BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS

FACULTY OF ARCHITECTURE

Department of Urban Planning and Design

2021

The Future for Sustainable Cities

Comparative analysis of contemporary mass housing developments in Budapest

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Budapesti kortárs tömeges lakásépítési projektek összehasonlító vizsgálata

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Abstract

In the 20th century mass housing has become an inevitable part in the development of cities brought by the urbanization. The built environment is created by the union of multiple aspects, from the micro scale to the macro scale. Mass housing developments which came as a solution to shelter an ever growing population, providing adequate and affordable housing need to go beyond that and now intends to create sustainable neighborhoods. But today, without original social aspects what does mass housing development mean? Why investors are interested in the realization of new large scale residential areas? And how contemporary urban sustainability aspects are integrated in their planning and design process?

The urban development vision for a sustainable city with enhancing performance, reducing costs and resource consumption depending on the needs of the community, the environment, social and economic values. A livable and likeable residential building complex must be settled in its environment with the continuous dialogue between green-blue infrastructure and architecture

The research focuses on the Danube riverside in Budapest and their contemporary mass housing developments from urban design aspects. The paper presents a critical analysis of three contemporary Danube-led mass housing projects in construction: The WaterFront City in Óbuda, the Duna Terasz in Angyalföld, and the Budai Walzer in Újbuda., The three case studies are compared using international literature on sustainable neighborhoods, and the comparison is based on field work (mapping, photo making) and documents analysis. The goal is to evaluate the complex sustainability of these large scale housing urban projects composed by sustainable buildings regarding their special position within the city, being next to the river.

KEYWORDS: Mass Housing, Sustainability, Urban Design, Riverside Development, Budapest, Danube.

Introduction

Housing is 80% of architectural production (Seraji, 2007), it is one of the most important components of social and economic development of a society,organization and arrangement of space and a big factor in raising the living standards of the population (MGIPU, 2013), as the rate of global urbanisation in the world is increasing every year has required more development of new areas for housing, social amenities, commercial and other urban land uses. [Figure1]

Urbanization in the world and its regions 1990-2050

Region	Urban Proportion *(Percentage of the population)*			Average annual growth
	1990	2014	2050	2010-2050
World	43	54	66	0.9
Africa	31	40	56	1.1
Asia	32	48	64	1.5
Europe	70	73	82	0.3
Latin America and the Caribbean	71	80	86	0.3
America	75	81	87	0.2
Oceania	71	71	74	0.0

Source: UN DESA (2015).

Figure 1

Urban design is the art of making places in an urban context which involves designing groups of buildings and the spaces and landscapes between them and further the creation of frameworks for successful development (Urban Design Group, 2011). Analyzing the architectural and urban planning impact, the micro scale context is a highly valuable factor as creating an adequate design is one of the architects' responsiblities which has a large impact on the users and their interactions with the built environment, where it should be stressed that this rapid housing developments create an amplified carbon footprint and further negative impacts on the environment.

Urbanization is a key factor of sustainable development. As the building sector is one of the largest consumers of natural resources and energy since it uses 30–40% of all primary energy

and natural resources over the building's lifespan (construction, operation, maintenance and demolition) and accounts for 30% of the global emission of greenhouse gases. **(Kocsis 2015).**

The research focus on mass housing in Budapest evaluated in urban and building scale. As the introduction of the'intensive' housing policy measures in Budapest, therefore increasing the number of the apartments without increasing the floor space began in the 1950s and almost total negligence of the housing stock nationalized while the lack of effective urban regeneration in the forty years to come . **(Zhang, X.Q 2015)** . And while according to Guichard, collective housing encouraged class ghettoization, a socioterritorial problem , which seeking to ensure diversity in aesthetics, the directive prohibited any one architect from designing more than 500 units in a single development (Guichard 1973), it has also been abandond since then in mass housing developments.

Urban development has a massive effect on our environment . It is associated with numerous environmental damages such as air pollution, greenhouse gases, waste and degradation of land and ecosystems. The difference between well-managed urbanization and uncontrolled urbanization is huge for people's quality of life and for the productivity and health of cities. Good strategies and policies can make a big difference in this dynamic process that will define our future. **(Jabareen, Y. 2014)**

The concept of sustainable development has given a major stimulus to the question of the contribution that certain urban forms might make (U.K. Department of the Environment [DoE] 1996; Breheny 1992a, 138). As studies on housing are addressing a wide range of sustainable issues, such as environmental sustainability, economic sustainability, social sustainability etc. Which is an indication that only with sustainable solutions is it possible to mitigate the tensions between urban growth, climate change and poverty reduction, offering affordable housing and access to quality residential services, clean energy and environmental conditions.

In a wider sense, sustainable cities are a matter of density (Carl 2000). Density and dwelling type affect sustainability through differences in the consumption of energy; materials; and land for housing, transportation, and urban infrastructure (Walker and Rees 1997). High density and integrated land use not only conserve resources but provide for compactness that encourages social interaction, while diversity of activity is essential to the sustainability of cities. **Jane Jacobs (1961). (Ilha , Gonçalves, Oliveira, Ywashima, 2009).**

To assess the sustainability condition of mass-housing case studies in Budapest. The definitions and descriptions of sustainable buildings were examined specifically identifying aspects of sustainability to compare the cases in similarities and differences.

Key Sustainability Requirements

It is estimated that by 2056, global economic activity will have increased fivefold, global population will have increased by over 50%, global energy consumption will have increased nearly threefold, and global manufacturing activity will have increased at least threefold . **Emas (2015)**

The overall goal of sustainable development (SD) (Published in the United Nations' 2015 Global Sustainable Development) is the long-term stability of the economy and environment; this is only achievable through the integration and acknowledgement of economic, environmental, and social concerns throughout the decision making process.**(Kagan, 2017).**

Sustainable communities are those which meet the diverse needs of existing and future residents, their children and other users, contribute to a high quality of life and provide opportunity and choice. They achieve this in ways that make effective use of natural resources, enhance the environment, promote social cohesion and inclusion and strengthen economic prosperity (Egan 2004:18) **(Bernardi, E. 2017)** [figure2] .

Figure 2: Dimensions of sustainable communities (adapted from Egan, 2004), Sustainable Communities: University-Community Partnership Research on Social Dimensions of Sustainable Development, January 2017

Given the growing interest in sustainable development worldwide. It is also encourages with many rating systems for assessing the environmental impact of buildings have been established in recent years, each one with its peculiarities and fields of applicability. They're designed to assist project management in making the projects more sustainable by providing frameworks with precise criteria for assessing the various aspects of a building's environmental impact., six main rating systems: the Building Research Establishment Environmental Assessment Methodology (BREEAM), the Comprehensive Assessment System for Built Environment Efficiency (CASBEE), the Deutsche Gesellschaft für Nachhaltiges Bauen (DGNB), the Haute Qualité Environnementale (HQETM), the Leadership in Energy and Environmental Design (LEED), and the Sustainable Building Tool (SBTool). **(Svedin, 2015).**

The aim is to improve urban quality of life, giving priority to the marginalized areas of the city. With this in mind, the future for sustainable urban developments in Budapest for mass housing respond to challenges of space organizations where individual needs of users with façade designs for building aesthetics.

Strategies for the Future

In 1987, the Bruntland Commission published its report, *Our Common Future*, in an effort to link the issues of economic development and environmental stability. From reliable sources this will help us indicates the key factors for acheiving the future for urban developments. When considering the future development of the urban sphere, especially in its European and EU context, one very important key strategic aspect has to do with sustainability considerations, i.e. the systemic interplay between environmental/ecological, economic and socio-cultural (sometimes here together referred to as "green") factors . **(Benkő, 2014)**

The presence of the Danube, is a very strong landscape element. Making Budapest's riverside development projects in the last decade an intriguing case to study as it is obvious that developments carried out seek to use the exceptional potential of the riverbanks. Where Sustainable development defined by World Commission on Environment and Development (Lee 2004) are those that meet the needs of the present without compromising the ability of future generations to meet their own needs. It embraces a long term perspective that looks beyond current problems, searching for durable solutions.

The future strategy for mass housing in Budapest must be a balance between the ecological aspect and social/economical aspect, presenting Budapest and the Danube as a unit. Taking into account the importance of sustainability and the integration of human and nature. As Budapest developments should not be seperated, represented alone and encouraging socioterritorial problems , but representing Budapest as a whole.

Research method: Selection of Budapest case studies

The research method for selecting the projects is divided to two main points. First is the literature review understanding the reason and the importance for choosing the locations with its past and future situation when studying projects built in the last decade. After the general introduction based on international literature overview the research focuses on Budapest's case studies. The academic references provided the background to define the criteria for the selection of the three case studies.

The design analysis for the projects need to be similar in criteria for a fair and justifiable comparison . Then empirical part uses photomaking in 2021 and mapping as primary resources. Last the Author's drawings help to visualizes and to compare the selected three cases.

Furthermore to understand the ecological aspect in their projects and of they had taken into consideration the long-term effects on the surrounding to be able to decide into the best approach for sustainable urban developments.

Budapest's historic urban development

As it is essential to give a historical overview to highlight the urban development through the years and understanding the reason behind modern urbanisation. Industrialisation was the first relevant phase of economic development resulted in Budapest urban explosion beginning in 1805- 1846 and finding Danube riverbank as it was the place of transport, with continuous growth and mass rural migration to Budapest 1896-1949 until post-industrial and post-communist development from 1990 **(Benkő, 2014)**

Part of Budapest was a sandy and swampy area owing to limited opportunities for agricultural production, mainly craftsmen and merchants started to settle here (Haltenberger, 1942). Starting from the 18th century the area has undergone a remarkably rapid development, since

the inner city became unable to accommodate the constantly increasing crowds attending its fairs. **(Baji, 2018)**

By 19th and 20th centuries, this newly established center already had a stock exchange, business houses, and headquarters of the largest companies, as the Hungarian Parliament and other governmental institutions were also built here. As another notable specificity of the area, the newly constructed 4–6 story buildings were the highest in Budapest at that time, thus, District V was soon towering above District IV (former inner city). [Figure3] Before World War II, Budapest's 'city' consisted of a southern cultural and a flourishing northern economic district as urban geographical analysis revealed that high-quality retail started to dominate up to the first floor of the buildings instead of homes (Bulla & Mendöl, 1947) population density was on the decrease in both districts. **(Baji, 2018)**

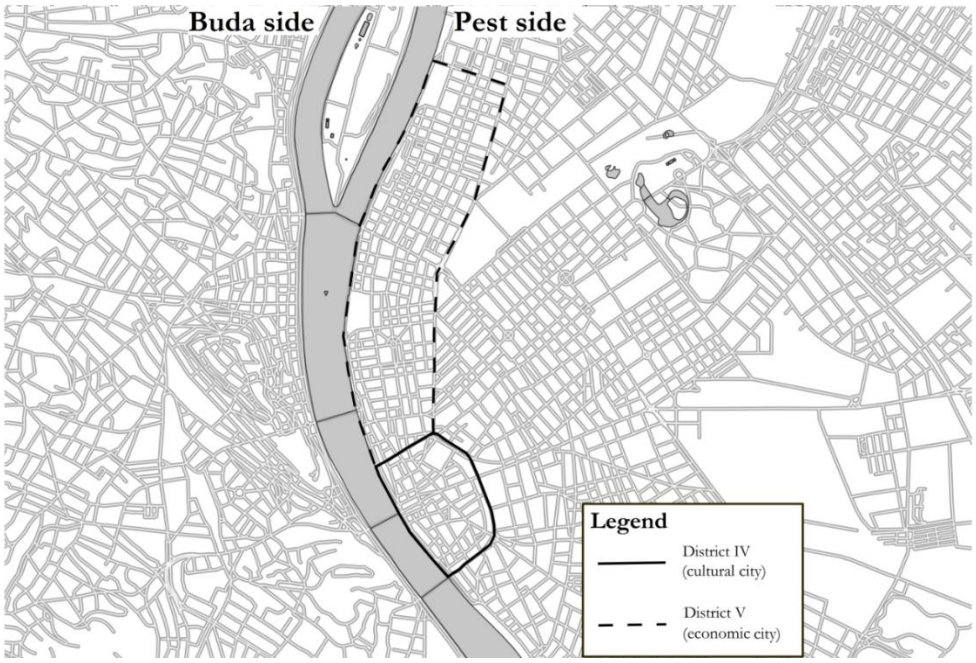


Figure 3 : The districts of Budapest's 'city' in 1942 , Source : Péter Baji, Márton Berki and Éva Izsák, transformation processes of the city center of Budapest: from historical development to the new economy. https://journals.openedition.org/espacoeconomia/5049

Although Budapest is not a typical port-town, choosing it's Danube waterway to be precise for our study is interesting for investigation. Emphasizing its importance as Budapest's morphology and urban growth is classified to five different zones: the historic urban core, transition belt, mountain zone, outskirts and the distinct Danube zone. **(Tolnai, 2018)**

Effects of the desindustrialization and privatization after 1990

In Hungary especially, after the political and economic change in 1990, the privatization started at the same time as the deindustrialisation, resulting in a significant setback in industrial production due to the political revolution, the structure of the economy changed. Large companies fell apart, with production completely stopped in several factories; meanwhile, in other places, production continued with a new profile.

Danube river back became hinterland:

with many former national industrial sites abandoned and privatised as new investment target area of the post-industrial developments (offices, institutions, shopping centres) with new functions, because proportion of land occupied by industry has decreased in recent decades, some industrial areas next to the river were partially or entirely renewed. Searching for a new position in the national and international markets, the scale of industrial zones reached only 4-4.5 percent. **(Benkő, 2014).**

Privatization / Land with fragmented buildings

During the period of 1990-1998 , deindustrialisation was significant. Making the Danube zone fragmented, and under-utilized, as many industrial sites were abandoned and privatised waiting for new functions, while other individual projects being planned and realised without city level coordination. huge areas became unusable in the urban fabric, renewal of the brownfield areas along the Danube must be activated and give new functions to former industrial buildings, which allows the free use of the riverside and ensures community functions their buildings and infrastructures waited for new functions such as the former Gas Factory on the Óbuda riverbank **(Benkő, 2014).**

Waiting for investment

Between 1998-2004, the city inherited vast brownfield areas among the most significant topics, the Budapest 2030 Long-Term Urban Development Concept determind the renewal of brownfield sites , part of the municipality thematic development programmes . Adding to that the urbanisation of the global information society, with the presence of international investors

and visitors resulting in the re-urbanisation and urban renewal in the city centre this encouraged the de-concentration and maintaining the large metropolitan areas.

Investments

After 2004, The Podmaniczky Program, a medium-term strategic program released in 2005, identifies Budapest as "the City of the Danube", where it is clearly the latter that provides the conceptual basis for the city's development. The presence of international investors and visitors In this sense, the Hungarian capital might be regarded as a city in the initial phase of waterfront redevelopment. Several million square meters were planned to be sold on the new banks of the Danube in Budapest before the economic crisis of 2008. **(Tolnai, 2018).** These “cities within the city” were already imagined. In this gigantic gathering of investors and boroughs, the former could build while the latter were content to wait. Meanwhile, this status has provided the opportunity for new developments that can be guided in a more con-text-sensitive and sustainable direction.

Urban development potential along the Danube

‘Waterfront’, in a broader understanding, is ‘a space where water (i.e., river, lake, sea and ocean) meets with urbanized land, creating a unique spatial interface’ (Davidson, 2009, p. 12:215).

Figure 4 : Budapest Danube Waterfront, December 2020, Source : The Author

In contemporary urban life, free time and recreational needs, environmental qualities and green mobility solutions are coming to the fore, but this requires both the users’ and the investors’ attitudes to change in the utilisation of the city.

The relative economic boom around 2000 made the city centre more attractive to developers but with the issue that the agents behind the projects and the methods applied are all inconsistent with this goal. The motivation behind such activity is not improvement of the situation, but changes on the real-estate market. and – not completely independently from this – more desirable for various middle- and higher-status social groups. **Benkő, M. (2009)**

With the law regarding the built environmental restructuring and protection matters, impose that the Local Government of Budapest mid–term development goals with the **integrated urban development strategy 2020** prioritises making Budapest a liveable and environmentally-conscious city with Green infrastructure strategy, spatial management plan of Budapest and environmental program 2017-2021 (under development). The strategy seeks to promote biodiversity and connectivity; adapt to climate change; increase the quality of social and health conditions; and improve the economic and tourism potential of the city which contributes to the implementation of the highest possible degree and the long-term urban development concept, called **Budapest 2030.** [Figure 5].

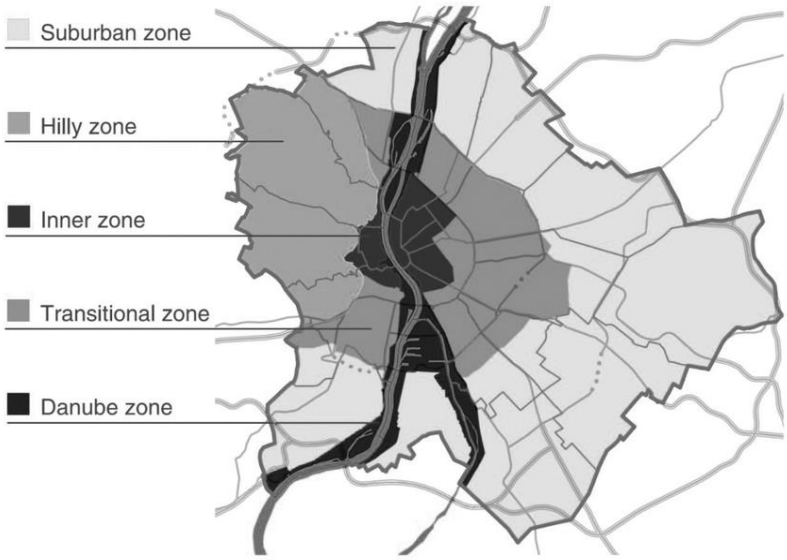


Figure 5: Map of Budapest Zones Source: Budapest Vision 2030 (2013)

Source : Budapest 2030 LONG-TERM URBAN DEVELOPMENT CONCEPT page 35

The awarness to the importance of a city living with the Danube strategy while improving the living quality for people and being business and investment friendly economic environment. The three case studies from Budapest must provide an opportunity for a comparative approach.

The data is based on the fieldwork, analysis of the relevant plans and surveys from the prominent architects of the projects. As the Danube zone is of central importance in Budapest's current development goals, it should become more than just a visual element, but become a more functional element of the complete program.

The Danube offers :

1. **The relationship between the Danube and Budapest** has been transformed with a harmonious coexistence of nature and built parts, as it dominates this landscape-scale spectacle but the river has become decisive not only on a landscape, but on an urban and architectural scale leading the development of the city.**(Kocsis, 2015).**

2. **Water being one of the main trade routes,** with the banks of the river being the city's largest markets it's a significant element in transforming land use by reducing road traffic near the riverbank in the interests of better pedestrian access . **(Kocsis, 2015).**

3. **"City within a city"** with the new situation created by the revaluation of the banks of the Danube offering an economical opportunity, around 2000, large international real estate development companies discovered the potential of the Danube areas of Budapest and the more distant districts along the Danube did not miss out although more restrained. **(Kocsis, 2015).**

4. **Historical value of Budapest,** being part of UNESCO world heritage 1987, with its richness being one of the largest cities in Europe encouraging tourism, with more than 52,500 hectares, historical downtown circle is approx. 2000 hectares and taking into account all the development areas along the Danube outside the City Center and 1000 hectares with culture and a significant part of its spectacular transformations are connected to the river.

Numerous possiblities and opportunities can develop areas along side the riverbanks [16]:

1. **Financially improves the remote parts of the city in the real estate market,** projects that are closest to the Danube bank and city center has incredible economic and urban development potential, by intervention with the existing facilities developing the biking and walking system.

2. **This integration between the water element and city life will increase the value of the surroundings.** An open, livable urban fabric with renewable energy sources and decreasing energy consumption, alongside reducing waste and pollution.

3. **Huge green areas are being created along the Danube**, for instance Csepel-North is becoming a park, and everyone feels like a resident of a quiet, balanced big city flowing with the Danube.

4. **Development and renovation,** Old industrial from Gas Factory, Bus, Veneer, etc. For the porpose of not deleting the old and replacing it but to insert it into the existing space and landscape, respectively over time.

5. **Cosmopolitan city life on the banks of the Danube** with Budapest being the most important geopolitical centers in Europe with densely built high-rise and lane houses, tidy public spaces, and panoramic teams with more than 25 km long waterfront linear city is being planned .

6. **In Budapest, the Danube zone is the principal target area** for this new future and acheiving Budapest 2030 Long-Term Urban Development Concept is connected to the development of the Danube riverbank and social housing and searching for a comprehensive solution. [Figure 6]

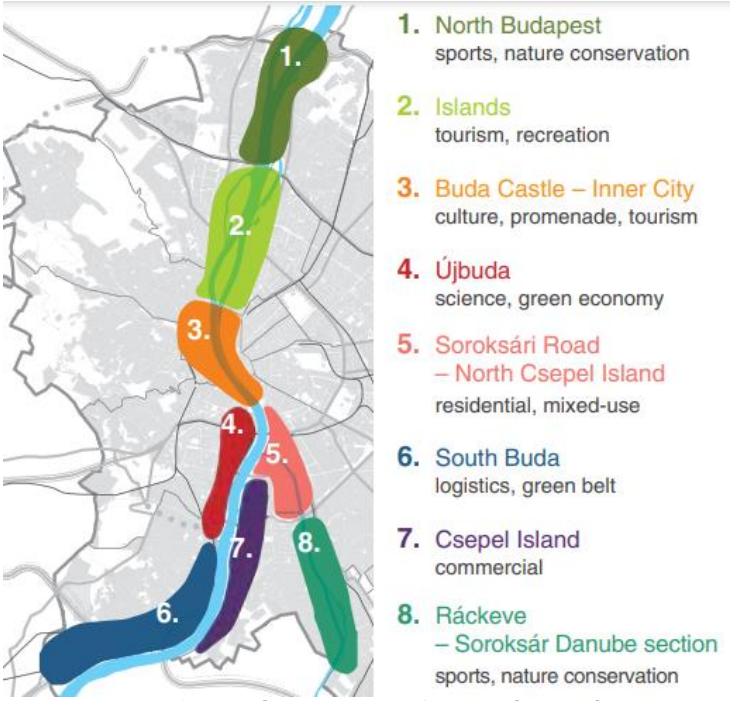


Figure 6 : Development Target Areas on the Danube

Source: BUDAPEST 2030 Long-Term Urban Development Concept

Situation in 2021

A real transformation and changes are taking place before our eyes, as people are becoming more aware of climate change and effect of the environment on our situation. As City life is on a different scale than that of a city dweller as contribution of riverbanks adds to the beauty of Budapest's architectural details and contributing to the stunning view landscape, Therefore i believe the quality of urban development is determined by current decisions and interventions.

While Urban environment is the combination of built and natural environment, in the case of Budapest there is a a huge potenital to create a harmonic system with the existing factors. The key question to what extent a changing urban fabric is capable of adapting to the rapidly developing technology, specially with the economic changes labeled under the umbrella of globalization and recent transformations in lifestyle and society.

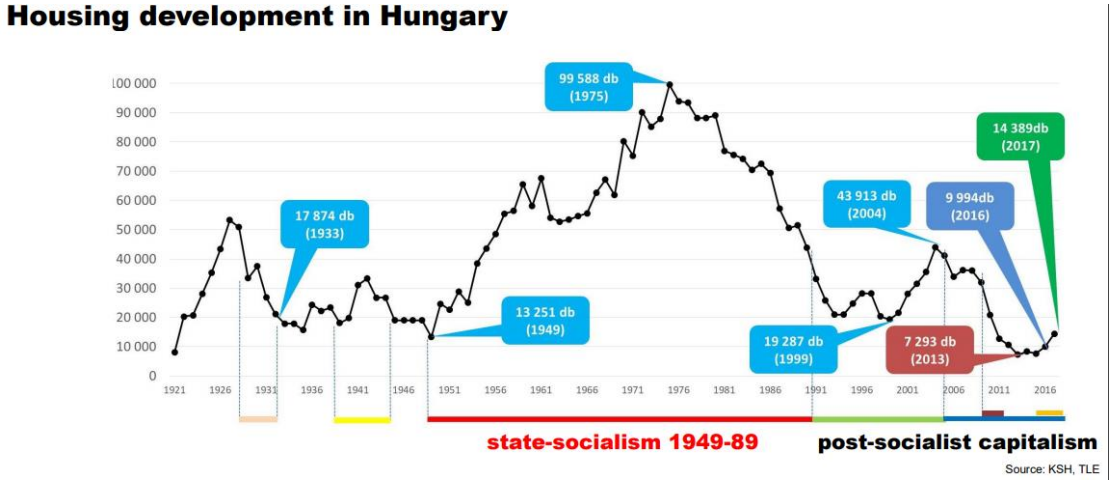


Figure 7 : Housing Estate Development in Hungary

Budapest is in a constant change and transformation from the beginning of the 20th century, apart from the socialist era. Budapest's mass housing estates were built between 1960 and 1990, and their social and physical context has changed a lot in the last thirty years. However, the real renewal process with technical renovation of residential buildings, open space renewal, social programs, and public building construction or reconstruction projects only started in earnest after Hungary's admission into the EU in 2004,**(Kocsis, 2015).**

Three Case Studies from Budapest selection criteria

Future For Sustainable Cities: Comparative analysis of contemporary mass housing developments in Budapest , **Four aspects:**

1. **Location – projects on the Danube in Budapest**
2. **Future / Contemporary – projects in construction phase in 2021**
3. **Dimension / Density - „mass housing" development projects with more then 500 dwelling units, regukated urban density is 3.**
4. **Sustainable / projects promoted as sustainable and innovative**

Location: Budapest, DANUBE

1. **The Effects of water elements in urban space perception, feeling and urban climate**

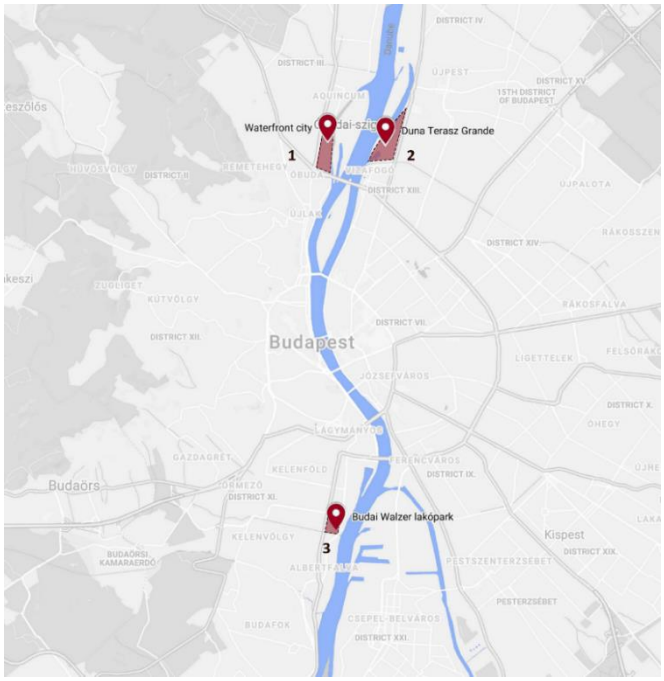


Figure 8 : Projects locations according to map (1.Waterfront City 2. Duna Terasz 3. Budai Walzer lakopark)
Source : Google map, Illustration : The Author

''Cities seek a waterfront that is a place of public enjoyment. They want a waterfront where there is ample visual and physical public access – all day, all year to both the water and the land. Cities also want a waterfront that serves more than one purpose :they want it to be a place to work and to live, as well as a place to play. In other words, they want a place that contributes to the quality of life in all of its aspects – economic, social, and cultural". Remaking the Urban Waterfront, the Urban Land Institute (Seattle Department of Planning and Design, 2012).

Water is an indispensible natural resource that is a renewable, but limited. It uses the aims of agricultural, industrial, energy generation, household, transportation, recreationaland

environmental. Kılıç (2001). As waterfront project became popular due to the gradual growth of the port cities that developed with the industrial revolution and the effort to evaluate the latge gaps in the coastline and to establish contact with water, which is the reason behind chosing the river banks of the danube – Budapest as the location for the chosen cases, having similar environment and how each project used this natural element into their benefit.

Period: after 2010 (policy, economy)

2. Contemporary Urban Development Projects

Figure 9 : Site plan 1.Waterfront City 2. Duna Terasz Grande 3. Budai Walzer lakopark , Sources: https://wfcity.hu/kepek/projekt-01.jpg, https://dunaterasz.hu/kepek/virtualis/epuletek.jpg, https://i2.oc.hu/realestate_images/800x600/crop/p657916-p3734-b-01-05-006_6r5ja72z.jpg?v=1

The concept of smartness in architecture cannot be done by the implemention of new technologies into old strategies. As the aim of this research is to reach a better startegy in the future, therefore the case studies are sleected to be contemporary projects done in the last decade to understand the direction of newly developed projects.

Density: mass housing more than 500 flats made by one investor / designer

Proximity in Projects Sizes

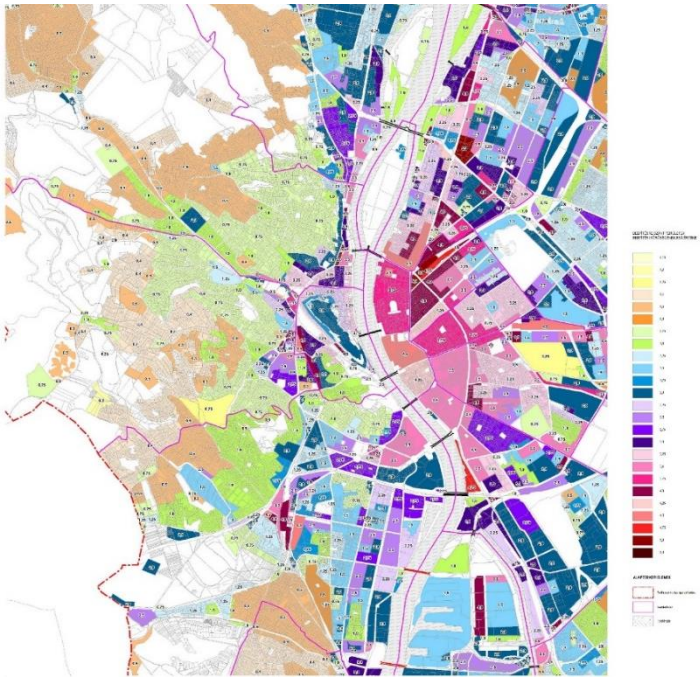


Figure 9 : Budapest Density regulation Value 3.0 in the three chosen cases, Source: BUDAPEST FŐVÁROS RENDEZÉSI SZABÁLYZATA 48/2017. (XII. 20.) Főv. Kgy. rendelete az 5/2015. (II.16.) Főv. Kgy. rendelet módosításáról

A strategy to chose project similar in total, built up area and number of flats (The three projects selected regulation density is 3.00) . This will contribute positively to the research as each project will deal with the urban fom, height and materials according to design and sustainability.

Sustainability: on building scale is planned and promoted

Implementation Of Technology And Sustainablity

In Europe around 75% of the population lives in urban areas. In some countries this figure is estimated to grow to 80% by 2020 (European Environment Agency, 2009). the Joint Programming Initiative (JPI) of European Commission (EC) promotes new development dynamics and new design strategies, encouraging systemic approaches in the ability to maximize possible benefits by advanced technologies also considering their socio-economic impacts.Therefore the need for innovation both in design thinking, making, and manufacturing, which makes smart living, sustainability and technology a positive addition in the chosen projects.

After the literature review and according to the above points , a report on data available on each project is collected . The data collection focused on the location of each project regarding the distance from the center of Budapest and its proximity to Danube, the period of construction and year of completion , data related to the master plan and buildings sizes and finally the implementation of sustainability and technology .The projects chosen for this comparison were WaterFront City Óbuda (WaterFront City, 2021), Duna Terrasse Grande (Duna Terrasse Grande 2020) and Budai Walzer (SISKIN Group of Companies, 2019) and (NetMédia Zrt. 2021) in [TABLE1]

		WaterFront City Óbuda	Duna Terasz Grande	Budai Walzer
1	**Location**	1033 Budapest, Folyamőr utca 3. Buda / North	1138 Budapest, Floating crane Pest / North	1117 Budapest, Budafoki út 215. Buda / South
	Distance from the center:	30 min. BKV / Deák Square or Astoria Sqaure	Metroline M3 5 minute 13 min. BKV / Deák square to 24 min Fővám sqaure	9 min. BKV / Fővám sqaure to 19 min. Deák square
	Physical context	District center with modern mass housing area and public facilities	Contemporary housing development area	Former industrail area, zone in trantition, next tot he planned Galvani bridge head
	Proximity to Danube	separated by a main road and railway	by the Danube	separated from the Danube by the main road
2	**Year Of Constrution**	design: 2018 completion :2021	completion :2023	completion :2021
3	**Dimension – Total Area**	covers 10,000 m² Built Up: 50,000 m²	-	8-hectare 30000 m²
	Number Of planned Buildings / realized in 2021	17 buildings / 3	5 buildings	**Phase 1:** 3 buildings **Total :** 21 building
	Number of planned buildings / Height	**10 buildings** /13 levels **7 buildings** / 9 levels	**4 buildings** / 8 levels **1 building** / 9 levels	**1 building /** 13 levels **2 buildings /** 8 levels
	Number of planned Flats / realized	**Phase1:** 3 buildings, 267 apartment 1 building, 169 apartment 3 buildings, 218 apartment **Realized 70**%:438 apartment	**Phase1** : 362-apartment residential park **Phase2** : 322-apartment Duna Terasz Premium **Phase 3: Teresz Grande** 790-apartment	**Total :** 2,200-apartment **Phase 1** : 291 apartments
	Flats Sizes	30 m² - 126 m²	30 m² – 117 m²	29 m² - 91 m²

4	**Implementing Sustainability**	• **Benches with solar panels** (to charge mobile phones and laptops). • **Balcony or Patio** to each Apartment • Green Rooftops • **ground floor open to pedestrians** with underground Parking • **Cleaning services** • **Waste collection**	• **Smart Benches** • **Balcony or Patio** to each Apartment • **Communal rooftop patios** in Building 2: yoga, sunbathing and grill patio • **Enclosed gardens** in both buildings • **Convenience Services** • **Excellent Air Quality**	• **Balcony or Patio** to each Apartment • **Footbridge** to facilitate pedestrian traffic, a charming little bridge spans over the creek and shortens the walk to Kondorosi Road. • **Huge green spaces** : The green areas with drinking fountains, rest areas and benches • **Waste collection** : for environmental awareness, an opportunity for the selective collection and storage of waste.
	Implementing Technology	• Community Car: Drive Now service • UV-B radiation sensor • Smart Home Ready • Street Light with motion detection • Package point • Smart Parking with electric car charging station • Security Gaurds • CCTV supervision • Free WIFI in the park • Application with services • Smart Living App	• Security Service in both buildings • SmartHome • Drinking Fountain • E-Charger charging points in the underground garage • Storages and Garages • Security Gaurds • Central WiFi in the garden	• Security Service • energy savings with smart homes and intelligent street lighting. • CCTV supervision for the ground floor entrances and garage exits • intelligent intercom system • Drinking Fountain • Free WIFI in in many parts of the park. • Electirc charging station. • Planned Mol limopont • Proxy card access system numbered car parks in the Walzer hall garages.

Key Points For Urban Scale Comparison

Criticizing these case to suggest the future approach and urban form for a sustainable mass housing development that qualify as a sustainable developmens and adapt these urban planning principles , with details analyzed for each point.

After summerizing data, fieldwork was made on the three sites during July – August of 2021 with 2D mapping to analyze the projects and help identify the similarities and differences between them.

1. Urban Form / 3D / Qualitative

1. **Waterfront city** is located between Folyamör utca and the Danube in the heart of Óbuda. The project is residential towers with inner staircases .The goal was to create a place where activities of your everyday life can be easily arranged, where citizens can relax far away from the noise of busy streets, but with a quickly and easily accessibility to the city centre. (WaterFront City, 2021)

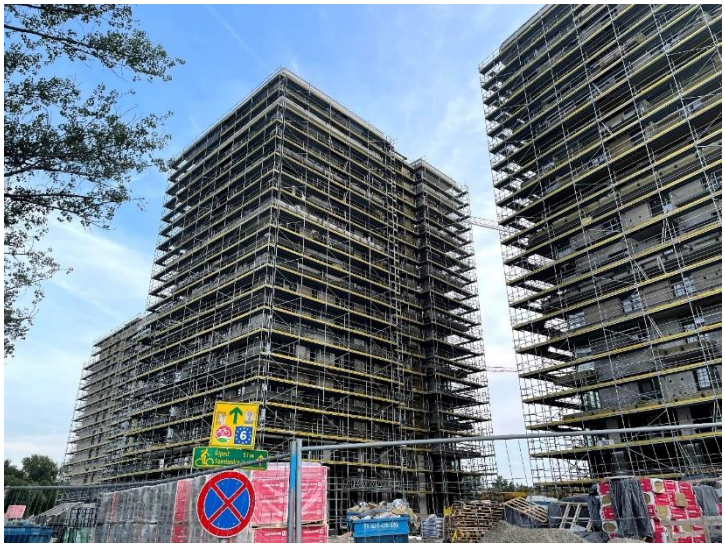


Figure 10 : Waterfront City project under construction Source: The Author (August 2021)

Figure 11 : Waterfront City project is seperated from the Danube by the main street but can be seen from the apartments ,Source: The Author (August 2021)

Although project has taken into consideration the old industrial building on site , the project height seemed segregated from from surroundings.

2. **Duna Terasz** is in a new isolated development area adjacent to the foregoing buildings in the central section built were you can enjoy the best air quality by taking short walks to the riverside but can also enjoy the convenience of city life if taking a few stops by subway by creating courtyards between these buildings. (Duna Terrasse Grande 2020). As for the height of the project, the isolated development seemed homogeneous with the already finished part , waiting for the rest of the development to be completed. (Figure 12)

Figure 12 : The Duna Teresz existing and under construction development seperated by pedestrian paths, Source: The Author (August 2021)

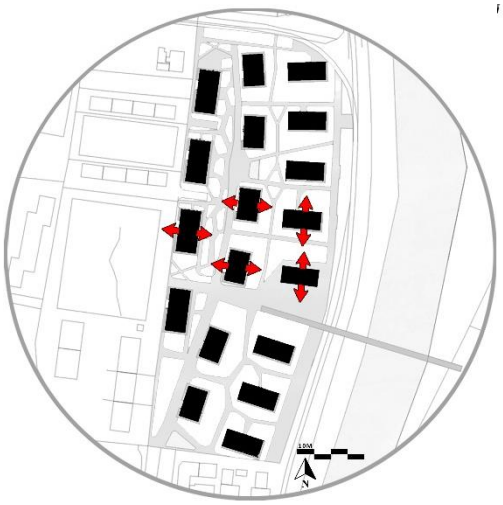
Figure 13 : 8 storey buildings under construction with roof gardens connected between them . Source: The Author (August 2021)

3. **Budai Walzer** is a pioneer project separated from the Danube by the main road with a close-to-nature concept with huge green spaces between residential building, as the project is mainly slabs connecting the buildings in lower floors. (SISKIN Group of Companies, 2019). For the height of the project it seemed to besegregated from the surrounding. (figure 14) and (figure 15)

Figure 14 : Budai Walzer under construction view from the side street Source: The Author (August 2021)

Figure 15 : Budai Walzer constructed apartments Source: The Author (August 2021)

2. Orientation of Blocks / Climate, sunshine and wind

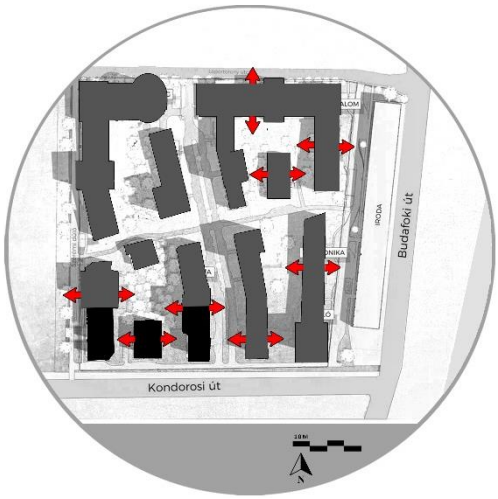


WaterFront City

Open blocks pattern oriented toward the Danube . Blocks is designed to give the same experience to all units. As for the living experience some buildings are oriented with consideration to sun direction, the apartments near the Danube are either exposed to north or south decreasing the chance of having natural lighting .

Duna Terasz

Isolated in between blocks pattern oriented toward the Danube . Blocks designed to allow a closed green spaces for all units but resulting in some apartments being oriented and exposed to natural lighting while others a lot less.



Budai Walzer

In between blocks pattern separated from the Danube. Blocks orientation takes into consideration natural lighting for apartments and creating community in the cozy park surrounding the buildings.

Illustration Source : The Author

3. Density / Regulation and reality = 3.0 / Quantitive

WaterFront City

Rehabilitating for Budapest industrial area, buidings with green rooftops and huge parks with several smart functions provide a quality, friendly and loveable environment for conscious future home owners.

33% built area with 67% open spaces

Duna Terasz

For premium environment, large private natural spaces with playgrounds, an outdoor gym and tennis court . While creating green rooftops between units

43% built area with 57% for open spaces

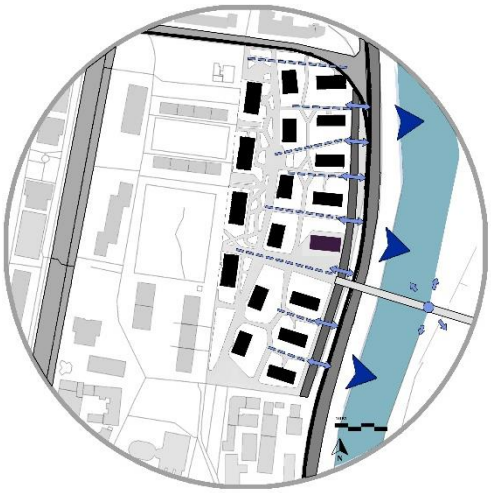
Budai Walzer

In between blocks pattern separated from the Danube. Blocks orientation takes the concept of peace and security by creating community in the cozy park surrounding the buildings. The green areas with drinking fountains, rest areas and benches

41% built area with 59% for open spaces.

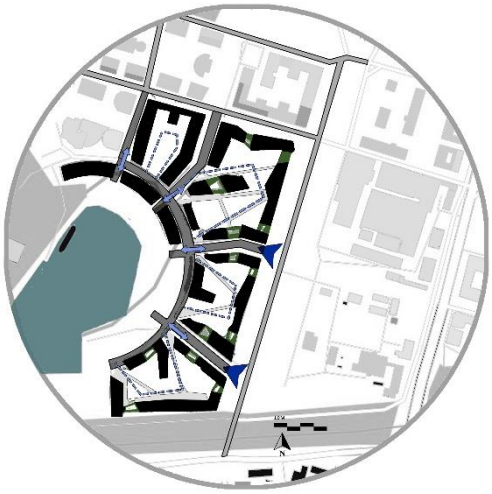
Illustration Source : The Author

4. Relationship to Danube / Blue Infrastructure



WaterFront City

Oriented toward the Danube to have a visual axis from terraces and from the middle platform and main street, creating a new bridge promenade of the river .



Duna Terasz

Visual connection for all blocks to have a terrace view to the Danube and can be reached by taking short walks to the riverside and a walking distance of the subway station

Budai Walzer

The project has a new bridge connecting it to the Danube. The blocks are seperated with a walking distance from side street to the Danube, making visual connection to Danube hard to acheive for all terrace but only to some .

Illustration Source : The Author

5. Urban Context / Integration

WaterFront City

The location of WaterFront helps the project to take advantege to only residential buildings and shops,offices and restaurants in the ground floor , as the neighbourhood is equipped with residential, educational, cultural and shops .

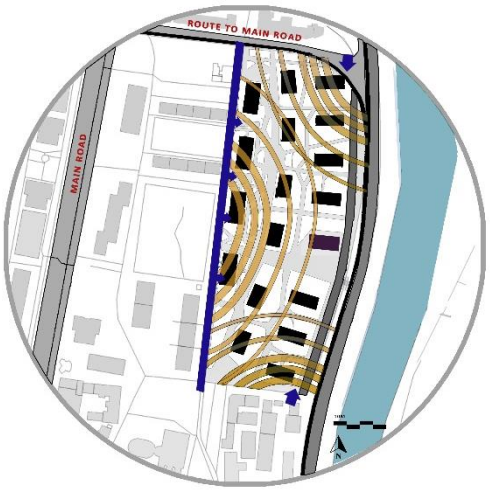
Duna Terasz

Duna Teresz Grande is phase 3 of Duna Terasz making this development is surrounded with a lot of functions adding to that community spaces, service, playgrounds, enclosed gardens in buildings . Also communal rooftop patios in Building 2: yoga, sunbathing and grill patio,toolbox and sports equipment.

Budai Walzer

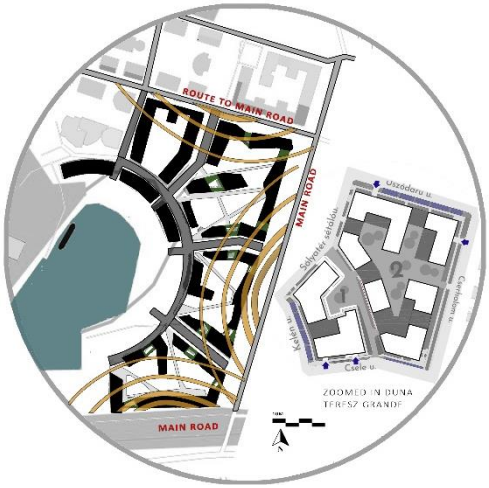
Reaching Budai walzer was harder than the previous two. A lot of car shops and offices in the area with minimal supermarkets, therefore a planned pubic spaces is part of te project to accommodate the needs of the people .

6. Parking



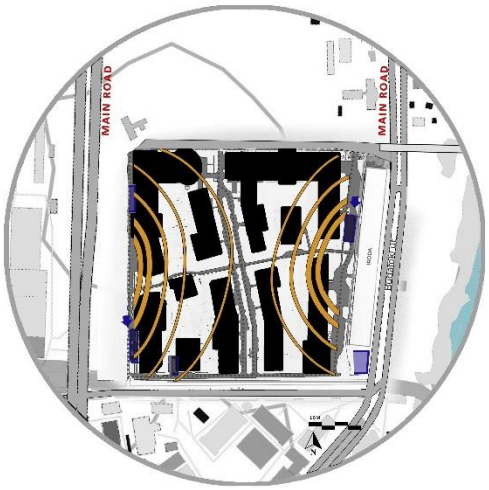
WaterFront City

Access to underground parking from back street and two main accesses from main street confining the noise and pollution from vehicles.



Duna Terasz Grande

Duna Teresz Grande ground parking and the location of buildings underground parking in main streets allowing a huge space for green spaces and parks between buildings.



Budai Walzer

Two Main roads lead to the project with underground parking from back street and main street confining the noise and pollution from vehicles to the edges and having an environmental friendly

7. Functionality – Space Usage

WaterFront City

The car parking are left to the edges of the site. As for the pedestrian paths buildings can be accessed from main pedestrian path and side paths.

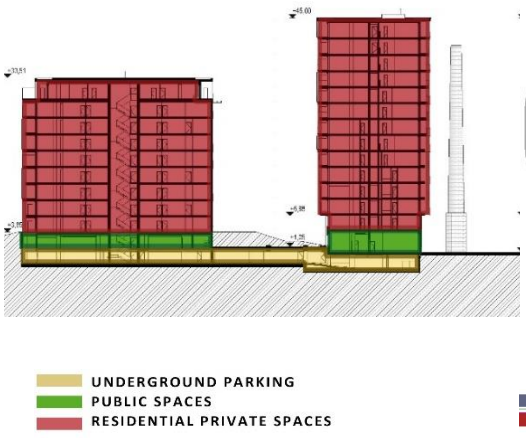
Duna Terasz Grande

Duna Teresz Grande building designed with underground parking in main streets which allows more privacy with green spaces and parks between buildings for owners.

Budai Walzer

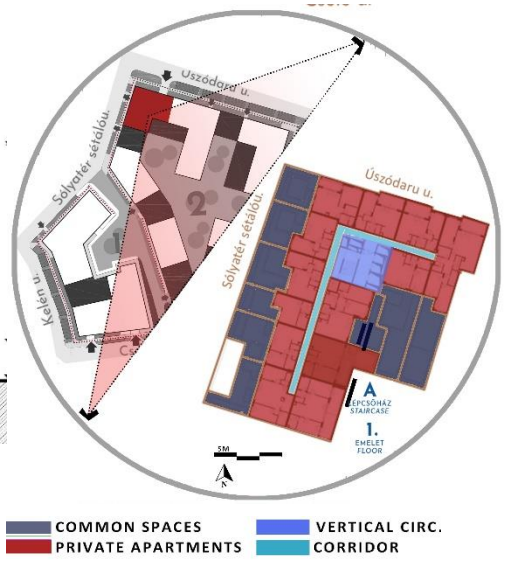
On the edges of the site there is the ground and underground parking which gives security and privacy for the owners in the developments.

8. Micro Scale – building context analysis



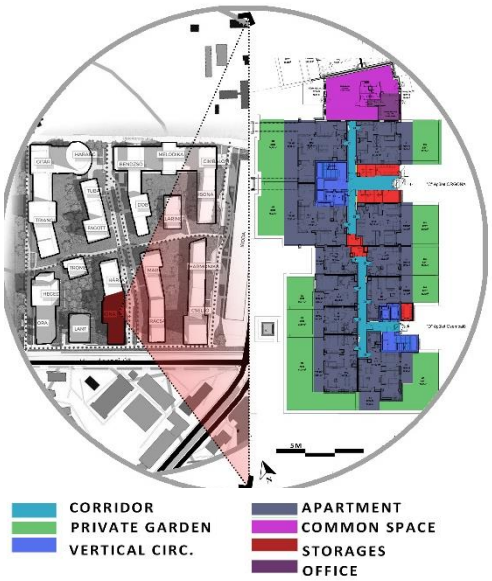
WaterFront City

From section we can see that apartments is oriented toward one side with a center staircase inside building without natural lighting, didcating ground to public spaces and privacy for apartments above.



Duna Terasz Grande

Duna Teresz Grande distribute some public spaces in ground floor and full privacy for apartments above and an interior center staircase with no natural lighting.



Budai Walzer

Some common spaces in the ground floor with a central vertical ciculation (while one staircase is exposed to natural lighting and ventilation the other is mechanical.

Illustration Source : The Author

9. Sustainability in Micro Scale – building context effect on urban context

WaterFront City

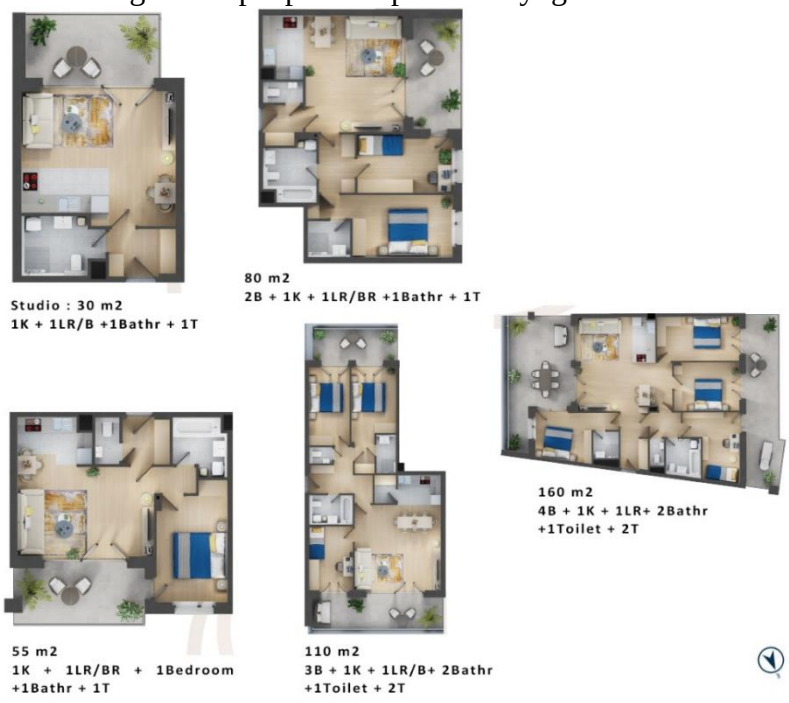
32 000 000 HUF for studios to 105 000 000 HUF for 4br apartments

- **Young families** can rent studios, go to Obuda island to do sports and enjoy green areas.
- Green areas are part of apartments and parks where you can enjoy nature.
- **Pet friendly** were they can play .
- Smart Home service and WIFI available in parks
- Playground for kids and picnic areas.
- Security cameras.
- A lot of urban furniture for **elderly** to rest and enjoy fresh air next to Danube.

Duna Teresz Grande

73 000 000 HUF -191 000 000 HUF

- Studios are available for **young families** and avaialble apartments for **big families**
- Green areas part of some apartments while parks attracting active people for sports and yoga on roof .
- **Pet friendly** were they can play and huge terraces
- sustainable and energy aware smart solutions, WIFI available in parks and Security cameras.
- Playground for kids and picnic areas.
- A development with large natural spaces, marina, evening walks on the Danube promenade, shared barbecue on the roof terrace or dinner on your own balcony.
- On the top level, a penthouse apartments with unusual, arched walls for people with love unique and extravagant interior.



Budai Walzer

35 000 000 HUF to-89 000 000 HUF

- Attracting **intellectuals, young people** with thickening of cycle paths, treadmills, the creation of community gardens, the establishment of street training parks
- as well as all those who want a peaceful life – **elderly**-with the renewal of the image of tree plantings.

- **big families** can also enjoy the public spaces and parks, the modernization of playgrounds and the organization of diverse cultural programs.
- These huge parks also makes the development **Pet friendly**
- Smart Home service and WIFI available in park, security cameras
- the South Buda Central Hospital,will be built in the Dobogó district providing high-quality health care.

Discussion : **Evaluation for the data**

Evaluation of these Urban forms in Budapest and analyzing in relation to sustainability and focusing on contemporary housing is related to our ability to foresee how the collective habitat will evolve in the future. It is important to identify how we can incorporate efficient methods and technology to the new residential figurations that where we can recognize the development in sustainable solutions .

A smart, self-sufficient city are emerging concepts that describe this new 21st century urban phenomenon. New technologies are encouraging designers to create new design, logics and new ways of designing and constructing for the future of the cities. The criticism for these cases in Budapest near Danube has focused on mainly multiple disciplines from ecological, environmental,technical and social aspects.

Based on the quantitative and qualitative analysis in [TABLE1] and mapping, 10 different categories were chosen to make relative comparison in [TABLE2]

Urban position : the project relation to Budapest and suroundings
Distance from Center / accessibility by public transport : Project distance from the center of the city plays a big role in understanding the accessibility to the development
Urban Form : The project height according to Budapest skyline and homogeneous to it surroundings urban context
Orientation of Blocks: Climate, sunshine and wind element interaction with the buildings according to the orientation can help increase the human comfort inside these developments
Density / ratio of built-up area and open space: the condensation of the buildings or increasing the open spaces in each development can shape human experience
Relationship in Danube the view and accessibility to the blue infrastructure
Integration to the surrounding : living near or far from accommodations **depends on the** neighbourhood of the developments if it's equipped with educational, cultural buildings and shops.
Parking : the number of in site parking and pollution / noise contribution to the surroundings
Functionality / Space Usage: open spaces usage and the common functions added accroding to people's needs has an effect on project importance.
(A) **Indoor Micro scale – building analysis :** Functions, circulation, ventilation and density in apartments numbers
(B) **Outdoor Micro scale – building context to urban scale** apartments connection to public spaces and the type of families the development attract can effect age groups living in them.

For simplification and based on the past analysis to reach a sustainable approach for mass housing in Budapest. The 11 main points indicated above is used in [TABLE2] to give a maximum 3 points for each criteria . Relative comparison is used in [TABLE3] to reach a quantitative conclusion to the best solution between these developments.

	WaterFront City	Duna Terasz	Budai Walzer
1. Urban position	3	2	1
2. Distance from Center / accessibility by public transport	3	2	1
3. Urban Form	2	3	2
4. Orientation of Blocks	2	1	3
5. Density / ratio of built-up area and open space	3	2	1
6. Relationship in Danube	2	3	1
7. Integration to the surrounding	3	2	1
8. Parking	2	3	1
9. Functionality / Space Usage	3	1	2
10. (A) **Indoor Micro scale – building analysis**	1	3	2
10 (B) **Outdoor Macro scale – building context to urban scale**	3	1	2
	27	**23**	**17**

Conclusion: New Sustainable Development Solution to be implemented in the future

Evaluating contemporary mass housing in Budapest in urban and building scale with housing policy measures being abandond proven by increasing the number of the apartments and encouraging the spatial segregation of social classes as explained, as it falls in living standards of the lower status groups for a more vibrant and liveable city centre.

To the developments advantage, the water element of the Danube is a winning key to create these new projects sustainability and to find a better quality of life . we cannot neglect that the historical value and the ecological aspect of the Danube and Budapest plays an important role to why investors chose these locations, the similarity in certain elements in design for the three projects shows enlightenment toward sustainability in mass housing developments but with the need to integrate these development as one unit with Budapest and Danube.

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