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Advancing urban ecosystem governance in Ljubljana

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ABSTRACT

Extensive green areas generate a recognizable green identity of Ljubljana. Due to the challenges of climate change and urbanization the city's spatial policy highlights revitalization of degraded urban areas, preserving the quality and scope of the existing green network and the protection of multifunctional natural areas surrounding the city. Article describes the project of Rakova Jelša Park as a good example of these policies. With an NGO initiative a former degraded area with illegal dumping and non-indigenous vegetation was transformed into recreational park with increased biocultural diversity. Important lesson of the project is that opening up space for public use not only prevents degradation, but also improves the quality of urban ecosystems. One of the challenges for the city's future sustainable ecosystem development will be a more active cooperation with its citizens in the green infrastructure policy and later also a partial transfer of responsibility for green areas to them.

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1. Introduction

Green areas represent almost three quarters of Ljubljana or 560 m² per inhabitant. The city's well-structured green system consisting of five green wedges stretching to the city centre give it its recognizable green identity (Fig. 1). The city's main spatial efforts at the present time are in the regeneration and renewal of existing developed areas, and protection of natural areas (The City of Ljubljana, 2014). The city won the Green Capital Award for 2016 for its achievements in the area of green development.

To overcome the modest investment in green areas in the 80s and 90s the city has in the last decade undertaken intensive rehabilitation of brown fields, and the development of green areas and open public spaces has become a priority in urban planning policy (The City of Ljubljana, 2014). The city preserves and complements the green system, focusing attention on the revitalization of brownfields, a more sustainable transport system, and multifunctionality, thereby improving and maintaining social as well as ecological ecosystem services. This appropriate governance of urban ecosystems increases resilience to the impacts

of urbanization and climate change. In addition, the growing number of NGO initiatives addressing the development and restructuring of green areas demonstrates the public's interest in and need for quality green spaces.

1.1. Urban ecosystem governance goals in Ljubljana

Ljubljana is the capital of Slovenia and is situated at the crossroads of Central and South East Europe. It is a city with a stable population of approx. 280,000 inhabitants. Green space in the city comprises parks, forests, agricultural land, and protected natural areas. The city of Ljubljana puts great emphasis on the preservation and improvement of the network of green spaces within the city. The strategic goal of the city is to create a connected network of high-quality public open spaces spread throughout the entire city area that will be equally accessible to all residents and that will be safe, recognizable, well-kept, and respectful towards cultural heritage, natural resources, and the environment. The preservation and maintenance of natural elements in public space is important for aesthetic, social, health, and sanitary reasons as well as for protection and ecological ones. The policy of urban development gives preference to the concentration and regeneration of degraded areas over the usage of other open areas. In this way, the spatial plan rationalizes the usage of urbanized areas and at the same time defines the ratio between built-up and non-built-up areas. With this vision the city has given special attention to the creation of quality

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Fig. 1. Five green wedges (two forested wedges), blue features and location of the Rakova Jelša Park. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of the article.)

new public green areas. In the Urban Master Plan of Ljubljana (*The City of Ljubljana, 2010*), 83% of all city development is directed towards the renewal of existing developed areas and brown fields. In last five years the city has created 80 hectares of new parks on formerly degraded areas such as overgrown riverbanks and abandoned industrial areas (*The City of Ljubljana, 2014*).

Due to the diverse functions green areas can fulfil within a city, such as recreational and ecosystem functions, the concept of multifunctionality is an important consideration when planning and managing them. With further planning and improvements of the green system, the city of Ljubljana aims to preserve the multifunctionality of its green areas. Such an approach is especially significant for urban forests and retention areas. These areas are frequently characterized by a high degree of natural preservation and, consequently, habitat function, high recreational appeal, and ecological functions such as air and water purification and buffer areas.

In the process of urban ecosystem management, we are increasingly striving towards sustainability. Regular maintenance of public spaces is financially challenging for the city, which is why we are searching for new approaches to more sustainable management in the ecological as well as economic sense. To that end, our greatest achievement so far has been to ensure a more sustainable transportation system within the city by reducing motorized traffic in the city centre. We have introduced a public rent-a-bike system, opened several 'park and ride' areas, updated public transport and improved the network of cycling routes and walkways. A small number of electric vehicles called 'Cavaliers' offer free transportation within the city centre. Our goal by 2020 is to improve the distribution of mobility, with a third being public transport, a third being non-motorized modes and a third being private cars.

In terms of biodiversity, Ljubljana's Environmental Protection Program 2014–2020 (*Jazbinšek Sršen, 2014*) involves preservation and improvement of the current state of biodiversity. More than 20% of the city's surface is protected within Natura 2000 and four nature parks around the city centre. These parks also ensure the conservation of endangered and protected species. Habitat improvement is achieved by ecoremediation projects on polluted streams and ponds and by revitalizing degraded areas into multifunctional green areas. Since 2002, we have been carrying out regular monitoring of nature conservation with an inventory and evaluation of habitat types in the city.

1.2. Planning tools adapted to challenges of climate change and urbanization

We are aware of the significance of a well-constructed network of green areas for ecosystems and mitigation of climate change. In this regard we strive to maintain these areas in our land use planning. To reduce the influence of urbanization on climate change and to better adapt to such changes, the spatial plan proposes the reduction of emissions of greenhouse gases from buildings and traffic, initiatives for energy-saving building activities, and reduction of the heat island effect by preserving non-built-up areas in prevailing wind corridors, conservation of green wedges and sustainable management of urban forests.

The most noticeable consequence of climate change in Ljubljana is the appearance of so-called heat islands, which are most apparent in the compact city centre. Within the European Urban Heat Island phenomenon project (started in 2011), the city has developed measures for the mitigation of this phenomenon. We have created new water and green surfaces such as roof gardens on public buildings and green pockets instead of parking places (*Loose and Komac, 2013*). One of most notable current measures has been the traffic regime modification on the main traffic artery of Slovenska Street. Traffic lanes were transformed into pedestrian surfaces, cycling paths and green areas. Only public transport is allowed. This has already impacted air quality, and it will provide a modelling tool for urban heat island phenomenon evaluation (*The City of Ljubljana, 2014*).

More than 46% of the city's surface area is covered with natural forest. In 2010 the city declared 1400 ha as special-purpose forest. We committed to gradually buy these areas (mostly privately owned) and ensure effective protection. Forests have a significant impact on the city's climate as a source of cool air in the summer, as protection of water source and as a CO₂ sink.

Urbanization follows the spatial plan in which the green space network is clearly defined. Wedges of green areas reaching inside the city centre not only reduce climate oscillation, but also offer protection against floods, which are another unwelcome consequence of a changing climate. Ljubljana is surrounded by four protected nature parks with a stricter policy of any activity in nature environment which can damage sensitive habitats or species what making them less open to urbanization.

There have been few alternative greenings, such as green roofs and green walls, in Ljubljana. Such practices would certainly contribute to the regulation of temperature in the city centre and should be more consciously planned in the future. The plan involves a pilot project of greening roofs on the city hall buildings which the city administration will present as an example of good practice.

1.3. The Rakova Jelša Park project

The example of Rakova Jelša Park very well reflects the city's urban ecosystems policy of giving priority to the regeneration of degraded sites and creation of multifunctional green areas with respect to providing both cultural and ecological functions. The initiative was introduced by an NGO, which is an indication of civil society's interest in the quality of urban green spaces. The project began to develop in the frame of the exhibition series entitled THE VISIONS EXIST by the Architects' Society of Ljubljana, which draws attention to overlooked issues regarding Ljubljana and its numerous unused areas. Later on, the municipality took over the organization and investment of the project. The new park is located on city land. Other stakeholders were the Institute of the Republic of Slovenia for Nature Conservation, which offered suggestions for native tree species, and the Ljubljana Marsh Nature Park, which has prepared a permanent exhibition in the park about the pile dwellers on Ljubljana's marshes.

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