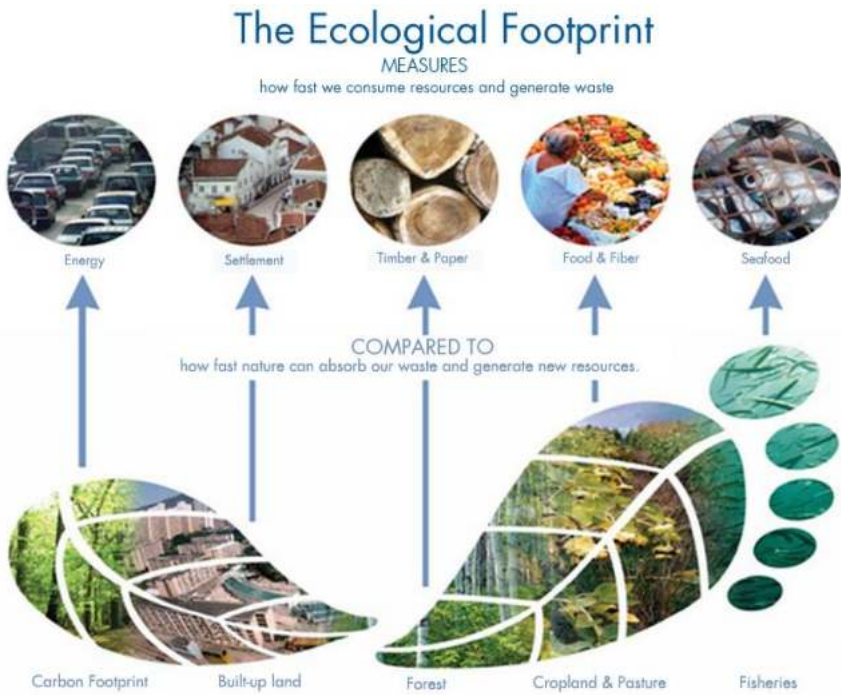


FUTURE SUSTAINABLE CITIES



ECOLOGICAL FOOTPRINT

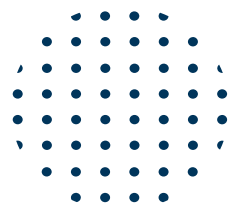
Measures **how much demand human consumption places on the biosphere**. It is measured in standard units called global hectares.



TOTAL ECOLOGICAL FOOTPRINT OF COUNTRY'S POPULATION (in global hectares)



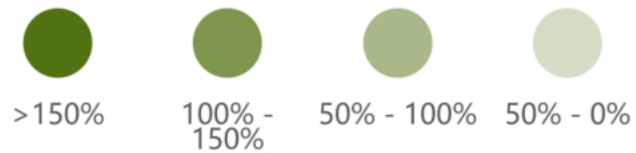
FUTURE SUSTAINABLE CITIES



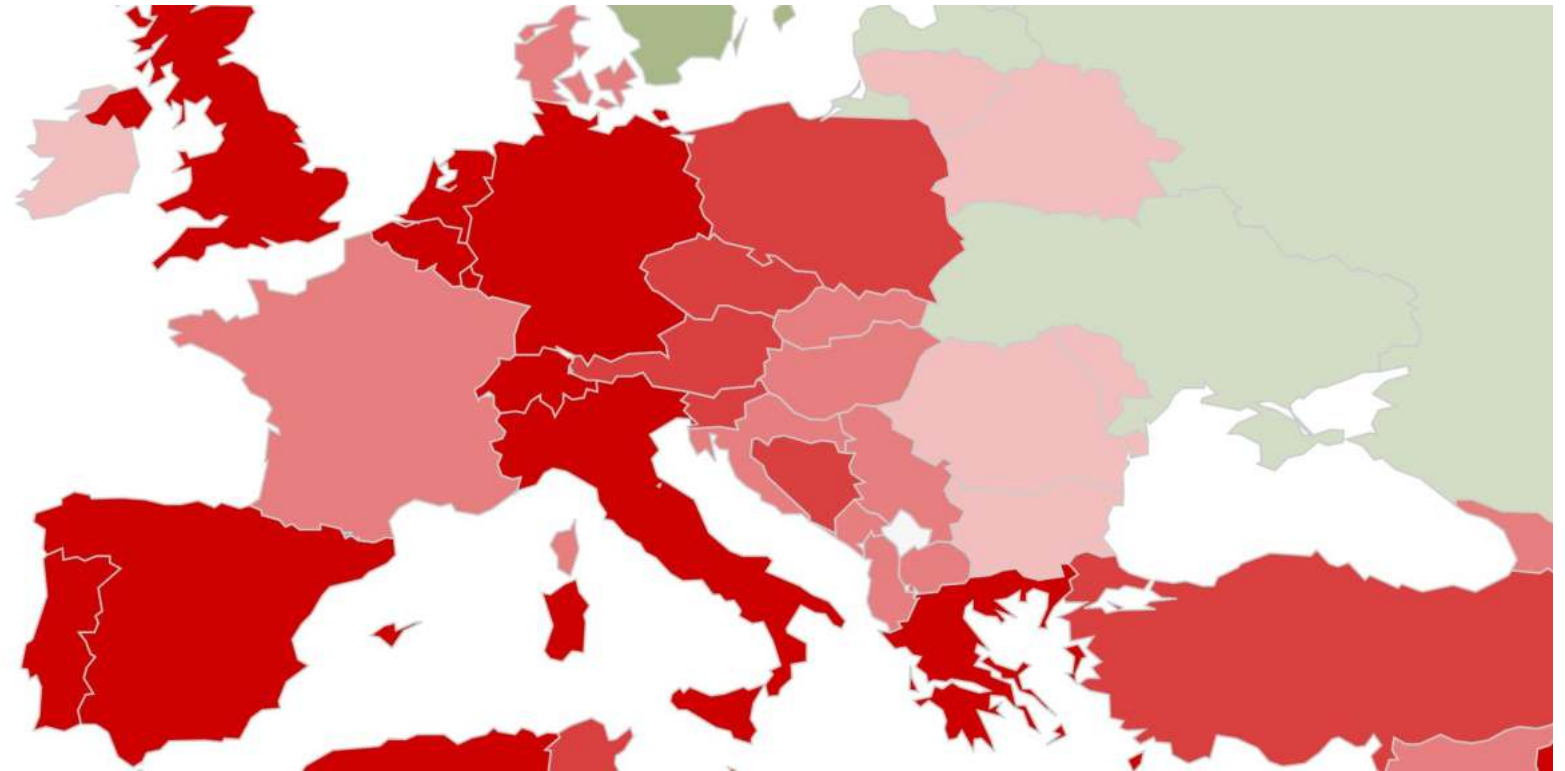
ECOLOGICAL DEFICIT/RESERVE

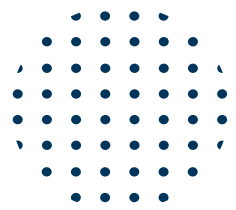
An ecological deficit occurs when the **Ecological Footprint** of a population **exceeds the biocapacity** of the area available to that population.

BIOCAPACITY CREDITORS
BIOCAPACITY GREATER THAN FOOTPRINT



BIOCAPACITY DEBTORS
FOOTPRINT GREATER THAN BIOCAPACITY

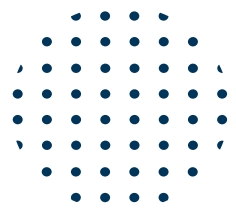




"IMPROVING THE QUALITY OF LIFE IN A CITY, INCLUDING ECOLOGICAL, CULTURAL, POLITICAL, INSTITUTIONAL, SOCIAL AND ECONOMIC COMPONENTS **WITHOUT LEAVING A BURDEN ON THE FUTURE GENERATIONS.** A BURDEN WHICH IS THE RESULT OF A REDUCED NATURAL CAPITAL AND AN EXCESSIVE LOCAL DEBT. OUR **AIM IS THAT THE FLOW PRINCIPLE**, THAT IS BASED ON AN EQUILIBRIUM OF MATERIAL AND ENERGY AND ALSO FINANCIAL INPUT/OUTPUT, **PLAYS A CRUCIAL ROLE IN ALL FUTURE DECISIONS UPON THE DEVELOPMENT OF URBAN AREAS.**"

11 SUSTAINABLE CITIES AND COMMUNITIES

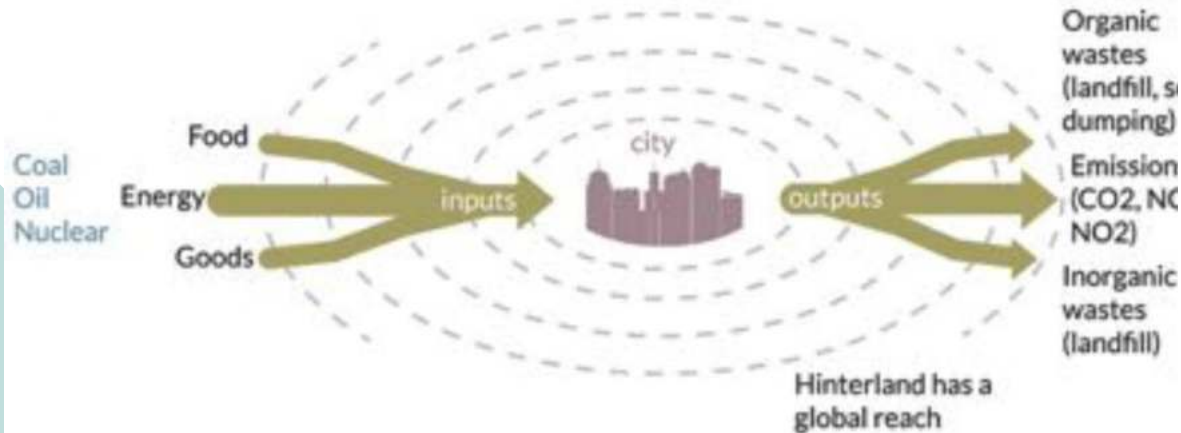




The flow principle= circular cities

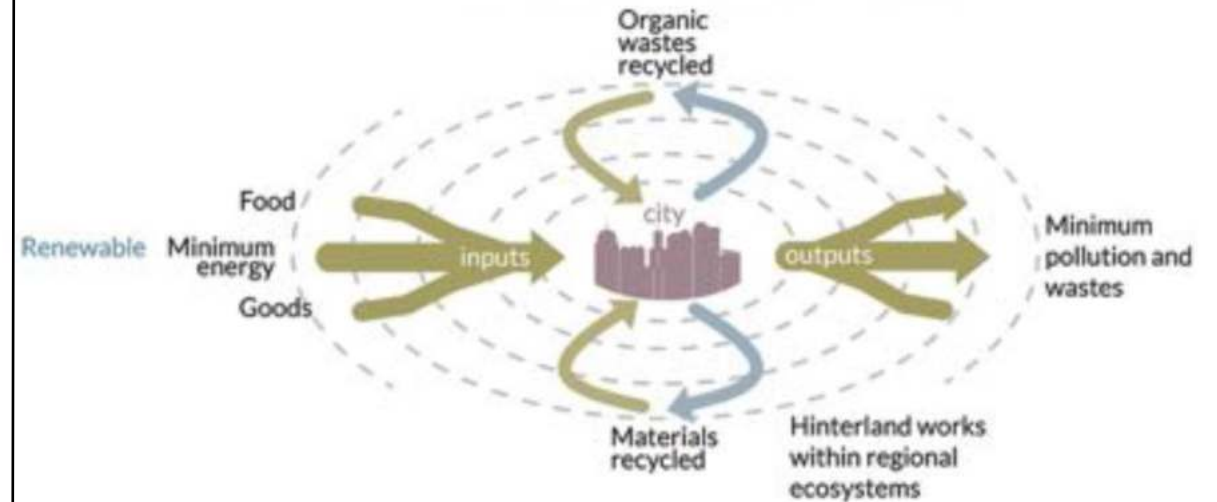
Circular cities apply the principles of circular economy to their management. They aim to reduce their environmental impact.

Linear metabolism cities consume resources and create waste and pollution at a high rate



CITIES TODAY

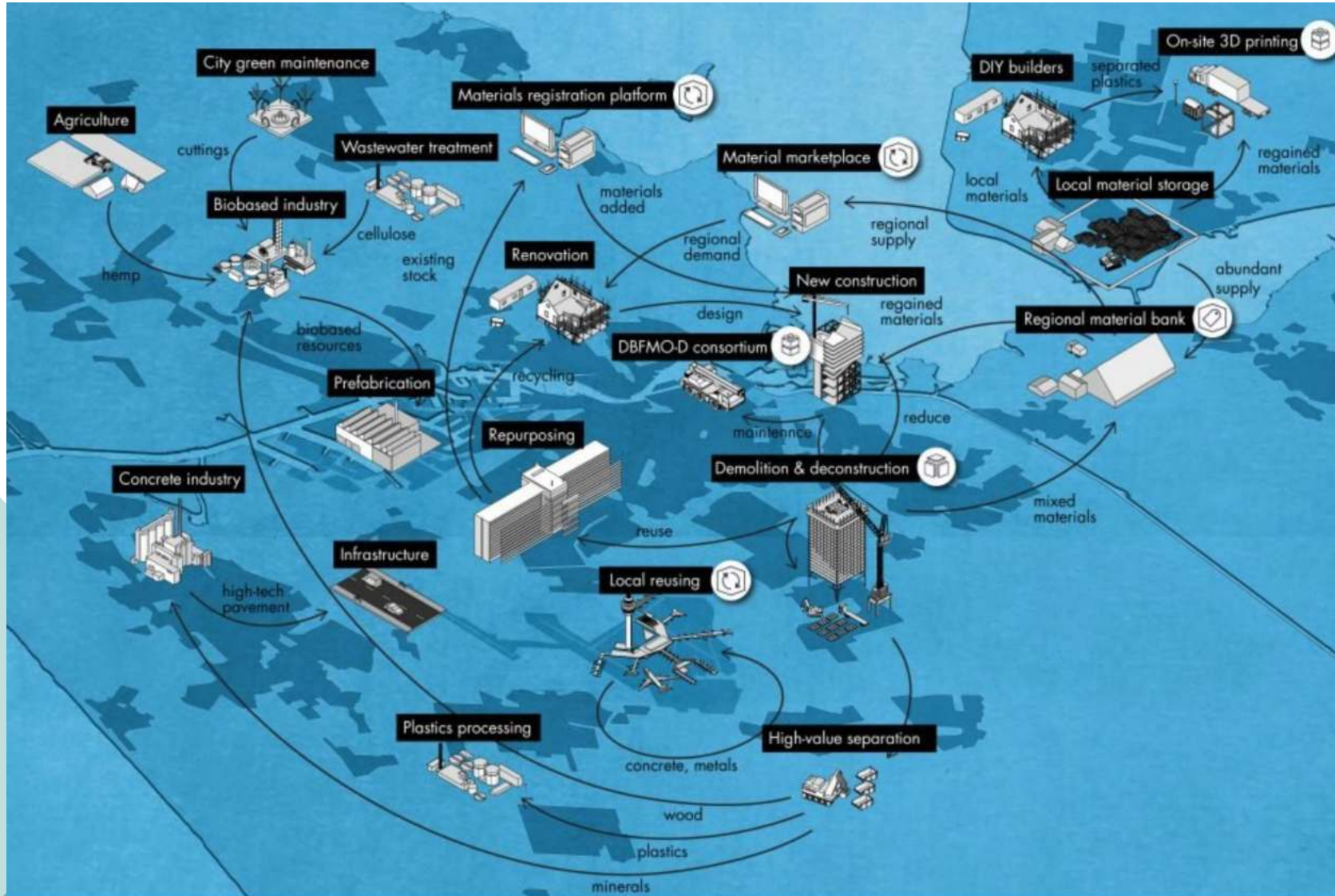
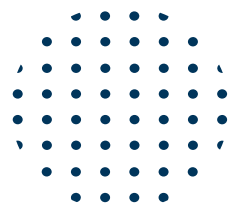
Circulative metabolism cities reduce consumption and pollution, recycle and maximise renewables



MODEL FOR FUTURE CITIES

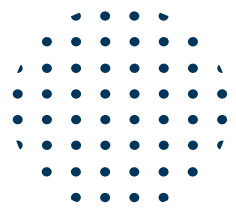


Examples: Circular Amsterdam 2050



- circular innovation lab for startups
- circular tendering process for public procurement
- circular pavilion for events
- circular fashion project
- plastic-free rivers campaign
- community composting network

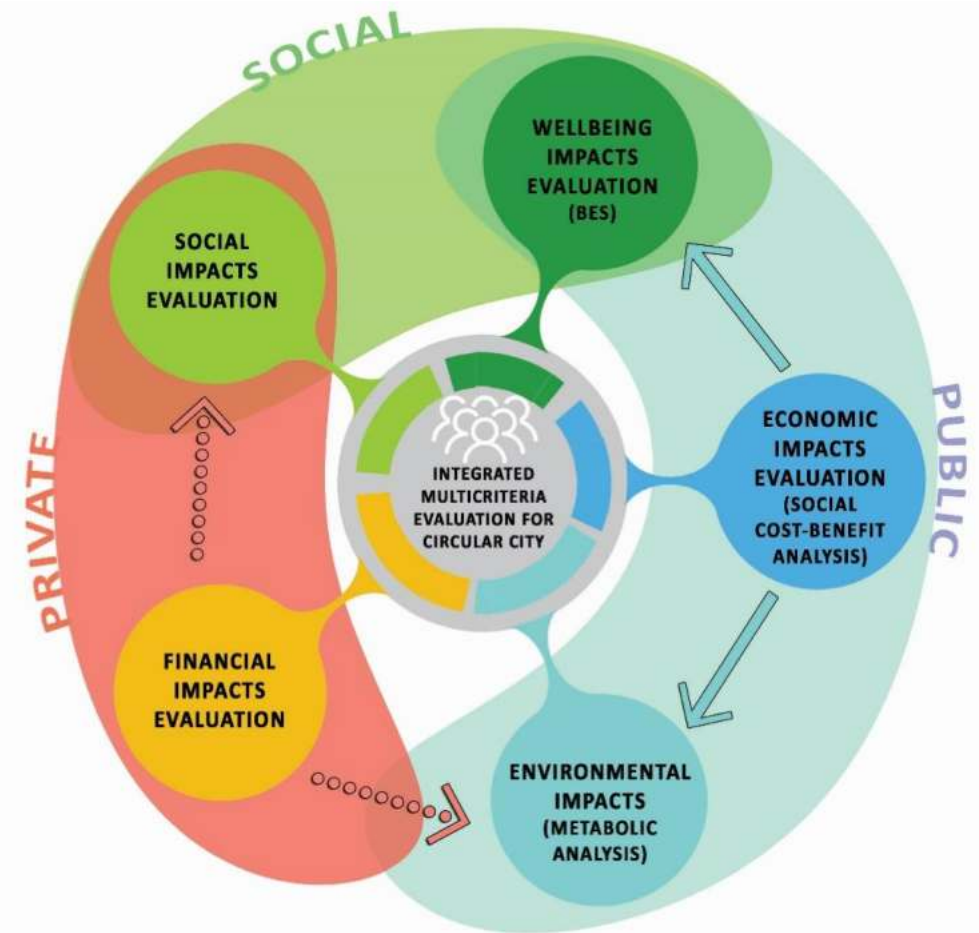
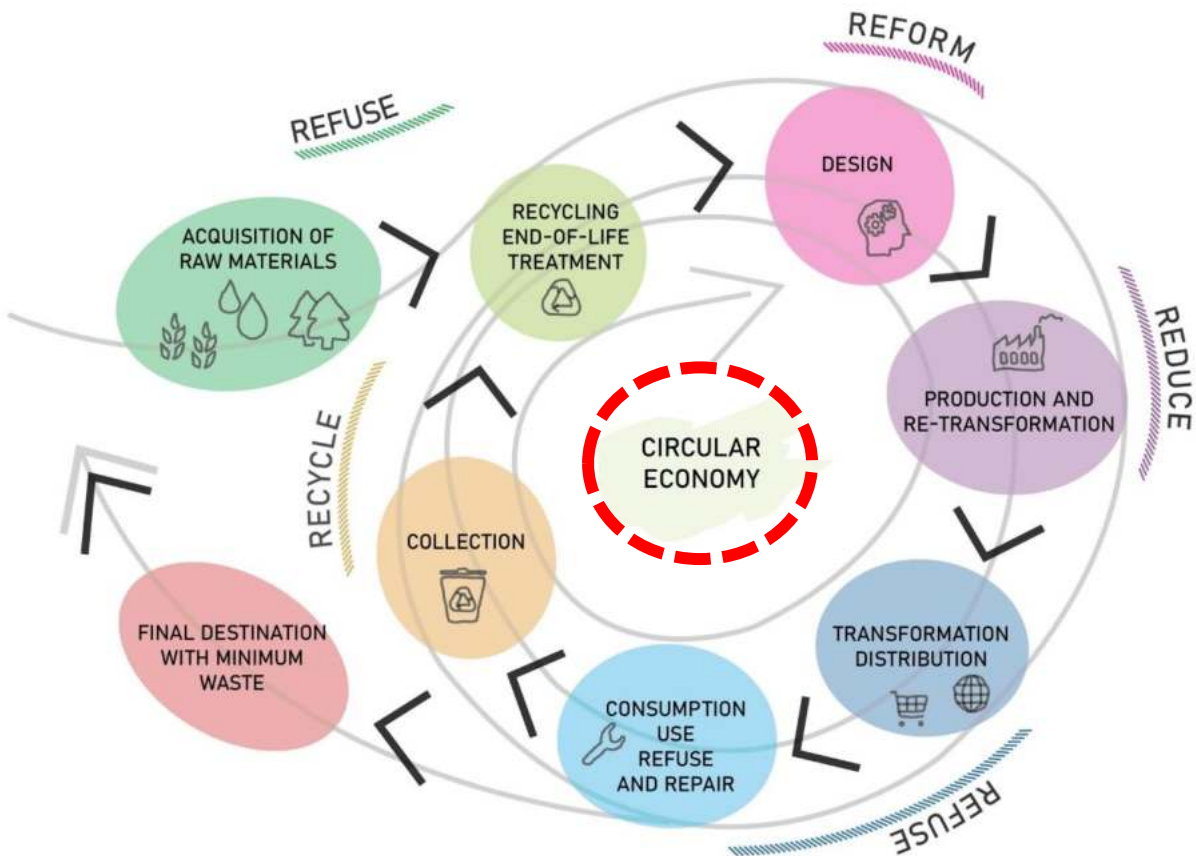




Circular city model: circular economy as a framework for sustainable urban planning

Keywords :

The integrated evaluation framework for the circular city.





Challenges

The **RAPID** and often **UNPLANNED URBANIZATION** witnessed worldwide has led to **INCREASED PRESSURE ON THE ENVIRONMENT**



Our cities account for up to **80% OF ENERGY CONSUMPTION** as well as **75% OF GLOBAL WASTE AND CARBON EMISSIONS**



Due to the high concentration of people, infrastructure, housing and economic activities, **CITIES ARE PARTICULARLY VULNERABLE** to climate change and natural disasters



Solutions

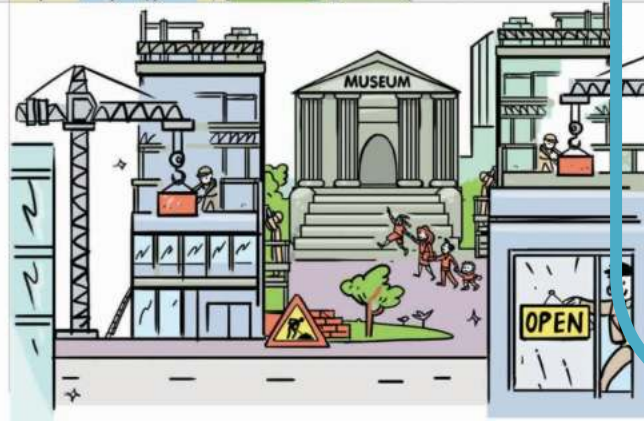
PROMOTE SOUND URBAN PLANNING, sustainable building, low-carbon transports, green spaces and sustainable lifestyles



INVEST IN RENEWABLE ENERGY, waste management, sustainable and green infrastructure



PROTECT CITIES - which are important social, cultural and economic centres - from environmental and climate threats

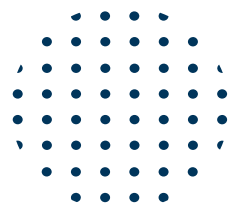


- *How does urban waterways fit into to the solutions?*
- *How can they contribute to circular cities?*



FUTURE URBAN WATERWAYS

Green-blue infrastructure as a Public space



MULTIFACETED ROLE IN URBAN DESIGN,
OFFERING BOTH FUNCTIONAL BENEFITS AND
AESTHETIC ENHANCEMENTS.

- **Urban commons** – they belong to everyone
- **Biodiversity** enhancement
- **Beautification , Health ,Culture & Microclimate** benefits



Shenzhen, China

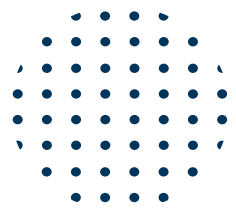
Co-funded by the
European Union



Copenhagen, Denmark



Tokyo, Japan



Benefits of Blue-Green Infrastructure for Circular Cities

Water Management:

- Stormwater Management

- Water Recycling

Resource Efficiency:

- Material Cycling

- Energy Savings

Biodiversity and Ecosystem Services:

- Habitat Creation

- Ecosystem Services

Social and Economic Benefits:

- Health and Well-being

- Economic Opportunities

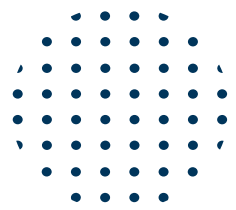


**ecological restoration of Maozhou River in Shenzhen / EADG Pan Asia International-Landscape Network*



FUTURE URBAN WATERWAYS

Reclaiming the rivers across Europe



Isar River near Munich



Ljubljanica in Ljubljana center

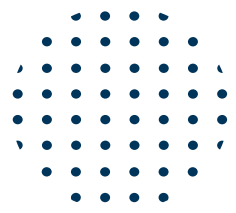


Limmar river via Zurich city center



Seine in Paris

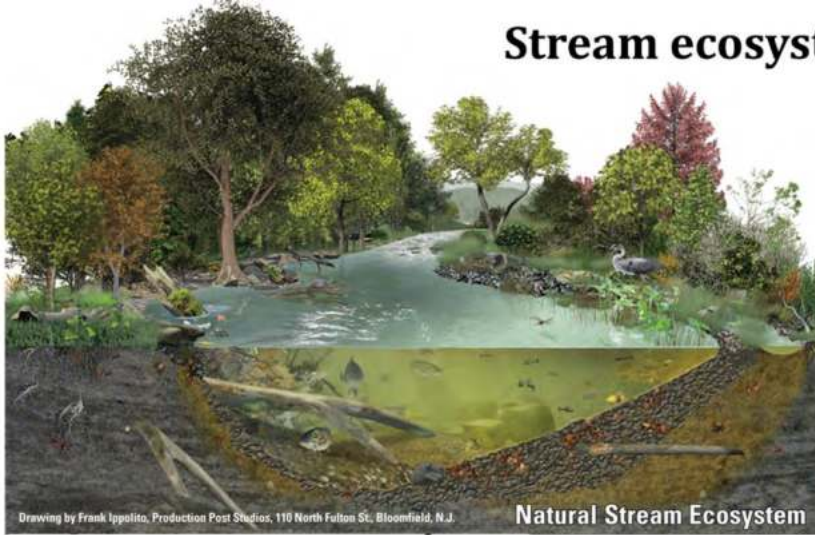




GBI supporting circular economy in Tokyo

* Presented at the 15th International Conference on Environmental and Rural Development at Khon Kaen, Thailand

Stream ecosystem change with urban development



Natural Stream Ecosystem



Urban Stream Ecosystem

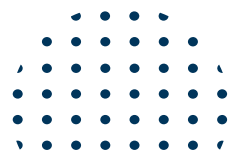


Culverted Urban Stream in Tokyo



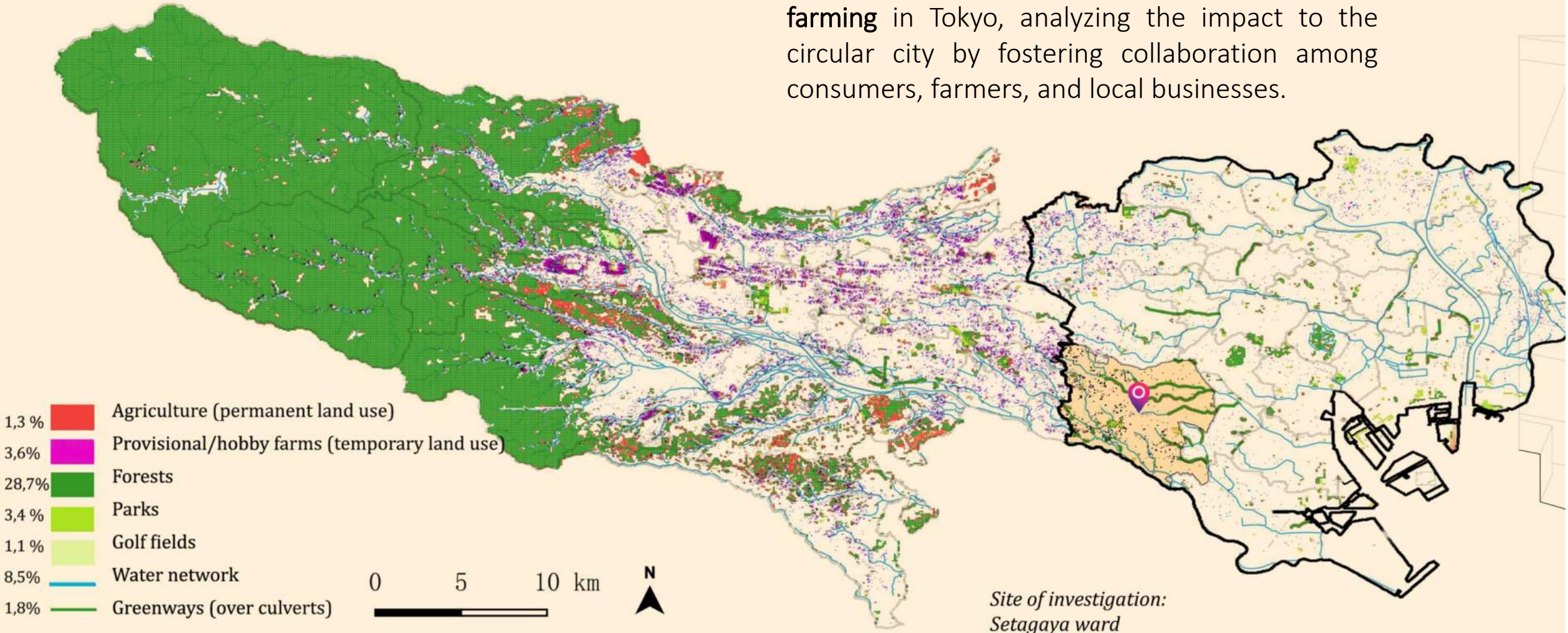
Regenerated Urban Stream Ecosystem

FUTURE CASE STUDY: Tokyo



Map of Tokyo Metropolis (東京都, Tōkyō-to)

Link between **green-blue infrastructure** and **urban farming** in Tokyo, analyzing the impact to the circular city by fostering collaboration among consumers, farmers, and local businesses.



Co-funded by the European Union

FUTURE CASE STUDY: Tokyo



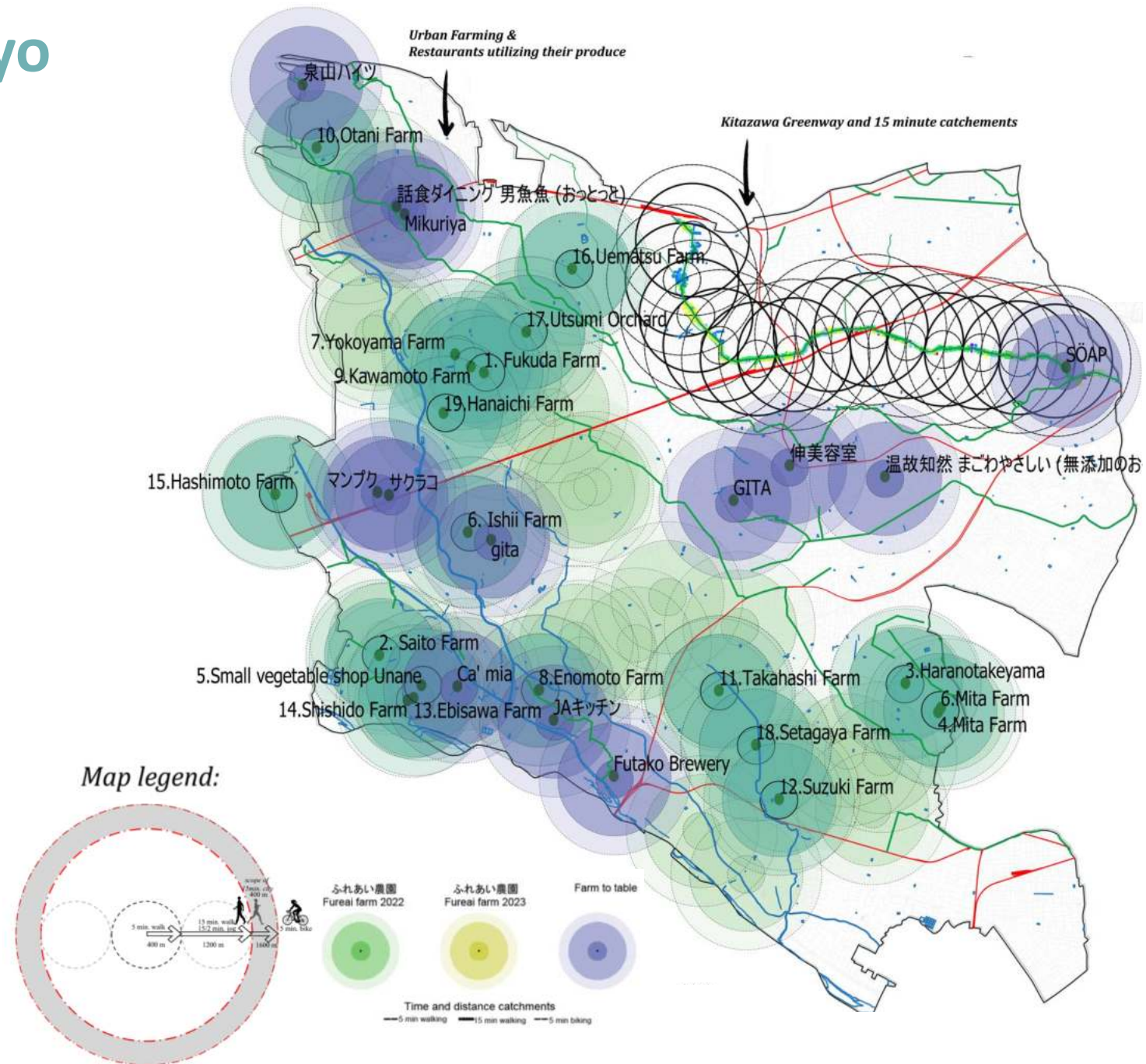
Urban elements	Ecosystem Services																	
	REGULATING				PROVISIONING				CULTURAL				SUPPORTING					
ON TOP OF THE WATERWAY																		
Covered area for walking and/or cycling	•																	
Greenery along path (tree lane and gardens)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Playground																		
Water along path	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Bridges	•																	
Open 'surface' waterway or pool	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Urban furniture (bench, bike stand etc.)																		
ADJACENT TO THE COVERED WATERWAY																		
Natural grass land	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Transitional woodland shrub	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
City parks & playgrounds	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Sport fields																		
Bicycle street																		
Vehicle street																		
Temples and shrines																		
Urban agriculture	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Residential area																		
Car park																		
Commercial area																		
Education institutions																		

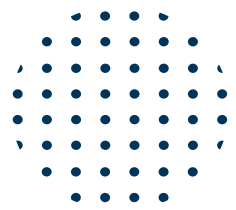
Ecosystem Services																		
REGULATING				PROVISIONING				CULTURAL				SUPPORTING						
Pollination																		
Flood regulation																		
Erosion regulation																		
Water purification																		
Water flow																		
Air quality - CO2 storage																		
Microclimate regulation																		
Moving - streets, links, navigation																		
Housing																		
Economy along waterway																		
Swimming																		
Navigable river - boat transport																		
Drainage																		
Sewage water																		
Spring water																		
Food stock																		
Aqua culture - fish stock																		
Plants and greenery																		
Mental health - purify the senses																		
Rituals - 'matsuri' and 'hanami'																		
Spiritual temples																		
Tourism - attractive to visitors																		
Natural heritage																		
Cultural heritage																		
Knowledge system																		
Inspiration																		
Aesthetics																		
Public participation - "machizukuri"																		
Recreation																		
Water cycling																		
Nutrients cycling																		
Fertile soil																		
Photosynthesis																		
Habitat for animals and plants																		
Biodiversity																		

Because of the high level of processability, urban streams have great Cultural Ecosystem Services

FUTURE CASE STUDY: Tokyo

Chrono-urbanism methodology based on the 15-minute city maps pedestrian, cycling, and jogging catchments in relation to the distribution of farmland and restaurants.



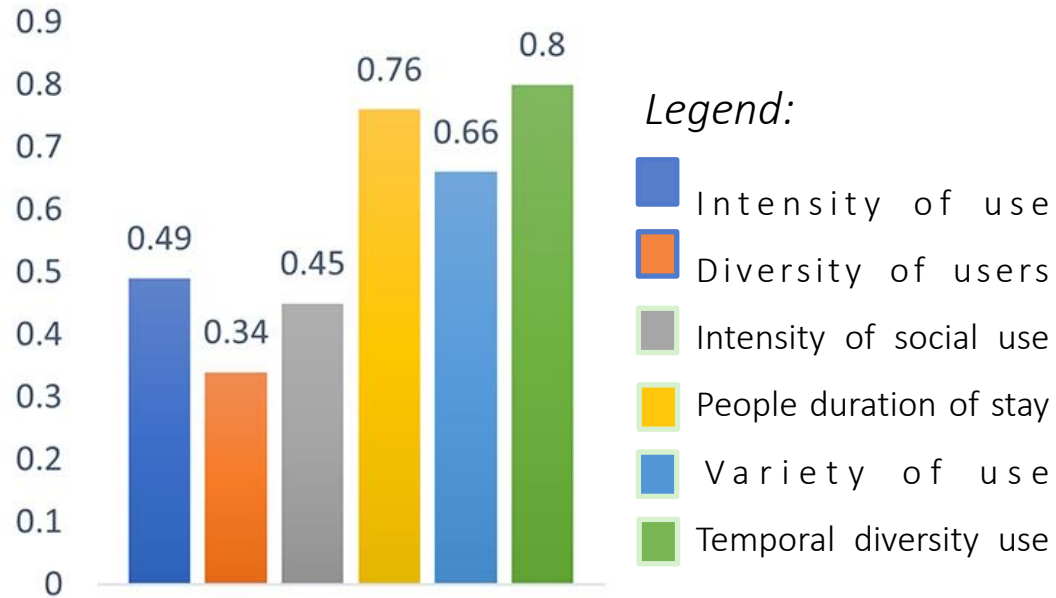


Good Public Space Index

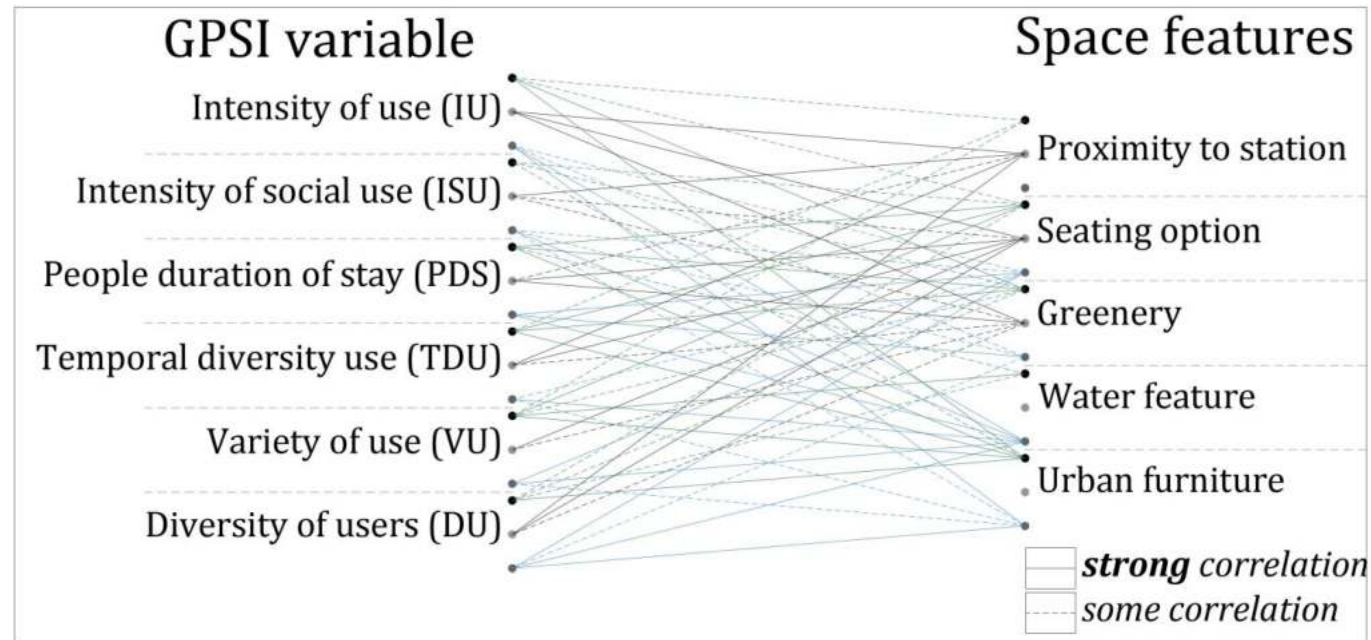
Kitazawa Greenway

sufficient

average level 0.588



Connection between GPSI variables and public space features



FUTURE CASE STUDY: Tokyo

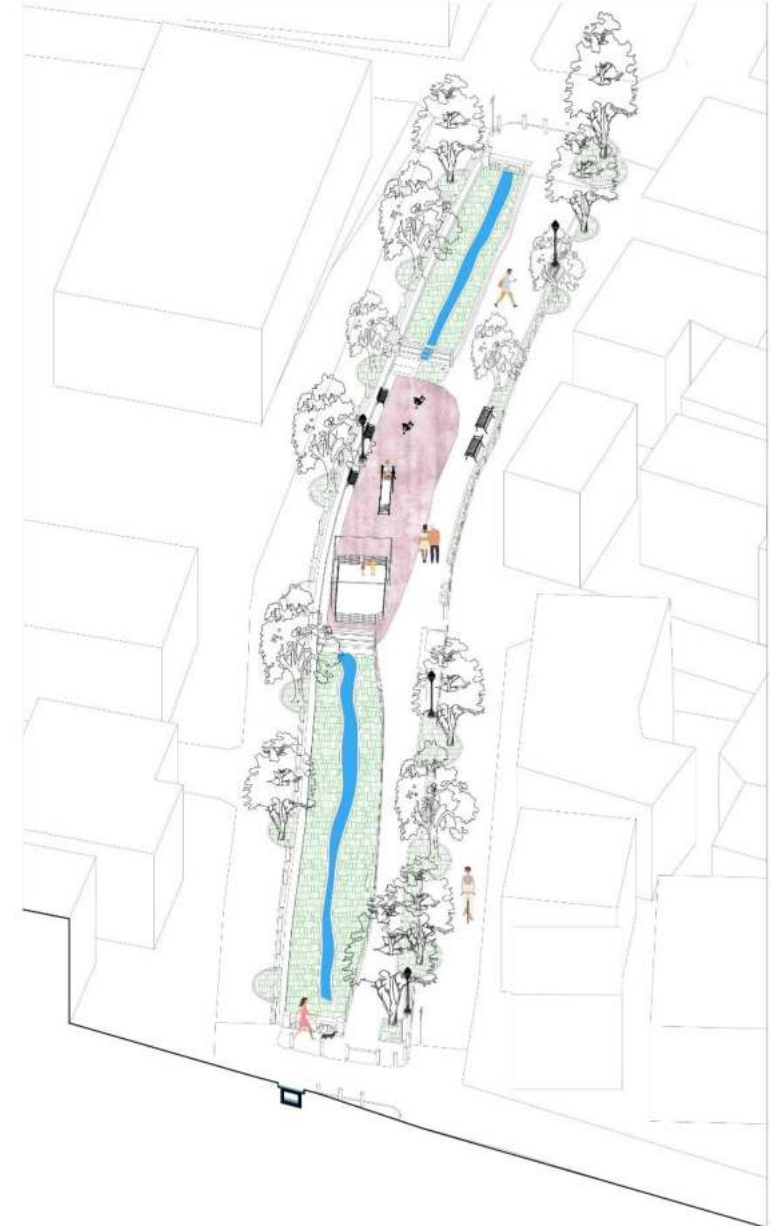
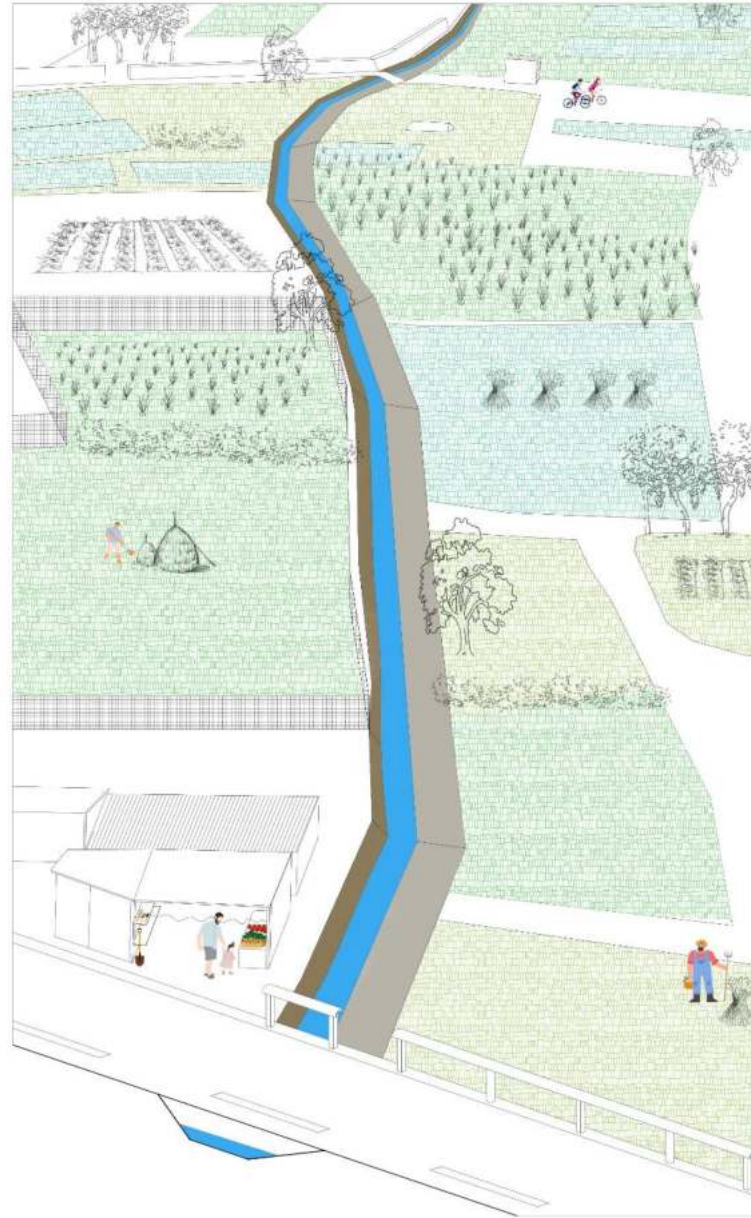


- a. Improved Access
- b. Sustainable Food Systems
- c. Community Engagement
- d. Health and Well-being
- e. Economic Opportunities

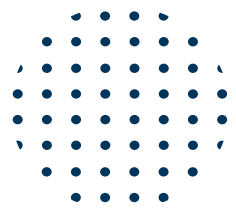
UN Sustainable Goals:



The same GBI
Peri-urban VS Urban stream



FUTURE CASE STUDY: Skopje



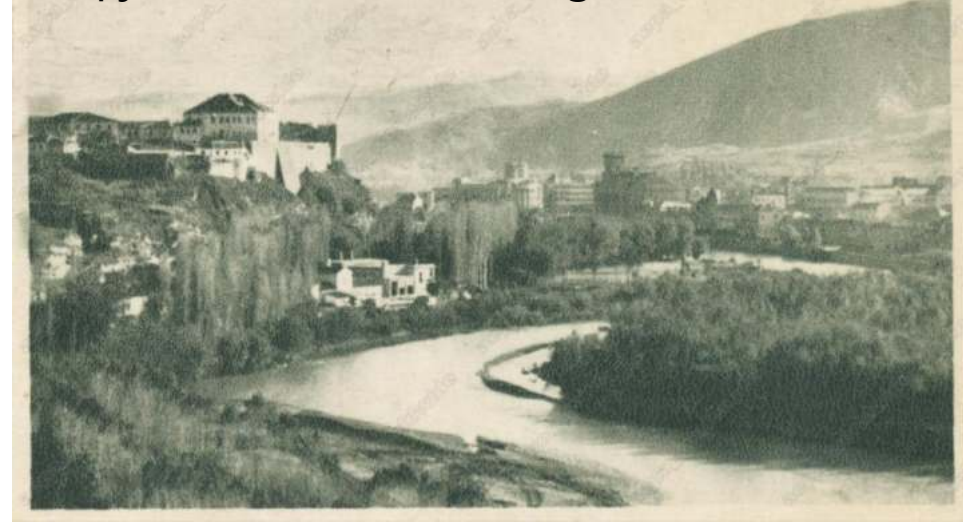
Skopje in 1594 by Jacobus Harevin



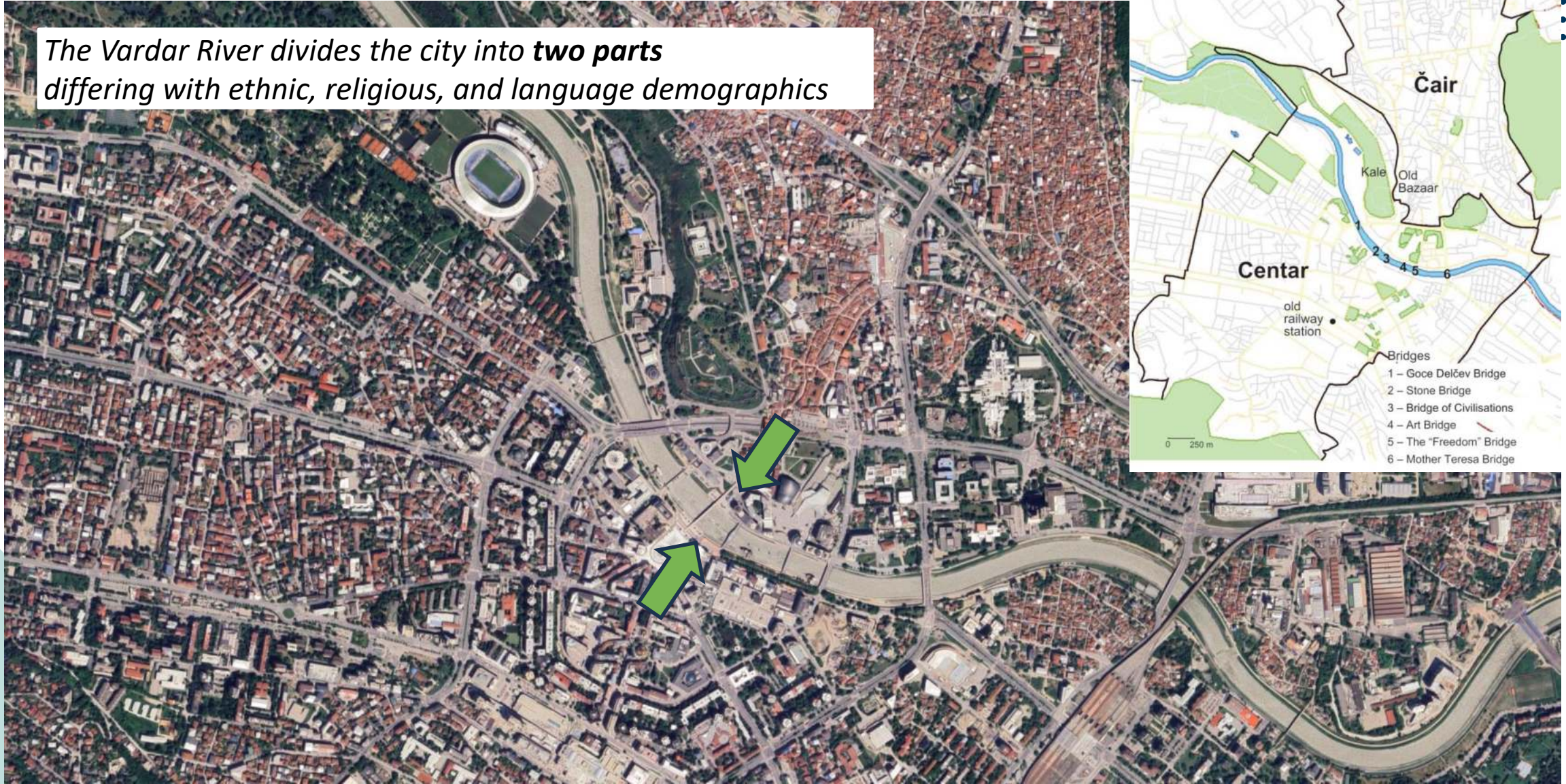
SCOPIA op de Revier de Veratazar
1927 postcard of Skopje



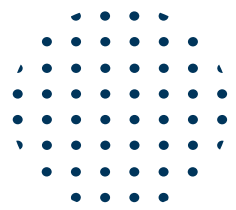
Skopje in the 40s. Semi-regulated riverbanks



The Vardar River divides the city into **two parts** differing with ethnic, religious, and language demographics

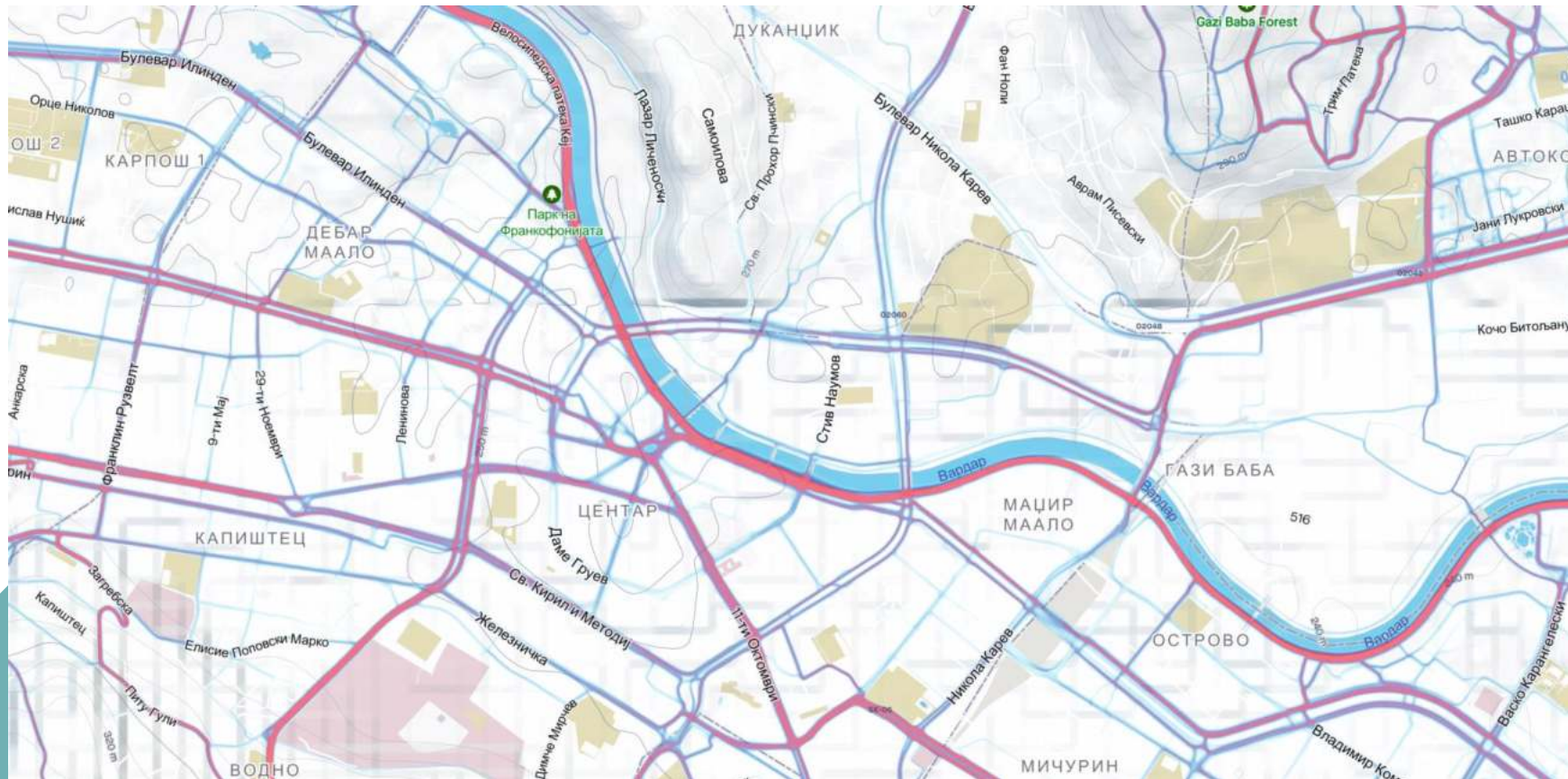


FUTURE CASE STUDY: Skopje



Global heatmap

Challenge: Only one side of the river (the Southern bank) is activated

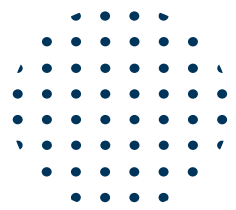


Hotspots of activity (jogging + walking)

Co-funded by the European Union



FUTURE CASE STUDY: Skopje



1. Green City Action Plan, 2020

Strategic & operational objectives



Biodiversity & ecosystems

Heavy, negative anthropogenic impact to species and habitats, leading to species decline.

Strategic Objectives

Improve safeguarding of natural habitats for wildlife by halting unplanned urban development and increasing the enforcement and number of protected sites against 2020 benchmarks.



Air Quality

High PM10 and PM2.5 concentrations.

Strategic Objectives

Regularly monitoring and incrementally reduce atmospheric concentration of pollutants to achieve AMBER status for all indicators within the lifetime of the GCAP.



Quality of water bodies

High pollutant concentrations in rivers.

Strategic Objectives

Incrementally reduce Biochemical Oxygen Demand and ammonium concentrations in the River Vardar to AMBER indicator status within the lifetime of the GCAP.



Water use & availability

Inefficient use of existing water sources.

Strategic Objectives

Improve the efficiency of water supply networks indicator by 50% within lifetime of the GCAP, against current benchmark.

- Mention of the importance of public green and blue spaces and water quality
- No mention of urban stream restoration as public space

Green Spaces

Expansion of the City has significantly reduced the provision of Green Space for residents.

Strategic Objectives

Increase the proportion of accessible public green spaces for residents by 100% against current benchmark.

Vision

The City of Skopje will be a leading sustainable city in the region, offering its citizens a high quality of life through the provision of clean air and water, healthy green spaces and accessibility for all, while contributing to national and international efforts to address climate change.



Soil Quality

Large number of industrial contaminated sites affecting soil quality.

Strategic Objectives

Clearly identify, categorise and reduce the number of contaminated sites within the city, by 50% within the lifetime of the GCAP.



GHG Emissions

Steadily increasing GHG emissions in the energy, transport and waste sectors

Strategic Objectives

Halt the increase of GHG in all sectors and reduce to achieve GREEN indicator status within lifetime of the GCAP.



Adaption & resilience

Historic flood risk and limited planning.

Strategic Objectives

Improve resilience to the impacts of weather events to reduce the number and severity of public assets and households at risk to AMBER status.

Key



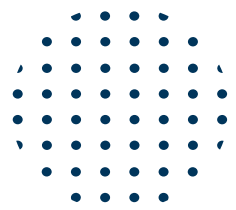
GCAP Priority levels:
Red – High;
Yellow – Medium;
Green – Low



Challenge priority level

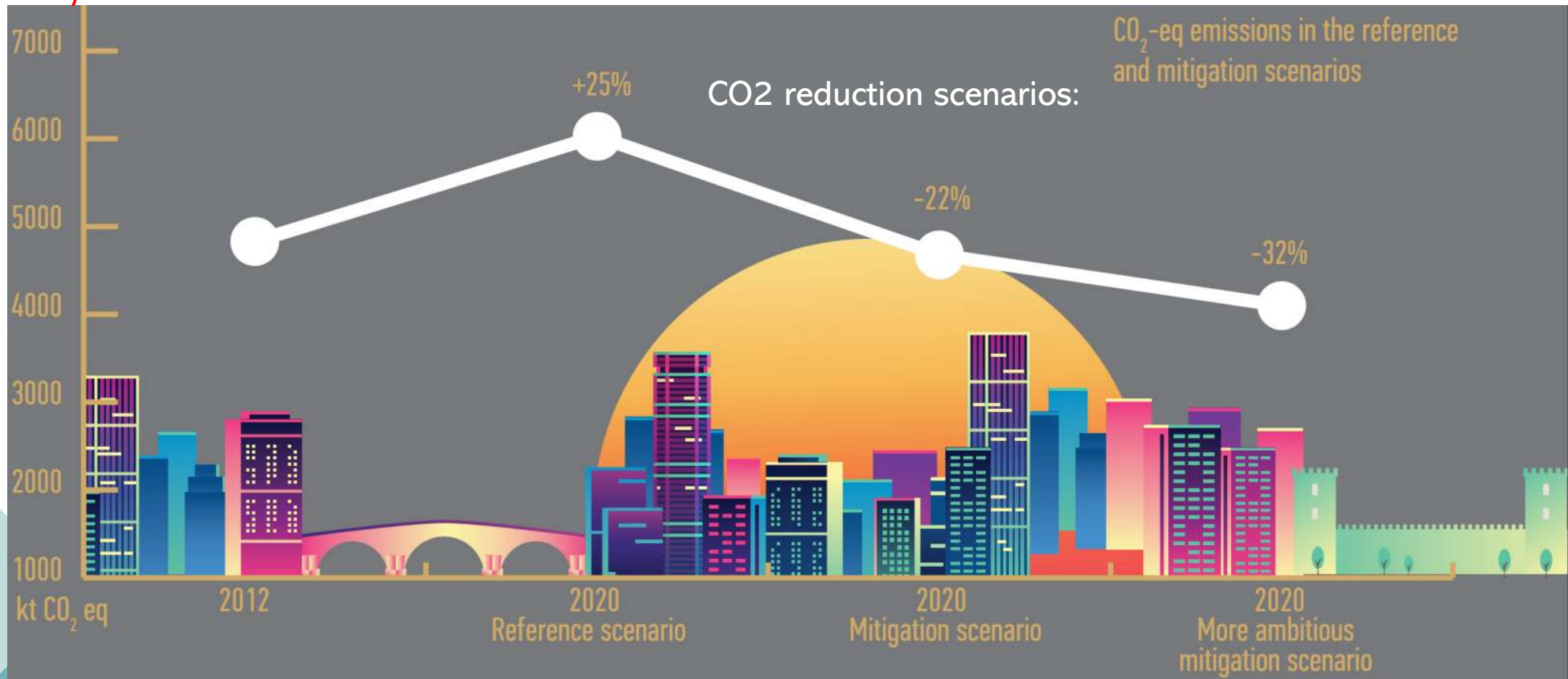


Co-funded by the European Union

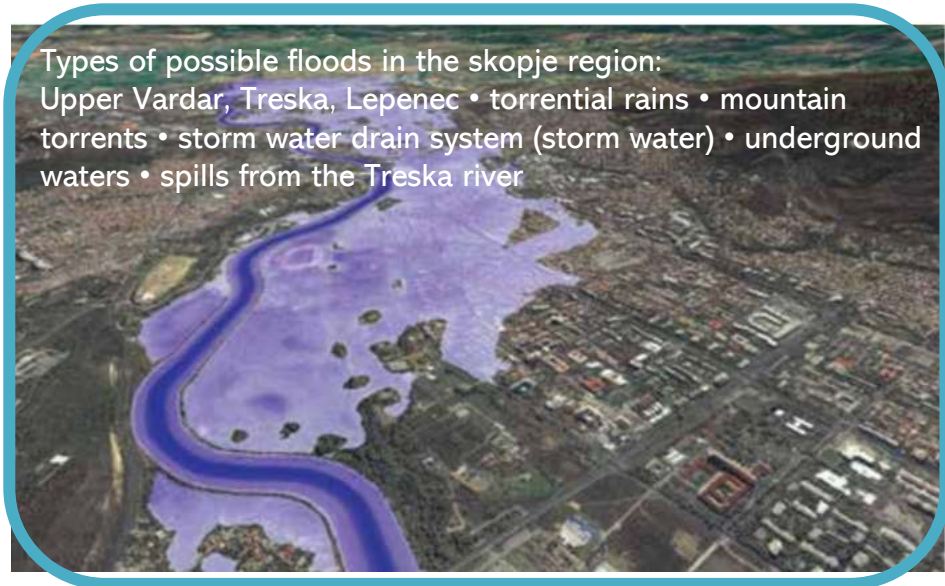
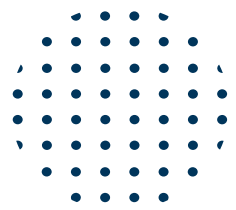


2. Resilient Skopje, Climate change strategy, 2017

*Today in 2024 the scenarios were not achieved



FUTURE CASE STUDY: Skopje



ADAPTATION

CONNECTION TO THE SUSTAINABLE DEVELOPMENT GOALS

WATER RESOURCES

POLICY MEASURE	BUDGET	DESCRIPTION/GOAL
Legal measures	40000	<ul style="list-style-type: none"> Updating expertise about the protection zones of the Raste-springs Updating the Decision about... Incorporating the legal require... in all the prescribed docum... Updating the expertise about... Updating the Decision about... Incorporating climate chang...
Institutional measures	40000	<ul style="list-style-type: none"> Increasing the capacity of climate change by introd... Introducing and creating p...

2 GREEN CORRIDORS

ACTION

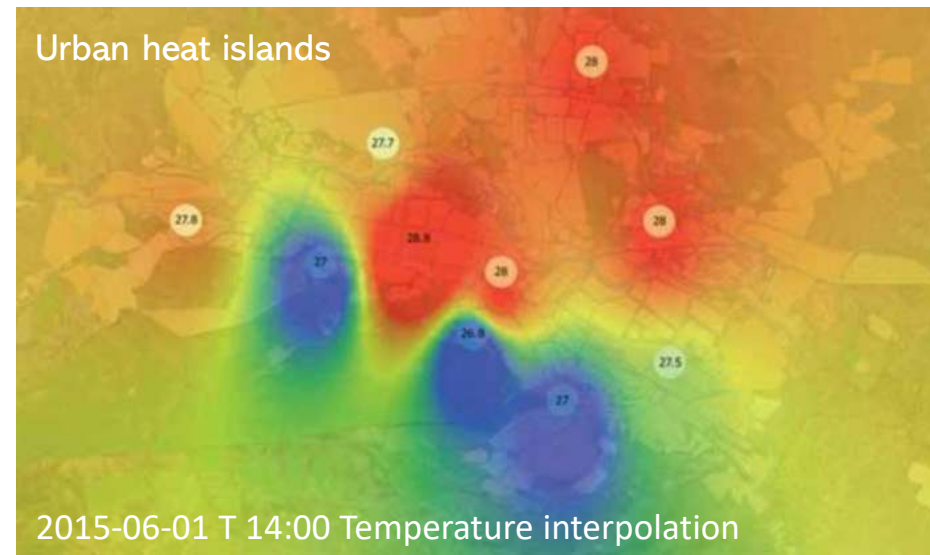
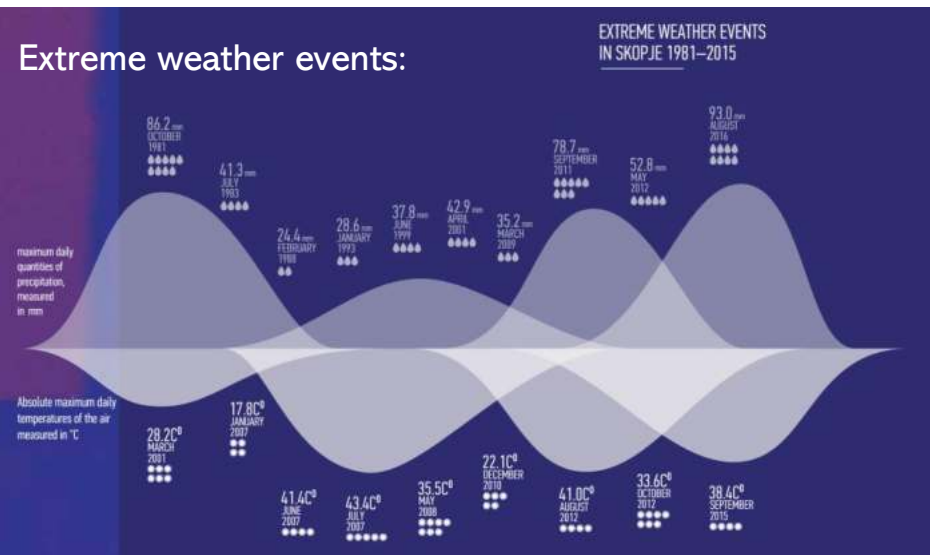
Currently we are working on a study for creating green corridors along the rivers Lepenec and Serava.

BENEFITS

The study will provide guidelines for specific activities to establish green corridors for which funds are allocated in next year's budget

- Mention of **green corridors along urban streams** for sustainability

- Mention of **Vardar riverbank restoration** as a adaptation measure against floods

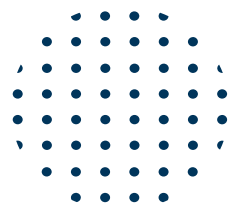


- Mention of **Vardar water quality monitoring**



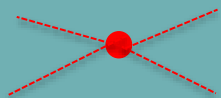
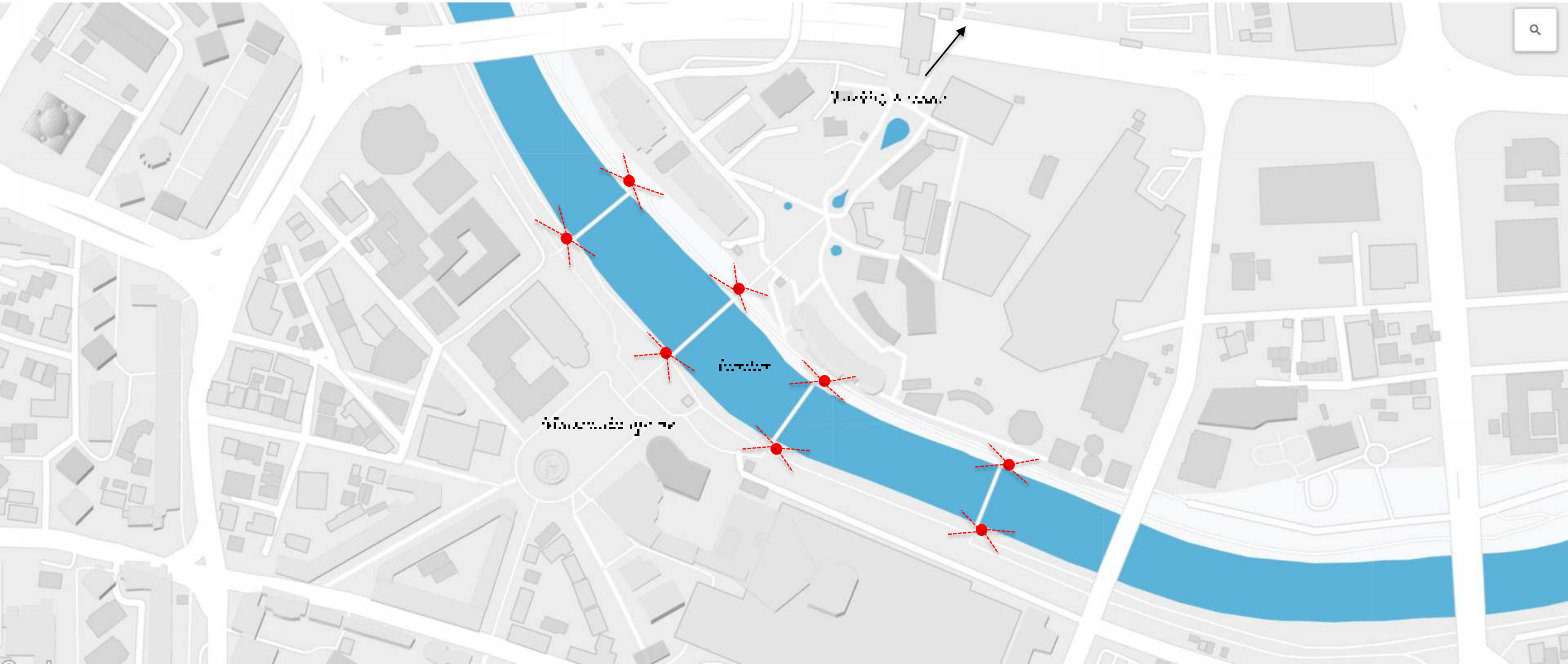
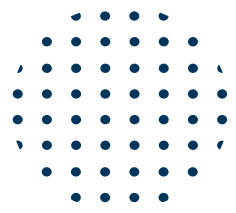
Co-funded by the European Union

FUTURE CASE STUDY: Skopje



Skopje's first bicycle and pedestrian pathways along the river were constructed in 2009 but the infrastructure is not well maintained



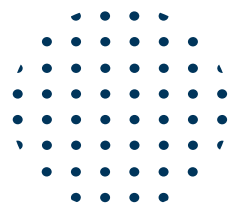


Sight reach

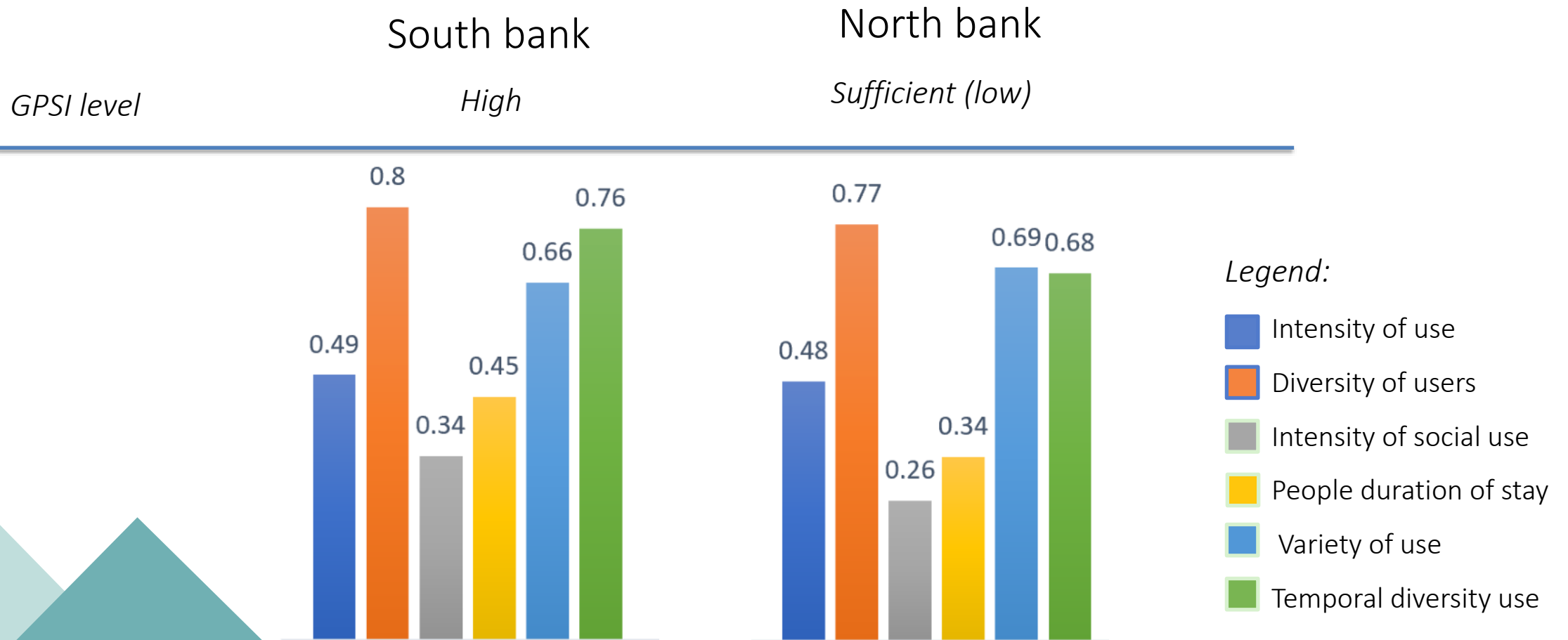
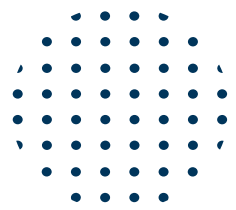


Co-funded by the European Union

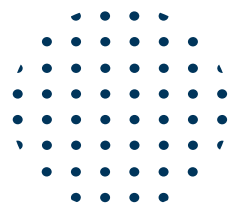




Results from the research:

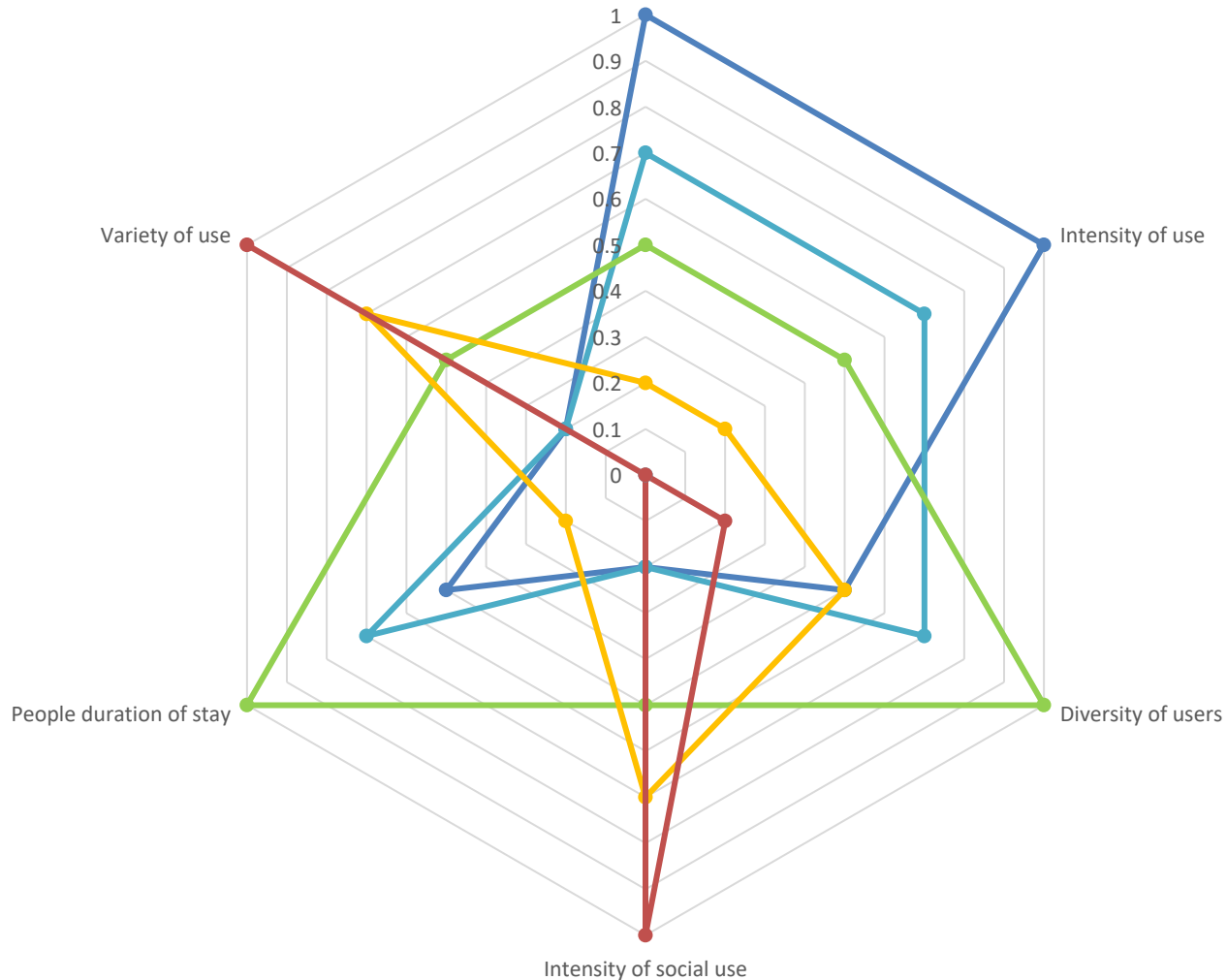


Results from the research:



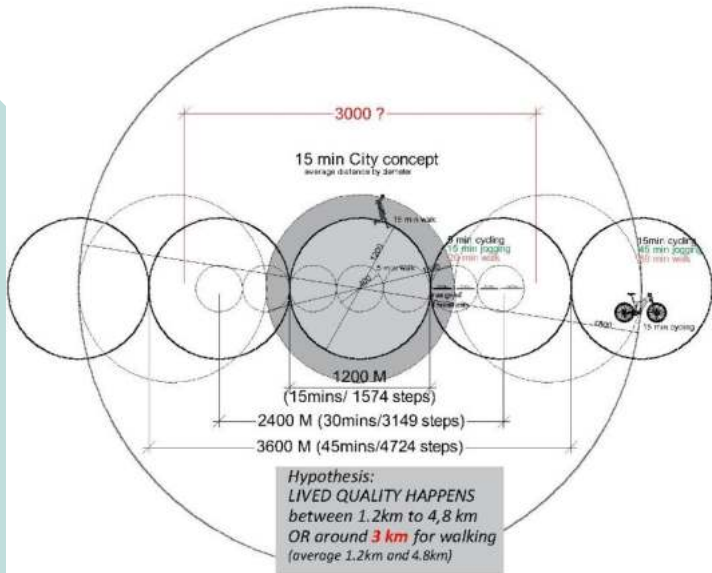
GPSI variables relation to quality themes

—●— Protection
 —●— between protection+comfort
 —●— Comfort
 —●— between comfort+enjoyment
 —●— Enjoyment



Employing the 15 min city strategy along the urbanized part of the river

The whole river line can be walked in 3h. and 15 min.



Activities and their spatiotemporal attributes .

ACTIVITY (recreational)	COMFORTABLE AVERAGE DISTANCE (in km)	DURATION (In minutes)	AVERAGE SPEED (km/h)
Walking	1.2	15	4.8
Jogging	1.4	15	5.6
Cycling	1.6 and 8.4	5 and 15	33.4

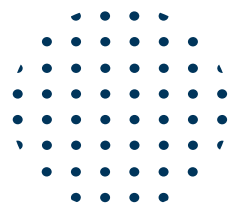
FUTURE CONCLUSION:



Rivers contribute significantly to the concept of circular cities through various environmental, social, and economic benefits:

- **Natural Resource Management:**
water resources & support biodiversity
- **Waste Management and Pollution Control:**
reducing pollutants & stormwater runoff
- **Energy Production:**
Renewable Energy: hydropower
- **Recreation and Wellbeing:**
linear parks & promotes health
- **Cultural and Historical Value:**
identity of cities
- **Climate Resilience:**
mitigate the impacts of flooding
urban heat island reduction
- **Economic Opportunities:**
job creation & mixed-use developments





Thank you for your attention

Contact info about the presenter:

Ivana Angelova

Ivanangelova@gmail.com

