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Authors wish to acknowledge Bartin University Scientific Research Unit for support given to the Project coded 2013.2.102 and master students who have been involved during the field and Office Works.

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Introduction

Due to rapid increase on population and construction for urbanization, cities of 21 century change rapid and dynamically. As the lands in different characters of cities change and spoil the character known is also changing. At this point landscape features which affect the infrastructure within green spaces and waterscapes have important limiting role on urban development.

Recent years climate change became an important topic and it brought the discussions on water management and green infrastructure issues. Green infrastructure (GI) approach is a trending subject for experts of urban development, landscape management and urban health.

The European Landscape Convention (ELC) seeks to embody the protection of landscapes in law. The ELC defines landscape as *'...an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors'*. Through provision of landscape character and place orientated design principles, green infrastructure can contribute to achieving the objectives of the Convention and related tools such as landscape character assessments and landscape strategies. As such, a green infrastructure approach can assist in delivering landscape visions and guidelines, and landscape quality objectives.

In this research benefiting from the values of ecological corridors of protected Bartin River and vicinity, green infrastructure approach and its contributions to urban ecosystem focusing on parks listed by Bartin Municipality was evaluated. Within the proposed management approach increase on the resilience via natural systems with economy of the city struggling floods anytime is examined. Bartin River as a whole is a passive recreation area of an ecological importance with biological richness of flora and fauna.

Findings in the research shows the requested connection of green spaces with active recreational areas has not been supplied with corridors, so the parks and open public spaces of the city could not serve as an input of green infrastructure element.

The findings and comparisons with many case studies within Europe shows actual green spaces which are called parks by the local authorities do not cover permeable pavements and roads, rain gardens, green roofs and roof gardens, rain harvesting systems, road plantations, maintenance of landscape designs and wetland formations. There is also misuse of plant material especially at some of the parks designed. GI approach is an important solution for cities living with floods such as Bartin.

Background/Literature Review

The enhancement of green areas has the potential to mitigate the adverse effects of urbanisation in a sustainable way, making cities more attractive to live in, reversing urban sprawl, and reducing transport demand. Nowadays, there is an increasing societal support for more green space in and around cities (De Ridder et al.,2004).

Urban green spaces provide essential ecosystem services and improve resident quality of life, but open space networks are often fragmented by urban development, and it is difficult to reclaim natural lands after they have been built up (Frazier et.al. 2015).

Rouse and Bunster-Ossa, 2013 in the book "Green Infrastructure: A Landscape Approach" tried to explain landscape approach to green infrastructure. They suggest GI is more than just implementing measures at various scales, from green roofs and rain gardens to regional greenways and open space. According to Rouse and Bunster-Ossa "A landscape approach to green infrastructure entails a design vision that translates planning strategy into physical reality while heeding the ecological and cultural characteristics of a particularlocalewhether a region or an individual building site. It is, by necessity, an approach that involves aesthetics: what a place should look like as informed by the people who live on the land, their past, and their aspirations" (Rouse and Bunster-Ossa, 2013).

Mark Benedict and Ed McMahon (2006) of the Conservation Fund defined green infrastructure as "a strategically planned and managed network of wilderness, parks, greenways, conservation easements, and working lands with conservation value that supports native species, maintains natural ecological processes, sustains air and water resources, and contributes to the health and quality of life for America's communities and people."

Foreword of the document published by the Landscape Institute-UK says "It has never been more necessary to invest in green infrastructure". In the document it is stated "The role of green infrastructure (GI) in addressing the

challenges of the 21st century cannot be underestimated. We define GI as the network of natural and semi-natural features, green spaces, rivers and lakes that intersperse and connect villages, towns and cities. It is a natural, service-providing infrastructure that is often more cost-effective, more resilient and more capable of meeting social, environmental and economic objectives than 'grey' infrastructure" (Landscape Institute, 2013).

Natural England's definition of green infrastructure 'Green Infrastructure is a strategically planned and delivered network comprising the broadest range of high quality green spaces and other environmental features. It should be designed and managed as a multifunctional resource capable of delivering those ecological services and quality of life benefi ts required by the communities it serves and needed to underpin sustainability. Its design and management should also respect and enhance the character and distinctiveness of an area with regard to habitats and landscape types. Green Infrastructure includes established green spaces and new sites and should thread through and surround the built environment and connect the urban area to its wider rural hinterland. Consequently it needs to be delivered at all spatial scales from sub-regional to local neighbourhood levels, accommodating both accessible natural green spaces within local communities and often much larger sites in the urban fringe and wider countryside.' 'Green infrastructure is a network of multi-functional green space, both new and existing, both rural and urban, which supports the natural and ecological processes and is integral to the health and quality of life of sustainable communities' (Natural England, 2009).

Method

This research is held within the borders of 18 Neighbourhoods covering the given list of parks by the Bartin Municipality (Figure 1). 92 parks are examined as some of the parks of listed are located at different neigbourhoods, some are duble written and some are not open to public (parks and children playgrounds listed on areas belonging to military).

As a data set 1:25 000 scaled Environmental Plan, 1:5000 and 1:1000 scaled Construction Plans are used.

The methodology covers three stages of analytical approach which are: (1) Fieldworks and visualisation (2) green/grey (hardscapes) relation and density (3) identification of park typology.

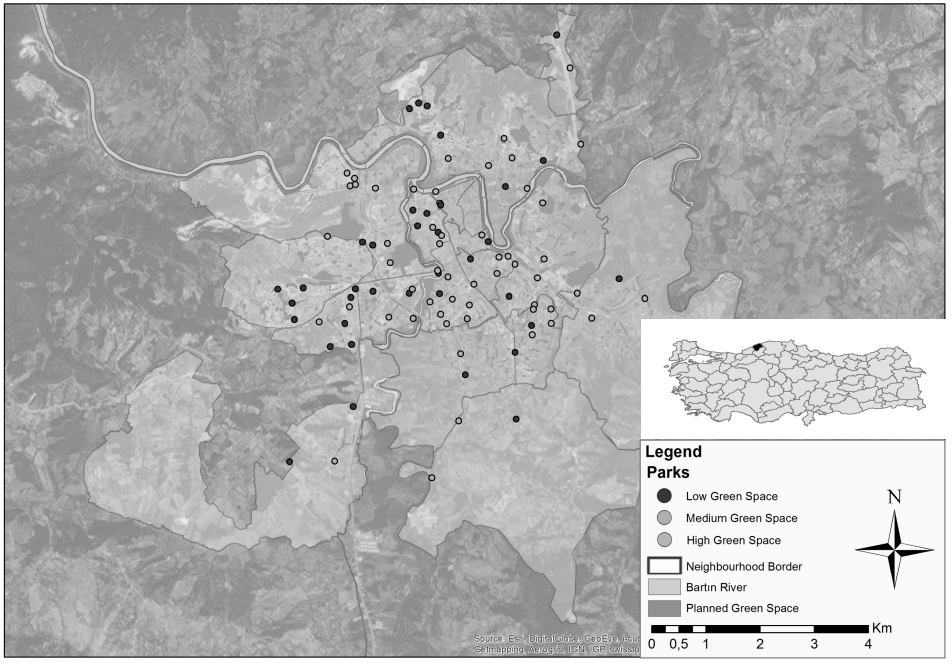

Figure1. Location of the study area, density of green coverage

Fieldworks and visualisation: All 92 parks listed by the Muncipality had been visited and evaluated. The location and the borders of the parks are recorded by GPS. Urban furnitures and green-grey interaction had been recorded via taking photos. Borders of the parks and the area are controlled via overlay analysis with Arcview GIS 10.1 version and the Basemap of the software and the actual areas of the parks are obtained.

Green space density: Park borders are overlayed with the neighbourhood borders so the number of parks located in concerning neighbourhoods are obtained. Areas are compared with the population living along the neighbourhood and green space per capita had been calculated.

Identification of park typology: Green space and unpermable land of each park had been calculated. Due to this theratios of green to grey (hard surfaces) is classified by less than 40%, 40-70%, more than 70% is classified low-medium and high green spaces respectively. This classification measured the total coverage of green spaces to hard surfaces. If the coverage of the trees and landscaped areas is less than 40 %, converning park had been classified as having „low green space".

Results

Details related with population of 92 parks listed by the municipality is given at Table 1 and Figure 1 below. According to the "Address Based Population Registration System (ADNKS)" dated 2014 the population of 18 neighbourhood in Bartin is 63 253 people. The table covers the details number of people below and over +18 years old. This is a record taken by the government and we assume this might give a clue for the future of the need of age based distribution of people demanding open green spaces.

Table 1. Neighbourhoods of Bartın, Population and Distribution of Parks (Bartın Municipality, 2015; TUİK, 2015)

#	Neighbourhood	Total Population	# of Parks	Area of Total Green Space (m2)	Green Space per capita (m2)
1	Ağdacı	2.622	3	2.459,73	0,94
2	Aladağ	4.714	7	3.611,78	0,77
3	Cumhuriyet	2.920	7	3.990,13	1,37
4	Çaydüzü	3.314	4	1.871,53	0,56
5	Demirciler	3.336	3	713,33	0,21
6	Esentepe	2.283	7	6.261,89	2,74
7	Gölbucağı	7.660	7	10.162,93	1,33
8	Hürriyet	2.688	0	0,00	0,00
9	Karaçay	323	2	16.948,40	52,47
10	Karaköy	2.412	2	1.210,76	0,50
11	Kemer Köprü	9.692	15	16.955,25	1,75
12	Kırtepe	3.780	8	22.138,62	5,86
13	Köyortası	1.664	3	26.262,70	15,78
14	Okulak	1.584	0	0,00	0,00
15	Orduyeri	6.560	12	9.561,12	1,46
16	Orta	1.881	2	2.601,33	1,38
17	Şiremirçavuş	904	3	821,07	0,91
18	Tuna	4.916	7	9.493,07	1,93
TOTAL		63.253	92	135.063,65	2,14

Green infrastucture assessments

Due to the green/grey assessments in parks of Bartin city, it can be said that most of the parks are lack of plant material, some of them have little amount of plant coverage and significant cases have important coverage of plant material. There are 92 parks listed by th emunicipality of which 37 have low green space, 29 have medium and 26 have high amount of green space with plant materials. Low planted ones include mostly the ones with only children playground or basketball / volleyball areas. Some of them have outdoor fitness equipments. This fact is discussible in means of benefits for green infrastructure. For those parks just have hard surfaces without no plant material the other discussion the use of the areas in all seasons. As most of the playgrounds with no green space locate close or in private residential sites most of them cannot be used under hot climate conditions in the daytime of summer season.

When evalutaed in means of urban equipment quality, cleanness, health and security it can be said that most of the parkslack of clean areas with broken banks and rubbish boxes. Most of the parks are not accessible for disabled people and many of them have dangerous electricity transformer stations close to children playgrounds. Some are located under electiricity power lines. If mentioned as a part of green infsratructure, most of the parks could not be evaluated as as part of the system as they are totally located under dangerours and unhealty circumstances. Those areas might be evalıutaed as a part of the system just only after revitilaziton.

As seen in the construction plans Bartın river forms an important ecological corridor in the city. Most of the parts of this corridor cannot be reached by the people living around. This might be important for ecosystem services of the river itself for flora and fauna. As seen from the Table 1 Green space per capita is 2,14 m^2 even though the Construction Law describes it to be 10 m2 per capita. Because of this fact the river banks and the corridors should be desinged via conncetions with other recreational areas of the city. Aladağ neighbourhood has the lowest green area per capita while Karaçay neighbourhood with new landscape design areas has the highest. Even though it has the highest amount per capita, that does not reach the amount of 10 m^2 of standart of the Construction Law.

There are many possibilities for green infrastructure applications in Bartin city. Beginnging from state buildings green roofs might bring an enormous solution for the rainwater investment. Most of the residential areas are covered by high grey walls and green Wall applications might also be solutions for many parts

of the city. Bartin city along the Western Black Sea is famous for its flood during all seasons. Little amount of rain in a short period might also cause flood problems. The rainwater line which is connected to sewage should be evaluated in a different manner. So as to use the rain water effectively rain gardens might be solution especially close to low altititudes. As the river rises which meant flood for the city design techiniques via sustainable use of water should be considered. The ponds after rain might be temporary wetlands and designed with natural vegetation which will mitigate the unexpected results of the flood.

Discussion & Conclusion

Bartin city is well known with its floods. A vast flood in the Western Black Sea region of Turkey in May 1998 caused great loss and significant damage. Communication network, transportation, and construction cost of the disaster was estimated around US $500 million. Rainwater management is an important issue for the city. The flood exists in a very short and limited time as recent years brought more alluvial material from highlands and the construction industry developed more than expected. Green infrastructure approach is more important on such cases and if GI is accepted as an approach, Bartin River might be not a problematic issue than an important feature for recreation and tourism.

As the river in the past covered most of the characteristics of GI approach which meant Multifunctionality, Connectivity, Habitability, Resiliency, Identity, Return on investment, it has a great potential. The river had been used for transport, connected different aspects of the city, gave birth to ecosystem and gave its name to the city. It is well known that GI offers cheaper solutions than traditional civil engineering activities.

Even with just the pollination effect, green roofs and greenways have significant contribution to urban health and social problems. Green systems let energy save water treatment and cause better infrastructure planning capability.

The findings and comparisons with many case studies within Europe shows actual green spaces which are called parks by the local authorities do not cover permeable pavements and roads, rain gardens, green roofs and roof gardens, rain harvesting systems, road plantations, maintenance of landscape designs and wetland formations. There is also misuse of plant material especially at some of the parks designed. GI approach is an important solution for cities living with floods such as Bartın.

Landscape planning and design due to the characteristics of the cities themselves is an important approach. Regulations for secure life, healthy cityscapes and happy nations might be supplied with interdisciplinary studies of green infrastructure approach. Grey infrastructure is assumed to be planned effectively if only thought with interaction with the green infrastructure. Bartin River shows an important ecological network feature and an important landscape character for the region. The river with the ecosystem services might only be carried to further generations with a common understanding of counsulting with stakeholders. GI approach which offers for all actors of city management to come together and plan the city might also bring effective results of increasing total income for residents.

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