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GREEN BRIDGES - BRIGHTER FUTURES

Study on Greening and Afforestation

of the Municipality of Gostivar

(urban area)

Gostivar, April 2025

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Initiative for EUROPEAN PERSPECTIVE

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GREEN BRIDGES - BRIGHTER FUTURES

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Abbreviations

PM – particulate matter

GI – Green Infrastructure

NBS - Natural Based Solution

EbA - Ecosystem Based Adaptation

GIS - Geographic Information Systems

CO_2 - Carbon Dioxide

MEPP - Ministry of Environment and Physical Planning

SUMMARY

When it comes to the connection between cities and the challenges of climate change, environmental degradation, and increasing inequality, it must be noted that their impact is unfortunately negative. The data shows that, although they cover only 3% of the Earth's land surface, cities account for around two-thirds of the global energy demand and contribute to 70% of CO_2[1]. Today, most systemic environmental and socio-economic challenges are felt most acutely in cities, particularly in the way they develop.

Therefore, cities have the responsibility to intensify efforts to ensure a good quality of life for future generations—through the protection of the environment, biodiversity, and ecosystems; by mitigating the impacts of climate change; and by radically reducing the consumption of natural resources. Green spaces, and their development, are an important part of every urban system, and in addition to their obvious aesthetic role, they also hold essential significance:

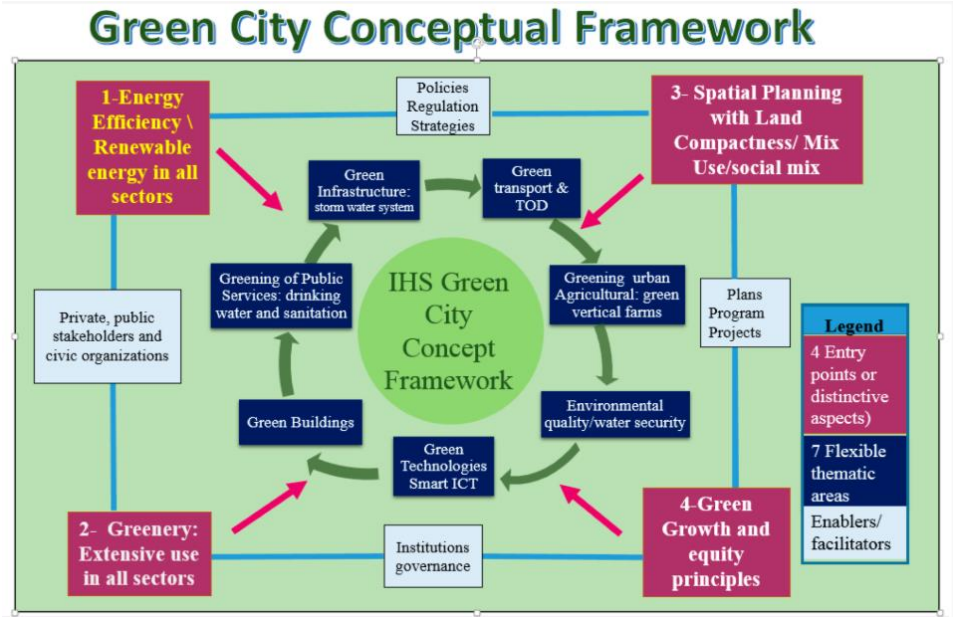
- to provide clean air

- to protect the environment

- to ensure public health for citizens

Today, activities related to the development of urban greenery are also part of every city's vision to become a "Green City"—a city without bare concrete surfaces, a city where trees and diverse vegetation adorn the streets and neighborhoods, contributing to improved air quality and overall quality of life. A "Green City"[2] does not only imply investments in greenery; it is a complex system that involves many sectors and stakeholders. Therefore, it is extremely important that investments in urban greenery be implemented across all areas.

Figure 1 – Concept of a "Green City""



[1] https://blogs.worldbank.org/en/sustainablecities/cutting-global-carbon-emissions-where-do-cities-stand

[2] https://www.mdpi.com/2071-1050/10/6/2031

I. Introduction

This Study on greening and afforestation of the municipality of Gostivar (hereinafter referred to as the Study), has been prepared in accordance with the Law on Urban Greenery[3]. Although, according to the law, every municipality is obligated to adopt a Strategy for the development of greenery for its territory for a period of 10 years, this obligation is not respected and the Municipality of Gostivar will be one of the few municipalities to comply with the legal requirements. The space designated for greenery at the city level is generally planned through the Study of the City Area, which should be incorporated into every new General Urban Plan on one hand, and the green space is further detailed in the Urban Plan for each district, which defines the designated zones for greener, on the other hand. The primary plan for the development and enhancement of greenery within the city area is prepared in accordance with the Study that follows the specific objectives of the Law on Urban Greenery, and the plan includes:

- planning, designing, constructing, maintaining, protecting and reconstructing greenery in a sustainable manner;
- determining the actual state of the greenery stock with the Green Cadastre;
- defining standards and norms for planning and designing greenery;
- defining norms for the maintenance of greenery;
- Identifying measures for the protection and restoration of greenery;
- establishing a system for managing and financing greenery;
- enhancing greenery to improve the quality of life and
- raising environmental awareness among citizens;

The Study also monitors the categories of urban greenery (as defined by law), both public and other types of green space. The Study proposes meeting the standards and norms for urban greenery by:

- retaining existing green areas,
- converting undeveloped and unparceled construction land into urban greenery;
- expanding green spaces through the reclamation of illegal dumpsites, degraded, and contaminated land;

[3] https://www.moepp.gov.mk/wp-content/uploads/2019/10/Sluzben-vesnik-br.205.pdf

- greening paved and asphalted surfaces with woody and shrub species grown in nurseries and
- construction of facade and rooftop gardens

Chapter II presents the Methodology for the preparation of the Study. The definition and objectives of the Study are presented. Chapter III gives an overview of the current situation, data from the Green Cadastre, as well as the possibilities for the development of urban greenery. The vision defines the intention to transform the current state, aiming for the Municipality of Gostivar to become a synonym for a green, sustainable city, where the health of the citizens and attractiveness for tourism are priorities. This is described in Chapter VI. After the field survey and discussions with various stakeholders, a SWOT analysis was conducted and is described in Chapter IV. Based on the WOT analysis, experiences from other cities, and the plans of municipal decision-makers, Chapter V defines the strategic development directions and priorities. These are grouped according to two criteria: in line with the legal definitions of the types of urban greenery, and by location, i.e. the facilities in front of which urban greenery interventions are carried out. Chapter VII highlights the implementation plans for the strategic goals, as well as suggestions for types of urban greenery that are not strictly defined by law but have proven to be extremely useful in other environments. To monitor the implementation of the Study, indicators have been defined and GIS tools have been proposed to ensure better and more efficient implementation and supervision. This is outlined in Chapter VIII.

An integral part of the Study, presented in Chapter X, is the Action Plan, which provides detailed information and contributes to specifying the measures that need to be implemented. It includes the priorities, expected results, and the planning and coordination of the work of the city administration, public enterprises, as well as public utility companies in the upcoming period.

NOTE:

The development of the Study for Greening and Afforestation of the Municipality of Gostivar (urban area) has been approached by the document's authors as a Strategy for Urban Greenery, following the "Rulebook for Planning, Designing, Construction, and Maintaining Greenery". In this way, the Municipality of Gostivar will not only meet the requirements of the project but will also be the second municipality in the Republic of North Macedonia to have its own Strategy for Urban Greenery in accordance with the Law on Urban Greenery.

II. Methodology for developing the study

As in any field, a strategic approach is important in urban greenery. This makes it easier to adapt future plans to changes in the environment, more efficiently determine priorities, and appropriately allocate resources. Strategic planning serves as the foundation upon which the local self-government takes responsibility for the development of greenery in the future, both in terms of planning and maintaining urban green spaces.

The development of the Strategy goes through several steps:

- Data collection
    - Data analysis, citizen surveys, web questionnaire, strategic documents (horizontal and vertical integration)
- Defining of the vision and strategic goals
- Establishing an action plan
- Preparing of a draft version
- Public debate on the final version through the Municipal Council

During the development process, a broad consultative process with stakeholders was conducted, which was reflected through relevant recommendations and comments received from the involved stakeholders.

According to the methodology, existing documents were also used during the data collection phase, which are linked to the Study, both vertically (documents at the central government level) and horizontally (documents adopted by the Municipality of Gostivar).

Vertical integration

- https://www.moepp.gov.mk/wp-content/uploads/2019/10/Sluzben-vesnik-br.205.pdf

This regulation prescribes the planning, designing, construction, and maintenance of greenery, as well as the format and content of the Green Cadastre, the Study for the Development of Greenery, the Basic Plan for Planning, Designing, Construction, Maintaining, Protecting, and Reconstructing Greenery, the Annual Operational Program for Construction and Maintaining Greenery and its form, as well as the Project-Technical Documentation for designing and construction of greenery.

Horizontal integration

- https://gostivari.gov.mk/wp-content/uploads/2022/03/STRATEGIJA-ZA-LER-_GOSTIVAR-2021-2025-FINAL.pdf

The Municipality of Gostivar defines its own planning through the strategic document for Local Economic Development (LED). This is essentially a process of creating a vision for its own future. The planning of the local economic development planning of the Municipality of Gostivar involves the residents of the municipality in defining priorities and shaping a common future, aiming for improved individual living standards, employment, and progress in all areas of social life. The responsibility for leading this process lies with the Mayor of the Municipality of Gostivar, as well

as with all employees of the municipal administration. The document "Study for Local Economic Development of the Municipality of Gostivar 2021–2025" is a comprehensive strategic approach to creating local economic development policy, based on the defined competencies of the municipality as a unit of local self-government. The strategic solutions for the local development of the Municipality of Gostivar for the period 2021–2025 define the policy for future local development, by establishing a development framework with specific goals and measures, i.e., programs and projects for their implementation in the longer term.

- https://gostivari.gov.mk/042/wp-content/uploads/2024/10/PROPOZIM-PROGRAMI-2024-2.pdf

The Program of Activities of the Municipality of Gostivar in the Field of Environmental Protection for 2024 is dedicated to addressing various sources of pollution. The deterioration of air quality is increasingly present in cities and is primarily caused by everyday human activities. This problem also affects the Municipality of Gostivar, where increased air pollution is particularly noticeable in the urban area, primarily in the city of Gostivar. Significant air pollution in the territory of the Municipality of Gostivar is especially recorded during the cold winter months, mainly due to atmospheric conditions and the increased use of fossil fuels for heating households and the facilities of both public and private legal entities. The program offers a set of measures and activities to address pollution.

- https://gostivari.gov.mk/wp-content/uploads/2020/02/42STRATEGJIA-P%C3%8BR-AJ%C3%8BR-T%C3%8B-PAST%C3%8BR-N%C3%8B-GOSTIVAR-2020-FINAL-mkd.pdf

The Clean Air Study is one of the most important documents, and its implementation is crucial for the entire municipality. The primary goal of this Study is to protect the health of the citizens. The Municipal Clean Air Study enables constructive collaboration with industry, small businesses, the government, environmental NGOs, the health sector, and also includes citizens in the process. In this way, united efforts will more easily ensure the protection of public health and improve the environmental conditions in the Municipality of Gostivar. This Study provides the municipality with the opportunity to define its own standards for the protection of nature and for the quality of air, water and soil. The Clean Air Study outlines the need for action against air polluters and emphasizes the need for greater determination by the municipality and the Municipal Council to improve air quality. The goals outlined in this document are ambitious, aiming to do the utmost to reduce citizens' exposure to toxic pollutants such as nitrogen oxides, ammonia, ozone, PM1 particles, PM2.5 particles, and PM10 particles, various volatile organic chemical compounds (non-methane), and sulfur dioxide.

Additionally, in the process of gathering guidelines and recommendations, European recommendations in this field are also utilized, including the following:

• Green infrastructure means "a strategically planned network of natural and semi-natural areas with other environmental features, designed and managed to deliver a wide range of ecosystem services, while also enhancing biodiversity."

(https://environment.ec.europa.eu/topics/nature-andbiodiversity/green-infrastructure_en)

• Nature-based solutions are actions aimed at protecting, sustainably managing, or restoring natural ecosystems, which address societal challenges such as climate change, human health, food, and water.

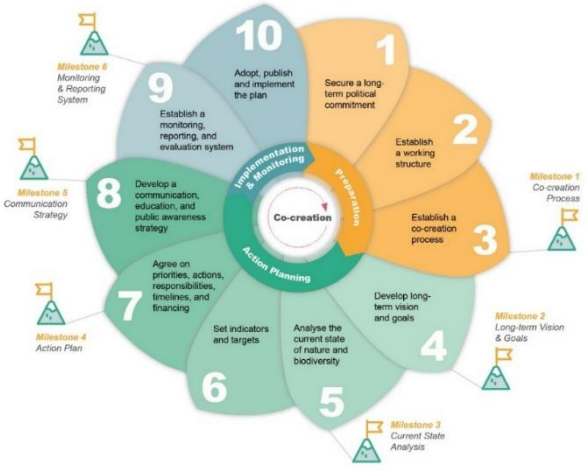
• Disaster risk reduction and security are approached in an effective and adaptive manner, while also delivering benefits for human well-being and biodiversity. (https://www.worldbank.org/en/news/feature/2022/05/19/what-youneed-to-know-about-nature-based-solutions-to-climate-change)

• Urban green space is a component of "green infrastructure" and can be defined as all urban land covered with vegetation of any kind. This includes vegetation on both private and public land, regardless of size and function, and may also incorporate small water bodies such as ponds, lakes, or streams (referred to as "blue spaces"). https://iris.who.int/bitstream/handle/10665/344116/9789289052498-eng.pdf?sequence=1

• The Urban Nature Plan is a strategic and operational document developed at the local level with the aim of reversing environmental degradation in cities and encouraging positive actions for nature. The EU Biodiversity Strategy 2030 requires all cities with more than 20,000 inhabitants to develop ambitious Urban Nature Plans.

https://environment.ec.europa.eu/topics/nature-and-biodiversity_en#:~:text=As%20part%20of%20the%20European,building%20on%20existing%20nature%20laws.

Figure 2 - Steps in the Urban Nature Plan Cycle[4]



(1) Political commitment;

(2) Working structure;

(3) Co-creation process;

(4) Long-term vision and goals;

(5) Current state of nature and biodiversity;

(6) Indicators and targets;

(7) Priorities, actions, responsibilities, timelines and financing;

(8) Study on communication, education and public awareness;

(9) Monitoring, reporting and evaluation system;

(10) Adoption, publication and implementation of the plan

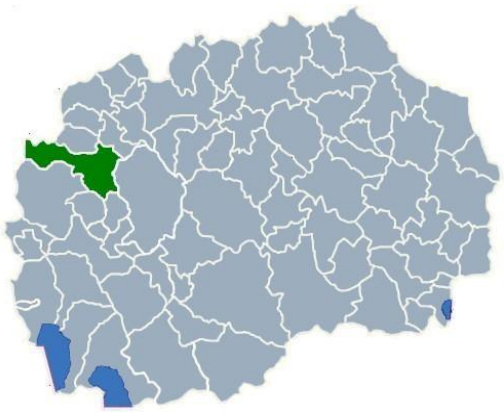
[4] https://urbanbynature.eu/our-methodology

III. Analysis of the Urban Greenery Situation in the municipality of Gostivar

General information

The municipality **Gostivar**[5] is located in the northwestern part of the Republic of North Macedonia. The municipality is situated in the Polog Valley, specifically in Gorni Polog, in the upper watershed area of the Vardar River. The municipality stretches on both sides of the river. To the east it borders the municipality of Makedonski Brod, and to the south it borders the municipality of Kičevo. The southwestern boundary of the municipality is with the Municipality of Mavrovo and Rostuše, while to the west it borders the state border with the Republic of Kosovo. To the north, Gostivar borders the municipalities of Vrapchishte and Brvenica. The municipality covers an area of approximately 650 km² and includes 35 settlements.

The municipality is situated in a favorable geographical location, starting at an altitude of 461 meters above sea level, as part of the Polog Valley, and enjoys a pleasant climate throughout the year, as part of the Shar-Pelister zone, which plays a significant role in the tectonic positioning of the municipality.



The city of Gostivar is located right on the edge of the main traffic artery in the western part of Macedonia, the E-871 highway (Skopje – Tetovo – Gostivar), which is part of the international transport Corridor 8. As such, the city holds a strategic position and significance for the development of this region of Macedonia, particularly in terms of logistics provision and offering tourism services to the millions of users of this transport route annually. This positioning of the city and the extension of the territory of the Municipality along this corridor provides a clear perspective for developing

[5] https://gostivari.gov.mk/wp-content/uploads/2022/03/STRATEGIJA-ZA-LER-_GOSTIVAR-2021-2025-FINAL.pdf

conditions for the development of several forms of tourism, the most significant of which are: transit, eco, and rural tourism, as a competitive advantage that the municipality itself possesses due to its natural and anthropogenic resources.

The characteristics of the Municipality, its location in the Gostivar Plain, and its natural resources provide the city of Gostivar with the potential to expand its territory without endangering the rural potential of the surrounding villages or its natural resources. At the same time, its location allows the city to prosper as the main administrative, political, economic, and cultural center in the upper part of the Polog Valley. An additional value comes from the large number of expatriates temporarily working in Western European cities, who, as a target group, represent one of the largest investors and drivers of the private sector in the municipality, which is in constant growth.

Geographical Characteristics and Natural Conditions

The Municipality of Gostivar encompasses part of the historical Derven Gorge, which forms the relief in the Polog Valley, as well as the hilly and mountainous areas that are part of the geographical scope of the municipality.

The territory of the Municipality of Gostivar is influenced by two climate types: mid-Mediterranean and moderately continental climate, whose interaction creates the typical microclimate of this part of the Polog region. Winters are cold, while summers are pleasantly warm, with cool summer nights. The average annual temperature is 10.60 C. The warmest month is July, with an average temperature of 21.10 C, and the coldest is January. The average temperature in this month is -1.10 C.

The average annual precipitation amounts to 954 liters, of which 80% comes from rain and only 20% from snow. The average humidity is 77%. Its peak is occurring in the months of November and December.

The territory of the Municipality of Gostivar belongs to the watershed area of the Vardar River. The municipality is notable for its numerous watercourses and water abundance, representing a rich area with both permanent and intermittent streams, forming a network of picturesque rivers and streams, abundant with water throughout the year. Most of the watercourses have clean, unpolluted water, rich in fish and other aquatic life. During rainfall and snowmelt, numerous torrents flow down the slopes of the surrounding mountains. The abundance of rivers and streams within the municipality gives it a distinctive character and adds value, particularly from the perspective of rural and alternative tourism.

The territory of the Municipality of Gostivar is characterized by a high diversity of vegetation, which is determined by the regional climate conditions, the relief, and the composition of the soil.

The flat terrain, favorable hydrological conditions and climate enable vegetation growth

throughout most of the year. Lush vegetation is concentrated along watercourses, with sporadic presence of tall and medium vegetation along local roads and boundaries between agricultural parcels.

The mountainous areas of the municipality are rich in forests, interspersed with numerous mountain rivers and streams. The higher areas of the mountainous massifs are rich in pastures, where large herds of livestock graze during the warmer months.

The landscape of the Municipality of Gostivar is one of its strongest assets for the development of alternative tourism.

The municipality boasts breathtaking nature and an abundance of resources, some of which are protected areas. The central part of the municipality's territory lies within the fertile Polog Valley, but it also extends to the slopes of the Shar Mountains (2,748 meters above sea level) and Suva Gora (1,853 meters above sea level). On the territory of the municipality, in the village of Vrutok, springs the largest river in the Republic of North Macedonia, which flows through the central part of the municipality, passing directly through the center of Gostivar. This river is one of the most significant ecosystems in the Republic of North Macedonia. To a large extent, it shows extreme levels of pollution with phosphates, sulfur, and organic waste, putting the aquatic life under great stress. There have also been cases of complete disappearance of living organisms from the riverbed bottom. Fortunately, due to the location of the municipality, the Vardar River is not polluted in this area.

The glacial lakes of the Shar Mountain, along with the many mountain rivers, represent a rare natural treasure that also holds significant economic potential. The location of the Municipality of Gostivar between Mavrovo National Park and the Shara Mountain massif makes the utilization of natural resources a key economic driver for both the municipality and the region. The utilization of natural resources in this area of the municipality can be highly beneficial for the development of tourism.

The pine forests of the Shar Mountain massif contribute to the development of ornithofauna and herpetofauna. The mountain itself is one of the most important centers in Central Europe. A small portion of Mavrovo National Park extends into the municipality’s territory.

The municipality’s natural, spatial, market, communication, and other resources provide a strong foundation for creating a platform for providing tourist services and developing tourism, specifically focused on mountain tourism, eco, and rural tourism, through the promotion of the authentic values of this part of the country.

Demographic characteristics

In the Municipality of Gostivar, which covers an area of 650 km2, there are 83,847 inhabitants (according to the State Statistical Office from 2015), resulting in a population density of 129 inhabitants/km2. This matches the population density of the Polog Region (128 inhabitants/km2) and is above the national average in the Republic of North Macedonia (82 inhabitants/km2). 4.01% of the total population of the Republic of North Macedonia lives in the Municipality of

Gostivar. With an average number of 4.47 members per household, 3.21% of the total number of households in the country live in the municipality. The national structure of the population is as follows: Albanians 66.7%; Macedonians 19.6%; Turks 9.9%; Roma 2.8%; Vlachs 0.0002%; Serbs 0.2%; Bosniaks 0.05%; Others 0.08% (Annex-Table 3 - according to the 2002 Population Census). The age structure of the population is favorable with 75.8% of the population aged 15 to 64, 14.8% aged from 0 to 14 years, and the remaining 9.4% aged over 65 years. According to the gender structure, 49.9% of the population are women and 50.1% are men, which mirrors the gender structure in the Republic of North Macedonia.

According to the latest Census of 2021[6] year, the situation is as follows:

Table 1 Overview - Census 2021

Municipality	Population	Households	Apartments
Gostivar	59770	20054	27945

Table 2 – Ethnic and gender composition – Census 2021

	TOTAL	Men	Women
Ethnicity – TOTAL	59770	29321	30449
Macedonians	12807	6342	6465
Albanians	33076	16126	16950
Turks	7597	3789	3808
Roma	2273	1144	1129
Vlachs	17	10	7
Serbs	73	36	37
Bosniaks	25	7	18
Other	487	237	250
Did not declare their ethnicity.	2	1	1
Unknown	4	3	1
Individuals for whom the data was obtained from administrative sources.	3409	1626	1783

The study is based on the Law on Urban Greenery ("Official Gazette of the Republic of Macedonia" No. 11/18 and 42/2020), and as such it follows the definitions, terms, recommendations and obligations outlined in the Law.

6 https://makstat.stat.gov.mk/PXWeb/pxweb/mk/MakStat/MakStat__Popisi__Popis2021__NaselenieSet/T1001P21.px/

The study also provides a broader picture of the trends in the implementation of urban greenery, but essentially follows the definitions from the Law, categorized as:

- Public greenery
- Other greenery

Public greenery	Other greenery
Park Forest park Green Square Tree line Green corridor Protective greenery Unkempt greenery Damaged tree	green spaces next to residential buildings green spaces next to commercial and business buildings green spaces next to public institution buildings green spaces next to production facilities green areas next to sports and recreation facilities green areas next to infrastructure special green complexes nurseries; greenery on rooftop terraces and vertical greenery on facades.

Both categories share a common thread: the Green Cadastre.

The Green Cadastre is a comprehensive inventory or database that documents all green spaces and natural elements in an urban area. It typically includes parks, forests, street trees, green roofs, urban wetlands, community gardens, and other areas of vegetation. The Green Cadastre also records detailed information such as the size, type, location, biodiversity value, and ecological health of these green elements (categories).

This tool is crucial for understanding the current state of green infrastructure and planning future greening efforts. It serves as a decision support system for urban planners, policymakers, and environmental managers, enabling them to prioritize investments, track progress, and ensure the long-term sustainability of green spaces.

There is no functional Green Cadastre in the Municipality of Gostivar, therefore the Study proposes the creation of a Green Cadastre. In addition, for more successful creation, several steps need to be followed, including:

Step 1. Data collection and mapping

- Conducting field surveys to document all green spaces in the city;
- Using satellite imagery, aerial photography and drone technology for comprehensive mapping;
- Recording key attributes such as:
    - Size and location of green spaces;
    - Vegetation types and species diversity;

    - Environmental health and environmental benefits (e.g., carbon sequestration, water retention);
    - Accessibility for residents;

Step 2. Creating a digital database

- Developing a GIS-based platform for storing and analyzing data;
- Ensuring that the database is user-friendly, accessible and allows for real-time updates;
- Integrating with additional information, such as climate zones, population density and pollution levels;

Step 3. Involving stakeholders

- Involving relevant municipal departments, non-governmental environmental organizations, as well as community groups in data collection and validation;
- Providing training for local government employees on how to use and maintain the cadastre;

Step 4. Analysis and prioritization

- Using the Green Cadastre to identify gaps in green coverage;
- Prioritizing areas for greening based on factors such as environmental degradation, population density, and climate vulnerability. Aligning findings with urban planning and zoning policies;

Step 5. Integration with urban planning

- Incorporating the Green Cadastre into the city's urban policy;
- Using the Green Cadastre as a decision-making tool for land use, tree planting programs, and creating green corridors;

Step 6. Public accessibility and transparency

- Developing public presentation and accessibility of the green cadastre, allowing residents to explore green spaces in their neighborhoods;
- Encouraging citizen science by enabling the public to report updates or propose new greening projects;

Step 7. Monitoring and evaluation

- Regularly updating the database to reflect changes in green spaces due to urban development efforts or the preservation of existing ones;
- Using the cadastre to measure progress towards urban greening goals, such as increased tree canopy coverage or improved biodiversity;

The benefits of the Green Cadastre, as part of the urban greening system

- Efficient allocation of resources: directing resources to areas with the greatest need for greening;
- Climate adaptation: Increasing resilience by identifying areas prone to heat islands or flooding, whose solutions require green interventions;

- Conservation of biological diversity: Protecting and restoring habitats by prioritizing areas with high ecological value;

Environmental conditions

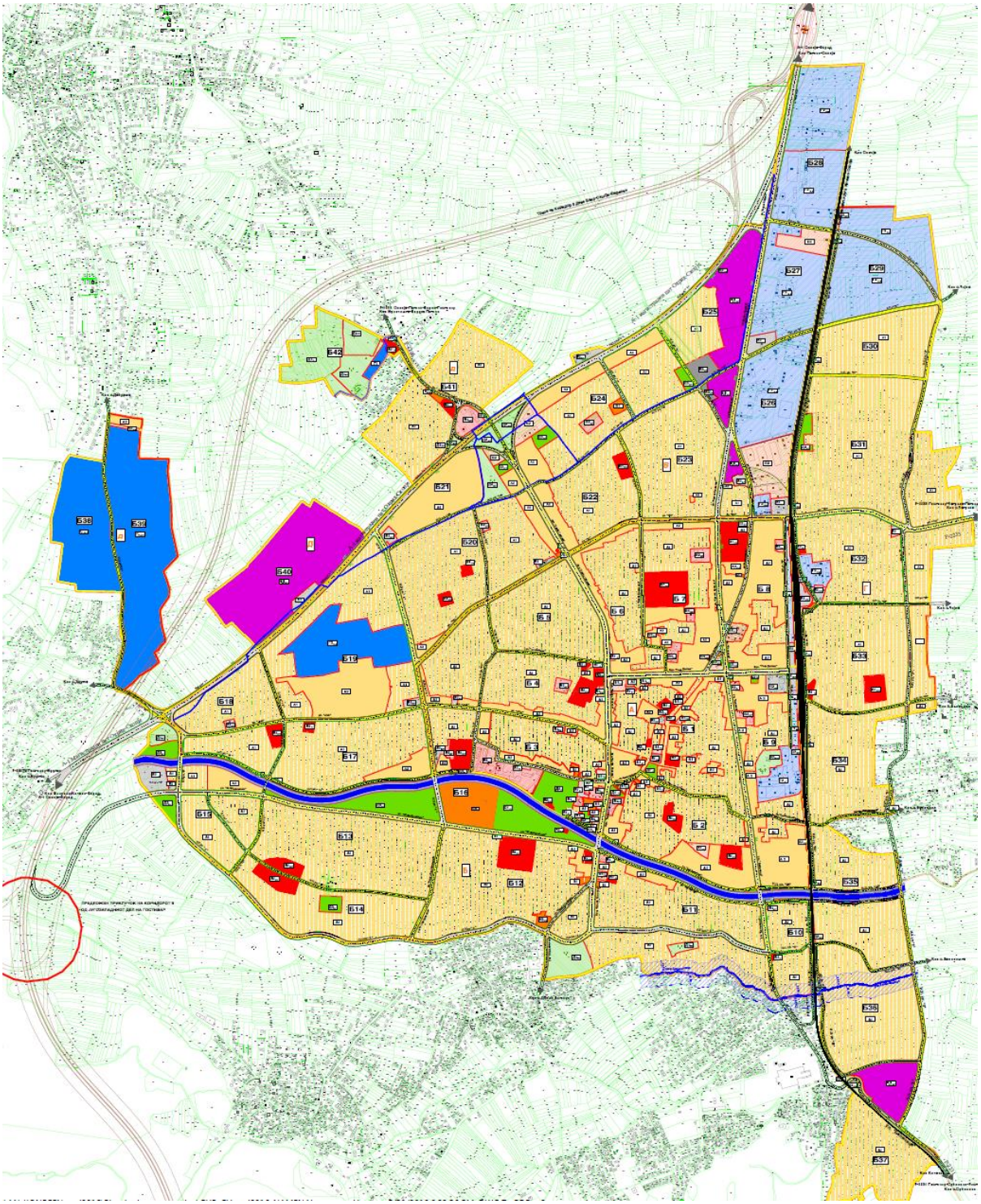
The environmental situation in the Municipality of Gostivar is relatively good. There are no major pollutants that could impact the abundance of natural resources. Within the territory of the municipality there is a National Park (Mavrovo National Park, a small part of which extends into the territory of the Municipality of Gostivar) as well as several protected areas. The protected areas in the municipality include: The sources of the Vardar River in the village of Vrutok, and natural resources such as: Popova Shapka, glacial lakes and clean mountain rivers. The municipality owns and manages green public spaces such as parks and sports and recreation fields. Most of them are located within the city. The city has three urban parks, which, considering the population size, do not meet the needs of the citizens, as they fall below the national standard of square meters of greenery per capita. The total area of green spaces is 99,500m2 and they are maintained by the public enterprise.

The study refers only to the area within the urban boundaries, and it is shown in Figure 3:

Figure 3 – Gostivar, Urban Area

As a starting point for assessing the state of greenery in the Municipality of Gostivar, particularly to highlight the visible difference between planned and actual implementation, the General Urban Plan is used, which is shown in Figure 4:

Figure 4 - General Urban Plan



In Table 3, specific numerical indicators for the graphic display are shown.

Table 3 – Overview of greenery within the GUP

Block	Block area (ha)	Purpose	Area (ha)	% of the block area
Block 1	24.618	Park	0.284	1.07
Block 2	18.923	Park	0.197	1.04
Block 3	22.578	Park	2.177	10.68
		Sports and recreation	0.235	
Block 4	22.485	No Greenery	/	/
Block 5	14.224	No Greenery	/	/
Block 6	13.068	No Greenery	/	/
Block 7	18.948	No Greenery	/	/
Block 8	18.643	No Greenery	/	/
Block 9	21.770	Park	0.126	6.49
		Protected greenery	0.417	
Block 10	7.011	Protected greenery	0.153	2.18
Block 11	29.549	No greenery.	/	/
Block 12	26.853	No greenery.	/	/
Block 13	22.522	No greenery.	/	/
Block 14	14.901	Sports and recreation	0.586	3.93
Block 15	13.439	Sports and recreation	1.504	16.92

In the Municipality of Gostivar, the responsibility for arranging and maintaining green areas lies with the Public Enterprise “City Parking and Greenery” - Gostivar. This entity is responsible for both the urban and rural areas.

Table 4 – Urban and rural green space

Greenery under the jurisdiction of the PE	**Area in m2**
Urban greenery	403,526
Non-urban greenery	342,325
Total	**745,841**

Table 5 - For regular maintenance of greenery under the jurisdiction of the Municipality of Gostivar

Area	Area in m2
Forest Park	65,801.00
Stadium (surroundings)	53,351.00
Triangles - Zdunje	17,537.00
Gas station (road)	7,956.00
Boulevard greenery	50,075.00
Triangles - Maleardi	1,946.00
Junction for Debreshe	2,455.00
"Macedonian roads"	3,332.00
Maleardi	19,556.00
From "Dam-Kom" to "Turbo"	3,718.00
The square park	3,775.00
Areas around the bus station	6,853.00
Roundabouts	412.00
Other urban greenery	159,172.00
Non-urban greenery	342,325.00
Total	**745,841.00**

In addition, the following areas are considered priority areas with increased maintenance intensity**:**

- Forest Park-Medical Center
- Green Square – Center
- Green corridor (boulevard greenery)
- Greenery around the municipal building
- Vardar Quay (Vardar River Promenade)

In the 2025 budget, there is a dedicated program for environmental protection. It covers several areas:

- Subsidies for citizens for the purchase of inverter air conditioners;
- Subsidies for citizens for the purchase of bicycles;
- Construction of new pedestrian and bicycle paths;
- Expansion of green areas;
- Efficient heating and energy use for public institutions;
- Educational campaigns;

Ongoing investments related to urban greenery are presented in Table 6.

Table 6 – Investments in horticultural landscaping

Horticultural investments		
Description	**Value 2024**	**Value 2025**
Horticultural purchases	**7,583,000.00**	**6,018,750.00**
Planting of seedlings in triangles throughout the city	753,000.00	481,500.00
Seasonal flowers	2.149.000.00	1,313,200.00
Evergreen and deciduous seedlings	1,960,000.00	1,901,500.00
City Park - left side	670,000.00	603,250.00
City Park - right side (project)	1,700,000.00	1,479,000.00
Green areas in schoolyards	351,000.00	240,300.00

As in other municipalities, the budget for expanding green spaces is sufficient for larger undertakings. But on the other hand, the municipality is also part of several projects aimed at creating new green spaces, such as part of the park within this particular project[7]. The goal of this project is to transform the City Park in Gostivar into an attractive social space, intended for people of all age groups, through the implementation of appropriate activities and features, that will improve the quality of the location, which is currently in poor condition with damaged urban equipment.

Figure 5 – Location of the park

[7] "Bridging Regions" financed by the European Union, through the Cross-border Cooperation program Kosovo - North Macedonia, Initiative for European Perspective invites

The park is located 400 meters from the city center and covers an area of 22,500 m^2.

Figure 6 – Current situation

Figure 7 – New park area in Block 3

Additionally, to enrich the content of the park design, urban equipment is also planned, including:

- 25 benches;
- 10 trash bins;
- 5 bicycle parking spots;
- 60 lampposts;
- 2 cameras

Within the framework of the project **"Tackling air pollution"**, which falls under the UNDP Program Framework, funded by Sweden[8], greening along the quay of the Vardar River is planned, and these activities are included in this Study of the Municipality of Gostivar.

Figure 8 - Greening and construction of walking paths on the northern (left) side of the Vardar River promenade (quay), from the "Democracy" bridge to the pedestrian bridge.

Figure 9 - Greening and construction of walking paths on the northern side (left) of the Vardar River promenade (quay), from the "Belichica" bridge to the pedestrian bridge.

8 https://www.facebook.com/story.php?story_fbid=3498778943782060&id=1488439521482689&m_entstream_source=timeline&_rdr

Figure 10 - Greening and construction of walking paths on the northern side (left) of the Vardar River promenade (quay), from the "Belichica" bridge to the pedestrian bridge.

Table 7 - Air quality situation

PM10 / mg/m³	Gostivar		
	January	July	November
24h limit value for the protection of human health	50	50	50
How many days was the 24h value exceeded during the current month?	16	0	18
How many days was the 24h value exceeded in 2024	16	39	63

The data presented in the previous charts show that PM10 concentrations are significantly higher during the cold months than in the warm months during the analyzed period, and they frequently exceed the prescribed limit value of 50 µg/m3. Smaller exceedances of the limit value are observed during the warmer months.

According to the conducted analyses, PM10 is identified as a critical air pollutant affecting air quality in the Municipality of Gostivar[9].

[9] https://gostivari.gov.mk/wp-content/uploads/2022/09/Plan-za-vozduh-Gostivar.pdf

The Municipality of Gostivar has developed a Plan for the Improvement of Ambient Air Quality, in accordance with the Rulebook on the Detailed Content and Preparation Method of the Plan for Improving Ambient Air Quality. The Plan for Improving Ambient Air Quality for the Municipality of Gostivar is based on the assessed air quality at the local level, using data from the measuring station as part of the State Monitoring System for monitoring air quality. According to this data, the most critical pollutant is particulate matter, with a diameter of up to 10µm. Exceedances of the limit value for PM10 are particularly noticeable during the colder months, when multiple exceedances of the 24-hour limit value of 50µg/m3 are recorded. According to the data, during the observed period, the annual limit value for PM10 of 40µg/m3 was exceeded in Gostivar.

Regarding the state of the forest fund, the data are as follows[10]:

Figure 11 – State of the forest fund

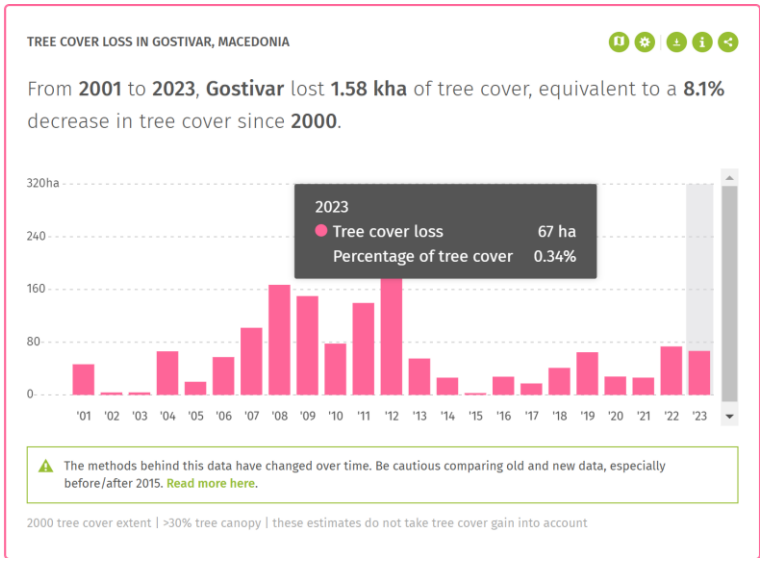
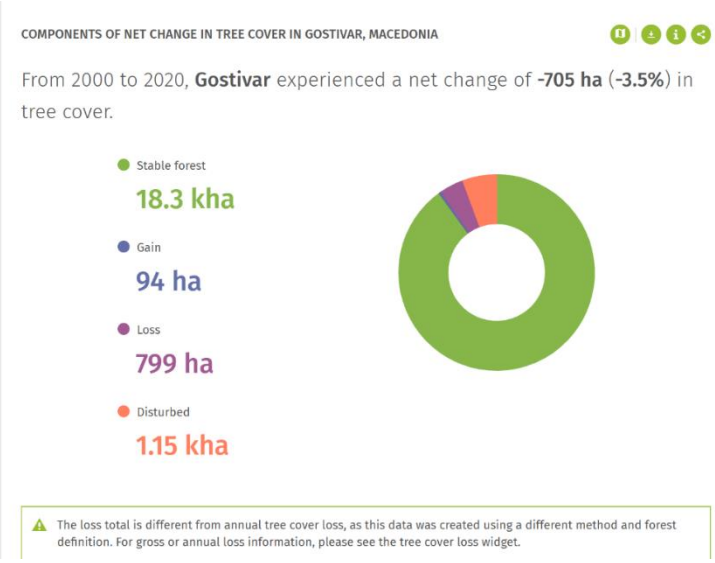
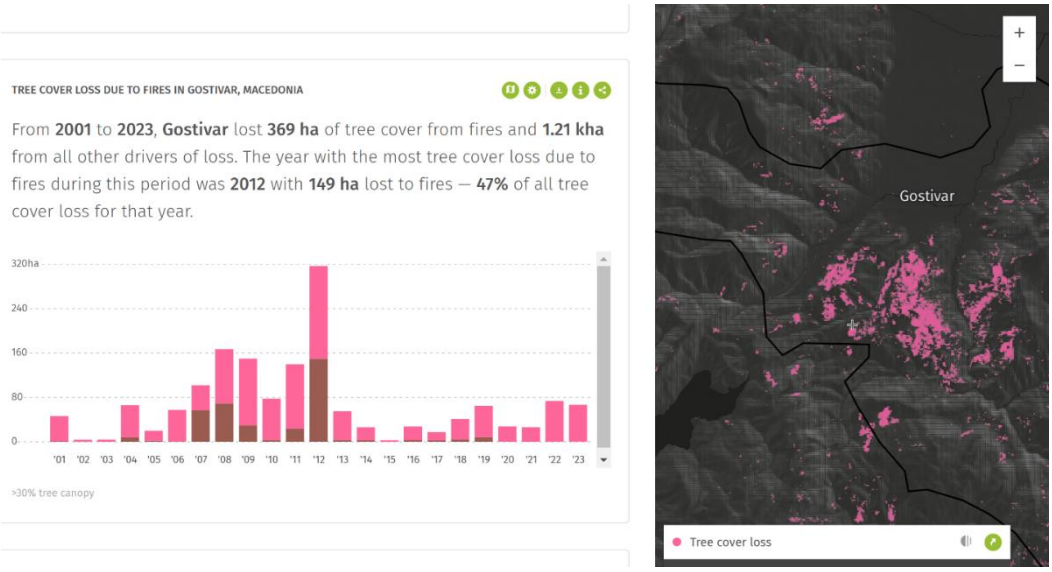


Figure 12 – State of the forest fund



[10] https://www.globalforestwatch.org/dashboards/country/MKD/?category=forest-change&location=WyJjb3VudHJ5IiwiTUtEIl0%3D

Figure 13 – Tree cover loss due to fires



In summary, the data shows that in 2020, Gostivar had 18.6 kha of natural forest, covering 41% of its total area. In 2023, the municipality lost 60 hectares of natural forest, which is equivalent to 39.9 kt of CO_2 emissions.

Overview of data from the survey questionnaire

As part of the preparation process for the Study, a questionnaire (Annex 1) was developed to gather more information about the needs of citizens, which was also posted through a web-based tool[11]. The initial questionnaires were shared and reviewed during a meeting with the Mayor, Dr. Valbon Limani and the representatives of the relevant sectors, related to the needs of the development of the Study.

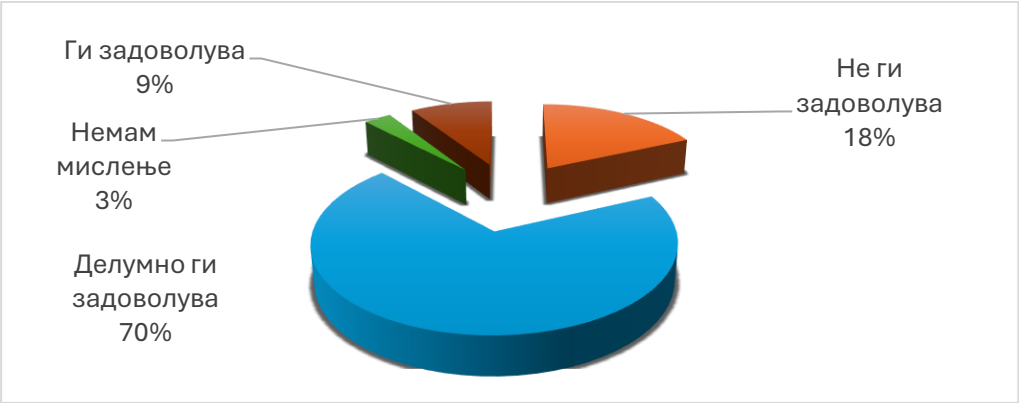
Additionally, on 20.02.2025, a public debate was organized with interested non-governmental organizations and citizens, from which additional proposals emerged.

In the process of developing the Study, there were additional consultations with the citizens of the Municipality of Gostivar, and the draft version of the Study was shared on 23.04.2025, and some of the comments were incorporated into it.

[11] https://docs.google.com/forms/d/1ttEt_p5MB0azLfvOVrXB8seDGkocVAoFnn4Lnlsvlu4/edit#responses

From the survey questionnaire and the corresponding responses, several needs for the Study were highlighted:

Figure 14 – Does local greenery meet your needs?



From Figure 14, it can be seen that the citizens are predominantly partially satisfied with the green spaces. Although the percentage of 70% is high, it still provides directions for improving the conditions of green spaces.

Figure 15 – How satisfied are you with the maintenance of greenery in the municipality?

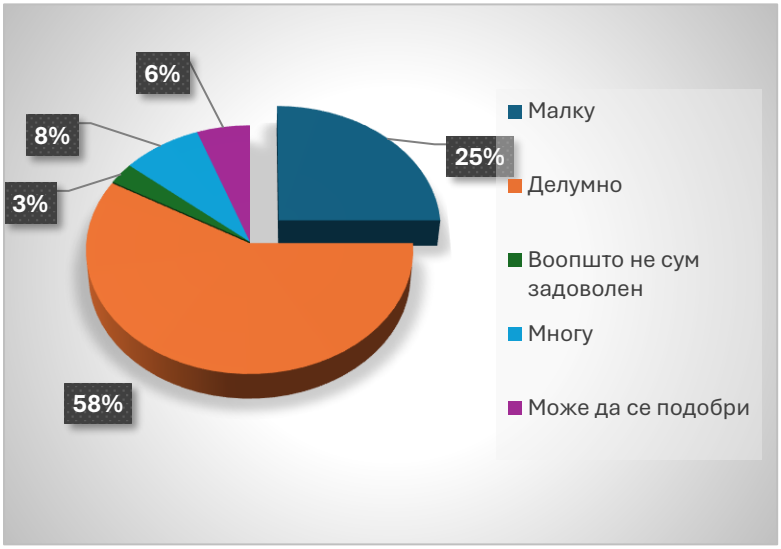
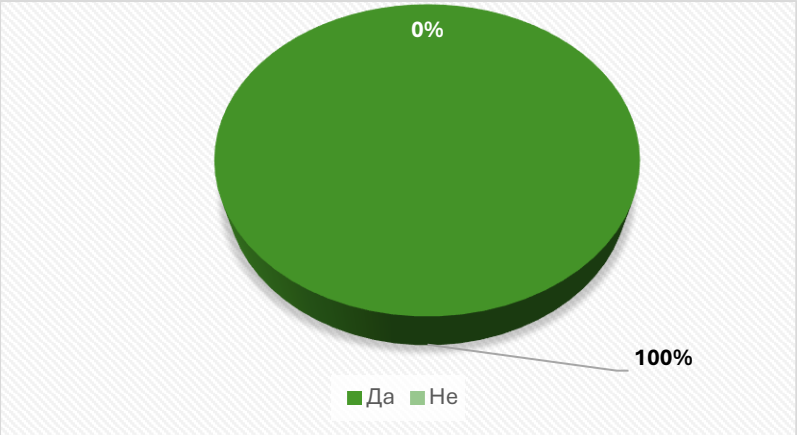


Figure 15 indicates the level of satisfaction among citizens regarding the maintenance of greenery. Since the value is slightly above 50%, at 58%, it sends a clear signal to the municipality for improvement in this area. It is important to emphasize that there are several activities by the municipality to improve the maintenance of green areas, and within the framework of those activities is the order for cleaning the entry and exit roads from the residues of transport trucks involved in construction activities, as their dust and waste affect the greenery.

Figure 16 - Would you contribute funds to the "Green Fund" which, according to the law, would exclusively manage investments in urban greenery in your municipality?



The data from Figure 16 is encouraging, showing 100% support for the establishment of the so-called “Green Fund”, whose sole purpose would be to manage investments in urban greenery. This information can also serve as a solid basis for the municipal leadership to organize meetings with the business community and involve them in this fund.

Figure 17 - What type of public green space should be developed in the Municipality of Gostivar?

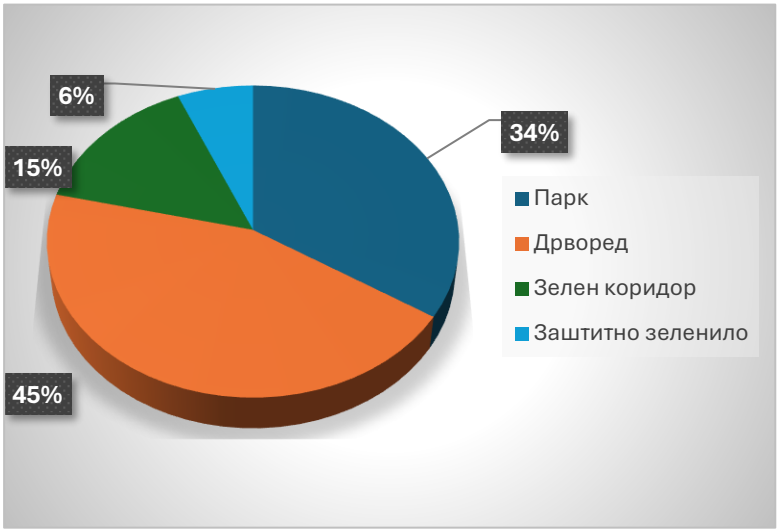
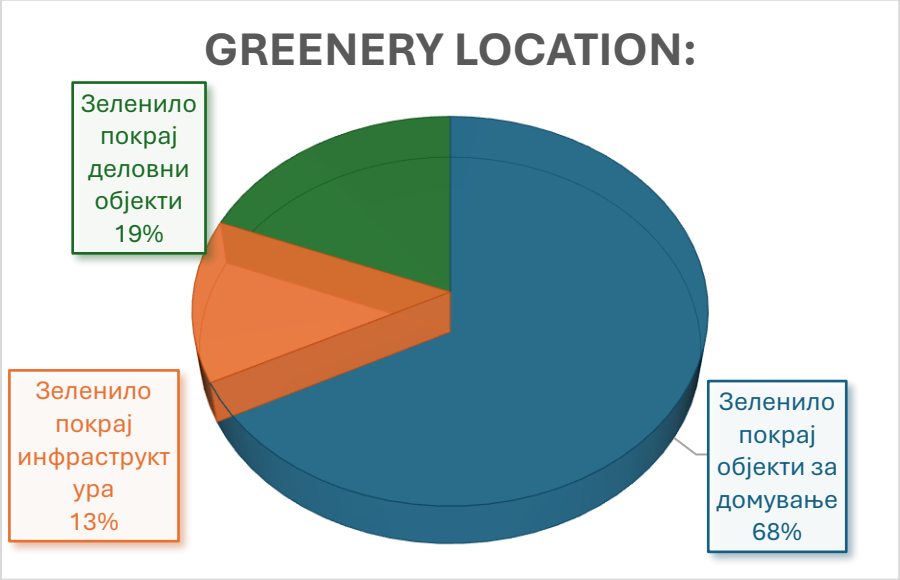


Figure 17 clearly identifies citizens' priorities regarding new green spaces. It is evident, just by moving through the city, especially in the urban area, that there is a lack of tree-lined streets. Therefore, in the proposed projects, there are 3 proposed road where greenery - tree lines would be planted. Although the Municipality of Gostivar, unlike many other municipalities in North Macedonia, has its own park area, citizens are requesting additional parks. Therefore, within the framework of this project, as well as other projects with the international community, these areas are prioritized, both in the Study and by the municipality.

Figure 18 – Priority locations for establishing greenery



From Figure 18, it can be concluded that the majority of citizen requests relate to greenery next to their residential buildings. In addition, in conversations with citizens, it was emphasized that these areas, in addition to the green component, should also include other features, primarily serving as entertainment spaces for young children.

According to public discussions, survey responses and conducted consultations, the following locations were identified as priority proposals by citizens:

- Str. “Boris Gjinovski”
- Str. "JNA"
- Str. "Belichica"
- Around the bus station
- Str. "Zheleznicka"
- Main square
- Buildings around “KAM”
- The area around the green market
- Surroundings of the “Dolomite” factory

The priority proposals are presented below from Figure 19 to Figure 24.

Figure 19 – "Braka Ginoski" Street

Figure 20 – Railway Park

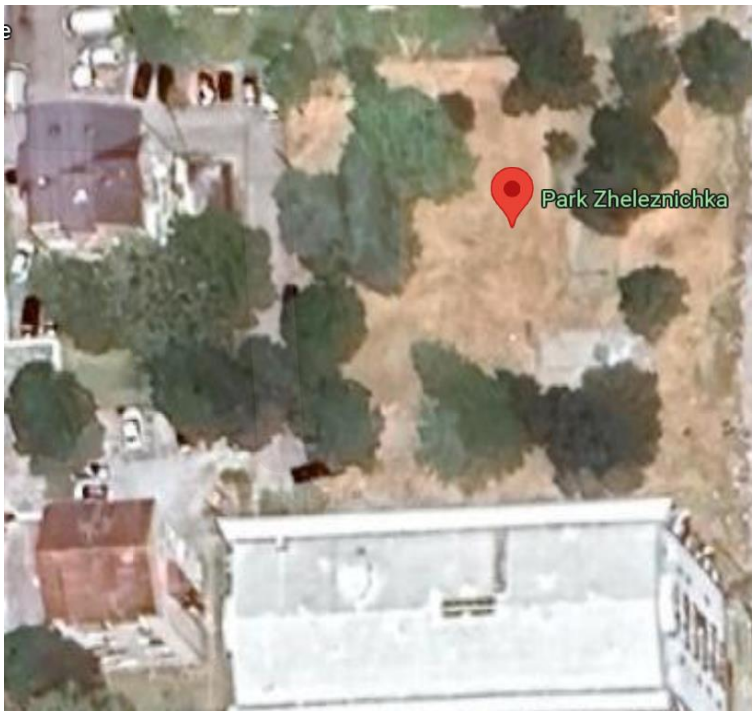


Figure 21 – City square with e floral arrangement with XXL flower pots

In the past, there were several proposed designs for the Square, and as part of the Study, we propose the additional placement of decorative XXL flower pots.

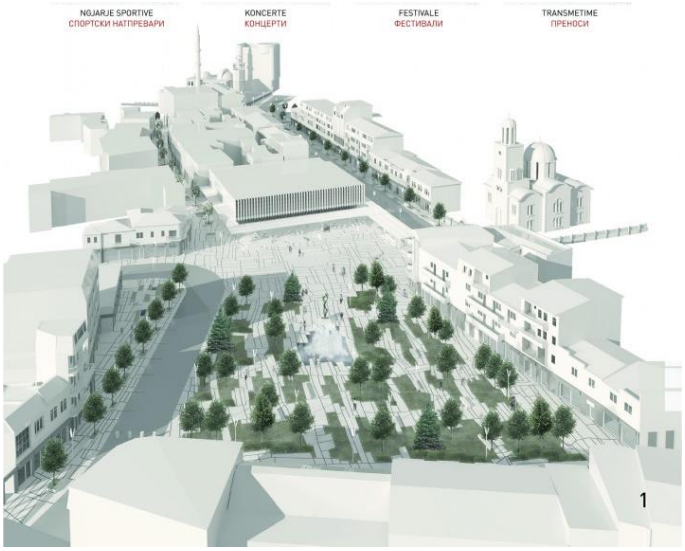


Figure 22 – Surroundings of the Dolomite factory

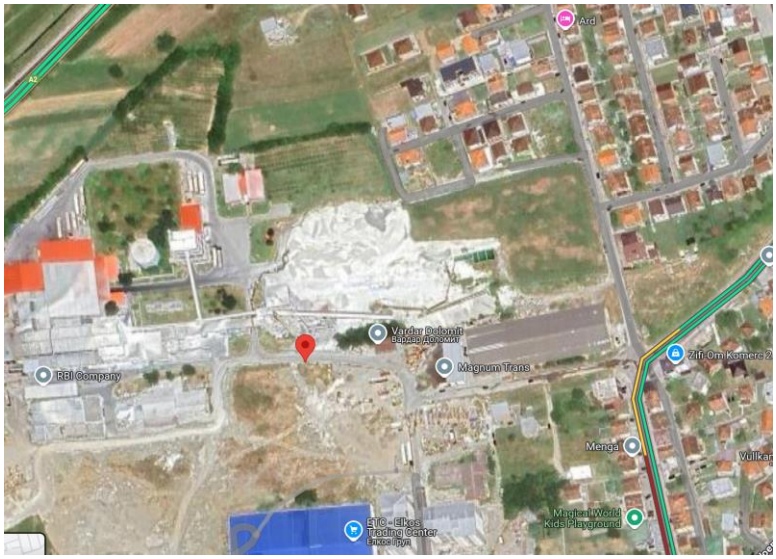


Figure 23 – Surroundings between the buildings near KAM

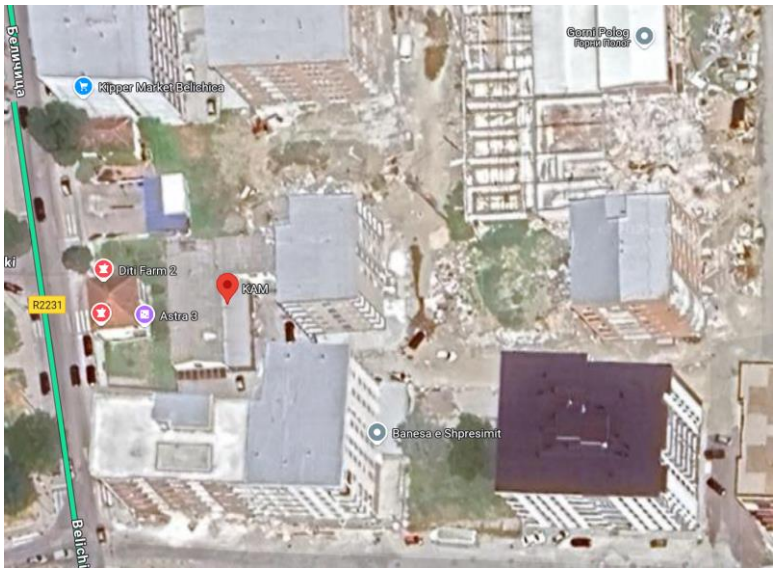


Figure 24 – "Belichica", "Pance Poposki" streets

IV. Advantages of developing urban greenery

The advantages of developing urban greenery can be systematized as follows:

1. Neutralizing carbon emissions

Integrating urban vegetation into cities helps neutralize carbon dioxide emissions. Trees and vegetation planted in cities act as a carbon sinks;

2. Improving the well-being of residents

Green spaces in cities are beneficial for both physical and mental human health, providing areas where people can engage in exercise and relaxation;

3. Improving air quality

Every year, air pollution in both urban and rural areas is estimated to cause around 4.2 million premature deaths, according to the World Health Organization (WHO)[12]. This makes air quality improvement a significant priority as the population and potential activity in cities grow. Similar to carbon offsetting, green areas absorb pollutants and harmful gases from the air and release oxygen. This improves air quality and reduces health risks for residents.

4. Noise reduction

Green spaces, especially those with multiple trees and other large plants, are often used to reduce noise during urban planning and redevelopment. Interestingly, factors such as tree density, tree height, tree grouping, trunk and branch dimensions, leaf shedding, and even leaf shape affect the extent to which sound is absorbed or redirected, and are therefore taken into account in the urban planning of green spaces.

5. Mitigating global warming

Cities are often identified as urban heat islands – concentrated areas that experience higher temperatures than their surroundings. In fact, research show that cities warm by 0.56 degrees Celsius during the day and 0.43 degrees Celsius at night[13]. The same study found that green urban spaces could solve this problem by creating a cooling effect, thereby reducing urban citizens' exposure to extreme heat.

6. Reducing flood risk

[12] https://www.who.int/health-topics/air-pollution#tab=tab_1

[13] https://joint-research-centre.ec.europa.eu/jrc-news-and-updates/urban-heat-islands-managing-extreme-heat-keep-cities-cool-2024-07-22_en

Another impact of climate change with potentially catastrophic consequences - flooding - can be mitigated through urban planning that incorporates greening. These green spaces can help intercept and slow down rainwater before it reaches waterways and sewage systems.

7. Providing natural habitats for wildlife

Green spaces can help provide habitats for biodiversity. Bees, whose population has been declining at an alarming rate in recent years (largely due to urbanization), will gain access to the food and resources they need to survive in green public spaces. Similarly, birds, which rely on access to trees, will benefit from the greening of urban spaces.

V. SWOT analysis

One of the most important components of any strategic plan is the creation a SWOT analysis. Through SWOT analysis, this Study defines the internal and external factors that influence the development, in this case, of urban greenery. It clearly identifies the strengths (advantages), weaknesses, opportunities and threats. This analysis also helps identify internal and external factors that can contribute to the successful implementation of the Study. This analysis also informs the link between the current and future "state" of greenery in the Municipality of Gostivar, aiding in the development of solutions to bridge the gap.

The SWOT analysis for the process of green can be structured as follows, providing a general overview:

Strengths

- Benefits for protection of the environment
- Advantages in social aspects
- Economic benefits

Weaknesses

- High initial investment costs
- Lack of adequate space
- Technological challenges
- Resistance from the local population

Opportunities

- Technological advantages
- Funding and partnerships
- Momentum behind green policies
- Community involvement
- Branding and tourism

Threats

- Impact of climate change
- Pressure to urbanize space with buildings
- Economic fluctuations
- Maintenance challenges
- Administrative barriers and legal changes

Strengths	Weaknesses
Internal overview (conditions in the municipality)	
• Location, Vardar River • Favorable climate conditions for developing greenery • Partially landscaped riverbed with vegetation • Annual, organized campaigns for planting new saplings • Joint volunteer actions with citizens • Solid maintenance of green areas • Functional sector for environmental protection • Special Public Enterprise "City Parking and Greenery" • PE "City Parking and Greenery" - Gostivar has organized several public forums with citizens to get their ideas and feedback on public greening; • Park 66,000 m^2	• Lack of visible engagement in creating new green spaces. • Unplanned development of the city • Ongoing trend of construction of residential buildings • Absence of tree-lined avenues on main roads and streets. • Damage to public green spaces • Low public awareness regarding the importance of planting and preserving greenery • Lack of financial resources
Opportunities	**Threats**
Internal reflection (external factors)	
• Untapped spaces for greening • International funds supporting the green agenda • Green Cadastre • Solid GUP, in terms of planned green areas • Use of digital technologies for monitoring • Procurement of new machinery suitable for developing greenery • Raising awareness about the benefits of urban greenery through workshops and educational campaigns • Joint volunteer actions with citizens	• Budget funds • Lack of staff in the PE "City Parking and Greenery" • Frequent election cycles affecting continuity • Ensuring continuous irrigation • General economic situation • Implementation of GUP • Climate change •

VI. Vision for the development of urban greenery

Considering contemporary trends in municipal development, the municipal leadership is convinced that the development of urban green spaces is vital for creating sustainable and healthy cities.

In addition to the aesthetic value of green spaces, they play an important role in improving the environment and the quality of life for residents.

The Municipality of Gostivar joins the Green Agenda, as well as projects with other national and international institutions, recognizing that these measures and activities offer environmental, social, health, economic and other benefits.

In accordance with the strategic priorities of the Municipality of Gostivar, for modern and contemporary infrastructure, the commitments outlined in the recommendations of the Greening Study will create a framework and action plans for future investments in our development and urban planning. The commitment of the Municipality of Gostivar to increasing green and forested areas will help mitigate the effects of climate change, while simultaneously improve living conditions for residents through more green spaces, combined spaces for sports and recreation, cultural and social interactions, etc.

As part of various projects supported by the EU and other donors, The Municipality of Gostivar is creating public local policies - programs and strategies that will guide the renewal and maintenance of existing green spaces. Through the reconstruction of parks and public unused spaces, the Municipality of Gostivar will actively involve the community in designing and maintaining of green spaces, while also collaborating with civil society organizations to organize educational programs on the importance of green spaces and their role in sustainable development.

Gostivar, a municipality with a modern and contemporary infrastructure, committed to greening, which ensures addressing climate change and improving living conditions, while building a future for the generations to come.

VII. Plans

In accordance with the elements outlined in the public call, and derived from the Law, the Study provides guidelines for the development of a Master Plan for planning, design, construction, maintenance, protection and reconstruction of green areas within the territory of the Municipality of Gostivar. These plans will support the municipality in fulfilling its obligations as per Article 9 of the Rulebook[14], to define a Master Plan for the development and management of greenery.

As previously emphasized, planning is structured into two segments:

- by category of greenery
- by location

For both segments, in addition to the recommendations, the benefits of their implementation are also provided. In the location-based segment, target areas for urban greening are specified, such as in front of public institutions, along key boulevards and streets, as well as around important buildings in the municipality, identified in the chapter on strategic priorities.

Recommendations on how to approach the planning of urban green spaces

Based on local experiences and best practices, several key aspects are recommended to be taken into account during the urban planning process. This will assist decision-makers and urban policy creators in shaping their approach during the planning process. Practice shows that it is useful to follow the recommendations below:

- Clearly define the objectives of the green space during planning.
  - What type and size is the planned urban green space?
  - What will be its main functions and who is it intended for?
  - Who is responsible for its maintenance and management?
  - Is it possible to realize the planned urban green space through the transformation of an abandoned area?

- Planning should have a long-term perspective and maintain flexibility.
  - Green spaces are a long-term investment, with their benefits becoming evident over time;
  - Urban green spaces should be planned and designed in a flexible manner, making them functional for possible adjustments, for some future needs;
- Facilitate the work of planners in developing detailed urban plans.
- The design of green spaces should be considered as a public, health and social investment.

[14] chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.moepp.gov.mk/wp-content/uploads/2019/10/Sluzben-vesnik-br.205.pdf

Based on various experiences and practices, urban policy makers and planners should take into account four important practical implications when planning and designing urban green spaces.

1. Bringing green spaces closer to people

Establishing street greenery, urban gardens and green pathways within one of the urban communities, and utilizing public open spaces for greening, whereby, as a rule, residents in a micro-urban area should have access to public green spaces of at least 0.5–1 hectares within a linear distance of 300 meters (about a 5 minutes' walk) from their homes. It is especially important to ensure adequate access to urban green spaces for all population groups and users (universal access).

2. Simple design features are recommended to maximize comfort in the use of urban green spaces.

When planning, it is necessary to establish clearly visible entry or access points, use marking in parks or on green pathways, consider different seasons, and take into account safety issues (lighting, visibility, accessibility). Additionally, it is necessary to provide urban equipment such as benches, trash bins, toilets, etc.

Planning of various types of urban green spaces, according to different needs and requirements, such as: greening with tree-lined streets, green squares, greenery around playgrounds, educational orchards, and similar. It is necessary to utilize biodiversity, by using a variety of plants when creating different initiatives; It is important to note that urban green spaces should not be overloaded with very specific functions or designed to attract only certain users, on the contrary, they should facilitate activities for all population groups; The establishment and development of greenery will be ineffective unless special emphasis is placed on the maintenance needs of urban green spaces. Therefore, regular maintenance is required in order for users to experience urban green spaces as safe, clean and well-cared-for. There must also be a swift response to signs of vandalism and antisocial behavior;

3. Planning process

Infrastructure projects should incorporate a "green component" from the very beginning of the design phase for new streets and other projects, such as ensuring sufficient space (both above and below ground) as well as allocating budget for planting trees and other greenery. Efficient green infrastructure encourages people to get out of their cars and instead walk or cycle more often. Therefore, the pedestrian experience is very important in the process of planning aesthetically pleasing and functional urban greenery; When designing new residential and commercial areas, green roofs or green walls should be included from the outset, using greenery

as a building block. A high-quality living environment in an urban area should contain **15-20% greenery**[15].

Green infrastructure has not only aesthetic value, but also increases property values, improves the health of residents and workers, fosters social interactions, regulates temperatures, retains storm water, enhances biodiversity, reduces energy demands in buildings, and removes air pollutants. Therefore, decision-makers should adopt a "green" mindset.

4. Joint investment

Various stakeholders such as the health care sector, businesses, engineers, designers, the construction sector, developers, cities/local governments, and residents themselves can only benefit from urban greenery. Therefore, the municipality should run ongoing campaigns highlighting the long-term benefits of greenery. A shift in mindset is needed: green spaces should be seen as capital investments, just like any other infrastructure investment. Costs should be viewed as an investment that returns value over time; The common practice that only the public sector is responsible for the environment we live in must also change. The business community can contribute to improving their business locations and make the city a more livable place for their employees, thereby attracting new talent;

Planners should also keep in mind that properties with quality green spaces in the neighborhood **are valued 4-12% higher**[16] than similar properties in "non-green" neighborhoods, and therefore the value of greenery must be properly accounted for in overall project evaluations.

In terms of financing, a key element is the availability of quality subsidies that promote sustainable development. It is essential to create mechanisms that invite the business community to invest in greenery, following the “People-Planet-Profit” principle. The municipality should offer incentives such as faster permitting process for projects that include green features or exemption from certain municipal fees.

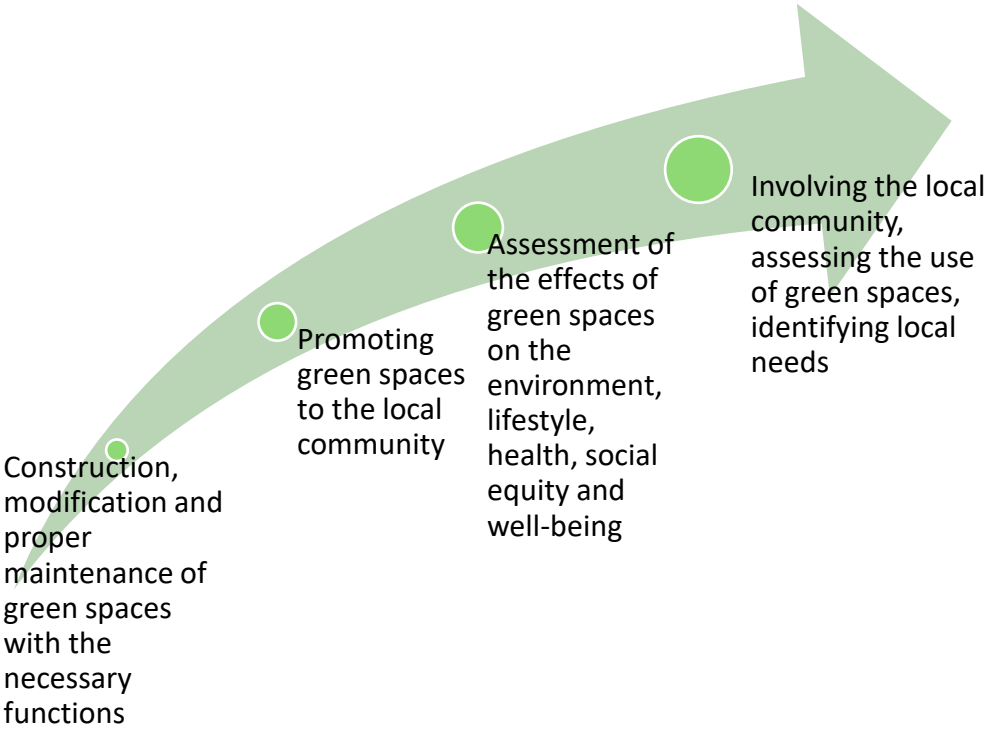
The study recommends that the planning process involve all stakeholders an inclusive approach, which lead to greater impact. In this regard, actors can be divided into 3 groups:

- Policymakers
- Investors
- Users

The planning process follows the same thread:

[15] Modern Compact Cities: How Much Greenery Do We Need?

[16] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6209905/#B36-ijerph-15-02180



When it comes to planning, it is especially important to emphasize that an inclusive approach is key.

Planning for people is planning with people.

Citizens should be involved and engaged from the very beginning, in order to create urban green spaces that meet their needs. The active involvement of local residents in the development of urban green spaces will increase their sense of ownership to that space and make maintenance easier. At the same time, it must be clear that community engagement is not a recipe for meeting every demand from all population groups - it is about finding the best possible compromise. Good practices show that more efficient planning, monitoring and evaluation of greening in urban areas can be achieved through collaboration with environmental experts, academic institutions and research centers, and greater impact is achieved when regional and local planning processes are also taken into account.

Benefits of community involvement

- The lifespan of the neighborhood is extended;
- Criminal and antisocial behaviors decrease and safety improves;
- Social control and social cohesion increase;
- People feel a stronger connection to their neighborhood and green spaces;

Encouraging residents, especially at key moments, to generate enthusiasm and get involved in the process of creating green spaces in the neighborhood is essential. It is best to use campaigns to foster enthusiasm for green activities. The municipality should organize various activities such as tree planting events or a competition "Our neighborhood park is the most beautiful";

Citizen participation ensures easier acceptance and use of urban green spaces.

Taking into account all the previous principles and postulates, the Study highlights several priority locations, with proposed visualizations of green elements, whose implementation will have a direct impact on improving the quality of life for the residents of the Municipality of Gostivar. The proposals are provided in a series of images, from Figure 25 to Figure 36.

Figure 25 – Protective corridor between the main road and the city

Figure 26 – Protective belt around and opposite the Dolomit factory

Figure 27 – Main square of the Municipality of Gostivar

Figure 28 – Tree-lined avenue, “Brakja Ginoski” Street"

Figure 29 – Protective greenery around a residential complex

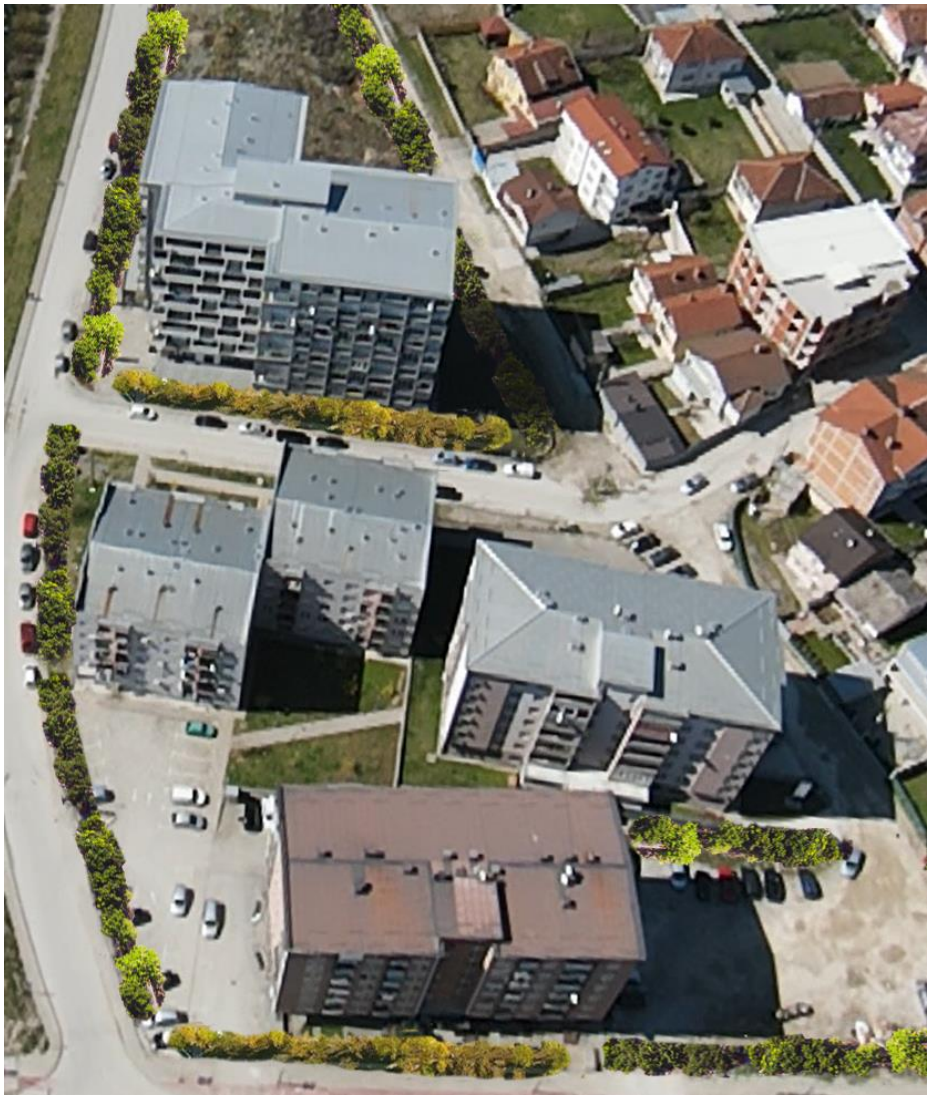


Figure 30 – Combined green parking lot

Figure 31 – Combined green parking lot behind AD “Pelagonija” with a corresponding tree-lined street

Figure 32 – Space near the green market

Figure 33 – Protective green tree-lined street

Figure 34 – Bus station

Figure 35 – Tree-lined street in the central city area

Figure 36 – Protective belt, tree-lined street, “JNA” Boulevard"

Additionally, in accordance with the recommendations for plan development, we propose greening of primary and secondary schools as well as health centers, specifically by creating green barriers along the roads. In this way, in addition to aesthetics, a key benefit is the improvement in the quality of life, through reduced pollution, better health for students and patients, as well as increased safety from traffic congestion. The proposals are systematized in the range of images from Figure 37 to Figure 43.

Figure 37 - Elementary School “Goce Delchev”

Figure 38 - Elementary School “Edinstvo”

Figure 39 - Elementary School “Ismail Qemali”

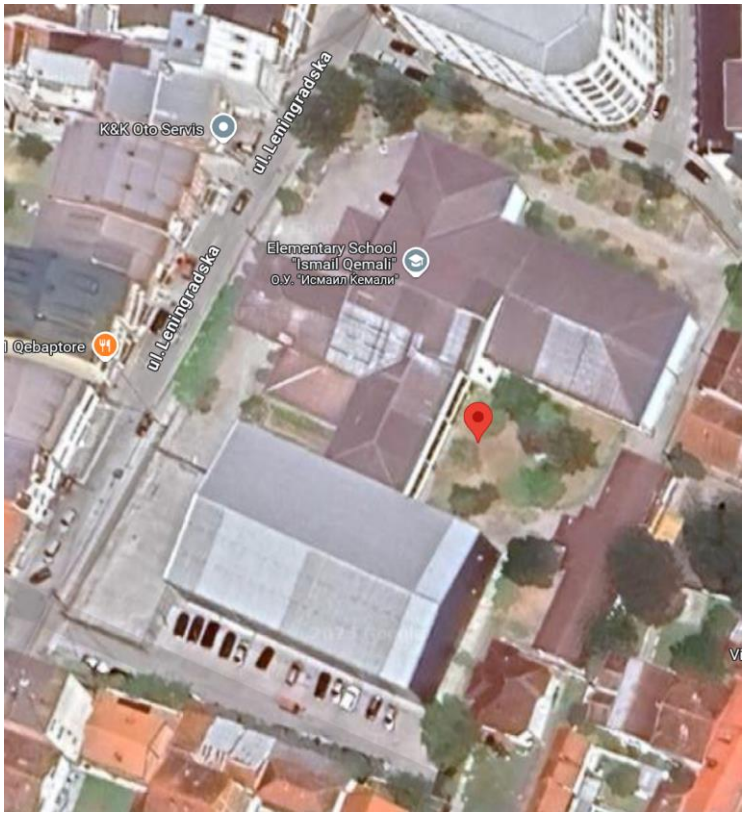


Figure 40 - Elementary School “Mustafa Kemal Atatürk”

Figure 41 – Secondary school complex

Figure 42 - Public Health Center – Gostivar

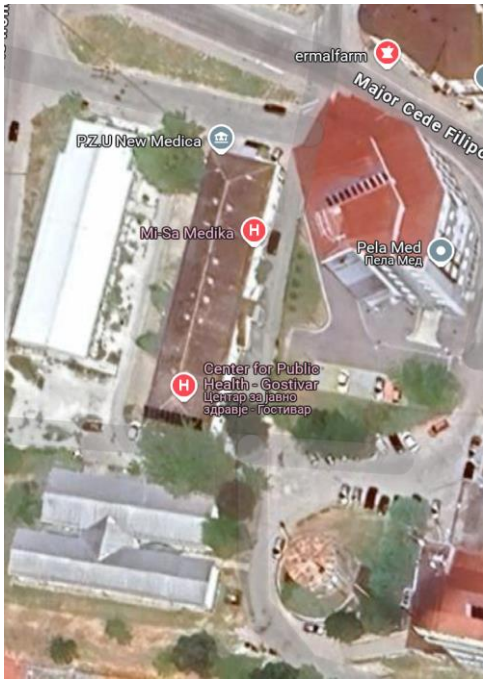
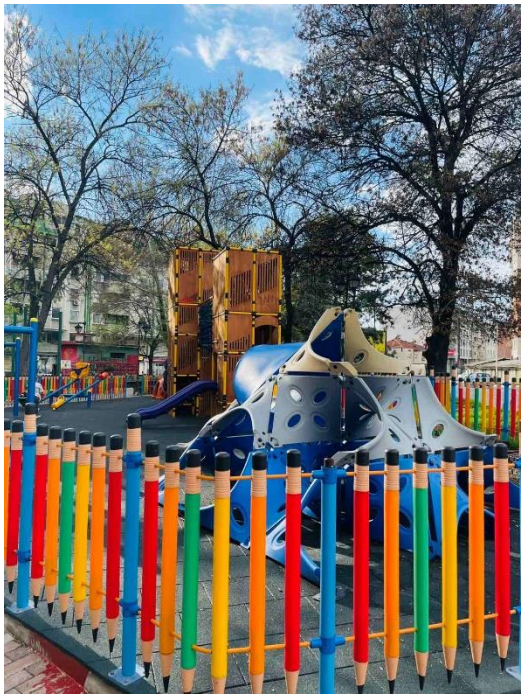


Figure 43 – Railway Park with a proposal for a multifunctional children's corner



During the process of public consultations, and based on suggestions from civil society organizations, the Study also includes the development of a botanical garden. The botanical garden represents a public space of scientific, educational and ecological interest. It plays a significant educational role through the installation of information boards and implementation of educational programs, aimed at raising awareness about plant life, ecology, and sustainable development. At the same time, the botanical garden contributes to biodiversity conservation by establishing seed banks, implementing propagation programs for endangered species, and collaborating with international networks and institutions. To be considered "official", a botanical garden must have a thematically organized and scientifically labeled plant fund, including indigenous, exotic, rare and endangered species, supported by accurate documentation for research and biodiversity protection. With carefully designed spaces and public accessibility, the botanical garden serves as a bridge between people and nature.

Figure 44 – General layout of an urban botanical garden

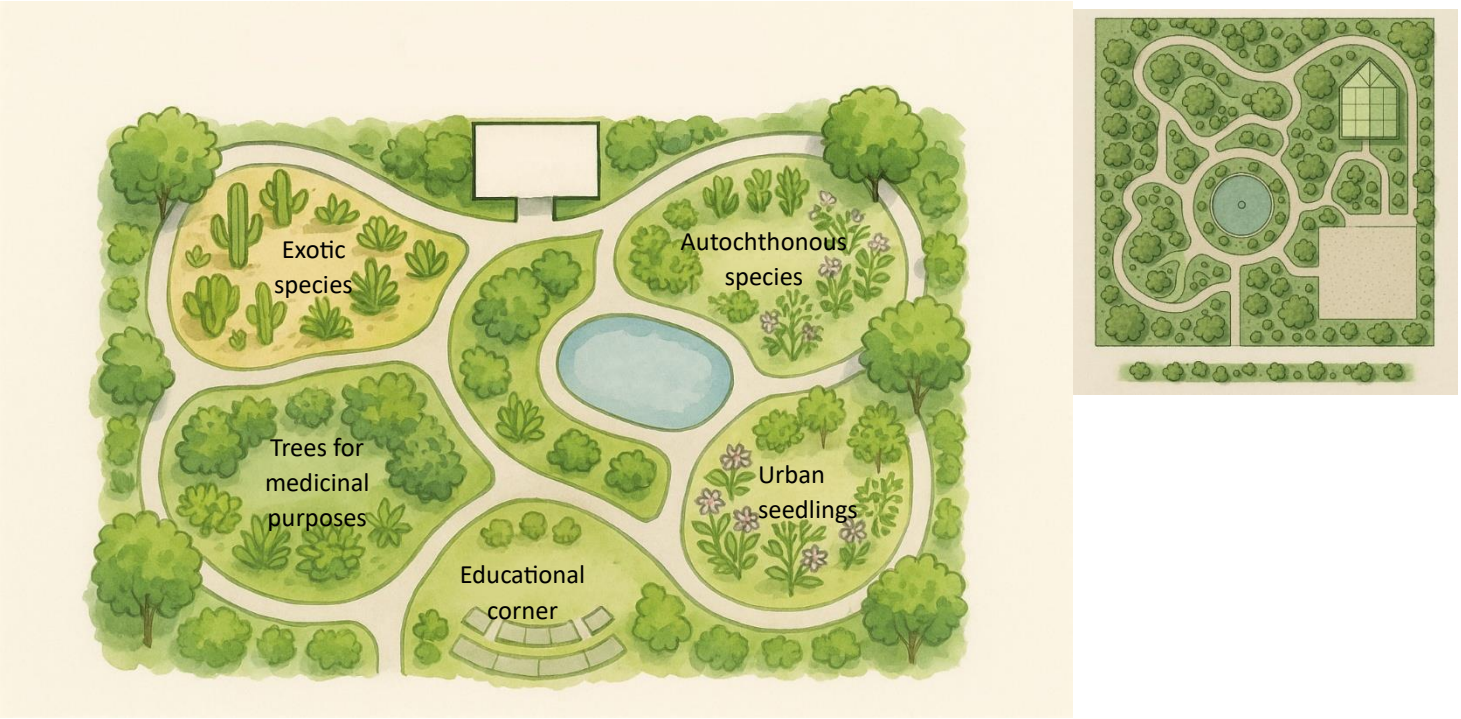


Figure 45 – Possible location of an urban botanical garden

VIII. Indicators, implementation and monitoring

Of vital importance for the successful implementation of the Strategy is the monitoring of its implementation. It is essential to track and asses urban greening efforts, specifically:

- whether the intervention delivers the intended benefits;
- what impact it has on the population - whether it advantages or causes any unintended negative effects;

Effective monitoring and evaluation of success are implemented through:

- defining the indicators to be used for documenting the results of the project and
- incorporating monitoring and evaluation activities into the project's timeframe and budget;

It is particularly important that the municipality ensures, in accordance with the Study's Action Plan, that monitoring is considered from the very beginning and that an adequate budget is allocated. In doing so, it is extremely important to use consistent data (ideally from the Green Cadastre) to reduce the need for new data collection and to ensure continuity.

The Study recommends using mixed/different monitoring methods, such as:

- Quantitative data collected through surveys, observations or measurements, to provide valid and comparable information on the use and impacts of urban green spaces;
- Qualitative data gathered through interviews, to explore the significance of urban green spaces to individuals and to understand personal priorities and concerns;

Indicators

Indicators for urban greening are essential for measuring the progress, impact and effectiveness of urban greening initiatives in the Municipality of Gostivar. These indicators can be categorized into environmental, social, economic and governance domains, as described in the detailed list of key indicators within the Urban Greening Study:

- Environmental indicators

In this category, the environmental and physical impacts of urban greening are assessed, through the following subcategories:

Biodiversity

- Number of plant and animal species in urban green spaces;
- Increase in populations of pollinators (e.g. bees, butterflies);
- Quality and connectivity of habitats (e.g. green corridors);

Green space coverage

- Percentage of green area relative to total urban area;
- Green area per capita (25 m²/person);
- Distribution and accessibility of green spaces (for example, within 500 meters of residence);

Air quality

- Reduction of particulate matter (PM2.5 and PM10);
- Level of nitrogen dioxide (NO2) and ozone (O3);

Urban heat island effect

- Changes in surface and ambient temperature in green and non-green areas;

Water management

- Volume of stormwater retained or treated through green infrastructure;
- Improvement in the water quality of nearby rivers, lakes and streams;

Carbon sequestration

- Annual CO_2 absorption by urban trees and green spaces;
- Increase in tree canopy coverage (%) over time;

- Social indicators

These indicators assess the social benefits and community engagement resulting from urban greening;

Public health

- Reduction in heat-related illnesses and mortality;

Accessibility

- Percentage of the population with access to parks or green spaces within a 10-minute walking distance from their place of residence;

Community engagement

- Number of citizens participating in urban greening projects;
- Satisfaction rates with green spaces (based on surveys);

Safety and comfort

- Safety in green areas (e.g. lighting, visibility);
- Reduction in urban noise levels near green infrastructure;

- Economic indicators

Economic indicators cover the economic impacts and cost-effectiveness of urban greening efforts;

Property value

- Increase in property value near green spaces;
- Number of new businesses opened around green spaces;

Job creation

- Number of green jobs created (e.g. landscaping, maintenance, urban forestry);

Tourism and recreation

- Revenue generated from urban parks and green attractions;
- Increase in park visitation rates;

Cost savings

- Reduction in energy consumption (less energy needed for cooling);
- Savings in stormwater management costs through green infrastructure;

- Governance and policy indicators

This category of indicators measures the efficiency and effectiveness of policies, strategies and the success of collaboration efforts.

Policy implementation

- Number of adopted and implemented urban greening policies;
- Percentage of urban planning projects that include green infrastructure;

Funding and investments

- Amount of public and private investments in urban greening;
- Percentage of municipal funds allocated to green initiatives;

Stakeholder participation and collaboration

- Number of partnerships established and signed with NGOs, businesses and community groups.
- Stakeholder satisfaction level with urban greening efforts.

Monitoring and reporting

- Frequency and quality of reporting on the progress of urban greening;
- Use of smart technologies to track progress in real time (e.g., IoT sensors);

Several tools are available for measuring indicators:

- GIS mapping: For spatial analysis of green areas and canopy coverage;
- Satellite imagery: For monitoring vegetation health and land use changes;

- Citizen Science: For monitoring biodiversity and gathering public satisfaction data.
- IoT sensors: For real-time data on air quality, temperature and water management;
- Annual reports prepared within the Council of the Municipality of Gostivar;

Note:

Examples of specific indicators may include:

- Increase in tree canopy coverage by 25% by the year 2032;
- Reduction of urban heat in priority areas by 1.5 degrees
- Establishment of 25 new local multifunctional green areas;

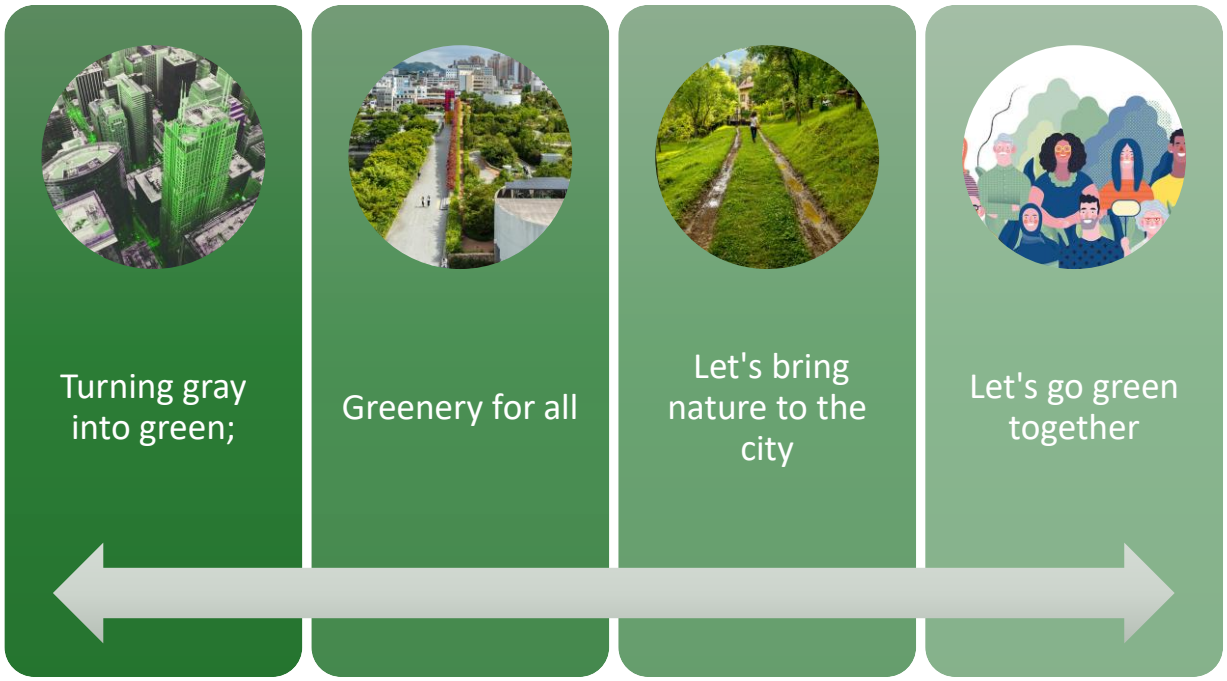
IX. Strategic goals and priorities for the implementation of the Study

The strategic goal of the Study is to fulfill the vision of transforming Gostivar into a sustainable "Green City". By achieving the vision, the municipality will also meet the legal requirement of providing 25m^2 of green space per capita.

The strategic objectives for the implementation of the Study are:

- Turning gray into green;
- Greenery for all;
- Let's bring nature to the city;
- Let's go green together;

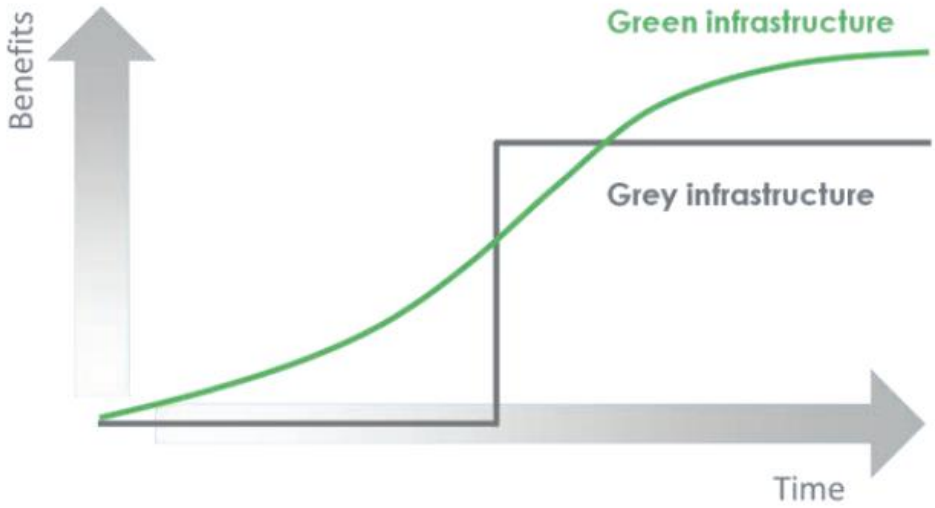
Figure 46 – Strategic goals



Goal 1 – Turning gray into green

In order to fulfill the legal obligation for the municipality to provide 25 m^2 of urban space per capita, it is necessary to increase green areas by 40% in all forms and types, in accordance with the Law on Urban Greenery.

Urban greenery, particularly tree canopy size, delivers the most significant benefits. Since trees provide exponentially greater benefits compared to other types of greening, it is crucial for the municipality to establish specific and ambitious targets for tree canopy coverage[17]. The community's need for increased greening, especially on or around buildings, as part of the urban development, should be measured against these goals/targets.



From the previous diagram, it is clearly evident that the benefits for citizens increase with the expansion of green infrastructure, while preserving asphalt, concrete pavers (bekaton), and other similar surfaces does not lead to an improvement in the quality of life of citizens.

[17] Accepted recommendation from Civil Society Organizations

Achieving the goals will be ensured through the green portfolio of the Municipality of Gostivar, including:

- The contribution of tree-lined streets is to provide 40% of the green area with a minimum of 30% tree canopy coverage;
- The contribution of parks is to provide 86% of the green area with a minimum of 30% tree canopy coverage;
- The contribution of green squares is to provide 28% of the green area with a minimum of 25% tree canopy coverage;

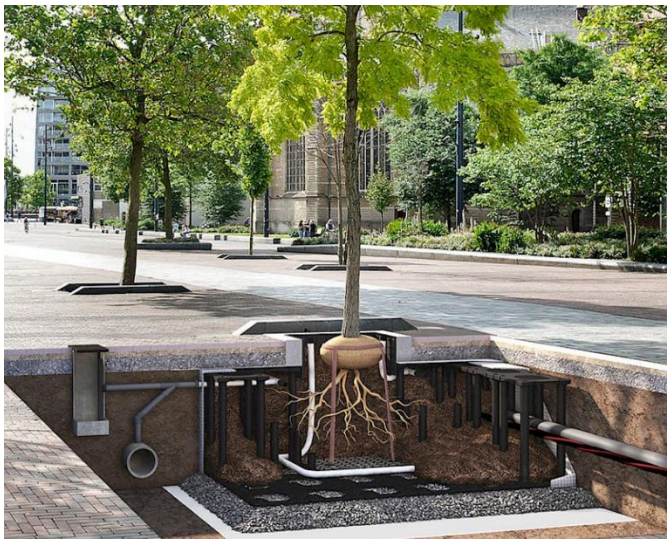
The city will develop policies, programs and projects to help all stakeholders parties meet these goals through:

- An increased number of tree-lined streets, street gardens and plantings, with more street trees planted. A comprehensive overview is required to ensure selection of diverse tree species appropriate for specific locations;
- Establishing park areas where feasible;
- Greening vacant spaces by developing planning tools and programs, even for areas not owned by the municipality, using resources from the designated Green Fund. This will support the achievement of both green area percentage and tree canopy cover goals; This also includes green roofs, walls and facades;

When selecting urban trees, four basic selection principles should be followed:

- Trees must be resistant to pests and adapted to urban environmental conditions;
- Trees must be highly diverse, including native and non-native species, while avoiding invasive species;
- Trees must meet functional and design goals;
  Trees must be manageable within existing maintenance constraints;

Therefore, it's not just about planting a tree, but also about continuous researching how to make better choices of trees for challenging urban locations, ensuring long-term benefits that we can all enjoy.



Flowers in the city – decoration that makes a difference

In every city, greenery is one of the most important elements, but in addition to green spaces, a key role is also played not just by long-living trees, but by beautiful colorful flowers. For this reason, many municipalities prioritize urban flowers, with the single goal of creating a public space that is welcoming to people. Although decorating parks or squares with plants is not an issue, it is often much more difficult to find a suitable place for greenery closer to or in the very city center. As part of this Study, a special approach is recommended for planting flowers, whereby not all of them need to be planted directly in the soil - on the contrary.

In search of a compromise between the built-up grey areas and the need for green areas, the installation of **large flower pots**. This is an excellent solution that allows for introducing greenery incrementally while also making the concrete landscape feel less dull and gray. Flower pots in the city can be made from various materials, and the city center is a recommended location, especially since the square in the Municipality of Gostivar is relatively small.

We therefore propose the use of so-called XXL flower pots, in vibrant colors. Instead of concrete, we suggest using an alternative material, for example polyethylene, which is equally durable and resistant to outdoor conditions. Flower pots made of this material can be produced in any color and shape.

Figure 47 – Flower arrangement on the bridge over the Vardar River

Goal 2 - Greenery for all

It is the obligation of the municipality to ensure sufficient and high-quality greenery within its territory. It is also imperative that the local population has equal access to the benefits of greening.

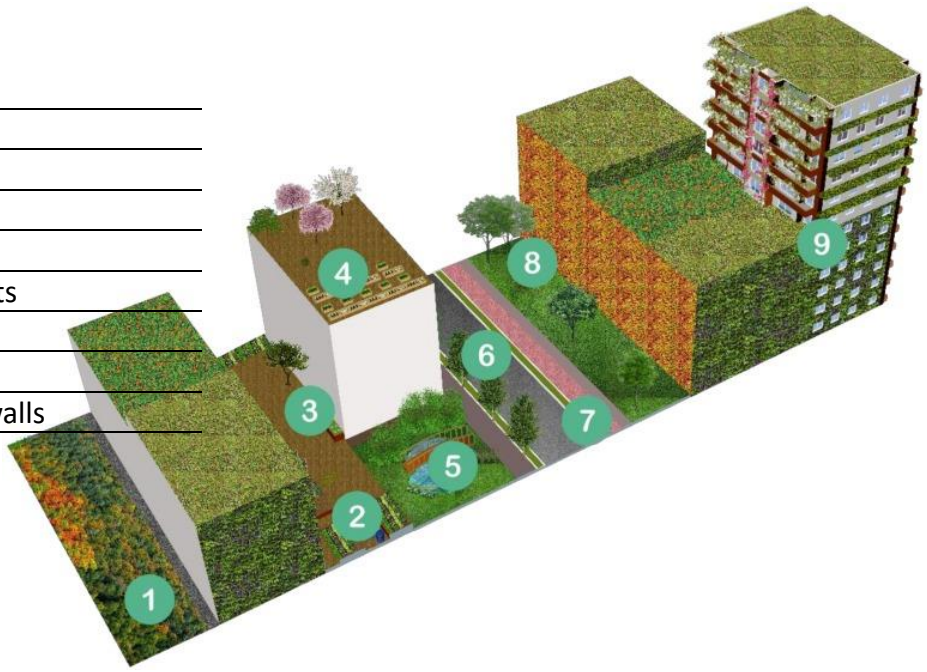
To achieve the goal, “Greenery for all”, the following actions are necessary:

- Equitable distribution of greenery
  - Regular mapping of all locations, to avoid favoring only certain neighborhoods;
- Fair access to green spaces
  - Green spaces should be easily accessible to both children and adults, including people with disabilities;
- Adaptation to new challenges, especially climate change
  - Analysis and apply scientific data when planting greenery (trees, plants) that best combat climate change and pollution;

The concept of ‘Greenery for all” includes several categories and is presented in Figure 46:

Figure 48 – Types of greenery in urban environments

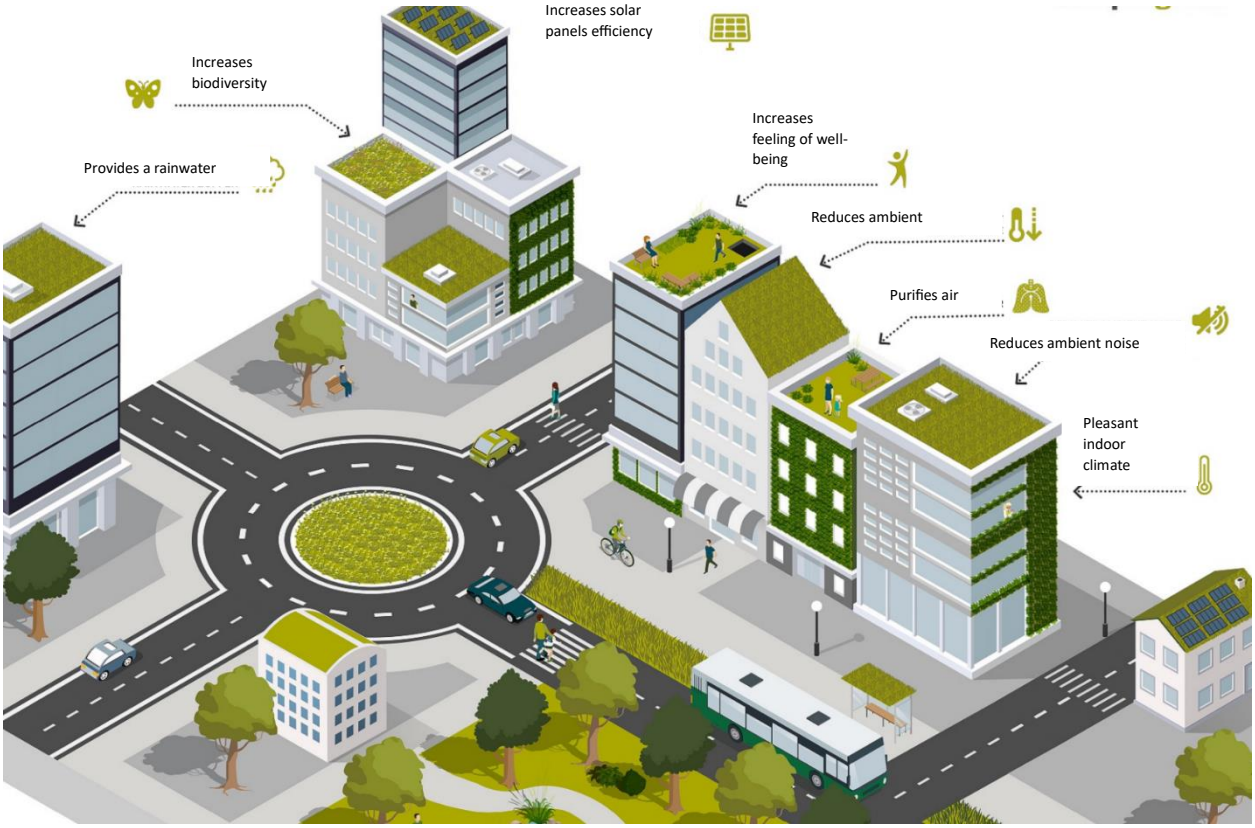
1.	Urban Park
2.	Parceled gardens
3.	Botanical gardens
4.	Green roofs
5.	Wildlife ponds
6.	Trees on the streets
7.	Bio
8.	Home gardens
9.	Green buildings, walls



Greening of roofs and walls

To encourage the installation of green roofs and walls, it is proposed that the Council of the Municipality of Gostivar adopt a decision, granting partial exemption from utility fees for new investors who implement green roofs or walls on their buildings. Since the maintenance of individual buildings is the responsibility of the residents, it is proposed that public institutions have the initial priority in installation.

Figure 49 – Benefits of green roofs and walls



Note:

In the fight against the energy crisis, while also preserving nature, the combination and construction of solar green roofs has become a global trend. This involves a combination of solar panels and green roofing. Solar green roofs are implemented in various ways, and this combination has several advantages:

- increased efficiency of solar radiation;
- enhancement of biological diversity;
- protection of the waterproofing layer from thermal and mechanical stress;
- Avoidance of point loads;

The effects of installing a green roof are summarized in Figure 48:

Figure 50 – Effects of installing a green roof

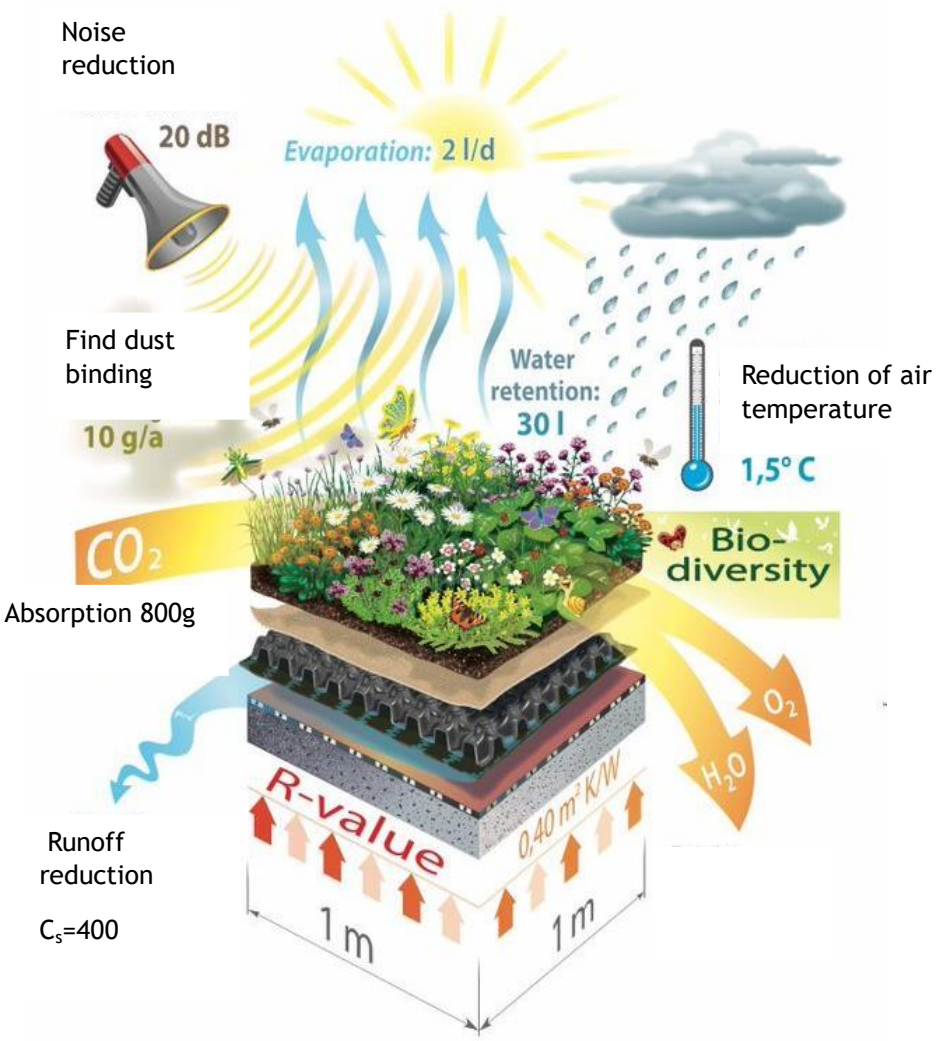
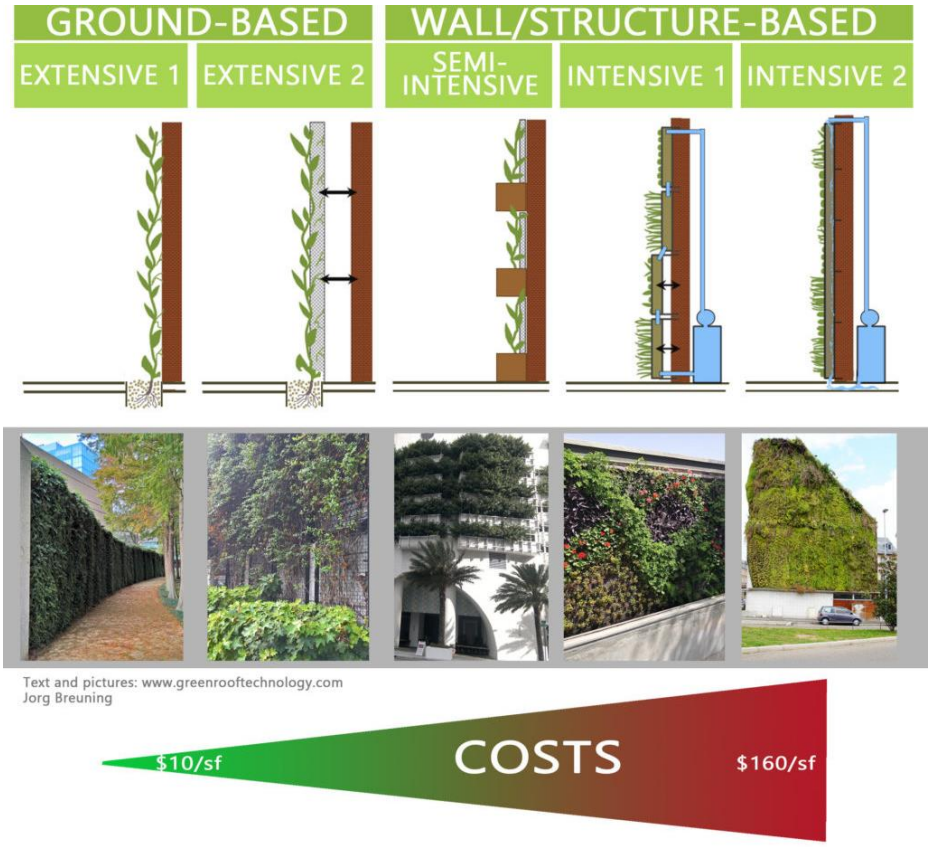


Figure 51 - Types of green walls and differences in installation cost[18]



Examples of green roofs and green walls:

[18] https://greenrooftechnology.com/living-architecture/green-walls/

Goal 3 – Bringing nature into the city

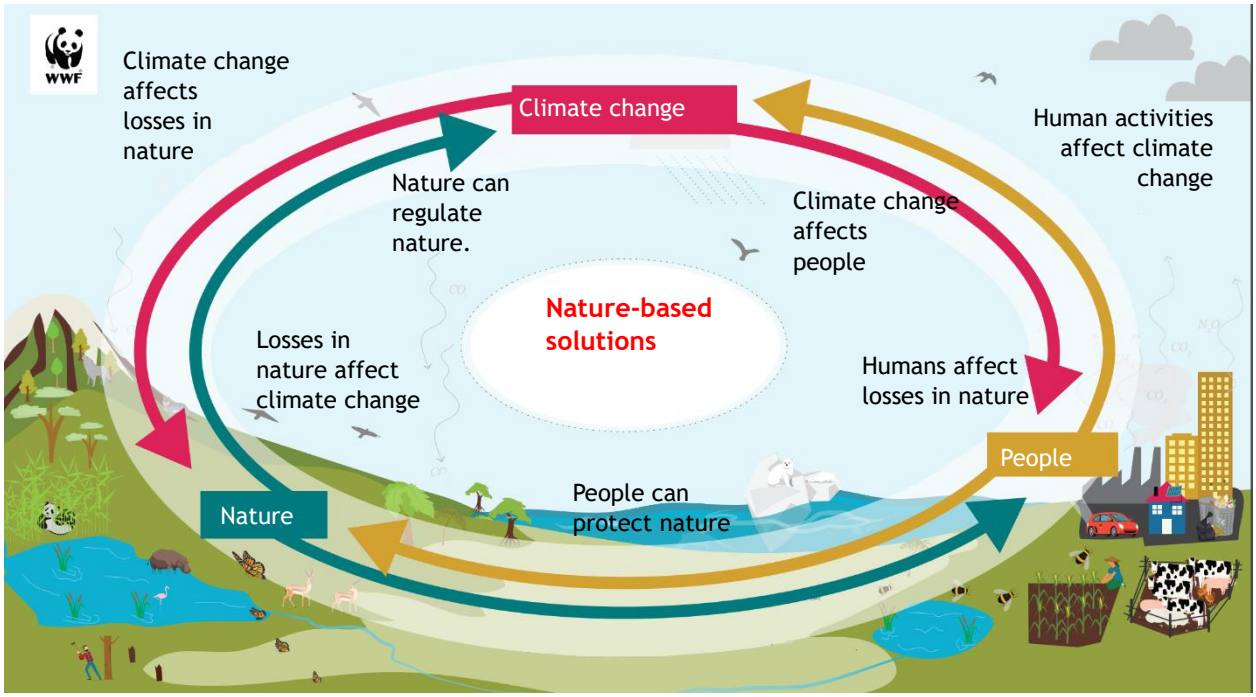
Cities that are considered advanced and modern have quickly embraced scientific data and facts, implementing a comprehensive approach to the energy and natural resources are used, and have swiftly prepared for the impact of climate change. Addressing these challenges requires strategic and systemic thinking and must be part of any study related to urban greenery. Solutions do exist and nature offers many of the answers, even for our cities. This includes incorporating nature-based solutions into cities and urban environments[19].

Figure 52 - Effects of green spaces

[19] https://www.upsurge-project.eu/nature-based-solutions-cities/

Figure 53 shows the concept of implementing nature-based solutions:

Figure 53 - Model of Nature-based solutions



Nature-based solutions, as defined by the IUCN[20] are "actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits."

These solutions include knowledge in their implementation to build resilience, with both social and environmental benefits, including:

- Natural habitats, for biodiversity and the migration of native species;
- Open green spaces, for recreation;
- Carbon sequestration to achieve mitigation goals in line with climate action;
- Water regulation, supply and purification, ensuring water security and reducing disaster risk;
- Greener and healthier transportation, including implementing bike lanes within these corridors and promoting more walking paths;
- Cleaner air, by using nature-based urban solutions as natural filters;
- Lower temperatures, including addressing the urban heat island effect;

Science has identified four main goals that can be achieved with nature-based solutions:

- Improving sustainable urbanization through nature-based solutions can stimulate economic growth as well as environmental improvement, making the Municipality of Gostivar more attractive with enhanced well-being of citizens;
- By restoring degraded ecosystems using nature-based solutions, the resilience of ecosystems can be improved, enabling them to deliver vital ecosystem services, thus addressing other societal challenges;

[20] https://www.iucn.org/

- Plans that develop adaptation and climate change mitigation using nature-based solutions can ensure a more resilient municipality;
- Improving risk management and resilience using nature-based solutions can provide greater benefits than conventional methods, offering synergies in reducing multiple risks;

Therefore, **the solution is green**.

Practical solutions, which are part of adaptation measures, include highly effective and socially accepted measures that can be a package of solutions, including:

- Rain gardens combined with tree pits
- Residential and low green roofs
- Planting trees and shrubs
- Residential areas of planting/gardening
- Permeable paving
- Grass pools
- Bee hotel

Bee hotels are an excellent way to help solitary bees, thereby strengthening biodiversity. They are called "solitary bees" because they build individual nest cells for their larvae. Many solitary bees are very small and we may not even realize they are bees. Solitary bees are harmless. They do not have painful stings like regular bees.

The location of a good bee hotel is key. The bee house must be placed in full sunlight, facing southeast or south, at least one meter above the ground, with no vegetation in front of it that would block the entrances to the tunnels. Solitary bees are cold-blooded and rely on the sun's warmth to warm them in the morning, hence the need for a sunny location.

Goal 4 – Let's go green together

For the successful implementation of the Study, the involvement of citizens and businesses in the municipality's plans is of particular importance. Additionally, the study emphasizes the need for an institutional framework in the process of implementing the planned activities. It is proposed to establish a steering committee chaired by the mayor, with members appointed by the Council of the municipality of Gostivar that include municipal administration staff from relevant sectors, as well as experts from the academic community and representatives from civil society organizations, by decision of the Council of the Municipality of Gostivar. By a decision of the Council, a Rulebook will be adopted with a commitment to public transparency and monitoring the implementation of the Study. Recommendations:

- In collaboration with civil society organizations, develop a Green Volunteer Network, to enable the sharing of community knowledge, networking and learning both online and in person;
- Create marketing campaigns;
- Organize events to increase citizen involvement:
    - My balcony is the most colorful.
    - Our neighborhood is the greenest.

Priority green activities for implementation of the Study

- Tree planting campaigns
    - Planting 5,000 native trees in urban areas, with priority given to hotter zones and areas with lower living standards;
    - Joint actions with local schools for educational tree planting activities;
- Green infrastructure projects
    - Support for public-private partnerships in the installation of green roofs
    - Education on installing vertical gardens on unused walls;
- Green spaces in local communities
    - Mapping and planting greenery in the vacant spaces between buildings;
    - Equipping parks with multifunctional urban equipment;
    - Designing multifunctional spaces to host local events and activities;

Securing funding and resources

- Applying for grants from environmental funds and international organizations;
- Developing public-private partnerships to co-finance large-scale projects;
- Establishing a dedicated green fund within the municipality’s annual budget;

X. Action plan for the enhancing urban greenery

The Action Plan for the Study serves as a roadmap for transforming urban spaces into greener, more sustainable and more livable environments. The plan begins by defining clear goals and objectives, which form the foundation of the entire Study. These goals typically focus on increasing green spaces, improving biodiversity, mitigating the effects of climate change, and improving public health and well-being through access to natural spaces.

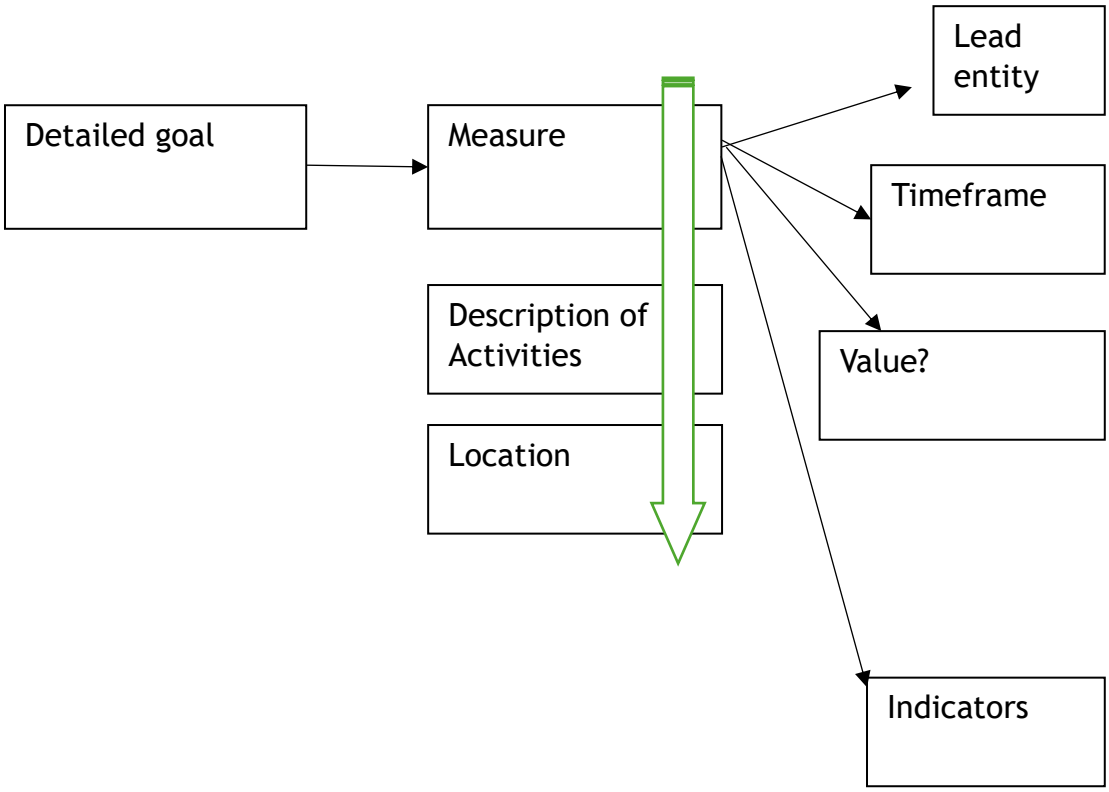
The Study suggests that the Municipality of Gostivar focus on conducting a review of existing green spaces and an assessment of environmental challenges, such as heat zones and areas with limited tree cover. These reviews will be used to provide necessary data to prioritize specific areas for intervention, as well as to map new potential spaces for greenery development. Public awareness campaigns and pilot greening projects, such as planting native trees in schools or creating small community gardens, can also be quickly initiated to accelerate the implementation process of the Study.

Stakeholder involvement is a critical element of the Action Plan. Urban greening requires an inclusive approach. Municipal planning departments usually lead implementation, supported by environmental protection institutions and other entities. It is important to emphasize that NGOs and community groups play a vital role in advocacy, education, and greening initiatives. Citizen engagement is especially important, as their participation in activities such as tree planting or urban gardening fosters a sense of ownership and ensures the long-term success of greening projects.

To ensure that the plan remains dynamic and effective, regular monitoring and evaluation are essential. The use of technology, such as GIS mapping and satellite imagery, enables real-time tracking of green cover and environmental impacts. Feedback from residents and stakeholders can also inform adjustments of the Study, ensuring that it evolves to meet changing needs and challenges.

An effective Action Plan not only outlines tasks - it inspires action, builds partnerships, and creates a shared vision for a greener, healthier urban future for the Municipality of Gostivar.

Figure 54 – Elements of the Action Plan



The action plan is presented through a general table, shown in Table 8, followed by a detailed breakdown of all proposed activities for the priority locations and accompanying activities.

Table 8 - General Action Table

Action / Initiative	Description	Timeframe	Stakeholders	Required resources	Expected results / indicators
Conduct urban green space audit in Gostivar	- Mapping existing green areas, trees and biodiversity; - Identifying areas for greening	1 – 6 months	Urban Planning Department, GIS experts	GIS software, surveys, NGO teams, budget	Comprehensive inventory of green spaces; identification of priority areas
Develop a policy framework	Creating policies to encourage investments in green roofs, tree planting and green corridors in urban planning	6 – 12 months	Municipal administration, Legal experts	Policy drafting, legal consultations	Adopted policies integrated into urban development regulations
Projects for greening the residents' surroundings	Launching community tree planting and urban garden activities in public spaces	1–2 years	NGOs, citizen associations, schools	Seedlings, tools, funding, volunteers	Increased green space; community (citizen) participation rate
Pilot green roof program	Promoting installation of green roofs on government and commercial buildings in pilot areas.	1–3 years	Local government, private development consultants	Funding, design expertise	Successful installation of X green roofs; documented energy savings
Establish urban forests	Developing urban forests in underused areas and around city outskirts	3–5 years	Environmental agencies, architects, agricultural experts	Access to land, native plant species	Creation X hectares of new urban forests; increased urban biodiversity
Establish green corridors	Connecting fragmented green spaces with corridors for potential wildlife and recreation.	3–5 years	Ecologists, city planners, transport department	Budget, land use data	Completion of X km of green corridors; improved connectivity with species
Implement maintenance programs	Developing long-term plans for maintaining new and existing green spaces	Continuous	Greenery Department, community groups	Training, equipment, continuous budget	Improved health of green spaces; reduced degradation rates
Raisie public awareness	Launching campaigns to educate citizens on the benefits of urban greenery	1–2 years, continuous	Marketing agencies, NGOs, municipal administration	Marketing budget, event resources	Increased public awareness; higher engagement in

Action / Initiative	Description	Timeframe	Stakeholders	Required resources	Expected results / indicators
	and how to increase their participation				greening activities
Monitor and evaluate progress	Using GIS, surveys and fieldwork to monitor changes in green spaces and project outcomes	Continuously	GIS experts, environmental experts	Monitoring tools, data analysis software	Annual report on green space coverage and appropriate biodiversity metrics

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 1: Let's turn gray into green				
Measure 1.1. Establishment of an urban park – location opposite KAM, (Zhito Shar), "Panche Poposki" street				
Activity 1.1.1 Analysis of the space for establishment of green space, urban park category	- Informed public; - Dashboards in the Green Cadastre	Municipality of Gostivar		2027
Activity 1.1.2 Project development	- Project prepared	Municipality of Gostivar, business entity		2027
Activity 1.1.3 Public call announcement	- Tender documentation prepared	Municipality of Gostivar		2028
Activity 1.1.4 Development of a park	- Construction logbook	Business entity		2028- 2029
Activity 1.1.5 Monitoring	- Increased number of visitors; - Reduced pollution; - Decrease in health issues; - Satisfied citizens	Municipality of Gostivar, NGOs		Continuously

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 1: Let's turn gray into green				
Measure 1.2 Establishment of greenery/tree line - "Braka Ginoski" Street				
Activity 1.2.1 Space analysis and location detection for tree line;	- Increased awareness;	Municipality of Gostivar, citizens from the relevant local community		2026
Activity 1.2.2 Project development for the establishment of greenery	- Finished project	Municipality of Gostivar, business entity		2026
Activity 1.2.3 Public call announcement	- Tender documentation prepared	Municipality of Gostivar		2026
Activity 1.2.4 Selection of seedlings	- Seedling list	Municipality of Gostivar, experts, NGOs		2026
Activity 1.2.5 Tree line establishment	- Construction logbook - Video recording	Business entity		2026
Activity 1.2.6 Monitoring	- Reduced pollution; - Decrease in health issues; - Increased % of green areas; - Increased public awareness; - Satisfaction with the work of the municipality; - Dashboards in the Green Cadastre;	Municipality of Gostivar, NGOs		Continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 1: Let's turn gray into green				
Measure 1.3 Establishment of a protective belt around the Dolomit factory				
Activity 1.3.1 Analysis of the area around the Dolomit factory to determine green space	- Dashboards in the Green Cadastre	Municipality of Gostivar		2025
Activity 1.3.2 Project development	- Project	Municipality of Gostivar, business entity		2025
Activity 1.3.3 Public call announcement	- Tender documentation prepared	Municipality of Gostivar		2025
Activity 1.3.4 Establishment of the protective belt	- Construction logbook - Video recording	Business entity		2025- 2026
Activity 1.3.5 Monitoring	- Reduced pollution; - Decrease in health issues; - Increased percentage of green areas;	Municipality of Gostivar, NGOs		Continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 1: Let's turn gray into green				
Measure 1.4. Establishment of a combined green parking lot, Blvd. "Goce Delchev", "Brakja Ginoski", "Nikola Parapunov"				
Activity 1.4.1 Mapping and analysis of the spatial potential for identifying an area, green parking lot category	- Informed public; - Dashboards in the Green Cadastre	Municipality of Gostivar		2026
Activity 1.4.2 Project development	- Finished project	Municipality of Gostivar, business entity		2026
Activity 1.4.3 Public call announcement	- Tender documentation prepared	Municipality of Gostivar		2026
Activity 1.4.4 Establishment of the combined green parking lot	- Construction logbook - Video recording	Business entity		2026- 2027
Activity 1.4.5 Monitoring	- Increased number of visitors; - Reduced pollution; - Decrease in health issues; - Satisfied citizens	Municipality of Gostivar, NGOs		Continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 1: Let's turn gray into green				
Measure 1.5. Establishment of a combined green parking lot, parking lot behind AD “Pelagonija”				
Activity 1.5.1 Mapping and analysis of the spatial potential for identifying an area, green parking lot category	- Informed public; - Dashboards in the Green Cadastre	Municipality of Gostivar		2027
Activity 1.5.2 Project development	- Finished project	Municipality of Gostivar, business entity		2027
Activity 1.5.3 Public call announcement	- Tender documentation prepared	Municipality of Gostivar		2027
Activity 1.5.4 Establishment of the green parking lot	- Construction logbook - Video recording	Business entity		2027- 2028
Activity 1.5.5 Monitoring	- Increased number of visitors; - Reduced pollution; - Decrease in health issues; - Satisfied citizens	Municipality of Gostivar, NGOs		Continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 1: Let's turn gray into green				
Measure 1.6 Establishment of greenery/tree lines - Boulevard "JNA"				
Activity 1.6.1 Space analysis and location detection for tree line;	- Increased awareness;	Municipality of Gostivar, citizens from the relevant local community		2026
Activity 1.6.2 Project development for the establishment of greenery	- Finished project	Municipality of Gostivar, business entity		2026
Activity 1.6.3 Public call announcement	- Tender documentation prepared	Municipality of Gostivar		2026
Activity 1.6.4 Selection of seedlings	- Seedling list	Municipality of Gostivar, experts, NGOs		2027
Activity 1.6.5 Tree line establishment	- Construction logbook - Video recording	Business entity		2027
Activity 1.6.6 Monitoring	- Reduced pollution; - Decrease in health issues; - Increased % of green areas; - Increased public awareness; - Satisfaction with the work of the municipality; - Dashboards in the Green Cadastre;	Municipality of Gostivar, NGOs		Continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 1: Let's turn gray into green				
Measure 1.7 New city square with green elements				
Activity 1.7.1 Analysis of the space and identification of needs for the city square and public call	- Increased awareness; - Involvement of experts;	Municipality of Gostivar, citizens from the entire municipality		2027
Activity 1.7.2 Project development for the establishment of the green square	- Project	Municipality of Gostivar, business entity		2027
Activity 1.7.3 Public call announcement	- Tender documentation prepared	Municipality of Gostivar		2027
Activity 1.7.4 Selection of trees	- Seedling list	Municipality of Gostivar, experts, NGOs		2028
Activity 1.7.5 Establishment of the green square	- Construction logbook - Video recording	Business entity		2028
Activity 1.7.6 Monitoring	- Reduced pollution; - Decrease in health issues; - Increased % of green areas; - Increased public awareness; - Satisfaction with the work of the municipality; - Dashboards in the Green Cadastre;	Municipality of Gostivar, NGOs		Continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 1: Let's turn gray into green				
Measure 1.8 Placing large (XXL) flower pots in front of business premises in the city center				
Activity 1.8.1 Mapping the area along the quay for the purpose of placing large flower pots for decorative and protective purposes	- Information on the municipality's website	Municipality of Gostivar, experts, public utility companies		2027
Activity 1.8.2 Development of a project for placing large flower pots and selection of flowers and low seedlings	- Finished project	Municipality of Gostivar, experts, public utility companies		2027
Activity 1.8.3 Public call announcement	- Tender documentation prepared	Municipality of Gostivar		2027
Activity 1.8.4 Placing the XXL flower pots	- Construction logbook - Video recording	Business entity, public utility company		2028 - continuous
Activity 1.8.5 Monitoring	- Increased pedestrian mobility - Reduced pollution - Satisfied citizens; - Increased green areas;	Municipality of Gostivar, NGOs		continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 1: Let's turn gray into green				
Measure 1.9 Green Cadastre				
Activity 1.9.1 Information about the need for a Green Cadastre	- Municipal Council decision	Municipality of Gostivar, experts		2026
Activity 1.9.2 Public call for the development of the Green Cadastre	- Tender documentation prepared	Municipality of Gostivar, experts, public utility companies		2026
Activity 1.9.3 Selection of a business entity for the development of the Green Cadastre	- Decision for selection, published on the municipality's website	Municipality of Gostivar		2026
Activity 1.9.4 Implementation	- Construction logbook - Video recording	Municipality of Gostivar, Business entity, public utility company		2027
Activity 1.9.5 Monitoring	- Satisfied citizens; - Increased transparency; - Inspection of the green spaces;	Municipality of Gostivar, NGOs		continuously

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 2: Greenery for all				
Measure 2.1 Installation of green roofs				
Activity 2.1.1 Analysis of locations for installation of green roofs	- Informed public	Municipality of Gostivar, NGOs, experts, educational institutions, business entities		2026
Activity 2.1.2 Project proposals for the installation of green roofs	- Project	Municipality of Gostivar		2026
Activity 2.1.3 Public call announcement	- Tender documentation prepared	Municipality of Gostivar		2026
Activity 2.1.4 Execution of construction works for green roofs	- Construction logbook - Video recording	Municipality of Gostivar, business entities,		Continuously
Activity 2.1.5 Monitoring	- Reduced pollution; - Reduced temperature; - Increased satisfaction with the work of the municipality; - Dashboards in the Green Cadastre;	Municipality of Gostivar, NGOs		Continuously

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 2: Greenery for all				
Measure 2.2 Installation of green walls				
Activity 2.2.1 Analysis of locations for installing of green walls	- Information available on the municipality's website	Municipality of Gostivar, NGOs, experts, educational institutions, business entities		2028
Activity 2.2.2 Project proposals for the installation of green walls	- Completed projects	Municipality of Gostivar		2028
Activity 2.2.3 Public call announcement	- Tender documentation prepared	Municipality of Gostivar		2029
Activity 2.2.4 Execution of construction works for green walls	- Construction logbook - Video recording	Municipality of Gostivar, business entities,		Continuous
Activity 2.2.5 Monitoring	- Reduced pollution; - Reduced temperature; - Increased satisfaction with the work of the municipality;	Municipality of Gostivar, NGOs		Continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 2: Greenery for all				
Measure 2.3 Establishment of greenery, tree line around the bus station				
Activity 2.3.1 Analysis of the area around the bus station	- Informed public	Municipality of Gostivar, NGOs, experts, educational institutions, business entities		2027
Activity 2.3.2 Project proposals for the development of a multifunctional park	- Finished project	Municipality of Gostivar		2027
Activity 2.3.3 Public call announcement	- Tender documentation prepared	Municipality of Gostivar		2027
Activity 2.3.4 Execution of construction works for the multifunctional park	- Construction logbook - Video recording	Municipality of Gostivar, business entities,		Continuous
Activity 2.3.5 Monitoring	- Reduced pollution; - Reduced temperature; - Increased satisfaction with the work of the municipality; - Dashboards in the Green Cadastre;	Municipality of Gostivar, NGOs		Continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 2: Greenery for all				
Measure 2.4 Establishment of a green corridor along the main road through the urban area of the Municipality of Gostivar				
Activity 2.4.1 Analysis of the area around the main road for establishing a green corridor	- Informed public through the municipality's website	Municipality of Gostivar, NGOs, experts, educational institutions, business entities, Ministry of Interior "Macedonian roads" (Road authority)		2028
Activity 2.4.2 Project proposals for the establishment of a green corridor	- Finished project	Municipality of Gostivar, Ministry of Interior "Macedonian roads" (Road authority)		2028
Activity 2.4.3 Public call announcement	- Tender documentation prepared	Municipality of Gostivar		2028
Activity 2.4.4 Execution of construction works for the multifunctional park	- Construction logbook - Video recording	Municipality of Gostivar, business entities,		2028- 2029
Activity 2.4.5 Monitoring	- Reduced pollution; - Reduced temperature; - Increased satisfaction with the work of the municipality; - Dashboards in the Green Cadastre;	Municipality of Gostivar, NGOs		Continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 2: Greenery for all				
Measure 2.5 Revitalization and establishment of a park area – Block 3 with urban equipment				
Activity 2.5.1 Analysis of the area within the park project – Block 3	- Informed public through the municipality's website	Municipality of Gostivar, NGOs, experts, international partners		2025
Activity 2.5.2 Project proposals for the establishment of a park area	- Finished project	Municipality of Gostivar, international partners		2025
Activity 2.5.3 Public call for construction works	- Tender documentation prepared	Municipality of Gostivar		2025
Activity 2.5.4 Execution of construction works for the multifunctional park	- Construction logbook - Video recording	Municipality of Gostivar, business entities,		2025 - 2026
Activity 2.5.5 Monitoring	- Reduced pollution; - Reduced temperature; - Increased satisfaction with the work of the municipality; - Dashboards in the Green Cadastre;	Municipality of Gostivar, NGOs		Continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 2: Greenery for all				
Measure 2.6 Establishment of a tree line along the pedestrian path, from Democracy Bridge to the Pedestrian Bridge				
Activity 2.6.1 Analysis of the area within the pollution reduction project	- Informed public through the municipality's website	Municipality of Gostivar, NGOs, experts, international partners, UNDP		2025
Activity 2.6.2 Project proposals for the establishment of a tree line along the pedestrian path	- Finished project	Municipality of Gostivar, international partners, UNDP		2025
Activity 2.6.3 Public call for implementation and selection of seedlings	- Tender documentation prepared	Municipality of Gostivar, UNDP		2025
Activity 2.6.4 Execution of construction works for the multifunctional park	- Construction logbook - Video recording	Municipality of Gostivar, business entities,		2025 - 2026
Activity 2.6.5 Monitoring	- Reduced pollution; - Reduced temperature; - Increased satisfaction with the work of the municipality; - Green Cadastre	Municipality of Gostivar, NGOs		Continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 2: Greenery for all				
Measure 2.7 Establishment of a tree line along the pedestrian path, from Belichica Bridge to the Pedestrian Bridge (north side)				
Activity 2.7.1 Analysis of the area within the pollution reduction project	- Informed public through the municipality's website	Municipality of Gostivar, NGOs, experts, international partners, UNDP		2025
Activity 2.7.2 Project proposals for the establishment of a tree line along the pedestrian path	- Main project	Municipality of Gostivar, international partners, UNDP		2025
Activity 2.7.3 Public call for implementation and selection of seedlings	- Tender documentation prepared	Municipality of Gostivar, UNDP		2025
Activity 2.7.4 Execution of construction works for the multifunctional park	- Construction logbook - Video recording	Municipality of Gostivar, business entities,		2025 - 2026
Activity 2.7.5 Monitoring	- Reduced pollution; - Reduced temperature; - Increased satisfaction with the work of the municipality; - Green Cadastre	Municipality of Gostivar, NGOs		Continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 2: Greenery for all				
Measure 2.8 Establishment of a tree line along the pedestrian path, from Belichica Bridge to the Pedestrian Bridge (south side)				
Activity 2.8.1 Analysis of the area within the pollution reduction project	- Informed public through the municipality's website	Municipality of Gostivar, NGOs, experts, international partners, UNDP		2025
Activity 2.8.2 Project proposals for the establishment of a tree line along the pedestrian path	- Main project	Municipality of Gostivar, international partners, UNDP		2025
Activity 2.8.3 Public call for implementation and selection of seedlings	- Tender documentation prepared	Municipality of Gostivar, UNDP		2025
Activity 2.8.4 Execution of construction works for the multifunctional park	- Construction logbook - Video recording	Municipality of Gostivar, business entities,		2025 - 2026
Activity 2.8.5 Monitoring	- Reduced pollution; - Reduced temperature; - Increased satisfaction with the work of the municipality; - Green Cadastre	Municipality of Gostivar, NGOs		Continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 3: Let's bring nature to the city				
Measure 3.1 Placing hanging flowers on all bridges over the Vardar River				
Activity 3.1.1 Analysis of the space and fencing of the bridges over the Vardar River	- Informed public through the municipality's website	Municipality of Gostivar, NGOs, experts, educational institutions, business entities		2026
Activity 3.1.2 Project proposals for the development of a multifunctional park	- Main project	Municipality of Gostivar		2026
Activity 3.1.3 Public call announcement	- Tender documentation prepared	Municipality of Gostivar		2026
Activity 3.1.4 I=Placing of hanging flowers on the bridge fencings	- Construction logbook - Video recording	Municipality of Gostivar, business entities,		Continuous
Activity 3.1.5 Monitoring	- Reduced pollution; - Reduced temperature; - Increased satisfaction with the work of the municipality; - Dashboards in the Green Cadastre;	Municipality of Gostivar, NGOs		Continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 3: Let's bring nature to the city				
Measure 3.2 Construction of a bee hotel in the part area near the Vardar River				
Activity 3.2.1 Selection of location for the bee hotel	- Information shared via the municipality website	Municipality of Gostivar, NGOs, agricultural experts, educational institutions		2030
Activity 3.2.2 Construction of the bee hotel	- Increased biodiversity protection; - Increased education; - Increased public awareness;	Municipality of Gostivar, NGOs, business entities, educational institutions		2030
Activity 3.2.3 Maintenance of the established hotels;	- Increased inclusiveness - Increased youth participation;	Municipality of Gostivar, NGOs, Youth Council, educational institutions		Continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 3: Let's bring nature to the city				
Measure 3.3 Establishment of micro farms				
Activity 3.3.1 Municipal Council decision to stimulate the establishment of micro farms	- Municipal Council decision	Municipality of Gostivar, NGOs, agricultural experts, educational institutions		2030
Activity 3.3.2 Mapping potential sites for micro farms (suitable buildings, business entities)	- Overview of potential areas	Municipality of Gostivar, NGOs, business entities, educational institutions		2030 -
Activity 3.3.3 Establishment and maintenance of established micro farms, supported by the municipality	- Increased biodiversity protection; - Increased education; - Increased public awareness;	Municipality of Gostivar, agricultural experts, hospitality businesses		Continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 3: Let's bring nature to the city				
Measure 3.4 Establishment of a botanical garden				
Activity 3.4.1 Municipal Council to establish a botanical garden	- Municipal Council decision	Municipality of Gostivar, NGOs, agricultural experts, educational institutions		2030
Activity 3.4.2 Mapping of potential spaces for the botanical garden (a mini-park is a possible option)	- Overview of potential areas	Municipality of Gostivar, NGOs, business entities, educational institutions		2030
Activity 3.4.3 Public call announcement for the establishment of a botanical garden	- Published decision	Municipality of Gostivar		2031
Activity 3.3.4 Establishment and maintenance of established micro farms, supported by the municipality	- Increased biodiversity protection; - Increased education; - Increased public awareness;	Municipality of Gostivar, agricultural experts		2031 - Continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 4: Let's go green together				
Measure 4.1 Establishment of a green area for seedlings for every newborn (alternative location – around the stadium)				
Activity 4.1.1 Analysis of the space and selection of a dedicated location for a green area where each newborn receives their own seedling from the municipality, planted by the parent(s);	- Increased awareness;	Municipality of Gostivar		2025
Activity 4.1.2 Project development for the establishment of greenery	- Plan, project	Municipality of Gostivar, business entity		2025
Activity 4.1.3 Public call announcement	- Tender documentation prepared	Municipality of Gostivar		2025
Activity 4.1.4 Selection of seedlings	- Decision of the Commission	Municipality of Gostivar, experts, NGOs		2026
Activity 4.1.5 Establishment of the green area	- Construction activities - Video recording	Business entity		2026
Activity 4.1.7 Monitoring	- Reduced pollution; - Increased % of green areas; - Increased public awareness; - Satisfaction with the work of the municipality	Municipality of Gostivar, NGO		Continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 4: Let's go green together				
Measure 4.2 Inclusion of the local community in urban greenery				
Activity 4.2.1 Adoption of a plan for citizen participation in the greening process (annual campaigns)	- Increased awareness; - Increased inclusiveness	Municipality of Gostivar, NGOs, Youth Council, educational institutions		2025
Activity 4.2.2 Education of local community members about the importance of their active participation in the process of improving the quality of community green spaces;	- Increased awareness of urban greenery and its benefits;	Municipality of Gostivar, NGOs, Youth Council, educational institutions		Continuous
Activity 4.2.3 Involvement of citizens (members of local communities) in defining projects;	- Increased awareness; - Increased inclusiveness	Municipality of Gostivar, NGOs, local community councils, educational Institutions		Continuous
Activity 4.2.4 Continuous involvement of local community members in analysis and quantitative and qualitative evaluation of established greenery;	- Reduced maintenance costs; - Increased visitation; - Increased satisfaction with the work of the municipality	Municipality of Gostivar, NGOs, local community councils		Continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 4: Let's go green together				
Measure 4.3 Establishment of a Steering Committee for the development of urban greenery				
Activity 4.3.1 Adoption of a Decision to establish a Steering Committee for the development of urban greenery, including various entities and stakeholders from the environmental protection and urban greenin sectors;	- Municipal Council decision; - Increased awareness; - Increased inclusiveness	Municipality of Gostivar		2025
Activity 4.3.2 Public call for participation in the Steering Committee through interest groups and stakeholders	- Published public call decision	Municipality of Gostivar		2025
Activity 4.3.3 Adoption of the Rulebook of the Steering Committee for the development of urban greenery	- Rulebook	Steering Committee		Continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 4: Let's go green together				
Measure 4.4 Campaign: Our neighborhood park is the most beautiful.				
Activity 4.4.1 Adoption of a decision for a joint campaign to reward the urban community with the best landscaped park;	- Municipal Council decision; - Increased awareness; - Increased inclusiveness	Municipality of Gostivar		2027
Activity 4.4.2 Selection of a campaign for the award initiative	- Municipal Council decision; - Increased transparency	Municipality of Gostivar		2027
Activity 4.4.3 Joint action	- Increased awareness; - Increased inclusiveness; - Added educational value on the importance of green spaces; - Increased number of green landscaped areas;	Citizens		2027 - continuous
Activity 4.4.4 Awarding of prizes	- Satisfied citizens; - Increased awareness;	- Municipality of Gostivar - Business community		Continuous

Objective/Measure/Activity	Indicators	Lead entity	Value	Time frame
Goal 4: Let's go green together				
Measure 4.5 Campaign: Procurement of micro sensors for monitoring PM10 and PM2.5				
Activity 4.5.1 Mapping of locations (suggesetd: "Brakja Ginoski" street) where sensors will be installed	- Municipal Council decision; - Increased awareness; - Increased inclusiveness	Municipality of Gostivar, experts		2026
Activity 4.5.2 Public call for procurement of sensors	- Municipal Council decision; - Increased transparency	Municipality of Gostivar		2026
Activity 4.5.3 Installation of sensors and appropriate campaign	- Increased awareness; - Increased inclusiveness; - Added educational value on the importance of green spaces;	Business entity		2026 - continuous
Activity 4.5.4 Monitoring	- Satisfied citizens; - Increased awareness;	- Municipality of Gostivar - Business community		Continuous

Conclusion

The study is just the first step in the efforts of the Municipality of Gostivar to develop a modern, urban, green and climate-resilient municipality. It provides guidance on the direction in which urban greenery should be developed, aiming in one hand to reduce urban sprawl, and on the other, to improve the quality of life for citizens.

The study offers the municipal leadership an opportunity to engage a large number of citizens in a transparent and inclusive process toward joint green development of the municipality, and by doing so, create strong cohesion between the Municipality's vision and the needs of its citizens.

For successful implementation, the Study recommends:

- long-term commitment;
- increased investments;
- continuous innovation and
- collaboration between government agencies, the private sector, civil society organizations and citizens;

The Municipality of Gostivar is one of the few municipalities in the Republic of North Macedonia actively pursuing a green agenda, with the park and the quay of the Vardar River standing out for their beauty. Furthermore, this Study offers a new perspective for the Municipality of Gostivar, allowing it to proudly showcase its urban green development.

Annex 1 – Citizen Questionnaire

"Local green space" *refers to a green space in the vicinity of your residence, no more than 100m away.*

- ***"Green Fund"*** *is a designated fund, created within the municipal budget for investments in urban greenery. In addition to funds from the municipality, the Fund will collect donations from citizens and businesses.*
- ***"Micro farm"*** *is an urban green area where fruits or vegetables are grown locally.*

Thank you!

II – Questions on local green spaces

1. Do you have a green space in the area where you live?

   Yes ☐ No ☐

   4.1. In the last 12 months, how often have you visited your local green space? (if the answer to 4. is "Yes")

   Every day ☐
   Several times a week ☐
   Once a week ☐
   Several times a month ☐
   Several times in 6 months ☐
   Once a year ☐
   Never ☐

   4.2. Would you like to have a green area in your place of residence?
   (if the answer to 4. is "No")

   Yes ☐ No ☐

   4.2.1. If the answer is Yes, please suggest a location in the area where you live where you would like to have a green space:

   Address: _____

   Nearby building or landmark: _____

I would like the local green space to be:

(multiple answers possible)

A place for relaxation ☐
A place for recreation ☐
An attractive place for tourists ☐
A safe place for children to play ☐
Nature in my neighborhood ☐
A place to meet neighbors/friends ☐
Other (please specify)_____

5. How far from your home is the nearest green space?

Less than 5 minutes ☐
5-10 minutes ☐
10-25 minutes ☐
More than 30 minutes ☐
I don't know. ☐

6. Overall, does your local green space meet your needs?

Fully meets my needs ☐ Meets my needs ☐ Partially meets my needs ☐
Does not meet my needs ☐ I have no opinion. ☐

7. Would you consider cultivating a micro farm with some product in your local green space?

Yes ☐ No ☐ Maybe ☐ I have no knowledge about this. ☐

III – Investments in green areas in the municipality and their maintenance

8. How satisfied are you with the maintenance of greenery in the municipality?

Very satisfied ☐ Somewhat satisfied ☐ Slightly satisfied ☐ Not at all satisfied ☐ I have no opinion. ☐

9. What is your opinion on the overall existing greenery in the municipality?

There is a lot. ☐ There is enough. ☐ It could be improved ☐
There is not enough ☐ I have no opinion. ☐

10. In which location within the municipality do you think a green space should be developed:

    Address: _____

    Nearby building or landmark: _____

11. What type of public green space should be developed in the Municipality of Gostivar? (multiple answers possible)

    Park ☐
    Tree-lined street ☐
    Green corridor ☐
    Protected green space ☐

    Other (please specify)_____

12. What type of other green spaces should be developed in the Municipality of Gostivar? (multiple answers possible)

    green areas around residential buildings ☐
    green areas near to commercial and business buildings ☐
    green areas near to public institution buildings ☐
    green areas near to production facilities ☐
    green areas near to sports facilities or memorial spaces ☐
    green areas along infrastructure ☐
    special green complexes ☐
    nurseries ☐
    green rooftops and vertical greenery on facades ☐

    Other (please specify)_____

13. Would you contribute funds to the "Green Fund" which, according to the law, would exclusively manage investments in urban greenery in your municipality?

    Yes ☐ No ☐

Annex 2 – Types of wood

CATALPA BIGNONIOIDES Nana - Catalpa 10/12 stem circumference, height 2.5 – 3m

Catalpas are beautiful trees, and the 'nana' variety is a fantastic compact form, making it well suited for those with less space. The attractive large heart-shaped leaves are attractive in mid-green during the growing season and turn buttery yellow in autumn.

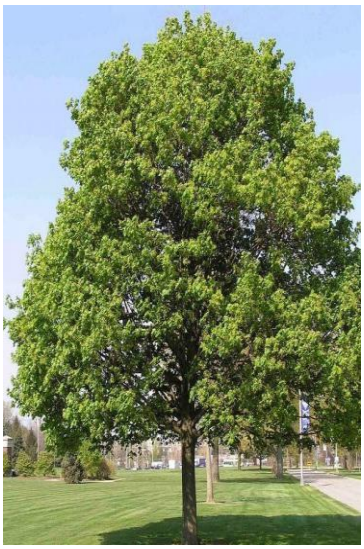
FRAXINUS EXCELSIOR, Ash Tree (Fraxinus) 10/12 stem circumference, height 2.5 – 3m

White or common ash

The ash tree (Fraxinus) is a widely distributed species and a true ornament of nature, found both in mountainous and lowland areas. Its natural splendor is most noticeable in spring, particularly in May and June, when it blooms with beautiful white and yellowish broad flowers, that cover almost the entire canopy of the tree.

ACER PLATANIODES – Maple 10/12 stem circumference, height 2.5 – 3m

It forms a dense crown with widely spaced branches. The buds are reddish-purple, a clear difference from *A. pseudoplatanus* which has green buds. The large, opposite leaves have coarsely serrated edges. The leaf stem contains a milky sap, another major difference with *A. pseudoplatanus.* In autumn, the foliage often turns a striking golden yellow. A very strong tree that can be used in a wide range of locations.



LAGERSTROEMIA INDICA, Lagerstroemia indica - Indian Lilac - Height 3 m, stem circumference 14 cm, crown diameter 80 cm.

The Indian Lilac is a fast-growing tree with several appealing characteristics, most notably its long-lasting, rich and attractive summer blossoms in vibrant colors. It is ranked among the top 10 ornamental flowering trees, and is a popular choice in landscaping. The flowers, which the tree is best known for, can be white, red, purple or pink. One of the features that makes this species especially beloved is its ability to retains its flowers for an extended period.

<u>ROBINIA UMBRACULIFERA,</u> Robinia Umbraculifera - Mophead or Globe Locust

Height up to 6 m, with a dense, spherical crown, with a diameter of up to 4 m. 350/400 cm

Once a very popular tree in the tree-lined streets of our cities. It has a wide range of uses: small gardens, front yards, narrow streets, pedestrian zones, architectural gardens, green urban spaces.

Choosing the right tree species is crucial for improving air quality in North Macedonia, especially for capturing PM10 particles. Here are a few species recommendations suitable for the region:

1. Macedonian pine (Pinus peuce)

• Description: Also known as the Balkan pine, this species is native to the mountains of North Macedonia. It thrives at altitudes between 1,000 and 2,200 meters and can reach heights of 35-40 meters;

• PM10 absorption efficiency: High. The needle-like leaves with a rough texture are effective at capturing particles;

• Additional benefits: Adaptable to harsh mountain climates, making it valuable for afforestation and erosion control;

2. Horse Chestnut (Aesculus hippocastanum)

• Description: a deciduous tree known for its dense foliage and distinctive conical flower clusters;

• PM10 capture efficiency: Very high. Research has shown that it effectively removes PM10 particles from the air.

• Additional benefits: It provides ample shade and is aesthetically pleasing in urban environments.

3. European White Poplar (Populus alba)

• Description: Fast-growing deciduous tree with characteristic white bark and leaves.

• PM10 capture efficiency: High. Effective in removing various air pollutants, including particulate matter.

• Additional benefits: Contributes to carbon sequestration and adapts well to different soil types.

4. Small-leaved Lime (Tilia cordata)

• Description: A deciduous tree with dense foliage and fragrant flowers.

• PM10 capture efficiency: High. Its dense foliage improves the accumulation of particles.

• Additional benefits: Supports urban biodiversity by attracting pollinators.

5. Field Maple (Acer campestre)

• Description: Small to medium-sized deciduous tree known for its tolerance to urban conditions.

• PM10 capture efficiency: moderate to high. Its dense canopy helps trap airborne particles.

• Additional benefits: Adaptable to different soil types and conditions, making it suitable for urban planting.

Incorporating a mix of these species can optimize PM10 capture throughout the year, taking into account both evergreen and deciduous varieties. It is also helpful to include shrubs such as Viburnum (Viburnum lucidum) and Japanese Spindle (Euonymus japonicus) to create comprehensive vegetative barriers that capture pollutants at different heights.

Literature

- https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en
- https://www.eea.europa.eu/highlights/how-green-are-european-cities
- https://nbsguidelines.info/
- https://thegreencities.eu/
- https://environment.ec.europa.eu/topics/nature-and-biodiversity/green-infrastructure_en
- Urban Gardening Handbook, Amadora Innovation/ Amadora Innovations BUPNET GmbH Einurd XWHY / Understanding Agency KMOP | Athens KMOP | Skopje Author Dimaka Dafni, KMOP, Greece
- Street Tree Management in Barcelona, City of Barcelona
- Greening Sydney strategy, City of Sydney, 2023
- Study on the development of the green space system of the city of Novi Sad 2015-2030, City of Novi Sad
- https://vlada.mk/PlanZaChistVozduh
- https://www.reliance-foundry.com/blog/best-trees-for-streets-and-tree-grates