Learning from European cities: Good practices on implementing green infrastructure for reducing the risk of disaster

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Abstract: The forecasts concerning the impact of climate change include an increase in extreme flooding. According to 2019 International Disasters Database, EM-DAT, between 1990 and 2019 Romania was the country with the highest number of disasters caused by flooding in the European Union (EU) (Mihai, 2019). Therefore, it can be estimated that the risk of flooding, and other climate-related hazards, will increase; the manner in which socio-economical activities are implemented will be affected. One of the measures to reduce the risk of flooding is green infrastructure (GI). GI contributes to the protection of biodiversity and also to meeting the objectives of the European Green Deal launched at the end of 2019. Green infrastructure projects refer to integrated and planned actions which focus on restoring/creating natural spaces which provide ecosystem services (European Commission, 2019a). In the European Union and beyond, green infrastructure projects which protect against flooding were implemented. These have many other benefits; not only do they protect against environmental risks and stimulate biodiversity, they allow for the construction of spaces for relaxation, exercising and spending time outdoors, they maintain the clean air, allow for water recycling and provide opportunities for the creation of new jobs. At the level of the other member states there are many initiatives which may serve as good practice models to Romania. Using the analysis of documents as a sociological method, I present four case studies from four EU countries that are described as good practices by experts from the European Green Capital Award. I highlight the relationship between green infrastructure and reducing the risk of flooding. Romania, as a member of the EU, has the tools and opportunity to learn from the experience of other EU member states and develop similar projects, with positive effects for inhabitants and low costs compared to grey infrastructure (O'Donnell et al., 2017). Taking into consideration the causes of the current SARS-CoV-2 pandemic, green infrastructure measures are needed for creating and maintaining sustainable ecosystems.

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Introduction

Climate change is one of the most pressing global problems of our time (Beck, 2016). Through scientific argumentation it is proved that the accelerated human developments within the last three centuries impacted the environment and were the cause of "approximately 1.0°C of global warming above preindustrial levels" increase in the average global temperature (IPCC, 2018, p.4). This increase is life threatening and needs to be slowed. Some argue that solutions could be found within the current socio-economic organisation system, such as the proponents of green growth (OECD, UNEP, World Bank) (Hickel & Kallis., 2020), while others (Clark & York, 2005; Dominelli, 2012) argue that for sustainable change the current system has to change. Even if a transition to a green economy was possible within capitalism, Stroud and colleagues (Stroud *et al.,* 2014) consider collaboration within all stakeholders and government participation to be "essential for effective and sustainable regeneration" (p.21).

It is assumed that climate change is not manifesting in the same manner all around the world. However, a common feature is that some natural phenomena, such as heavy rains, drought and hot temperatures, are expected to become more extreme with the increase in the average global temperature (IPCC, 2018, p.7). Even though climate change is a global problem, it is expected that its effects will be mostly experienced at the local level (IPCC, 2018). Therefore, it is important that cities and localities act together to become more resilient in the face of these environmental risks.

In the European Union, flooding is one of the hazards which produces much damage to humans, property and nature. Considering the threats of climate change, the European Union has taken steps towards limiting the damage produced by flooding, by encouraging member states to assess and manage this risk (The European Parliament and The Council of the European Union, 2007). It is not a matter of stopping flooding from happening, but mostly about building more resilient communities, reducing vulnerability and decreasing the sensitivity of infrastructures to the negative effects of flooding.

Flooding is defined as the covering of a surface with water which is not usually covered (The European Parliament and The Council of the European Union, 2007, p.29). When discussing flooding, it's usually in reference to the negative consequences of the event. The higher the negative consequences people experience after an event, the more likely it is that a discussion on disasters begins. A disaster is not the event itself, but rather a label placed on a situation which includes processes which cause harm to people and the environment, natural or otherwise (Wisner *et al.,* 2004). The respective processes are not brought about by the hazard, but rather part of the social, economic, political and cultural organization of the respective system (Dorondel, 2016).

Currently, the world is working on reducing the risk of disaster, meaning that the main focus is not solely concerned with reducing the hazard, but rather with improving the response to the hazard, which includes taking measures both before and after the hazard, on short, medium and long term timelines (Organizația Națiunilor Unite, 2015).

One of the strategies to be employed for this purpose can be the implementation of green infrastructure solutions (GI). GI is a solution for responding to climate change threats, not only flooding risks, but also droughts and other climate-related hazards. Not only is it important to build more green areas within both urban and rural communities, it is also important to interconnect these areas in order to maximize expected benefits (Ghofrani *et al.*, 2017). In addition to green, these solutions can also be blue (blue green infrastructure, BGI), referring to the measures which interconnect green spaces with water in order to be more efficient (Lamond & Everett, 2019).

In this article I explore good practices from European cities that applied for the European Green Capital Award between the years of 2010 and 2020. I investigate the beneficial practices by these cities, in order to identify the examples selected by experts that highlight the green infrastructure projects and that contribute to reducing the risk of flooding. This is an attempt to learn from the experiences of more advanced cities in terms of green urban infrastructure. Given Romania's exposure to flood risk (Mihai, 2019), learning from the experiences of other cities could contribute to developing strategies which take into account local specificities.

European Union's commitment to green infrastructure

European Commission defines green infrastructure 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 such as water purification, air quality, space for recreation and climate mitigation and adaptation. This network of green (land) and blue (water) spaces can improve environmental conditions, as well as citizens' health and quality of life. It also supports a green economy, creates job opportunities and enhances biodiversity. The Natura 2000 network constitutes the backbone of the EU green infrastructure" (European Commission, 2019a). As such, the definition states that green infrastructure refers to interconnected natural or semi-natural areas which are built in order to provide ecosystem services such as those previously mentioned, whilst also protecting people and ecosystems. In addition, blue and green infrastructure projects are expected to positively influence the economy, directly through the creation of jobs and indirectly through providing health benefits.

Ghofrani and collaborators (2017) mention that green infrastructure "can be considered to include all artificial, natural, and semi-natural components of multifunctional environmental systems around, within, and between urban areas." (p.17). Therefore, green infrastructure measures utilise both natural habitats and man-made habitats in an integrated and multi-purpose network to protect against hazards while also enjoying nature in human settlements.

At the end of 2019, The European Commission presented the European Green Deal which is the EU's strategy for growth for the foreseeable future. The most ambitious target of the plan is to reach climate neutrality in Europe by 2050. It is estimated that, in order to reach this goal, 25% of the EU's budget should be directed towards climate-related actions. A Just Transition Mechanism is envisioned to support the EU countries to move towards greener economies (European Commission, 2019b).

The *2.1.7. Preserving and restoring ecosystems and biodiversity* section of the European Green Deal (pp.13-14) presents the main strategy concerning improving biodiversity, forests' health, and of the oceans and waters. Its main focus is on restoring and extending the habitats to reverse the negative trends associated with climate change. The focus of the entire strategy is to harmonise the economic needs and development with the wellbeing of the environment and thus of Europeans.

The European Green Deal doesn't directly mention green infrastructure. However, it makes two references to *nature-based solutions* for preventing and mitigating the effects of climate change (p.5) and improving the health of oceans and seas (p.14).

The benefits of green infrastructure

The benefits of green infrastructure can be separated into three categories: nature related, economy related, and social related (Alves *et al.*, 2018). The first type refers to the benefits green infrastructure brings to the ecosystem. The second one to the benefits of investing in green infrastructure solutions, as they bring through the development of a new area which requires investments, improvements in skills and collaboration between stakeholders (Stroud *et al.*, 2014). The third one refers to direct benefits for inhabitants, which gain more access to green areas. These can provide more space for outdoor activities, which contribute to improving wellbeing.

Green infrastructure can play an important role in reducing the volume of storm and flooding waters through porous pavements and sustainable water storage solutions in urban areas (Alves et al., 2018; Moura et al., 2016; Recanatesi et al., 2017). Despite the advantages brought by nature-based solution for water management within cities, O'Donnell and colleagues identified that the barriers to implementation are not as much biophysical as they are social and political such as "the reluctance to support perceived novel approaches and change practices, and the lack of knowledge, education and awareness (of the general public and decision makers)" (p.970). The elimination of these barriers represents not only a matter of improving knowledge, but also of designing evaluation tools for assessing the efficiency of green infrastructure investments (O'Donnell et al., 2017).

The European Commission (2010) promotes green infrastructure for its role in increasing biodiversity, as well as for its many contributions to a healthy ecosystem, such as "water purification, soil fertilisation, carbon storage, etc" (p.2). One of the roles of green infrastructure is to stimulate the ecosystem services that nature provides to society, which include the provision of food and clean air, regulation of climate-related phenomena, providing spaces for relaxation and spare-time activities (European Commission, 2019a), as

well as many other resources which, if sustainably used, generate economic value and ensure protection. It has a role in ensuring water flows through nature, as well as maintaining biodiversity, adequate temperatures and air quality for well-being (Alves et al., 2018, p.7).

Green infrastructure can prevent the negative effects of climate change (European Commission, 2010). The European Commission argues that the benefits of investing in nature are not only in the favour of those who directly interact with nature for a livelihood, but also of society itself (European Commission, 2010).

An example of green infrastructure projects is investments in public urban gardens (Škamlová et al., 2020). People who live in the neighbourhood could volunteer their time to grow produce locally. Such initiatives may not be economically competitive on the market, given their limited scope. However, they could provide the context for spending more time in nature, for teaching children how to grow vegetables and plants or for enhancing community spirit. The produce could be used for public events or could be donated to those residents who struggle financially. Depending on the community garden strategy, various solutions could be found in to fit the community's needs. For instance, Göttl and Penker (2020) analysed 51 gardens from six countries (Germany, Austria, Switzerland, USA, Canada and UK) and identified three types of community gardens in urban areas.

Implementing green infrastructure measures can lead to an increase in green space. These areas could be used for increasing green tourism, by offering visitors outdoors activities such as hiking or cycling, as proposed by Andryeyeva and colleagues (2018).

Falxa-Raymond and colleagues (2013) conducted interviews among employees, supervisors and management of the MillionTreesNYC, an initiative in New York which aims to plant one million trees by 2017 (p.289). The program provides training, and employment opportunities to youth who struggle financially. The study found that those who graduated and retained their job, were motivated by their colleagues and by the environmental work they were doing, despite having challenges in balancing their personal and professional lives. The authors (Falxa-Raymond et al., 2013) consider that the creation of green jobs provides opportunities, for people who lack experience or high academic achievements, to improve their skills, allowing them to transition to long-term employment (p.294).

A key benefit is the role that GI solutions can have upon improving citizens wellbeing. Creating green infrastructure projects with green areas for locals to enjoy, can contribute to increasing life satisfaction. Analysing studies which researched the connection between nature and happiness, Capaldi and colleagues (2014) argued that "individuals who are more connected to nature tend to be happier" (p.10). All of these reasons contribute to recommending the implementation of green infrastructure solutions.

Methodology

In Europe, the European Green Capital Award was set up (RPS Group Limited, 2018a) as the initiative of the European Commission environment directorate (Rudden *et al.,* 2015). Each

year, a new city is designated the European Green Capital. It is funded by the Environment Action Programme (p.2). It aims to reward the cities that constantly implement environmentally friendly programmes, which continue to set ambitious objectives to create better cities for inhabitants through environment-friendly strategies, technologies and measures that inspire other cities to implement similar approaches (p.3).

Cities interested in winning this title, that comes with a financial reward (European Commission, 2020b), must enter the competition. In order to win the award, the proposals of the cities that enter the competition (based on administrative compliance) are assessed, taking into consideration the following indicators: "1. climate change: mitigation, 2. climate change: adaptability; 3. sustainable urban mobility; 4. sustainable land use; 5. nature and biodiversity; 6. air quality; 7. noise; 8. waste; 9. water; 10. green growth and eco-innovation; 11. energy performance; 12. governance" (p.8).

In the period of 2010 and 2020, 136 cities applied for the award. 11 cities won the European Green Capital Award, within this period. The winners were: 2010 – Stockholm, Sweden, 2011 – Hamburg, Germany; 2012 – Vitoria – Gasteiz, Spain, 2013 – Nantes, France; 2014 – Copenhagen, Denmark; 2015 - Bristol, United Kingdom; 2016 – Ljubljana, Slovenia; 2017 – Essen, Germany; 2018 – Nijmegen, the Netherlands; 2019 – Oslo, Norway; 2020 – Lisbon, Portugal (European Commission, 2020c).

In their application, cities need to provide proof that they meet the following three conditions: they took consistent action towards reaching high environmental goals, they strategize to reach ambitious environmental goals in the future and they can be a good role model to other cities (Rudden et al., 2015, p.75).

This article presents four good practices of using green infrastructure which support reducing the risk of flooding. The case-studies were selected from expert reports drafted for the European Green Capital Award. The reports include good practices from the applications submitted for the last decade's cycles (2010-2020) (European Commission, 2020a). In order to select the four good practices presented below, I started by making an inventory of all good practices nominated in the reports. I proceeded to only select those which had two clear components: implied green infrastructure examples and were also created to reduce the risk of flooding.

The good practice reports showcase projects from the cities that submitted an application for being awarded the European Green Capital Award. The reports are available online, on the website of the European Commission. These reports aim to promote good practices in order for cities to identify solutions for their problems and adopt strategies already implemented by other cities. My paper builds on this purpose.

Seven of the winners have been included in the good practice reports more than in one year, meaning they had applied more than once for the award. 48 cities from 24 countries that applied for the European Green Capital Award had initiatives which were selected as good practice models by the organisers. On average, these cities were mentioned in the nine good practice reports (first four years were comprised in two reports) nine times, while the rest were mentioned, on average, 4 times. The winners' minimum number of practices introduced in the good practices report, per theme, were three (Hamburg, Germany) and the maximum, 15 (Nijmegen, the Netherlands).

The case studies detailed below are the following: (a) Bristol, United Kingdom, presented in the 4th Good Practice report in 2014 cycle, (b) Antwerp, Belgium, also presented in the 4th Good Practice report in 2014 cycle, (c) Nijmegen, the Netherlands, presented in the 5th Good Practice report in 2016 cycle and (d) Lisbon, Portugal, presented in the 8 Good Practice Factsheets in 2019 cycle (European Commission, 2020a).

Results

This section is focused on presenting the measures implemented by each of the four cities below, in relation to green infrastructure. Three of the four cities (Bristol, Nijmegen and Lisbon) won the European Green Capital Award. All cities have implemented many other measures in order to improve their environmental conditions, in areas such as recycling, transportation, biodiversity, noise and air pollution reduction, improving water quality and enhancing civil society participation. However, for all of the four cases, the focus in this article is mainly on green infrastructure and its contribution to reducing the risk of flooding and improving the overall quality of life.

Bristol, United Kingdom, presented in the 4th Good Practice Report in 2014 cycle

Bristol won the European Green Capital award in 2015 (European Commission, 2020c). When the city applied for the award, the approximate population was 430'000, with a growing urban population trend (Bristol, n.d.). In their technical bid, the city mentions that in order to obtain the benefits of green infrastructure, they included 27% of the city's surface into the Wildlife Network (Bristol, n.d., p.1), observed in Figure 1. The benefits of this particular project are mentioned and include protection against flooding through water storage, together with the absorption of carbon and maintaining proper temperatures.

Bristol started its journey to become a green city in 2003 (Bell et al., n.d., p.8) before the prize was set by the European Commission environment directorate (Rudden et al., 2015). Evidence about Bristol's success is the contribution of a wide collaboration at the local level, through the creation of Bristol's Green Capital Partnership (Bell et al., n.d.; Ersoy & Larner, 2020). Bristol made a priority to reduce its carbon footprint and this goal appealed to many stakeholders (Bell et al., n.d., p.8).

Bristol was awarded the European Green Capital in 2015 for various projects focused on cleaner transportation and energy, many recycling projects and food sustainability (European Commission, 2015). However, in the 2014 award cycle Good Practice Report, the city was recognised for its focus on wildlife. The city created a Wildlife Network which was comprised of protected areas. The nature conservation sites were selected as a result of scientific analysis, through an assessment methodology. "The Wildlife Network contributes substantially to the city's overall green infrastructure" writes the report (O'Neill & Rudden., n.d., p.15).

According to the Bristol Biodiversity Action Plan, the main strategy to reduce the risk of flooding without affecting biodiversity is to reduce the effects of the current

defence mechanisms and to focus on water "retention or restoration of floodplains" (Bristol Biodiversity Partnership, n.d., p.88).

In the Local Flood Risk Management Strategy, green infrastructure is mentioned once in the notes (p. 41). The strategy takes into account the implementation of Sustainable drainage systems to reduce the risk of flooding. One of the proposed measures (p.31) is to use nature-based solutions, such as green areas and waterways in order to prevent flooding. The strategy enumerates creating more green spaces, such as "planters, swales, rain gardens, grassed verges and green roofs" (p.33). The document mentions more benefits than just the reduction of flood risks, when green solutions are implemented (which include improving water quality, urban temperatures, habitats, site beautification). It states that these benefits are harder to quantify, which makes it even more relevant if needed to argue in favour of green infrastructure measures (Flood Risk and Asset Management Team - Bristol City Council, 2018).
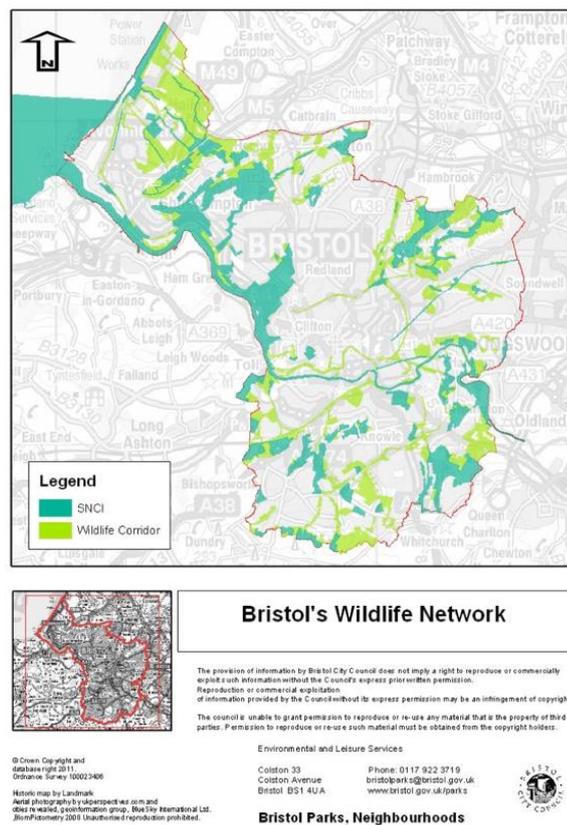
Figure 1 – Bristol's green corridor called Wildlife Network

Source: The picture is taken from the Bristol technical bid for the European Green Capital Award, chapter 4 Nature and Biodiversity, 3rd page of the document (Bristol, n.d.)

Antwerp, Belgium, also presented in the 4th Good Practice Report in 2014 cycle

Antwerp is a city located in Belgium which has approximately 500'000 inhabitants (Naturvation, 2017). The city has not won the European Green Capital Award yet. It was mentioned twice in the Good practice reports, which contain the information from all candidates in the 2014 cycle. One of the mentions refers to the city's initiative to make neighbourhoods green (O'Neill & Rudden., n.d.).

The city has a strategy for diminishing and preventing flooding. Several measures were put in place, such as the obligations when constructing new buildings to "install a flow-back prevention system to prevent floodwater flowing out of the sewage system" (O'Neill & Rudden., n.d., p. 26), water retention and transportation systems, green roofs or water wells on the roofs' surface, and separated drainage system for rainwater on buildings.

One such example is the Rozemaai neighbourhood. In this place the municipality initiated a project which includes creating a sustainable drainage system for the water coming from storms which is directed towards green areas to be used by residents as relaxation spaces. The vision began in 2006, with the plan to develop Antwerp. In 2009 a Masterplan for Rozemaai was drafted and included the implementation of the green measures for building social cohesion (Naturvation, 2017).

Figure 2 – New part in Rozemaai neighbourhood, Antwerp, Belgium

Source: This picture is taken from the Antwerpen morgen's website and presents the participation in the opening event of the new park in Rozemaai neighbourhood (Antwerpen morgen, 2018).

The project was started in 2015 and was ongoing in 2017 and 2018. The inhabitants of the neighbourhood dealt with social difficulties, such as unemployment, social-cultural

differences, and the lack of relaxations spaces (Naturvation, 2017). The park opened in May 2019, with the participation of locals, as seen Figure 2 above (Antwerpe Morgen, 2019).

Between July 2018 and February 2022, Antwerp is part of the European Project *Nature Smart Cities*. The project aims to develop business models for smaller cities (less than 550'000 inhabitants) to implement green infrastructure for reducing the risk of flooding, drought and heat stress (Institute of Environment and Sustainable Development - University of Antwerp, n.d.).

The city is considering another green infrastructure project. In this one, a location currently used for parking would be transformed into green and blue areas with the capacity to harvest storm water and thus reduce the risk of flooding. The project is currently halted as the permits for building two underground parking spaces were not obtained (Atelier GroenBlauw, 2019). Nevertheless, these initiatives highlight the commitment of the city towards using green infrastructure to reduce the risk of flooding.

Nijmegen, the Netherlands, presented in the 5th Good Practice Report in 2016 cycle

Nijmegen is a city located in the eastern part of the Netherlands on Waal River and has a population of approximately 170'000 inhabitants (European Commission, 2018). Nijmegen won the European Green Capital Award in 2018 (European Commission, 2020c). Overall, the measures implemented in the city were described in the Good Practice reports 15 times in four years.

It has "$92m^2$ of green space per citizen" and most inhabitants live within 300m away from green areas of at least 0,5ha. In terms of land use, about a quarter is considered green space; blue space covers approximately 8% of the city (European Union, 2017, p. 12). The municipality installed $1400m^2$ of green roofs (European Union, 2017, p. 48).

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Figure 3 – Nijmegen "Room for the River" project

Source: This picture is taken from worldlandscapearchitect.com (Holmes, 2017)

Two main projects have been implemented in Nijmegen in relation to reducing the risk of flooding: (a) more space was created for the Waal River and (b) previously covered surfaces with impermeable pavement were turned green in both public and private spaces.

The city's approach to reducing the risk of flooding is to make more space for the water. To this end, the Waal River was extended with a secondary channel, the river's dike was moved and an island was created, easily accessible from both sides of the river, by bridges with special lanes for biking and running (European Union, 2017, p. 50), as shown in Figure 3.

The second project of the city was to make more green spaces, replacing paved areas with plants. This initiative targeted both private and public spaces and included citizens' participation (European Union, 2017, p. 51).

Also, other initiatives were taken in order to reduce flood risk, such as creating water storage systems and re-naturalising the banks of ponds (European Union, 2017, pp. 51-52). The city planed for the next years to invest in reconditioning the flood defence walls on the south side of the river Waal. With the extension of the river, a new "flood defence wall on its northern banks" was created (p. 52).

Lisbon, Portugal, presented in the 8 Good Practice Factsheets in 2019 cycle

Lisbon is the European Green Capital in 2020. Lisbon is the capital of Portugal and has a population of 537'412 (O'Toole *et al.*, n.d.).

Lisbon was mentioned 10 times in the Good practice reports and factsheets in 2017, 2019 and 2020 cycles on various indicators. The selection in this article is based on the description from the 2019 good practice factsheet concerning the waste water management indicator (RPS Group Limited, 2018b).

In order to respond to future climate risks, such as "water scarcity, flooding and pollution" (RPS Group Limited, 2018b, p. 2), Lisbon invests in green infrastructure projects which encourage reusing water. At the same time, Lisbon is involved in awareness raising campaigns in order to inform its citizens on sustainable water use.

Lisbon is ambitious concerning its green objectives. In the four-year period between 2017 and 2021, the city planned to plant 80'000 new trees, have 9 green corridors and increase its green spaces by 20%. The city is focused on reducing the risk of flooding, on improving the air quality and on reducing the distance between green areas and the residents through the implementation of green infrastructure (Lisbon, 2018).

There is an important connection between the improvement of the water use indicator and the maintenance of green spaces, as water is used in a more sustainable manner; the waste water is treated and then used for irrigation of green spaces and for washing the streets (Lisbon, 2018).

The sustainable land use which includes creating green spaces, has an important role in the beautification of neighbourhoods and increasing the value of the property. With this aim in mind, the municipality of Lisbon invests in green spaces, especially in

neighbourhoods dealing with socio-economic difficulties (personal communication with municipality representative), as illustrated in Figure 4.

Figure 4 – Lisbon green spaces

Source: This picture is part of the author's personal archive

Discussion/Conclusions

It is quite clear that trying to win such a prestigious award requires a long-term commitment towards developing a healthy city. It requires leadership, participation and collaboration from: the local (and regional, and national) government, businesses, academia and from the citizens (Rudden *et al.*, 2015).

Winning the prize creates new economic opportunities, brings in more revenue from tourism, brings people together in public events, supports the increase in quality of life for citizens and creates new jobs as it requires a change in how things are presently being done.

The EGCA is seen through the lenses of a new management paradigm, as it implies communication between the municipality and citizens, and the collaboration between individuals, civil society, businesses and the local government (Agnoletti *et al.*, 2017).

The cities are discouraged to focus on sustainable development solely for winning the European Green Capital Award. The prize is rather given to the cities that manage to prove the long-term commitment towards environment-friendly solutions, through measures already in place, through concrete actions concerning the next months and years and through making green solutions part of the city's long term development strategies (Iacomoni, 2019). There are however critics who question the positive outputs of the implementation of sustainable solutions within cities, by considering what the outcomes

of those solutions are on the environment overall, not just at the cities' level (Sareen & Grandin, 2019).

Maybe as important as the others, if not more so, the European Green Capital Award constitutes a clear goal for which many stakeholders need to contribute. Bristol mentions in its 2015 year review after it won the European Green Capital, that the award brought focus to their strategy (Bell *et al.*, n.d., p. 8), as the plan to be a green city is a long term one and doesn't end after winning the prize.

A limit of the study is that it only presents the good practices highlighted within the European Commission's European Green Capital Award. In the process of selecting a winner, experts evaluate cities' proposals. This means that the cities which made good progress on using green infrastructure to protect against flooding and enjoyed the socio-economic benefits of such investments but have not applied for being a green capital are not highlighted in the good practice reports. Thus, there may be other cities which have made good progress in the area of green infrastructure but are not presented here.

At the same time, the analysis is based on the formulation of the Good Practice reports. Therefore, there may be other cities which implemented green infrastructure projects and are highlighted in the reports, but the flood protection component is missing (e.g. Umeå, Sweden).

Visible in the description of the four cities is the focus on the observable positive results of creating a city in which dwellers live in more harmony with nature. The extension of the space for Waal River in Nijmegen reduces the risk of flooding. The reports on the 2018 year, when Nijmegen won the European Green Capital, focus mostly on the benefits it brings to people in terms of spending time in nature and the impacts upon their quality of life. Even though the decrease of the risk of flooding is mentioned, the focus is on the benefits brought by the project rather than on what was prevented.

Green infrastructure has the potential to improve urban areas and make cities more sustainable. Implementing such solutions requires partnership between stakeholders, leadership from various levels of government and the long-term commitment towards creating a better future.

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