

**Ecological Resilience and Urban Resilience: A study on the
Resilience of Biological Ecosystems and their relationship
to Resilience of Urban Forms.**

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ABSTRACT

Resilience from the Latin ‘resilire’, ‘to recoil or rebound’ is the ability of an object, person, or system to bounce back and adapt after some form of change. In urban studies this noun has appeared in the research community and in many conference topics over the last 20 years. With so many fast changes reaching our cities and communities in global and local levels this topic’s relevance is ever growing.

I propose to examine resilience of biological ecosystems and compare principles to working resilience of urban forms. Nature tells us much about growth, adaptation, transformation, cycles, structure and ultimately resilience. I will focus on these characteristics in nature and their relationship to how we think about the negative spaces in the urban fabric of European cities like Budapest. Studying the cycles and relationships which contribute to nature’s resilience can teach us about the way our urban spaces impact human development and the resilience of our communities.

To accomplish this, I will focus on 4 different public spaces in the city of Budapest and make a deeper analysis of these areas, connecting their spatial and behavioral characteristics to theoretical aspects of the term resilience. With the final objective of learning about factors in these spaces which contribute positively or negatively to urban resilience and which reflect aspects found in biological resilience.

All this will be done taking into consideration the new phenomena of global pandemics which has become extremely relevant with COVID-19, having a strong effect on the use of our public spaces. Considering factors of how these negative spaces in cities can contribute to the new world in midst of pandemics and other natural and sociological phenomenon’s.

The analysis of the chosen spaces will be carried out through a mixed research method, which is a mix of qualitative and quantitative methods. The urban analysis approach of Jan Gehl's methodology is used to understand the impact of the established areas on people using those spaces.

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1. INTRODUCTION

Humans are known for their ability to survive. The director of the Human Origins Program at the Smithsonian Institution National Museum of Natural History Rick Potts states that humans *“ability to think creatively and to imagine novel solutions to survival threats, has proven to be a major asset within the context of the earths swiftly changing landscape.”*

It is known inside and outside the scientific community that species, including humans, have a built-in ability to survive, adapt, and thrive. This need for adaptation is in many cases directly affected by their local context- that being climate, geography, landscape, or culture. This ability which is inherent to us all can also be translated into something called resilience.

To say a system or organism is resilient is to comment on its ability to deal with change. The term originated from the Latin ‘resilire’ to recoil or rebound. According to the Macmillan dictionary blog the term was used to *“signify ‘spring back’ in the 1640’s but was not used figuratively about individuals or groups of people until circa 1830.”* (STAN CAREY, 2017)

An essential characteristic of resilience, described well by Dr. Geoffrey Deverteuil, is that resilience requires a threat which is usually external. In his paper he explains that there is a difference between the term resilience and vulnerability or sustainability. He goes on to quote that *“resilience is more about anticipating, living, and dealing with threats as diverse as climate change to neoliberalism, rather than suffering from them or avoiding them altogether.”* (DEVERTEUIL, 2017) This again reflects on the continuous and adaptive qualities inherent to resilience.

Despite the term having these inherent meanings, nowadays resilience can have slightly different meanings depending on the field with which it is being associated. For example, the term “resilience” holds a slightly different meaning for engineering, biology, and urban development. However, in all these fields the general concept is that resilience relates to the surviving and adapting qualities of an organism, object, material, or space. The U.S. Department of Health and Human Services (2015) defines individual resilience *“as the ability to withstand, adapt to, and recover from adversity and stress.”*

A common scenario when speaking about resilience is to confuse it with the idea of ‘bouncing back’. This refers to an aspect which signifies stability and resistance. This interpretation of the

term is mostly related to the engineering field where a structure or mechanism is considered resilient when it has withstood an impact by a load without being permanently deformed or has overcome a stimulation and bounced back to functioning the way it was programmed to. The interpretation does not necessarily apply to ecosystems and urban resilience. (Holling, 1973)

Finally, Dr. Geoffrey Deverteuil states that “*resilience is a continuous process, not an endpoint. It is a dynamic property rather than a fixed one and can be produced by a variety of agents from states to individuals.*” (DEVERTEUIL, 2017). This continuous process is a prominent feature of both the resilience of ecosystems as well as urban resilience.

In the study of urbanism, the approach of relating ecology to the urban form is not a novel one. This approach started with urban scholars of the Chicago School in the 1920’s and 30’s. However, “*this line of thought did not for long, adequately address complex human-nature system relations of urban resilience.*” (BARTHEL, 2016). In recent years, more and more studies have been done studying the effects of nature on humans. Research done by Giusti et al, 2016, “*showed that pre-school children that experience nature environments in their daily routines develop significantly stronger environmental attitudes and better ecological knowledge that those that do not.*” (BARTHEL, 2016) This highlights the importance of people’s engagement to nature for physical and mental benefits but also to our learning process.

2. RESILIENCE OF ECOSYSTEMS

The study of resilience of ecological ecosystems was first introduced by the Canadian ecologist C.S Holling. Holling established that, “*ecological resilience is the ability to absorb disturbance and still maintain the same relationships between populations or state variables.*” (Holling, 1973) This maintaining of relationships refers to the fact that ecosystems involve many complex interactions between members of different species. These species often have different relationships that contribute to the overall balance and survival of the ecosystem.

Holling states “*if we are dealing with a system profoundly affected by changes external to it, and continually confronted by the unexpected, the constancy of its behavior becomes less important than that persistence of the relationships. Attention shifts, therefore, to the qualitative and to questions of existence or not.*” (Holling, 1973)

He goes on to argue that parameters and definitions used to study, and measure ecological resilience have been essentially borrowed from developments in physics and engineering which inevitably emphasize the quantitative aspect rather than the qualitative. This being said, as ecological systems are composed by species which are very much affected by external change and in ecological systems the persistence of the relationships are more important than the constancy of the system, it is not advisable to treat them in the same way.

For my research, it is important to emphasize the connection between what is being studied and what definitions we are using, in order to more effectively create ways to measure resilience. As earlier proposed, I will examine some aspects from the resilience of biological ecosystems which can be translated into aspects found in urban resilience thus helping us learn from this area.

A key aspect of the biological resilience of ecosystems is the bio diversity of species. This diversity contributes in very different ways to the overall resilience of the system. *“Ecosystems involve many complex interactions between members of different species.”* (Petra Tschakert, n.d.) These interactions are composed of complex relationships which balance the system. When these ecosystems encounter external threats or disturbances like the extinction of a species either this can signify the total collapse of the system or the system can somehow adapt and reconfigure to the loss of that species.

“Ecologists often explain the role of biodiversity in case of resilience using the metaphor of the house of cards. When we remove cards from the house, one of two things can happen. If the card was not essential for the house's structure, then the house remains standing. Or, if the card was essential to the house's structure, then the entire house falls. There is often no middle ground in which part of the house remains standing.” (Petra Tschakert, n.d.) This metaphor can also be applied to the way our cities function and how the introduction or absence of different functions in the city can affect the whole working of the urban context especially in relation to public spaces.

Another important aspect of biological ecosystems are negative spaces. (solutions, n.d.) Negative spaces appear in many different ways such as the physical space between plants which ensures their proper growth (Chao Si, 2019) and spaces in soil which are just as vital as the material that makes up soil. These negative spaces are likely just as important in the urban fabric where the in between spaces provide leisure places for citizens where activities can happen and where they play many other essential roles.

3. URBAN RESILIENCE

“Urban resilience is the measurable ability of any urban system, to maintain continuity through all shocks and stresses, while positively adapting and transforming toward sustainability” (HABITAT, n.d.)

The term urban resilience is relatively new to the urban academic world, having been a reoccurring topic in the urban context only for the last 20 years. In a recent conference held by RESCCUE, 2020 a study was presented by Juan Francisco Arrazola. Through a analysis of google searches he presents a graph measuring the level of importance of topics such as climate change and resilience appear all over the globe. The result showed that these topics compared to other current topics, such as COVI-19, and Donald Trump, currently has very little importance to the general population. Thus, there is still a long way to go when it comes to research on urban resilience and population awareness of urban issues.

A key aspect of urban resilience is the different sectors which compose it. Urban resilience is comprised of different elements: the social/human aspect, the environmental, the economic, and the governmental dimension. All these sectors are essential components of a city and contribute to making a city capable of withstanding and adapting to varying changes and ultimately to its resilience.

In the past, social- ecological research has contributed greatly to the understanding of how our cities work *“ an approach that really began with the urban scholars of the early 1900s. It is in such social-ecological research traditions where the most prolific authors on urban resilience are found.”* (BARTHEL, 2016). This line of research reveals the importance of interaction between different sectors but has a greater focus on the behavior of the city as an organism towards the external context rather than on the behavior and interactions within its boundaries among its citizens. Thus, the importance of studying the role of people in urban resilience is enhanced.

Because in many species each organism has similar aspects but is also a unique composition of living matter, it is possible for different organisms to adapt or evolve in different manners. The way people, animals, and plants thrive can look different depending on age, genetics, and environment. This can also apply to cities because cities are made up of people.

The UN predicts that in 2018, 55% of the world's population lived in cities and the trend is for this percentage to grow. As cities house half the world's population they find themselves in need of adapting and thriving as much as humans do. While this trend has its positive and negative sides people who rush to live in cities also find themselves becoming more disconnected from nature and thus from learning from it. I propose in this paper to take a step back and discover what we can learn from nature and how it can help in the study of Urban Resilience.

4. METHODOLOGY

Of the many aspects of resilience the focus of this paper leans towards social resilience and the relationship it has with public spaces and proposes to examine the impact these places can have on keeping societies resilient. This focus comes out of the need to balance the discussion of urban resilience while factoring in the human aspect as opposed to well discussed topics such as climate change and others. However, this does not mean leaving the other aspects of urban resilience unacknowledged as a holistic view is essential to the study of urban resilience.

The methodology is based on a mix of qualitative and quantitative research. The objective is to present a proposal on how to measure the resilience of public spaces. This will include measurable aspects such as quantities and areas alongside qualitative aspects which can be gathered through observation. The mixed method gives us the possibility to respect and consider the quantitative aspect of measurement while also highlighting the importance of observation when it comes to variable indicators such as humans themselves. To form the criteria for this methodology Jan Gehl's method of observation served as an important source of inspiration along with authors such as Jane Jacobs.

One of the criteria borrowed from Jan Gehl's book *Life in Between Buildings* was regarding human activity where he considers the importance of the kind of activities in public spaces. He states that *"People will foremost start with activities that are necessary, like grocery shopping. But when people are already at the public space for the necessary activities, they will more likely do optional ones too, like taking a coffee. Therefore, the character of the functions, according to Gehl, must be inviting and easily accessible"* (Gehl, 2011). This indicator gives us a tangible measurement through observation which can indicate how healthy public spaces are by what kind of activities happen in those spaces. These kinds of activities ultimately

contribute to the safety, opportunity for social connectivity and ultimately to the resilience of the space.

The city of Budapest was the chosen location for the case studies due to practical reasons such as easy access to the public spaces and possibilities of multiple occasions for observation and collection of data. Another fact is that Budapest is a fast-growing urban capital which faces many of the current global issues that affect urban centers, thus it is a good European indicator to be measured. All the chosen public spaces are located either in the city center (district 5) or very close to it with areas that vary from 1500 m² to 15000m².

In relationship to ecological resilience, three principles were used as references to relate to urban spaces. The first being the “dynamic nature of species” in an ecosystem and the relationships between the agents that form the system. The second is the importance of biodiversity in these systems to ensure the survival of the systems and lastly, the role of negative spaces in the process of growth and resilience of these organisms. These principles serve as a basis from which some of our measurements gain their relevance.

In the following paragraph I highlight what has been measured in each public space and why these measurements can be indicators of the resilience of public spaces.

WHAT TO MEASURE?

1. **Number of activities-** List the activities which have been observed in the space, how people use the urban furniture, what are possible activities according to the space and furniture provided and categorize them according to Jan Gehl's method of observation (necessary, optional, and social)
2. **Density of space-** Map the space on ground floor level, which is occupied, by furniture, tree trunk, bushes, gardens, buildings. vs. unoccupied or “free space”. Represented via a monochrome map.
3. **Accessibility-** Measure a 500m and 200m ratio around the public space to and mark bike stands, public transportation stops, parking, public bike sharing, public transport boat docks and etc, on a map.
4. **Public space infrastructure -** Count and write the number of public infrastructure amenities such as benches, garbage's and lighting posts.
5. **Impact ratio** – Count the number of windows and doorbells around the perimeter of the public space. Number and list the different functions at the perimeter of the space (shops, cafes, offices, etc)

6. **Green Space** - Map the area of green space vs non green space. Include trees, flowers, bushes, and grass surfaces.
7. **Surface Coverage**– Map the different types of surface coverings including permeable, semi-permeable and impermeable.

WHY MEASURE?

1. **Number of activities**- To have a grasp of the diversity of people who use and have the possibility to use the space and on the diversity of the use of space. Which reflects the “mixed use functionality” of the space. Which reflects the principle of biodiversity and dynamic nature of species from the ecological study.
2. **Density of space**- To understand the ratio between the physical space occupied by a certain function and the free space which can give room to temporary functions or emergency functions. This relates back to the presence of negative spaces in ecosystems and reflects on the flexibility of public spaces in adapting to new functions.
3. **Accessibility**- To know what the access possibilities are to reach the space and how easily it can be reached by people with low mobility.
4. **Public space infrastructure** – To know how well equipped the area is in terms of spaces for people to stay and spend more time, ie. the number of benches. To have a grasp on the safety of the space at night and the possibility of 24h use. To consider what contributes to maintenance and cleanliness of the space.
5. **Impact ratio** – To provide an idea of the number of people directly impacted by the space, visually, acoustically, socially. Have a better grasp of the safety of the place due to “eyes on the street” * and have an idea on how the surrounding functions can impact the space and its users. This measurement relates to the dynamic nature of species and presence of biodiversity from the ecological study which can be seen in mixed use functions and social relations.
6. **Green Space** – To have a grasp of the impact of the space on people’s mental health. Multiple researches have been carried out confirming that exposure to nature increases human’s mental wellbeing. This map also reflects on the spaces contribution to absorbing CO2 from the environment and thus creating a more sustainable future for cities.

7. **Surface coverage**– To reflect on the ability of the space to radiate or not heat which ultimately creates heat waves and can increase discomfort of users. It also relates to the ability of a space to drain water and contribute to the water resilience of cities against climate change.

*Eyes on the street- terminology used by Jane Jacobs in her book the life and death of great American cities. Where she relates to the phenomena of having windows on the street and ultimately people watching the street as a healthy contribution to people's sense of safety as opposed to not having them.

The collection of data in the case studies will serve as a base for a qualitative assessment of which spaces are perceived as most resilient. Based on which of these present the most positive levels of the above-mentioned features related to established urban methods of observation and new measurements which arose from the study of biological systems.

5. GELLÉRT HILL PLAYGROUND

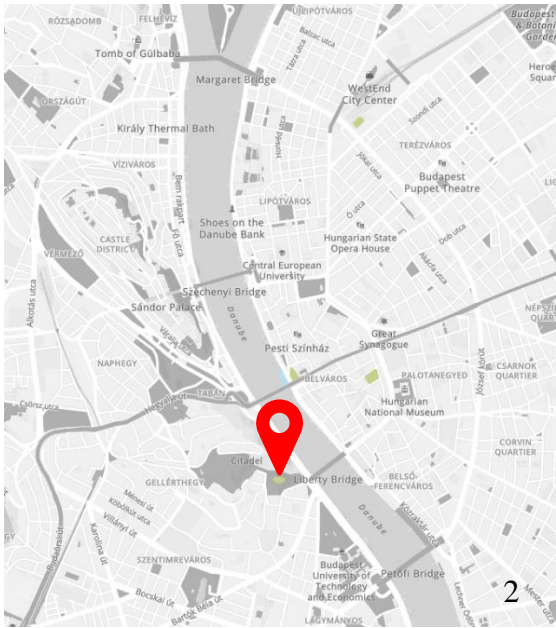
Located on Gellert hill along the Danube river on the Buda side, the Gellert hill playground is a unique public playground in the city of Budapest. It is characterized by the integration of the playground equipment into the natural terrain of the hill, creating a dynamic and fun environment for children and parents alike.



District: XI

Address: Budapest, Szabó Dezső lejtő, 1118

Area: 1071 m²



The different kinds of playground equipment are spread out evenly in 3 different levels. The slides and a central set of stairs connect the upper section to the lower part. The liveliness of the area created by active kids and fun equipment also invites the curiosity of other age groups wanting to join in on the fun.



NUMBER OF ACTIVITIES

Social>Optional>Necessary

Talking, playing, sliding, jumping, running, sitting, laughing, screaming

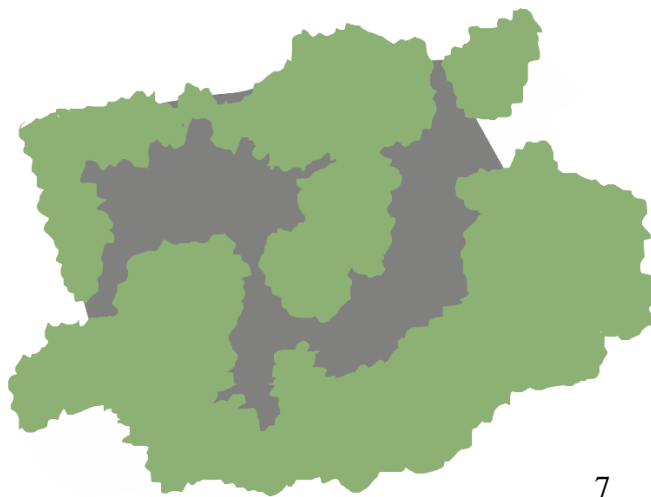
PUBLIC SPACE INFRASTRUCTURE

- trash bins: 9
- benches: 29
- Lighting posts: 0
- Bike parking: 4
- Drinking fountain: 2

IMPACT RATIO

- Doorbells: 0
- Windows: 0
- Shops: 0
- Cafes/ Restaurants: 0
- Offices: 0
- Art Galleries: 0
- Museum: 0

GREEN SPACE MAP

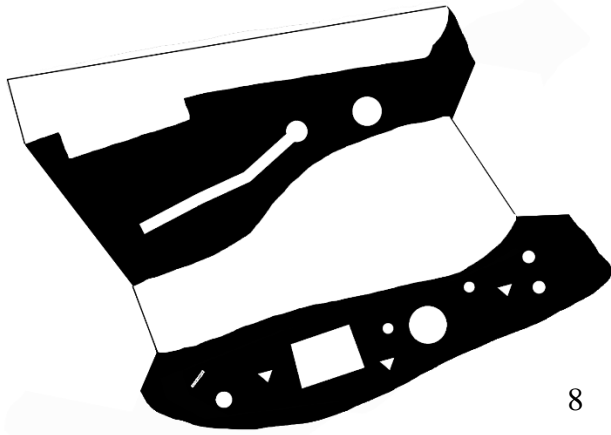


The ratio of green space to non-green space is 3:1. The dense green canopies above the playground are a great heat buffer in the summer and offer protection from rain. While contributing to the environment and increasing the wellbeing of the users.

Level:



DENSITY OF SPACE MAP

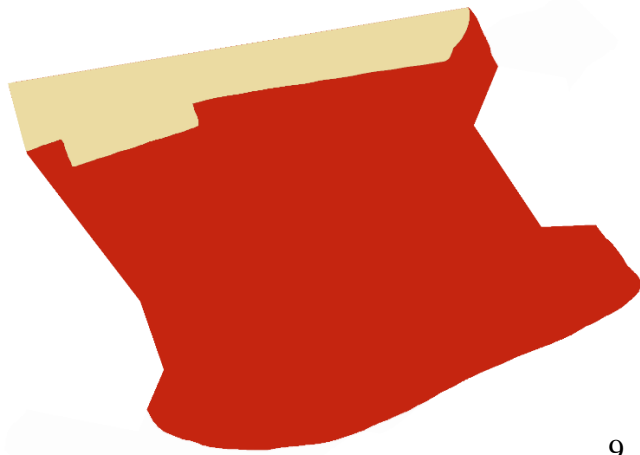


The ratio of occupied to unoccupied space is 1:1. However, because of the distribution of the fixed playground infrastructure the space for flexible activities is reduced even more.

Level:



SURFACE COVERAGE MAP



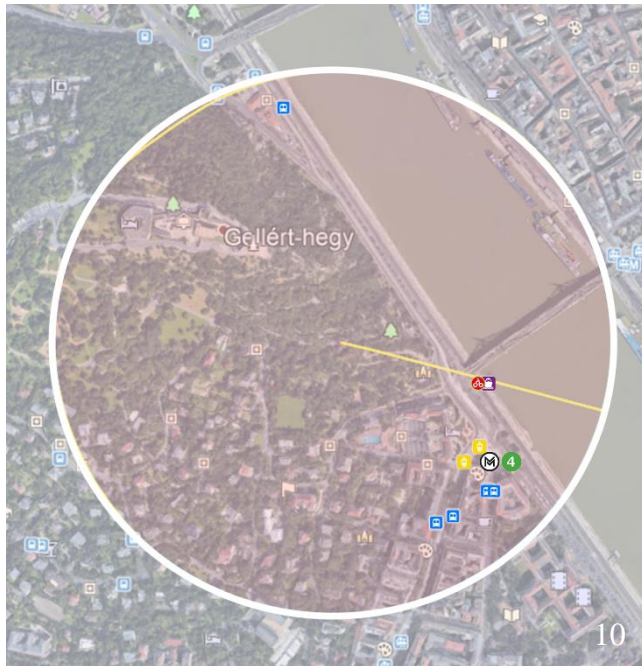
The heat coverage map has a ratio of 7:1 for impermeable surface to permeable surfaces. Because the playground is located in a large green area of the city this ratio does not have such a negative impact on the space vs if it were in a dense concreted area.

Level:



ACCESSIBILITY MAP

500 M



In this radius there is one metro station, 2 tram stops and 5 bus stops. There is also a mol rental bike stop, lime scooters, a public boat dock and street parking.

In terms of function, the area has: universities, the Gellert thermal bath, residences, shop, restaurants, cafes, and pubs.

200 M



In this walking distance radius, you can enjoy the rest of the greenery of Gellert hill, reach the top of the hill where the citadel is located and on the other end visit Gellert thermal baths.

The park is unique to the city with lush green spaces surrounding a well-equipped and designed park. Out of all the case studies this one has the highest level of green space and offers the most secluded situation which contributes to protection from harsh weather but also leaves the space unguarded at nighttime. The social activities create a dynamic situation for children parents, grandparents, and other generations to have fun and enjoy

laughter and each other. The public infrastructure is modern and works well however the fact that the space is secluded and there are no “eyes on the street” contributes to acts of vandalism to the infrastructure such as graffiti. Because of the density of playground infrastructure there is not much flexible space for emergency activities or changes in the function which may not present a problem as activities for children are always necessary in a variety of circumstances in the urban fabric. Impermeability of the surfaces does not contribute positively to heat waves and water management however since the park is in the midst of a large green space and is covered by greenery this effect is reduced. The accessibility of the space is rather difficult compared to other case studies locations however it gives users a chance to gain some physical activity while climbing the hill.

6. EIFFEL SQUARE

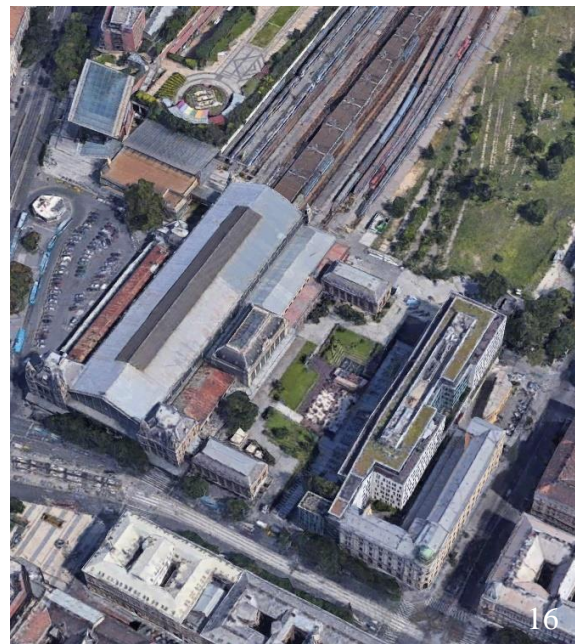
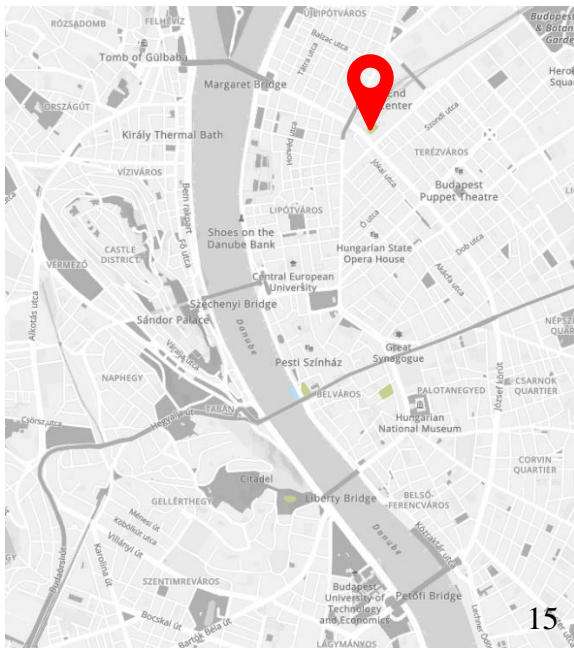
The Eiffel square is located on the Pest side between Nyugati train station and the Eiffel office building in the North part of Budapest. This space serves as a buffer between two seemingly large and active buildings. The square creates a buffer zone of open space full of greenery and restaurants. Curiously, in certain times of the year the green spaces are more populated than the restaurants with proper seating which makes this space relaxed and casual.



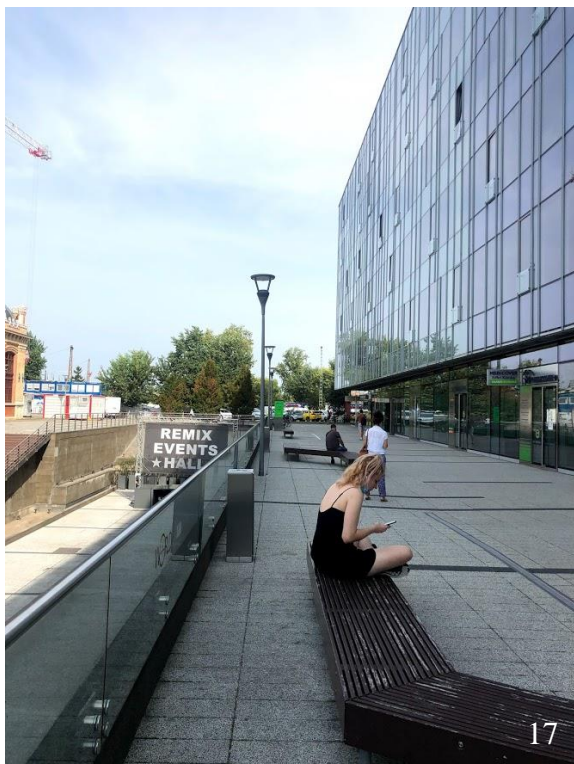
District: VI

Address: Budapest, Eötvös u., 1062

Area: 4772 m²



However, in cooler months the green space is less used. The upper part consists of benches alongside the front facade of the office building. People wanting to get out of the office or wait for appointments can spend their time there.



NUMBER OF ACTIVITIES

Social>Optional>Necessary

Talking, reading, sleeping, eating, sitting on grass, walking, talking on phone, drinking.

PUBLIC SPACE INFRASTRUCTURE

- trash bins: 18
- benches: 10
- Lighting posts: 34
- Bike parking: 46
- Drinking fountain: 0

IMPACT RATIO

- Doorbells: 0
- Windows: 115m x7 floors= 136m²
- Shops: 1
- Cafes/ Restaurants: 7
- Offices: 7
- Art Galleries: 0
- Museum: 0
- Train Station: 1

GREEN SPACE MAP

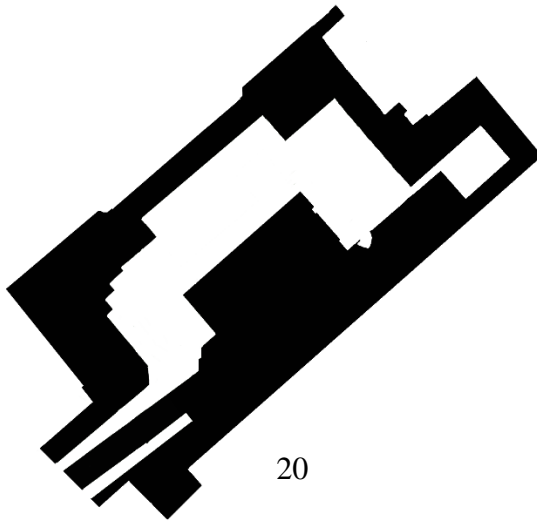


Level:



The ratio of green space to non-green space is 1:2. The green space attracts users to get away from the busy train station, offices, and mall in the surrounding area. The non-green space serves as circulation corridors and extensions for outdoor restaurants.

DENSITY OF SPACE MAP

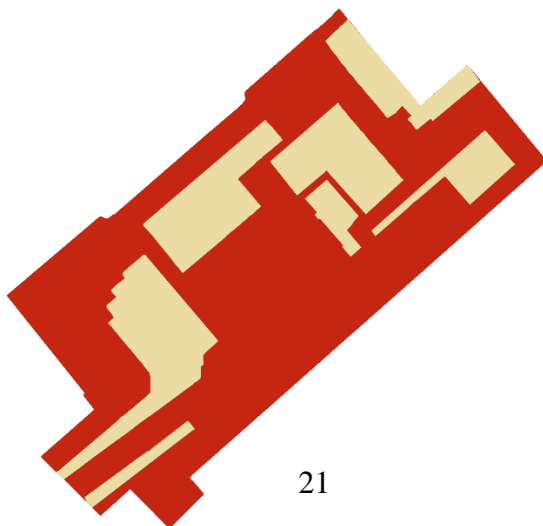


Level:



The ratio of occupied to unoccupied space is 2:1. The unoccupied space can temporarily hold events such as concerts and serves as an extension space for the restaurants located on the perimeter. Unoccupied space can also assist in providing space for food distribution and other temporary support functions during emergency situations such as accidents or natural disasters.

SURFACE COVERAGE MAP



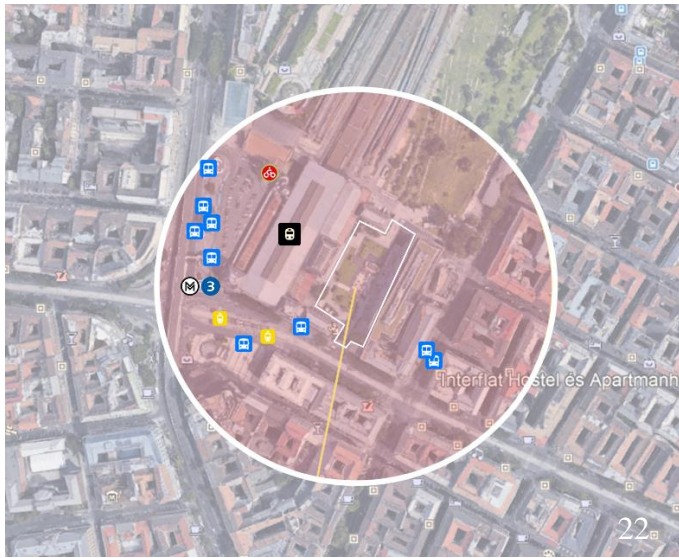
Level:



The ratio of permeable space to impermeable is 1:2. This is not an ideal indicator as more impermeable space contributes to hotter surfaces and less places for water to flow. In the summer season people will tend to stay on cooler and more permeable surfaces such as grass.

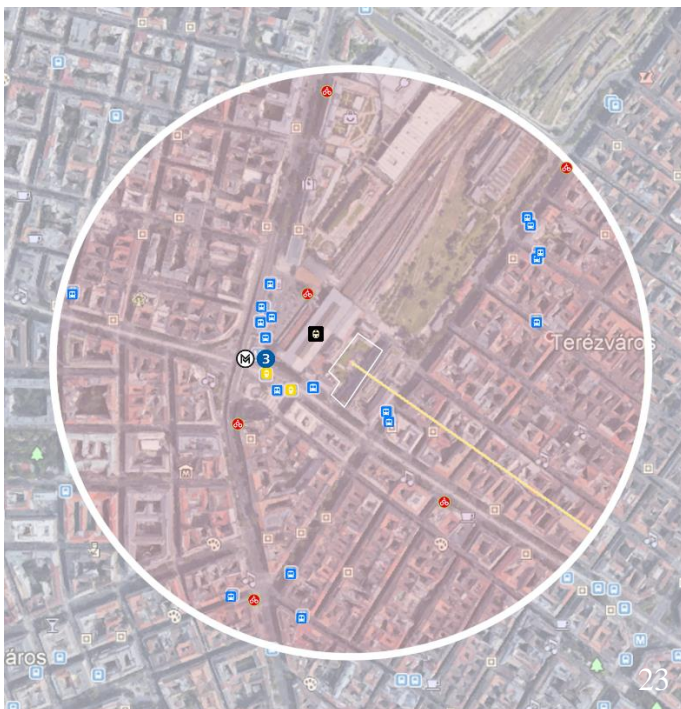
ACCESSIBILITY MAP

200 M



In this walking distance radius, there is one of the major train stations of the city, 9 bus stops, 2 tram stops stations, a rental bike stop, lime scooters and the M3 metro line. There is also a large mall.

500 M



In the larger radius there are 18 bus stops in total, 2 tram stops, 6 rental bike stops, the M3 metro line, underground parking and the Nyugati train station. This area is a main transportation hub in the city of Budapest and there are a lot of people passing through this area every day, to get to work, school, or home.

Because of the nature of the surrounding area there are a large amount of necessary functions in the square. However, the intriguing design attracts people to stay and gather. The great quantity of public infrastructure and the presence of security in working hours ensures the safety and cleanliness of the space. While the presence of active surrounding functions creates constant movement in the square. The amount of green space could be increased especially because there are many restaurants in the surrounding area and no green spaces.

The ratio of unoccupied space which coincides with impermeable surfaces provides a generous area for temporary activities such as food banks, distribution centres and temporary events. However, those surfaces can also contribute negatively to overheating in the summer.

7. KAROLYI KERT

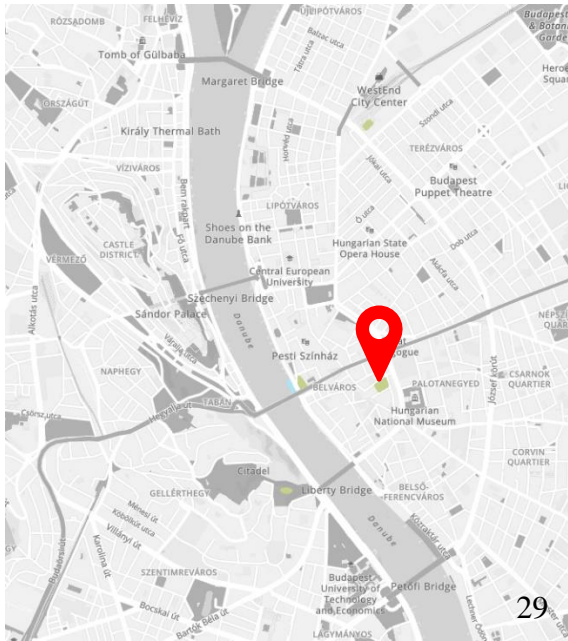
Located on the Pest side of the city, this quaint green park is located in the old city center of Budapest in the same district as the Parliament building, the banks of the Danube and transport stations such as Astoria, Deak and Kalvin square. The constant activity and diversity of space in and around the park attract all kinds of people of all different age groups throughout the year.



District: V

Address: Budapest, Karolyi Kert 25, 1053

Area: 7648 m²



The surroundings of the park include many functions such as residential buildings, schools, universities, museums, restaurants, cafes, pubs, offices, hotels, galleries, and churches. The square takes up half a city block and is situated amidst a very tight fabric where its perimeter is mostly composed of 3/4 story high residential buildings, with only a few having other functions on the ground floor. Because of this, the surrounding streets do not have high traffic flows and thus create a quiet situation for this park.



NUMBER OF ACTIVITIES

Social>Optional>Necessary

Playing on playground, swinging on swings, sliding, sitting, talking, reading, eating, playing ping pong on a table, looking at at rabbit, taking a book from the community library, finding places to get used books in the city, having a class, watching the fountain, contemplating, walking, meeting in groups, writing, drawing.

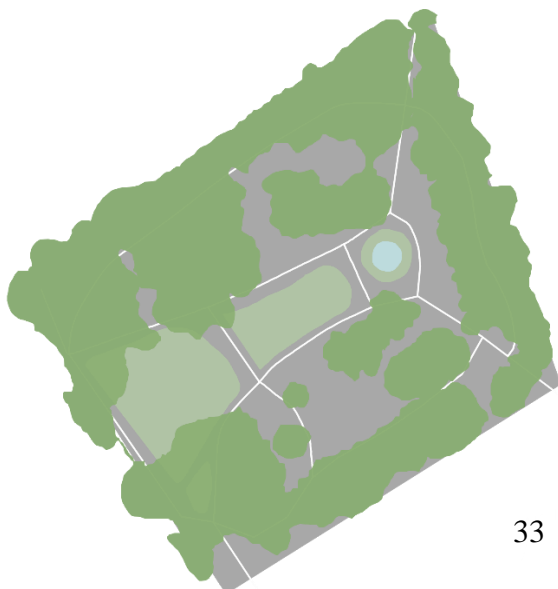
PUBLIC SPACE INFRASTRUCTURE

- trash bins: 25
- benches: 56
- Lighting posts: 24
- Bike parking: 0
- Drinking fountain: 1

IMPACT RATIO

- Doorbells: 228
- Windows: 450
- Shops: 4
- Cafes/ Restaurants: 2
- Offices: 1 (real-estate)
- Art Galleries: 1
- Museum: 1

GREEN SPACE MAP

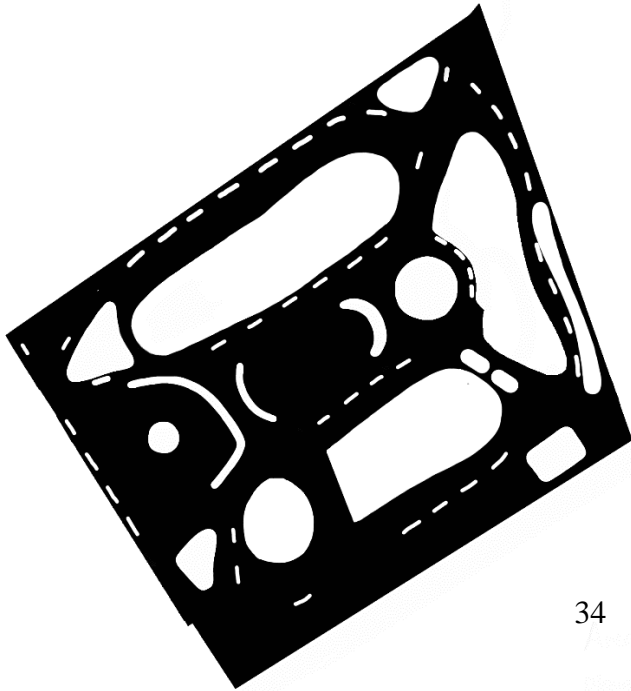


The ratio of green space to non-green space is 2:1. This reflects on the spaces contribution to absorbing CO₂ from the environment and contributes to the users emotional and mental health.

Level:



DENSITY OF SPACE MAP



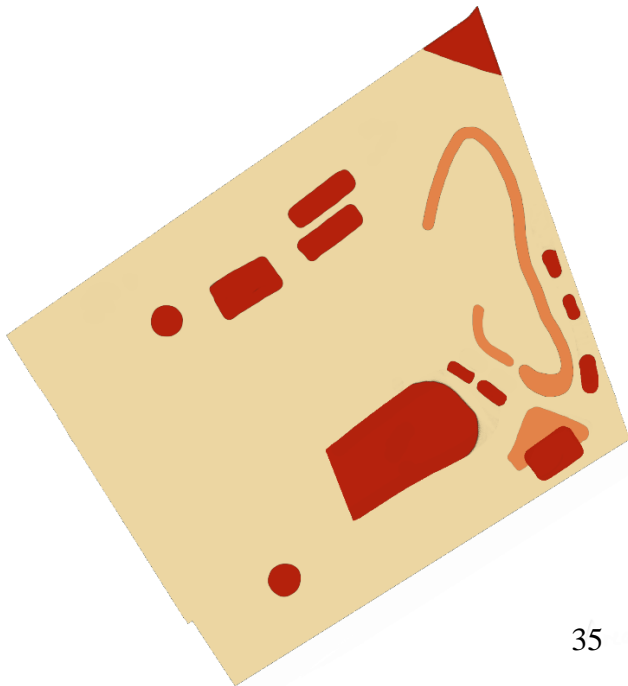
34

Level:



The ratio of occupied to unoccupied space is 1:1 reflecting on its ability to accommodate emergency or spontaneous functions vs predefined functions. In this aspect the space qualifies as average, there is space to accommodate new functions but not much.

SURFACE COVERAGE MAP



35

Level:



The ratio of permeable to impermeable and semi-permeable surface is 8:3:1. The large quantity of permeable space provides a fresh and cool space in the midst of the dense city centre which attracts a constant number of users.

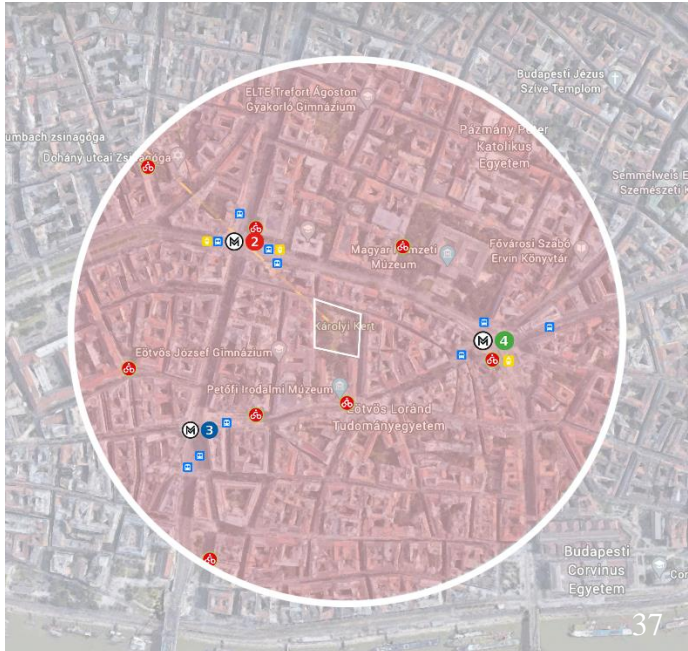
ACCESSIBILITY MAP

200 M



In this walking distance radius, there is one bus stop, and two rental bike stops. In this radius there are also multiple cafes, restaurants, galleries, shops, bookstores, groceries, schools, a museum, and residential buildings.

500 M



In the larger radius there are 3 major transportation points with metros, trams and bus stops. There are also rental bike stops, lime scooters and underground and street parking.

In terms of functions, the area presents a huge diversity. From residences all the way to major public buildings and services.

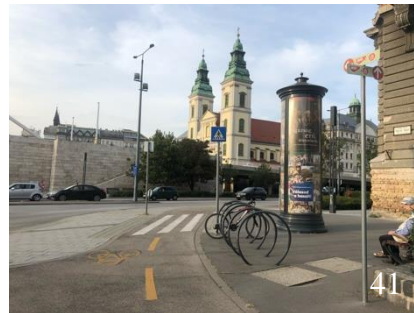
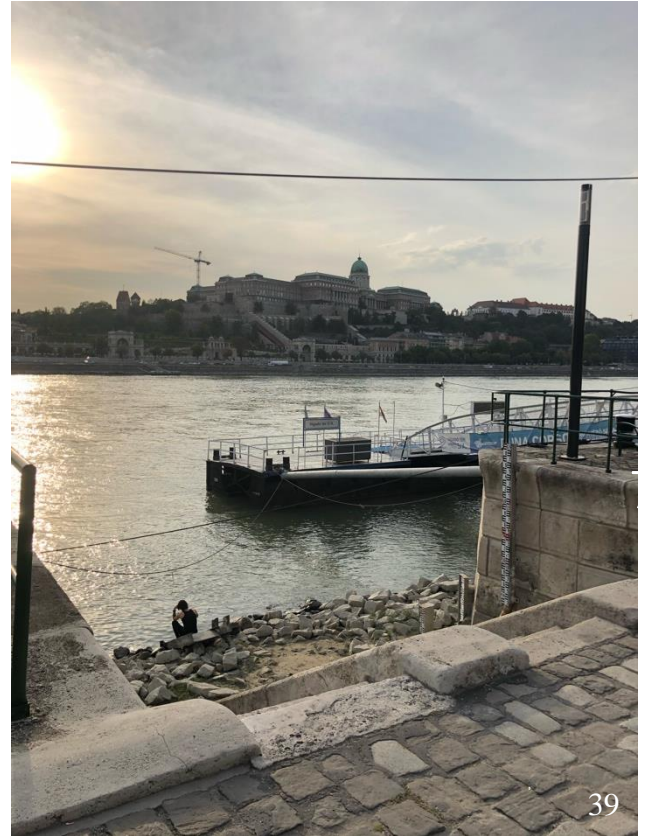
The diversity in amenities and amount of public infrastructure in the park are large factors contributing to the diversity in social behaviors of the users.

The number of eyes on the street, the presence of security, a fenced in space which controls closing hours and the presence of a local community of residences invested in the space contribute to the cleanliness, upkeep and safety of the space.

The number of trees and flowers in the square provide an ideal space for people to breathe fresh air and get away from the densely populated city. The lack of unoccupied space does not make the square an ideal place for temporary or emergency functions. However, the present functions contribute to the Social resilience of the city by providing space and activities which enhance social relationships. The presence of water features such as the fountain in the middle of the garden also provides an inviting atmosphere, especially in the summer, giving opportunity to users to cool off or just enjoy the sound of splashing water. All these factors reflect a space which is attractive, safe, diverse, and most importantly, used by people.

8. MARCIUS 15 SQUARE

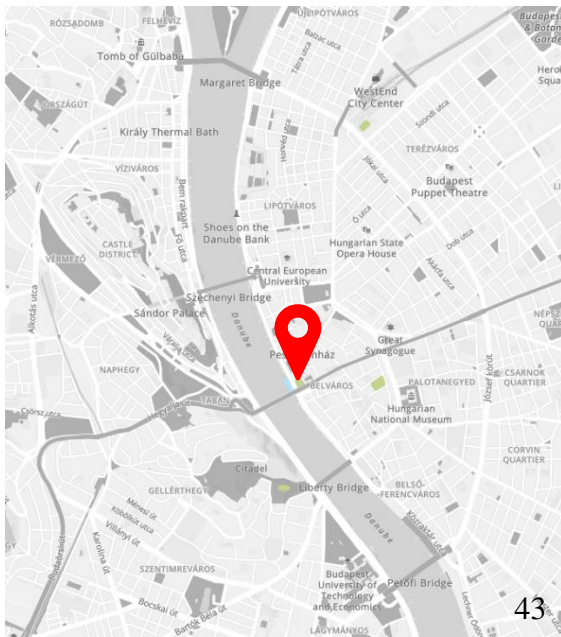
This space located on the Pest side of the city on the banks of the Danube is located between the Elisabeth bridge and the chain bridge. This area of the riverbank adjacent to the historic center of Budapest is also part of the tourist route. This case study will serve as an analysis of the relationship of public spaces along the Danube to the banks of the river and how the space and its connection to the river contribute to urban resilience.



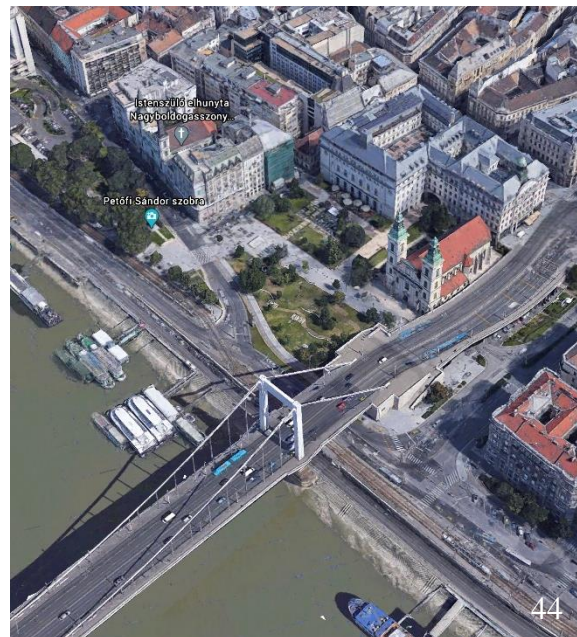
District: V

Address: Budapest, Március 15. tér 1, 1056.

Area: 20.000 m²



43



44

The square is located beside the Budapest Inner-city Mother church of the Blessed Virgin and is connected to the Elisabeth bridge, one of the many bridges which connects Pest to Buda. It is also a block away from Vaci utca, the longest and busiest pedestrian street in Budapest which is also a big tourist attraction.



45



46



47

NUMBER OF ACTIVITIES

Social>Optional>Necessary

Talking, reading, sleeping, eating, sitting, walking dogs, biking, skateboarding, exercise activities.

PUBLIC SPACE INFRASTRUCTURE

- trash bins: 18
- benches: 96
- Lighting posts: 36
- Bike parking: 25
- Drinking fountain: 0

IMPACT RATIO

- Doorbells: 0
- Windows: 158
- Shops: 0
- Cafes/ Restaurants: 1
- Offices: 2
- Art Galleries: 0
- Museum: 0
- Church: 1
- Historical monument: 1

GREEN SPACE MAP

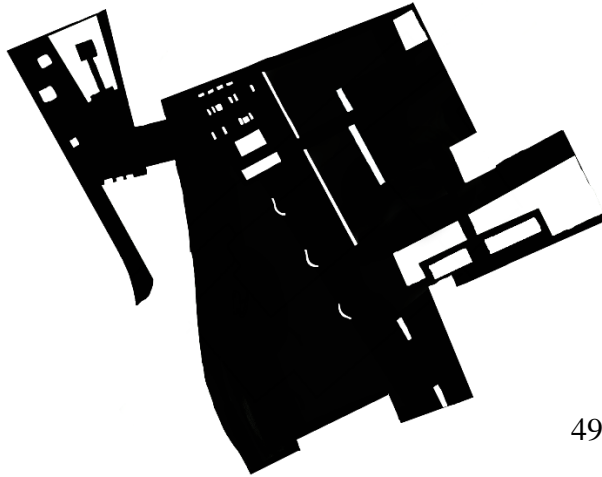


Level:



The ratio of green space to non-green space is 1:1. This ratio creates a good balance between green spaces and concreted surfaces for other activities.

DENSITY OF SPACE MAP



49

The ratio of occupied to unoccupied space is 1:2. It provides a large amount of space for housing temporary functions which contributes to the overall flexibility and adaptability of the space.

Level:



SURFACE COVERAGE MAP



50

The ratio of permeable to impermeable space is 1:1. This ratio could be improved. However, due to the large area of the park it provides the most permeable space in area out of all the case studies.

Level:



ACCESSIBILITY MAP

200 M



In this walking distance radius, there are 4 bus stops, 2 tram stops, one bike rental stop and a public transportation boat stop. The banks of the Danube are also in walking distance from the park and are a space of leisure especially when the street along the river is closed to car traffic on the weekends.

500 M



The larger radius includes 10 bus stops, the end of the metro 1 line, the metro 3 line, 4 rental bike stops, lime scooters, 2 tram stops and a boat dock. The Elizabeth bridge and Rudas bath house are also present on the other side of the river alongside various public buildings, commercial establishments and residential units.

Even though this space is in a key location of Budapest's river bank the lack of diversity in public infrastructure and surrounding functions makes it a quiet and somewhat dormant

public space. The square is much more of a memorial park than a dynamic space. This attracts people who enjoy a slower place and quieter activities. On the other hand, this lack of dynamic activities, the connection to the bridge, large tree canopies and dim lighting leave the area susceptible to vandalism and contribute to an unsafe feeling after dark. The amount of greenery is generous however not dense in trees. The topography and ratio of unoccupied space provides a good scenario for temporary functions such as the march 15 celebrations. These kinds of open spaces can also serve the overall resilience of the city in providing space for emergency functions. The large area of permeable space also helps the thermal balance of the space in the summers and contributes positively to water drainage.

9. CONCLUSION

“Anyone who decides to observe life in the city will quickly realize that you have to be systematic in order to get useful knowledge from the complex fusion of life in public spaces.”
(Gehl and Svarre, 2013)

This statement is also applicable when analyzing the resilience of a city and its public spaces. As resilience is a recent term in the urban academia, it follows that the methodologies and observations used to measure the levels of resilience are also new. The novel characteristic of this term in the urban world invites us to examine its use in different fields of study which have been more thoroughly researched, such as biology/ ecology.

In an ever-changing world of pandemics, climate change and accelerated technological growth, it becomes our responsibility to work towards healthy and sustainable progress while integrating and adapting to quick and constant changes. In desiring to do so, it is important to acknowledge and learn from the work which has been done before us and be open to finding information from experts in different fields of study. The similarities, which can be analyzed between ecological systems and urban contexts provide an interesting foundation for starting this study and provides readers with a different tangent to the study of urban resilience.

The aim of this paper was to initiate an examination of the term resilience in other areas of study and out of this analysis find practical ways to measure and analyze resilience in urban contexts.

The focus on public spaces draws attention to their importance in contributing to the lives of citizens and thus to the resilience of cities. This social, environmental, and spatial contribution is essential to the survival of our cities and their populations.

In the case studies different scenarios can be observed and their effects measured by the proposed parameters. Part of this analysis proposes to connect behavioral characteristics in urban spaces to theoretical findings in the term resilience. In the category of activities, spaces such as Karolyi square and Gellert playground, presented many more dynamic activities and amenities such as playground infrastructure, resulting in much more dynamic atmospheres and a larger presence of a multigenerational community of users. This observation confirms Jan Gehl’s theory where he states that *“by integrating different activities and functions to the same place, more people will assemble to the same space at the same time. This creates more social*

activities and safety.” (Gehl, 2011). It also reflects the dynamic nature between species and the positive contribution that diversity can bring to the resilience of a space, principles which can be translated from ecological resilience.

This can also be analyzed in the density of space. Cases which were more occupied by amenities and had more activities were also more dynamic and lively creating a positive reaction to the space. However, these spaces also had less room for accommodating temporary functions which can prove to be a negative characteristic in the flexibility of the space. This lack of negative spaces between the functions results in spaces which can prove less efficient in emergency situations. The location of Karolyi, Eiffel square and Marcius 15th square were all very accessible with more than one option of transportation to and from the public spaces. However, Gellert park’s less obvious location can only be accessed by foot which makes it harder to reach and more susceptible to possible vandalism.

The safest and cleanest space was Karolyi, which was also the only fenced in park providing for defined closing and opening hours, all other cases had some graffiti on the public infrastructure which hinders the resilience of the space. Another contributing factor to safety and maintenance was the impact ratio. Spaces with more “eyes on the street” such as Karolyi also had a safer atmosphere as opposed to those without security or public lighting such as Gellert playground. Lastly, all spaces presented at least 30% of greenery. The greener and more permeable the space the healthier it is for people and for the environment, contributing to the social and environmental resilience of the city. All spaces were positive in this aspect aside from Eiffel square which has the least amount of green space at only 30%.

A situation which directly affects our cities resilience nowadays are global pandemics. During a pandemic there is an increased need for outdoor spaces to be used instead of indoor spaces as respiratory virus transmission is decreased in outdoor areas. Eiffel square has the potential for increased outdoor seating for restaurants. Increased outdoor seating can contribute to the survival of restaurants during a pandemic and thus economic resilience in a city. As well, diversified activities in the spaces can accommodate a diversified range of uses and people of all ages in times where other activities (schools, gym class, libraries, museums and art galleries) are limited or unavailable, such can be seen in Karolyi. Some spaces could also accommodate temporary outdoor markets in the city when supermarkets may not be open or have reduced supply and hours of operation (like when we are quarantine). As well, green spaces with flowers and various interesting architectural structures that provide pleasing vistas from residential windows are good for mental health during a quarantine. They can also provide play

and educational opportunities when schools are shut down during natural disaster, pandemics, etc. As well, the diverse transport routes to a public space could help when transport routes or modes of transport are limited. Eg. The Danube parks could be access by boat, or these places could be used for evacuation or bringing in of supplies.

Overall, it is important to state that each public space contributes differently to the urban fabric and is directly impacted by its surroundings. The presence of different public spaces in a city is important to the overall fabric of the city and to the interest of its users. However, resilient public spaces should attend to all stages of life and provide healthy spaces for everyone. It is not possible to state with certainty the exact level resilience based on this study alone as it was not realistic to cover all the aspects of resilience. However, the attempt to gather important data regarding social resilience and shape it into a way to measure the resilience of these spaces is a starting point of an exciting process.

It is my hope that this effort can contribute to enhancing contributions of interdisciplinary studies of resilience. As well, the proposal for measuring urban resilience can provide an initial framework and insight into the understanding of the resilience of urban forms. Ultimately, both can contribute to the pursuit of ensuring the resilience of our cities and the survival of their public spaces.

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