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# A green infrastructure paradigm for Prishtina. Learning from Best practice, identifying systems and key components for approaching Green Infrastructure Strategy

Key words / Green Infrastructure, Sustainable Spatial Planning, Green Network, Multi Functionality, Landscape Conservation

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## Abstract

*In the global world, Green infrastructure is being a highly suggested framework, as a successful strategy for dealing with smart development and a necessity application towards sustainable spatial planning.*

*Implementing Green Infrastructure in the cities, has resulted with benefits in several aspects regarding the environment, image of the city, population health and also biodiversity conservation.*

*The impact of the Green Infrastructure, especially in the cases of cities dealing with urban sprawl, air pollution, land waste, as well as social and economic chaos, is considered a great potential for addressing most of these issues.*

*Green Infrastructure is achieved through application of processes and policy themes which constitute the principles of Green Infrastructure, as an approach to promote and contribute to the quality of life and resilient cities.*

*This paper argues for a critical and local approach of Green Infrastructure in Prishtina, in order to initiate and facilitate the adaption of this framework in planning processes and implementation phases. The research aims to provide a framework for conceptualizing further applications of GI<sup>1</sup> in the level of municipality territory.*

*First, the research aims to understand the principles and concepts of Green Infrastructure systems during the literature review, focusing in the assessment of green systems in the local, national and international policies.*

*Mapping the territory of the city and evidencing the main issues; land use, natural assets as well as agricultural sites, pollutant elements and green urban spaces, is considered an indispensable phase for the elaboration of this study.*

*A further understanding of other cities experience is accomplished by conducting a comparative analysis of GI principle applications in three case studies, to conceptualize successful interventions in green spaces in urban environments.*

*Hence, to generate an outcome of local elements, as proposals and recommendations for approaching Green Infrastructure in Prishtina, these layers are overlapped with the concept of GI as a system of links, hubs and sites. This concept is elaborated by Benedict and McMohan, two researches who have significantly contributed to the understanding, defining and approaching GI and which would be cited in the following parts of the article.*

*The research finally aims to give in site-recommendations for comprehending, approaching, and implementing the GI Strategy in the specific context of Prishtina Municipality, as a result of researching phase.*

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<sup>1</sup> / Hereafter, GI would be used as an acronym for Green Infrastructure

## Defining Green Infrastructure

The term Green Infrastructure (hereafter as GI), is certainly a broad concept. Technically, it is thought to have originated sometime in the mid-1990s, whilst the definition also varies from the context. "For example, some people refer to trees in urban areas as green infrastructure because of the 'green' benefits they provide, while others use Green Infrastructure to refer to engineered structures" (Benedict, Mark A., McMahon, Edward T., 2012, p. 5). The first effort on integrated green infrastructure design, was born in 1990, in US, when Maryland began an initiative of greenways planning, which paved the way for green infrastructure (Benedict, Mark A., McMahon, Edward T., 2012, p. 35).

However, the first initial attempts to identify the GI as systems, are considered to have originated much earlier by Frederic Law Olmsted, with the 'concept of connected system of parks' (Martin, 2011, p. 376) and by Howard (1902) in (NATURA Environmental Consultants, David O'Connor, 2008, p. 12) who sustained the idea of satellite communities, defining the limits of the city by greenbelts.

In the European Level, European Commission has presented the main principle of GI, dedicated to 'protecting and enhancing nature and natural processes' (E.C., 2013, p. 2), but trying to define GI, is important to understand it as '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; in terrestrial, aquatic, coastal & marine environments; (E.C., 2013, p.3).

This definition includes three important aspects: the idea of a network, the planning and management component

and the concept of ecosystem (Hartig, T., Mitchell, R., De Vries, S., Frumkin, H., 2014).

The GI term is certainly captured in a wide perspective as "an interconnected network of natural areas and other open spaces that conserves natural ecosystem values and functions, sustain clean air and water and provides a wide array of benefits to people and wildlife" (Benedict, Mark A., McMahon, Edward T., 2002, p. 5).

Despite the flexibility of the theoretical concepts or policies guidelines, practical applications have been relevant in the development of the GI concept in specific contexts. In any case, what the scholars have agreed about GI, are the main principles represented by connectivity, multi-functionality and integrating networks. Moreover, it is necessary to understand that GI represents a holistic system which requires a long-term commitment, participation of many stakeholders and the engagement of the community (Benedict, Mark A., McMahon, Edward T., 2002, p. 24).

Green Infrastructure has become significantly important in spatial and environmental planning. It has been presented as a potential answer to address multi challenges, therefore it has gained special attention in the overall spatial policies in national<sup>2</sup>.

Research shows "that access to decent green space, alongside access to housing, health and education, is a basic requirement for a good quality of life" (CABE, 2010, p. 44). While Benedict and McMahon (2012, p.5) refers to protection of natural system as a necessity, not an amenity.

## The diversity of scale approach

Considering the effectiveness of GI and the adaption with smart

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<sup>2</sup> / The impact of the external environmental factors in our wellbeing and general health has been accepted by various researches and established by evidences. "Eventually, GI features contributes in several health benefits related with physical health, psychological/emotional and socio-economic benefits which are easily identified at both individual and community level" (E.C., 2012).

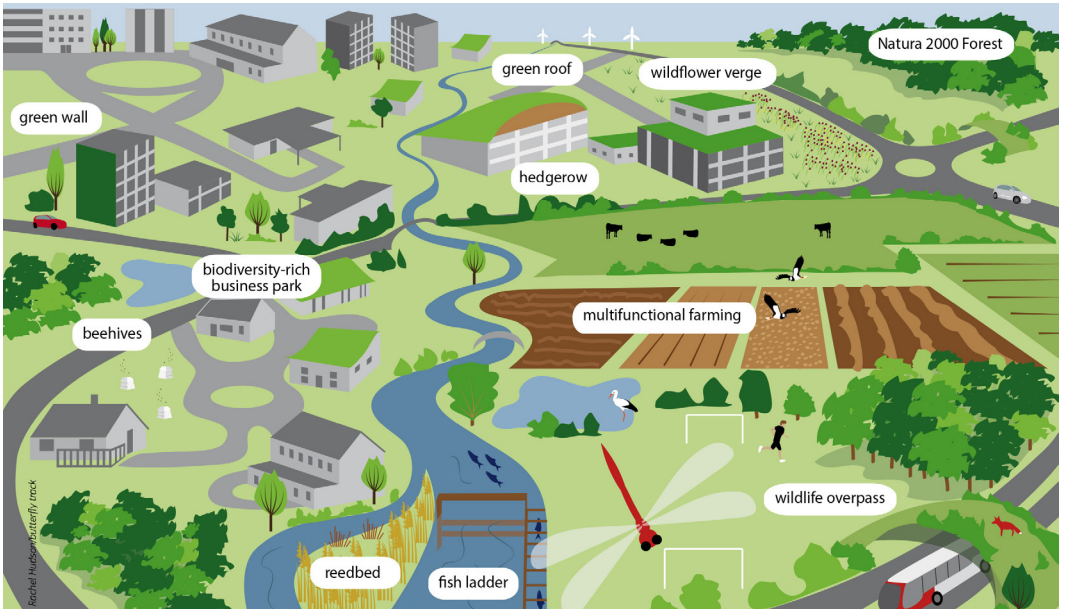


Fig 1 / Potential Components of a Green Infrastructure.  
 Source / [https://www.eea.europa.eu/themes/sustainability-transitions/urban-environment/urban-green-infrastructure/green\\_infrastructure\\_infographic\\_EC.png/image\\_view\\_fullscreen](https://www.eea.europa.eu/themes/sustainability-transitions/urban-environment/urban-green-infrastructure/green_infrastructure_infographic_EC.png/image_view_fullscreen)

and sustainable development, the presence of Green Infrastructure has been positioned in the International Policy.

“At a European level, green infrastructure policy is promoting a systems approach to integrated and strategic investment/management. Within these debates the European Union proposed that “Green Infrastructure [GI] can contribute significantly to achieving many of the EU’s key policy objective” (Danielle S., Nick S., and Sarah B., 2016, p. 111)<sup>3</sup>.

Mell (2013), in (Danielle S., Nick S., and Sarah B., 2016, p. 106) has stated GI as an evolving concept which regardless evidence of the main principles, it also discusses the proactive perspective and the discourse of what green infrastructure should deliver in the local context. Moreover, Benedict and McMahon discuss the concept of implementing green infrastructure in different scales: the individual parcel, the local community, the state or even multi-state region.

At a community level, green infrastructure address and capitalize the community needs and mainly visualized by greenways, contributing to the sustainability and resilience for the community. At the regional level, it can be considered as an establishment of widening landscape links, connecting forests, natural parks or other natural areas, also taking into consideration the animal’s habitat (Benedict, Mark A., McMahon, Edward T., 2012, p. 14)

While in the sub-national and local scales, according to (Beatley, 2000; 2012; Mell, 2010, in (Danielle S., Nick S., and Sarah B., 2016, p. 112) the definition becomes significantly broader and it reflects the national characteristics and place-specific goals<sup>4</sup>.

Considering these overviews, it can be agreed that the knowledge and awareness for the GI has defined its inclusion as a primer factor in the municipal or regional plans as well as in the national policies.

<sup>3</sup> / For the purpose of facilitation this process, The European Commission has elaborated legislation, manuals and several strategies for sustaining urban green and blue spaces; the Biodiversity Strategy (E.C., 2011) like the Habitats Directive (E.C., 1992), Interpretation Manual of European Union Habitats (E.C., 2013c) Green Infrastructure (E.C., 2013b) Natura 2000 Network (E.C., 2017) and the more inclusive programme Horizon 2020 (E.C, 2014).

<sup>4</sup> / UK have significantly incorporated advocating organizations which has conducted on site-specific investigations, and assisted in the conceptual development of green infrastructure thinking while USA has applied a narrower policy-deliver focus, according to Benedict & McMahon in (Danielle S., Nick S., and Sarah B., 2016, pp. 112-113) addressing water management and land conservation.





Fig2. / Polluted Air in Prishtina, 31.1.2018. Source / [kallxo.com/prishtina-qyteti-ndotur-ne-bote](http://kallxo.com/prishtina-qyteti-ndotur-ne-bote)



Fig2.1 / Action against pollution. 29.01.2018; Source / <https://balkaneu.com/Kosova-continues-to-register-high-levels-of-air-pollution/>

## Methodology and Results

To demonstrate the need and importance for a GI strategy in Prishtina, as well as to acknowledge the character and specific elements for its application, the proposed methodology is based in a mix-method. For the purpose of this research, the following steps were undertaken:

1. Desk review of the public documents and studies regarding spatial planning, by focusing in determining: a) The viewpoint of Planning Strategies towards possible GI aspects and b) National data for Green Spaces, Forestry, Agriculture, Pollution, Environment, Public Health, aiming to

evidence the main issues.

2. Case Study examination for green cities which has prosperously implemented green strategies.

3. Field Study through mapping methodology and highlighting Hubs, Links and Sites as essential parts of the GI system.

## Review of National and Local Documents

Prishtina is the newest capital in Europe. Having positioned the main economy, connecting infrastructure and producing industry in its territory, has at the same time reflected negative emissions in the environment proving the fragility of Prishtina municipality



Fig2.2 / Obiliq Station. Source / Photo by Arselda Brahim

to deal with the urges of the present growth<sup>5</sup>.

In the Spatial Development Strategy of Kosova (ISP, 2010, p. 121) the whole territory is designated to be divided in four main areas, according to their characteristics and potentials. Prishtina and its precincts compound the 'Harbor of Kosova' evidenced as the Blue Area with mainly the characteristics of administrative, service and trade, agriculture, industry and tourism.

The plan also accentuates the fact that the energy sector, is one of the great polluters in Kosova, especially in the Prishtina Region, which generates high pollution in air, soil and water, up to 40 million tons of ash, in 150 hectares of land<sup>6</sup> (ISP, 2010, p. 35). In Prishtina, the energy sector pollution represented by TCA and TCB, located in Obiliq, is followed by household use of lignite and wood, industry and mines, transport and furnaces for incineration

of hospital waste (TWB, 2013, p. 17).

- In the Spatial Strategy of Kosova, there is no evidence to address pollution issues towards specific provisions, even though the authorities have identified pollution as a priority. The responsible institutions take periodic actions to measure the impact of these factors in the environment, by providing important data on the environment<sup>7</sup>, but they are limited to data collection and interpretation, rather than providing specific recommendations for reducing the impact of pollution.

- On the other view, the natural resources of Prishtina, like hills, the regional Park, lakes and rivers on the Annual Green Reports or Strategy for Biodiversity Conservation are only highlighted as assets to be restored, conserved and regulated by law, rather than included in an inclusive strategy on management with multi-dimensional benefits.

<sup>5</sup> / To approach the challenges, the government of Kosova, has undertaken Strategies of Development in the country and city level, as well as analysis and reports to maintain awareness of actual problematic.

<sup>6</sup> / The Energy sector in Kosova use coal as a primary source without sustention of renewable sources, which beside providing limited coverage with energy, results with high levels of gas emissions, concentration of acid materials and coal dust.

<sup>7</sup> / Some of the revisions, measures and reports regarding environmental impact are disseminated in: Environmental Analysis of Kosova, Annual Reports of Environment in Kosova, Air quality reports for Kosova, Strategic Environmental and Social Evaluation or Air quality reports for Prishtina.

The Development Plan of Prishtina (DPP) is the essential document for the further development of the Municipality. The main challenges addressed in this document regards the following: "a) Prishtina as an urban metropolitan region, functional and integrated; b)city of knowledge economy; c)city of culture, art, history and diplomacy; d)green city; e)city administered with good governance, with numerous regional collaborations". (Hidroing-DK, 2013, p. 121). Going further into the concept of 'green city', it can be realized that the interventions regarding these objectives are only limited in the topics of: quality of life and social development, green public spaces, management of urban waste, energy and heating; and management of water source (drinking and polluted water) (Hidroing-DK, 2013, pp. 136-137).

This research has evaluated that

- The DPP has only identified the existing potentials for a future GI, included in the 'green city' section, but treating them individually and not aiming for a whole system.
- The concept of urban parks, agricultural space, natural park, green corridors, water resources and

recreational areas (Hidroing-DK, 2013, pp. 208-209) are defined but are treated separately as well without a concept of a system.

- Proposals for intervening in these urban aspects are presented in the general recommendation level, but not resulting in concrete objectives or actions to be undertaken.
- The Land use incorporated in this plan has taken in consideration only the preservation of Germia Natural Park and the regeneration of existing urban parks, therefore without localizing sensitive, potential or new areas which can lead to a base contribution for identifying the main elements of a possible GI.

### Learning from Best Practises

The Methodology used in this phase is based on the investigation of the GI application and comparison of three green cities which has prosperously implemented green strategies based on Green Infrastructure as a sustainable tool for unraveling urban and environmental issues.

Detroit City was chosen as a model for having simultaneously managed the main issues of the city and addressed them in a unified strategy. Whilst the

| Case Study         | Needs and Demand Factor Drivers   | Approach for GI   | Tools and Actions Adopted  | Implementations  |
|--------------------|---|---|--|--|
| Detroit City (USA) | Problem<br>Suffered after 2000, the reduction of population, which affected the economy and the urban environment   | Levels<br>Detroit Future City is presented in a) Land Use Plan and b) Image of the City. Proposed interventions in the residential layer, neighborhood, district, industrial layer, city center and green areas.                              | <ol style="list-style-type: none"> <li><b>1. Innovation Productive</b> - an established to convert vacant land to productive uses.</li> <li><b>2. Innovation Ecological</b> - A concept for transformation of the landscape where predominated by ecological development</li> <li><b>3. Large Parks</b> - at least 4 acres space, perceived as urban green isles, offering recreational opportunities in the open nature.</li> </ol>   | <p><b>Pilot projects and immediate interventions</b> has taken place after the endorsement of the plan. <b>Urban agriculture, Vacant Land Adaption and Innovative Forest Creation</b> are some of the first pilot projects implemented. The interventions are based in the precedent experience of German Regions or Emerald Necklace Project in Boston, conceived with ecological principles.</p>   |
|                    | Potential<br>Land resources are a major asset   | City's GI Strategy<br><b>Future Green City Vision:</b> Main aim is creating a green city where landscapes contribute to a healthy environment, clean water, air and soil, by boosting the local economy.                                      |  |  |
| Almada (Portugal)  | Problem<br>Almada City belongs to Metropolitan area of Lisbon. The construction of the bridge connecting Lisbon and Almada, during 60's led to unregulated growth, illegal constructions and social | Levels<br>Portuguese state authorities conduct planning in three levels: national, regional and municipal.  | <ol style="list-style-type: none"> <li><b>1. Municipal Ecological Network</b> - main instrument which combines areas for environmental protection and re-establishes ecological connectivity in natural, rural and urban environments.</li> <li><b>2. Ecological restoration of dunes and streams</b>, based on ecological engineering technique for coastline erosion.</li> <li><b>3. Network allotment gardens</b> combines Ecological corridors + smaller spaces as parts of the system which promotes multifunctionality.</li> </ol> | <p><b>Sobreda Multi-use Park.</b> This park is a 7 hectares, multi-use park, designed to be a meeting place, including a large playground, skate park, picnic area and a circuit training area. The main objective: <b>to develop a green community space</b> where the people would establish a sense of belonging.</p> <p><b>Costa da Caparica Urban Park</b> was generated by transforming an illegal urban for a 14 hectares park space.</p> |
|                    | Potential<br>The city, was driven towards industry during the 19th century  | City's GI Strategy<br><b>The municipal strategy</b> addresses the protection and enhancement of ecological features, their connectivity in natural, rural and urban environments and promotes coordination with grey infrastructure planning. |  |  |
| Lodz (Poland)      | Problem<br>The city is recognized from the 19th century for the textile industry, but in the last 20 years, it has been faced with constant population decline.                                     | Levels<br>The documents that focus on environment at regional level are: a) The Environmental Protection Programme and b) Spatial Management Plan which are responsible for the environmental protection and green network management.        | <ol style="list-style-type: none"> <li><b>1. Blue-Green Network</b> - key factor to influence the quality of life by improving the micro-climate and providing public space for recreation.</li> <li><b>2. Green Circle of Tradition and Culture (GCTC)</b> - an instrument which consists in the protection of green spaces affected by cultural heritage.</li> <li><b>3. Linkage between Green and Grey infrastructure</b> is the third main tool towards a successful GI for Lodz City.</li> </ol>                                    | <p>The city of Lodz, has artfully managed to turn post-industrial into recreational spaces, with studios, ateliers and new festival centers. <b>The rehabilitation of the Sokolowka river valley</b> was the first major project carried out to implement the Blue-Green Network, based in the restoration of the river to support stormwater management and increase water retention capacity and biodiversity.</p>                             |
|                    | Potential<br>The city has undertaken significant revitalization processes which has given a new image.  | City's GI Strategy<br>The confrontation of environmental issues in the city level, are integrated in the <b>Development Strategy of Lodz 2020+</b> .  |  |  |





Fig4 / Analysis of the actual land use and green spaces in Prishtina. Source / author's drawing.

city of Almada, Portugal and the city of Lodz, Poland are considered valuable models not just for their nearest scale to Prishtina, but also as best practices, included in Green Surge Guide<sup>8</sup>.

The case studies are compared and evaluated according to the following four indicators:

Needs and Demand Factor Drivers

a. Approach for GI

b. Tools and Actions Adopted

c. Implementations

The selection of case studies, has taken into consideration the nature of their context, the relevant undertaken strategies and their successful experience in implementation.

The three case studies have undertaken actions to integrate the GI in the planning plans and policies according to the planning structures and alternatives, including the national level, regional and municipal-city level. The implementation projects in a smaller scale has confirmed the importance of beginning the conceptualization of GI in the city level

or neighborhood.

The conclusions regarding the evaluation of the case studies are based on the concept of local issues, or potentials influence, which has generated the argument that GI is generated by local inputs. In the national level, the GI strategy is generally marginalized within the environmental policies or spatial plans, while in the region or city level the approach is more focused on the resources and investments itself. The municipality or city GI strategy in the three cases is represented by: a) Chosen Tools and b) the implementation of the investments. The 'adopted tools and actions' are dedicated to concepts, networks, connected spaces or even innovative proposals which has been tested by the local authorities in public projects, whilst the implementation phase has evidenced a pilot-project regarding the proposed tools.

### Field Analysis represented by mapping.

As previously stated, the Land Use Plan and a strategy for managing the

<sup>8</sup> / Green Surge Guide, is a guide for practitioners, towards urban green infrastructure planning, based on research on European Cities, as part of the EU FP7 project GREEN SURGE.

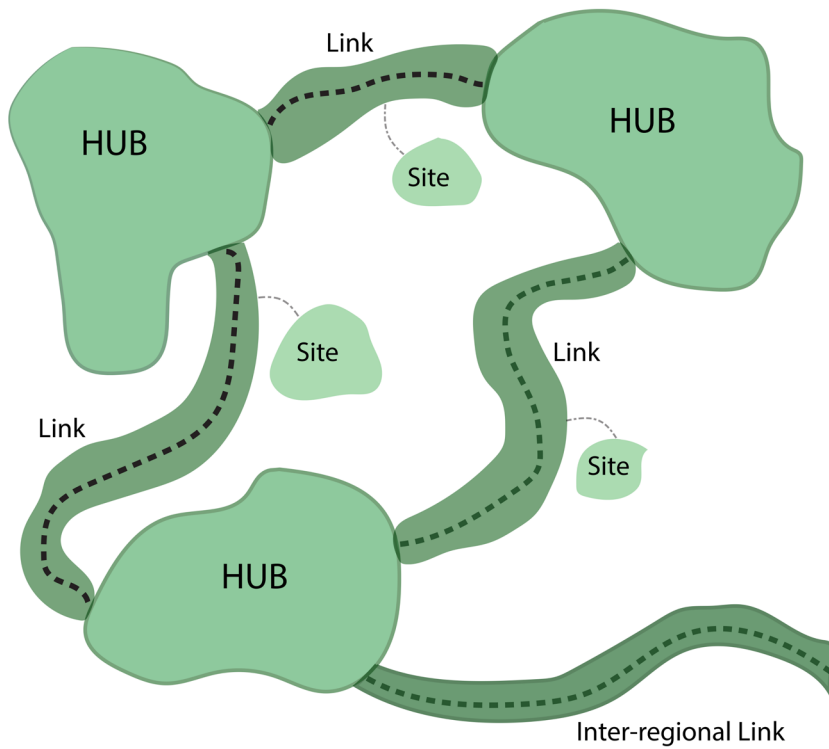


Fig5 / Green Infrastructure System connected with hubs, links and site.  
 Source / Re-drawing of the author, according the Fig 1.5 in (Benedict, McMahon, 2012, p. 13)

urban landscape is missing in the DPP. This enhances the need for viewing on site and mapping the main green areas, free spaces, natural resources and problems, in order to address the corresponding issues to planning and implementing<sup>9</sup>.

The information generated by this research through mapping, provide the main inputs for articulating a spatial concept of GI structure, by concluding in a visualization of the territory in seven main land use components: a) urban area, b) agricultural land, c) vacant/wasted land, d) polluted soil, e) green urban areas, f) natural park, g)urban forestry area<sup>10</sup>.

According to Benedict and McMahon (2012, pp. 13-14) a GI system should connect landscape and ecosystems by incorporating in the spatial configuration of the city, three

main components: hubs, sites and links. Hubs are considered the main units of the green infrastructure which represent considerable space, attributing to natural reserves, protected areas, forests, farmlands and even recreational sites, frequently related with the peri-urban surfaces. In the idea of sites, all the features of hubs are included but considering the smaller size of sites, they can be easily introduced in the urban and community level. Whereas links are understood as landscape linkages which hold the system together, often identified with greenways, greenbelts or green corridors<sup>11</sup>.

### Recommendations for Approaching a Strategy of GI in the Region of Prishtina and Implementing GI in the urban area

The results of the conducted study

<sup>9</sup> / During the International PhD Workshop "Prishtina, New European Capital, Images of a City to be discovered" a preliminary analysis phase has taken place which is further elaborated for the purpose of this research.

<sup>10</sup> / The territory of Prishtina Municipality is dominated by a mountain landscape on east, north and south-east, while on the western side it extends to Field of Kosova. The main natural assets of Prishtina are: Gërmija Park, Badovci Lake, agricultural lands, whilst the city, within its urban space contains few urban parks and urban forestry, visible also in the map. The Gërmija Park is a natural park positioned in the western part of Prishtina Territory which constitute the main natural eco-system of the municipality, with 115.05 km<sup>2</sup>, while Badovci Lake is an artificial lake built for water supply purposes.

<sup>11</sup> / The sustainability and the effectiveness of the GI system is obviously associated with strategically planned system, initiating with mapping and management of resources, conservation and restoration of natural assets, evidencing needs and issues, which makes the implementation of GI components a long-term commitment.

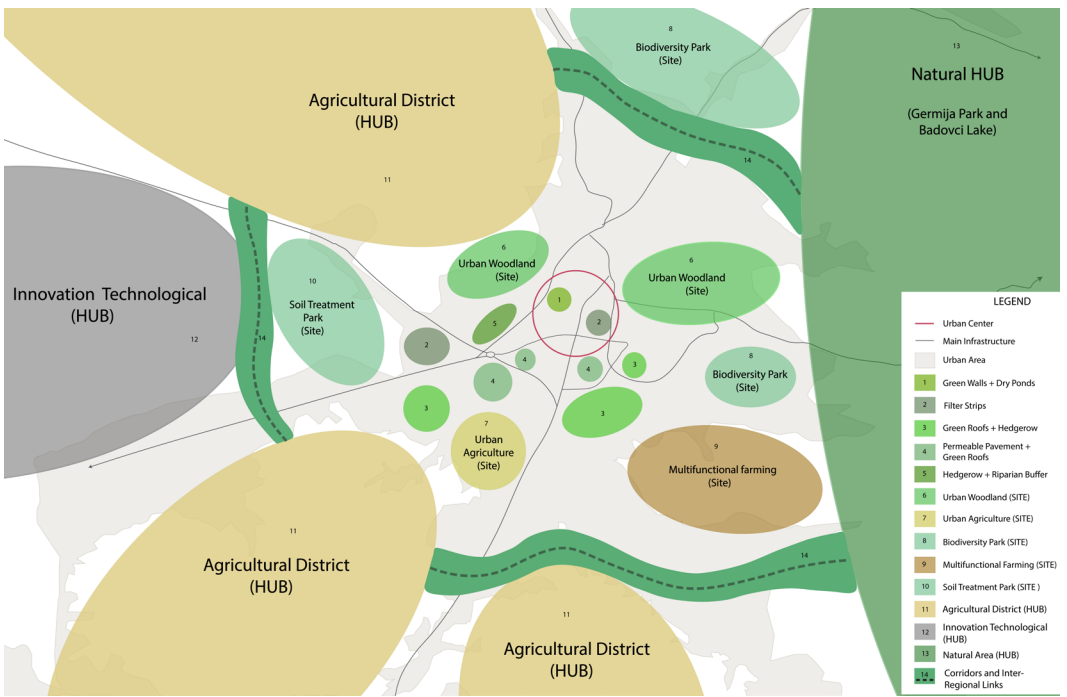


Fig6 / Proposal of GI System in Prishtina. Identification during mapping and proposal for applying the system of hubs, links and sites. Source / author

are a straightforward product of the outcome derived from the three steps-methodology for Prishtina city. These outcomes can be understood in two levels:

- Recommendations for approaching and implementing GI in a formal strategy as an active part of Spatial Planning Policies (national and local level)
- Mapping and identifying the main components to be complemented in a green strategy. These two results are identified in accordance with the methodologies followed by the case studies and by using the system-elements: hubs, links and sites.

- Since there is an absence of GI concept in the Kosova Planning Framework, it is crucial to recommend the inclusion and adaption of the Green Strategy in the Spatial Development Policies.
- Mapping the territory by searching ways to adapt to GI is a powerful tool for identifying features, prioritize lands, insulate natural and protected areas, to generate the proper diversification on implementing Green Infrastructure and in these terms, laying the

foundation for sustainable growth. Returning to the actual situation in Prishtina, the research concluded that; air quality, soil state and gas emission are some of the most relevant 'needs and factors' to address the GI.

- Following the experience of the case studies<sup>12</sup>, Kosova must simultaneously work on the implementation of green infrastructure at the three levels: international, national and local which is a practice used also in the case studies, in the 'Approach for GI'
- The 'Tools and Actions' phase should follow the identification in the territory and rely on a concrete concept, furthermore relating and overlapping the results with the model proposed by Benedict and McMahon on the system of GI, the system of hubs, links, and sites as the next measure to undertake towards an effectuation of a GI. In the case of Prishtina, the previous analysis on the territory has led to a proposal which identifies three types of Hubs: Natural, Agricultural, Innovation-Technological; three main links relating the system together by green corridors and belts and a

<sup>12</sup> / The practice used by the case studies, can be considered applicable in Prishtina context, based on the four phases explained in the methodology.



system of small and medium size of sites within the urban area of the city, subsequent by an in-site analysis for problematics evaluation.

- The 'Implementation' phase is recommended to start in the city level. Participation of the community is a key point during implementation, the awareness of which is captured mostly in the local level.
- The main objective leading the GI Strategy, sustaining the urgent issues, should be elaborating GI components as a response for pollution impact reduction.
- In this case it is recommended to initiate with short term phase, which doesn't require much investments like: developing proposals for projects of Soil Treatment (East) and restoring Urban Woodlands. By Mid-term implementation phase, in this study is considered the elaboration of Agricultural Hubs and other internal thematic sites in the city, including urban agriculture. In the long-term implementation phase: the focus could be shifted to Biodiversity Parks, Multifunctional Farming and Innovation Technological which require larger investments.

The above mentioned phases, based on the revision and analysis of the national documents, field analysis, concepts evaluation and best-practices evaluation, are considered relevant initiators proposals for approaching GI in the context of Prishtina.

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