

## Abstract

*The transitory belt of Budapest contains a great number of underused, brownfield areas awaiting rehabilitation as a result of the economic transformations of the last few decades. The paper deals with a characteristic problem of this belt, the visual and spatial fragmentation, and examines it at one specific location: the neighbourhood of the Gas Works area in Óbuda. Through this example, it proposes specific urban design and landscape oriented spatial strategies that could be applied to this fragmented site. These strategies use densification tools, deal with the reprogramming of the open landscape, and propose urban landscape design interventions with the goal of hydrological management. The objective of the paper is to identify approaches dealing with the fragmentation of the neighbourhood and propose tools for articulating a more connected, visually more integrated environment.*

## Keywords

*Óbuda · Gas Works · Urban strategy · Urban landscape · Brownfield area*

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Buda, Pest and Óbuda developed into a unified metropolis during the second half of the 19th century because of its massive agricultural processing industrial development. The formerly compact and dense market-town became surrounded by an industrial belt, which provided the background for the further development of the city in the early 20th century. [1]

This economic belt maintained its importance until the 1980s. In the early 1990s, after a relatively rapid transformation from socialist economic structure to market economy, the urban belt with mainly outdated industrial premises lost its function, and most of the areas became superfluous. These areas have deteriorated into derelict and underused sites. In some zones, building utilisation continued with the spaces rented out to minor private enterprises, but in most cases, the building stock of the old industrial premises prevented complex renewal.

The various mid-term and long-term development concepts of the city in the early 2000s have defined two main development target zones along the Danube in Budapest. One is north of the city centre (Római Beach, Gas Works, Hajógyári Island, Mocsárosdűlő) and the other to the south (North of Csepel Island, Kopaszi Dam). These mainly brownfield zones along the Danube, with their proximity to the centre, still have enormous economic and urban development potential today. [8]

One specific part of the urban zone north of the city centre, the neighbourhood of the former Óbuda Gas Works, is especially interesting because of its urban heritage and spatial conditions. It is situated south of the western pier of the Újpesti railway bridge on the Western side of the Danube and is the site of the Aquincum Museum, the Graphisoft information technology park, the former Gas Works, a large retail centre and numerous other functional units.

To overcome fragmentation, three distinct urban and landscape design oriented spatial strategies can be applied to such sites. Our goal is not to give direct and instantly applicable design proposals, but to identify various approaches dealing with the fragmentation

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of this specific neighbourhood, propose tools for articulating what should be separated, and connecting that which is disjointed. The three possible strategies investigated in the paper are:

(1) *Densification*: densification can be used as a tool for creating spatial and programmatic continuity by “filling-up” underused intermediate spaces, and by generating functions and space usage with building activity. Through construction, new programmes and new users can be brought to the site generating new dynamics. [6] Thus, the intermediate public and privately owned spaces can be viewed as development sites where new functional units can be erected. These new functional options can be shared by anyone from the surrounding zones, in turn creating an interface of space usage.

(2) *Intensification*: Instead of densifying with building activity, the option of strengthening space usage by introducing new mainly leisure-oriented functional programmes to the open and green spaces could also be applied to the site. Green spaces along the existing brownfield areas are usually regarded as unmaintained by both possible investors who consider them underused, but also residents and local municipalities who perceive them as abandoned and badly affecting public safety. In the case of brownfield rehabilitations, the renewal of green spaces can have special functions: (a) the brownfield areas can be converted into large public parks; (b) new developments can be organized around the new parks of the former brownfield areas; (c) they can provide a possibility for the desurbanisation of left-over spaces, by converting them into extensive green fields of undeveloped natural or semi-natural vegetation. [9.] In this case, the strategy mainly proposes to reprogramme it as open and public space using existing and planned vegetation as a tool for articulating open space.

(3) *Redefining landscape with a hydrological strategy*: A third strategy to deal with urban fragmentation is using hydrological design tools, with a substantial emphasis on cohesion between water and green elements. In this case, the cohesion is not created by the continuity of the functional programme, but by the integrity of the landscape while at the same time giving new roles to in-between spaces such as rain-water treatment and preventing stormwater runoff, while providing a variety of natural habitats.

The paper investigates the possible use of these three strategies on the site of the former Gas Works, through presenting and analysing reference projects with similar approaches.

### Past and present-day conditions of the site

The site has been a wetland; the areas to the north and the west of our investigated site are still swampy today. The name “Mocsárosdűlő” (swampland) is a reminder of a once more natural marshland. The area was the location of the civic city of Aquincum, the capital of Pannonia province, with the Aranyhegyi Creek passing just north of the ancient city walls. The Roman city used the creek as a water source, and with its thermal water, the Római Beach north of the site soon became a favourable place for bathing.

Although, by the end of the 19th century, the area had become largely uninhabited, the Aranyhegyi-Creek for a long time determined the role of the area. Several watermills were located along the creek and at its confluence with the Danube. These mills appeared at the end of the Middle Ages and could also be used during the winter period since the creek, partly fed by thermal water, never froze solid. The Krempl, the Klingelmeier and Elias mills were located on the creek. On the Danube, boat mills were moored, while north of the site the Enzinger mill was grinding gunpowder. [18]

The railway line south of the Aranyhegyi Creek and north of the investigated area was built between 1894 and 1896 with the Újpesti railway bridge opened on the 3rd November 1896.

The idea of building a new municipally owned gas factory in Budapest had already arisen in the 1870s, and the site of this sandy beach in Óbuda was chosen; nevertheless, implementation only started several decades later. In 1908, an international planning competition was held with Weiss Albert as the winner; the final decision on the actual implementation was made on the 26th May 1909. The concept of the central emblematic element of the factory, the group of three containers around the central water tower, had already been finalised by this time. The construction finished, and the factory opened in 1913. [2]



Fig. 1. Landscape conditions of the Óbuda Gas Works today (Photo by Alicja Romaniak)

Besides the gas factory, two housing estates were built for the employees. To the south, a series of detached houses with relatively large gardens were built for company officials according to the plans of Kálmán Reichl, while to the west, a workers housing colony was erected with the assistance of the architect Almási Balogh Lóránd. Here, a row of two-storey buildings surround a central public park while behind the buildings small private allotment gardens were created. [5]

The factory was enlarged several times, and although it never reached its originally planned capacity, it served as the main gas producing plant of the city. In October 1984, due to technological changes, the plant was completely shut down. The severely contaminated area of the plant was only partly

used, and in 1997 part of the area was sold to Graphisoft, which started to develop an information technology park on the site.

Along the Szentendrei road, south of the Aquincum site and west of the officials' colony, a housing factory operated from 1965. This factory produced one-story high prefabricated building panels for housing estates based on Soviet technology. After the closure of the factory in the early 1990s, the area was deserted until, in December 2003, a new large-scale retail centre was opened.

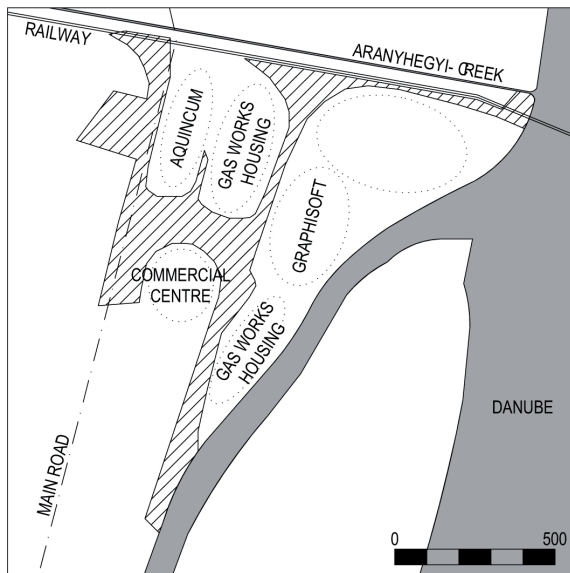


Fig. 2. Underused fields (hatched area) of the Gas Works area and the surrounding urban elements (figure by Judit Skaliczki)

Today this urban space can be characterised by immense fragmentation and discontinuity of space. Various urban fields and introverted thematic parks alternate next to each other without visual and programmatic communication between them. A left over and very slowly transforming brownfield industrial area (gas factory); a highly sophisticated information technology park (Graphisoft); a publicly owned housing estate with rental flats still mainly inhabited by the former workers of the gas factory; the most important Roman archaeological open-air museum of the city (Aquincum Museum); a large-scale introverted retail centre with its “wasteland” of parking spaces and some highly positioned apartment houses south of the Graphisoft park all coexist next to each other. The intermediate spaces are rather faceless transitory spaces, and instead of creating cohesion, they separate the monofunctional zones, with their undefined use.

These zones are dominated by motorised traffic and unmaintained green. Although the Eurovelo 6 international bicycle route crosses the site, it does not affect the intensity of public space usage. The local municipality owns the public spaces, however, they are not maintained due to a lack of resources; the adjacent proprietors do not sustain the area either since they cannot get control over it. The surrounding functions work in

an introverted way and the intermediate public spaces can be characterised by abandonment. Most of these areas have visual and sound separation walls, which reduces the possibility of visual cohesion and communication. This spatial and functional network is further layered by its temporal stratification, which means that every single part of the area is above possible archaeological excavation sites from the Roman Age.

### Densification as a tool for spatial and programmatic continuity

This strategy tackles the issue of spatial coherence. The newly built elements can generate a feeling of continuity and cohesion. With this approach, we can provide options to walk or bicycle along interesting and vital routes eliminating the currently dominant unfriendliness of intermediate spaces. In addition, new functions generate higher residential or functional densities, which is vital for a more sustainable and effective urban environment. By reaching a specific threshold density, the amount of possible users in a specific area reaches a level sufficient to generate that amount of interactions that make certain urban functions and activities viable. If we have a greater number of urban activities, the public life of the area becomes more diverse and even more attractive for new functions [6].

Densification can also mean a simple building development process of the vacant sites of the former Gas Works as per the university projects prepared for the area in the 2014 spring semester. (authors: Cloe Darmante; Victor Gautier and Carlotta Cini; Marina Romano). The projects increase the number of possible users on the site, although, they do not deal with the issue of connectivity and fragmentation in a complex way. The proposals carefully handle the existing elements of the Gas Works, but takes them as isolated fields of intervention; by not treating the boundaries and not affecting the public zones of communication, they do not create links beyond the limits of the former factory, ultimately even increasing fragmentation.

So densification, without a complex networking and linking strategy dealing with edge situations, will not provide solutions for the problem. The strategic approach of densifying in-between space has been used in the European 11 international competition for the Norwegian site of Haugesund, a mainly underused area close to the city centre. Here, the question raised by the competition brief was how new developments can activate and reconnect the area to the traditional city centre by using high densities, public spaces and by proposing a diverse and integrated new fabric. The winning entry (“Hip-hubs”; authors: Gonzalo Coello de Portugal, Marta Granda Nistal and Ana Moriyon) proposed density clusters very directly connected to the existing network of the city. These sheltered “hubs” use buildings with shared programmes that generate urban dynamics at very clearly defined focal points of the area through intensification. So densification, in this case, is not just simply increasing residential density in a monotonous way but comes with



Fig. 3. Densification strategy in Urban Design projects at the Department of Urban Planning and Design (Drawings by Cloe Darmante; Victor Gautier and Carlotta Cini; Marina Romano)

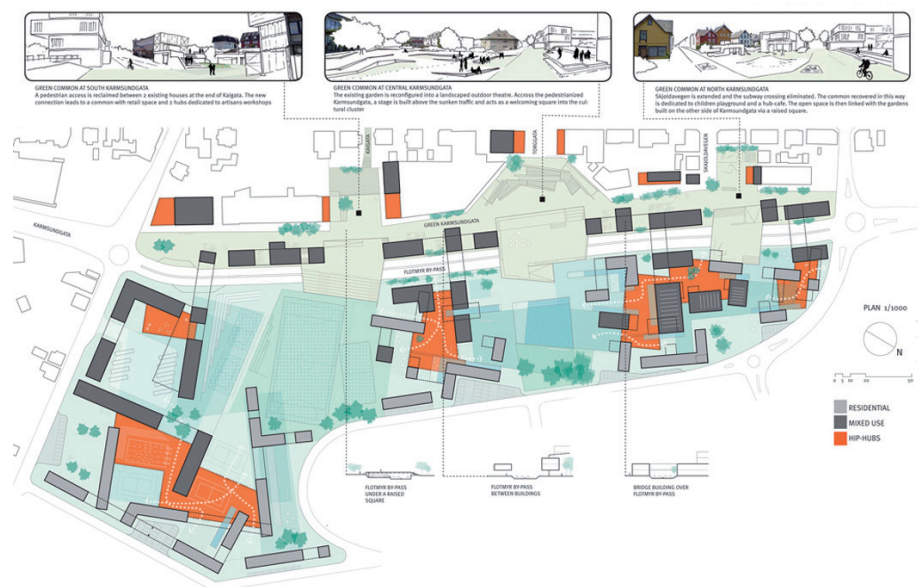
intensifying events and services by providing the greatest variety of possible programmes. The location of the intensity hubs is also a crucial issue in the project, since with their carefully chosen location they increase connectivity and interaction. [4]

In addition, in the densification approach, we should also emphasise the importance of enriching social structure and mixing social groups. Monotonous residential or working environments attract the same type of people and programmes; consequently, creating interfaces by mixing these social groups and forming newly intensified public zones at these vacant areas can have a positive effect on the complexity and variety of programmes of the area. [4] From this aspect, the recently opened new educational facility in Graphisoft Park (Aquincum Institute of Technology and International Business School) can affect the programmatic complexity of the site in a positive way with its new social group of users.



Fig. 4. Underused zone (hatched area) in Haugesund and the surrounding urban elements (figure by Judit Skaliczki)

Fig. 5. Densification strategy of in-between spaces in the “Hip-hubs” project (Drawing by Gonzalo Coello de Portugal, Marta Granda Nistal and Ana Moriyon) [20]



## Intensification of the intermediate by reprogramming open and green space

The second strategy to deal with the unused area is to reprogramme it as open and public space. The existing undervalued zone, in our case with continuous open spaces, could be perceived as the backbone of a new green network tuned up by new functions. This continuity can connect all the fragmented elements of the area and can create a new dynamic interface of publicly accessible open-air programmes.

In the Dessau landscape corridor project of the Rudolph Langner Station C23 architecture landscape urbanism office (authors: Michael Rudolph, Sigrun Langner), the concept of unifying and converting a series of underused open spaces and former industrial sites has been applied to reprogramme and revitalise the areas adjacent to the city centre. These areas had no urban character and were suffering as a result of the overall shrinking of the city. In this new “landscape stretch” project, the areas not only provided an opportunity for creating a series of new public spaces and parks, but also linked the urban centre of the Dessau-Rosslau area with the natural spaces of the riverside along the Elba and Mulde rivers. Interventions included transforming brownfield areas into grasslands containing various attractive vegetation types with the goal of removing contamination from the soil; transforming pathways into new better quality walkways with rest areas suitable for cyclists; creating memorial squares on the sites of demolished buildings where formerly unexcavated ancient ruins are also displayed; regenerating ecosystems by reinforcing migration routes, and providing nests and shelters for animals to settle; greening existing streets, reusing existing structures for street furniture and managing rainwater. [3,19]

The landscape corridor project in Dessau illustrates that the programme of urban open spaces should be defined by the possibilities of the site, as well as considering the potential of using the historical remains. As a large part of our investigated area is awaiting archaeological excavation, it should be used as a positive dynamic in the process of reprogramming the site.

In the European 12 competition at the site of Zugló in Budapest, the topic of transforming the intermediate landscape from

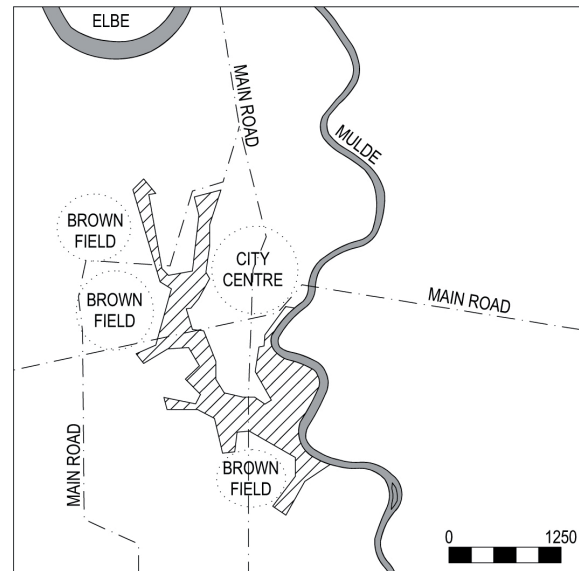


Fig. 6. Underused zones (hatched area) in Dessau and the surrounding urban elements (figure by Judit Skaliczki)

a separating to a linking zone emerged. Here, the continuous long strip of the Rákos Creek was used as a site offering possibilities to generate new urban activities and create a continuous network of reprogrammed open spaces.

The runner-up project called “Manual Towards a Clumsy City” (authors: Romain Granoux, Francois Justet, Margaux Minier) does not even propose a landscape or urban design vision in a classical sense, but only a menu of possible functional interventions. It offers programmatic elements or seeds of activities that, in their current form, provide the possibility of later defining the actual intervention programme with the involvement of the surrounding communities. All minor and major proposals are completely equal, they require the active participation of the “neighbours” and have to be defined through a dialogue with local communities and local enterprises. This strategy uses public space as a tool to generate activity through involvement and interaction, transforming open space into an interface of communication. [10]



Fig. 7. Dessau landscape corridor project after the intervention (photo by medial mirage Leipzig / Matthias Möller)

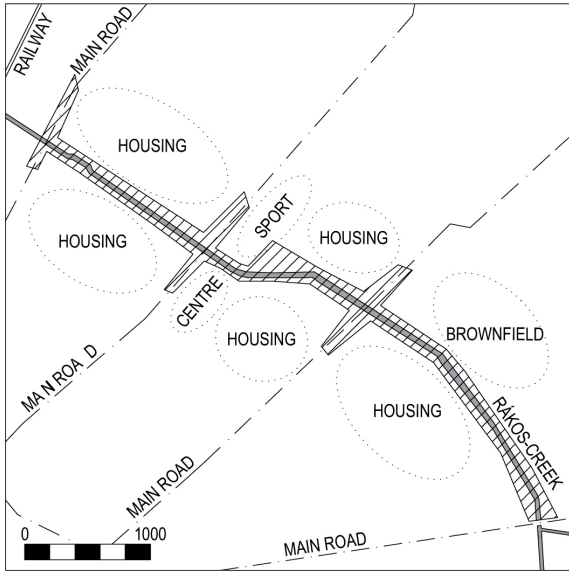


Fig. 8. Underused fields (hatched area) along the Rákos Creek in Zugló and the surrounding urban elements (figure by Judit Skaliczki)

### Hydrological design as a tool for generating a unified image

Today cities are highly urbanised with a considerable percentage of urban fields covered by impermeable surfaces. Consequently, a permeable surface that imitates the rainwater runoff attributes of a natural environment becomes valuable, both environmentally and socially. A compact urban structure can benefit from greater efficiency in terms of sustainability; however, a densely developed area will typically have higher level of impervious surfaces. Combined with the extreme rain events of global climate change, the increases in the volume and rate of stormwater runoff can result in local flooding. Furthermore, the decrease in vegetation, the use of surface materials that prevent water penetrating the ground, the degradation of terrestrial and aquatic habitats and the increase in maximum summer temperatures are also negative effects. [12]

All these aspects were taken into consideration in the urban planning processes in the city of Malmö, where the numerous redevelopment and new projects were recently implemented. Among them, the renewal of the eco-city Augustenborg, an estate of 3-6 story apartment blocks from the 1950s, is notable for its hydrological and landscape approach. The area was redeveloped in the late 1990s because the housing estate has had major environmental problems connected to its rainwater management. The main issue of the Augustenborg redevelopment was to transform the area into an ecologically, socially and economically sustainable settlement. [13] This was achieved by the use of innovative projects, all strictly connected to social, landscape, environmental and hydrological aspects. The implementation of a stormwater system was one of them. This water system links together built up and green areas, but at the same time connects areas of different functions - residential, educational and commercial - providing cohesion. Landscape based elements for stormwater management were incorporated into a school yard, residential courtyards, walkways as well as office and workshops areas, providing a multitude of new functions in the neighbourhood. Some of the roofs were transformed into the green ones, and a new botanical roof garden was created. This green and blue network transformed formerly uninteresting and monofunctional areas into lively fields, and at the same time, a new sustainable eco-city was created for different groups of users.

The area of the gas factory had been closely connected to water features such as marshlands, creeks and ditches until the second part of the 19th century; these determined the character and function of the broader area. Even nowadays, the presence of water is tangible. The groundwater levels are mostly high, which affects development projects and provides construction difficulties with only deep-building foundations viable. Simultaneously, the direct, hydrological connections to the Danube can create a spirit of place and can provide a new identity for future developments.

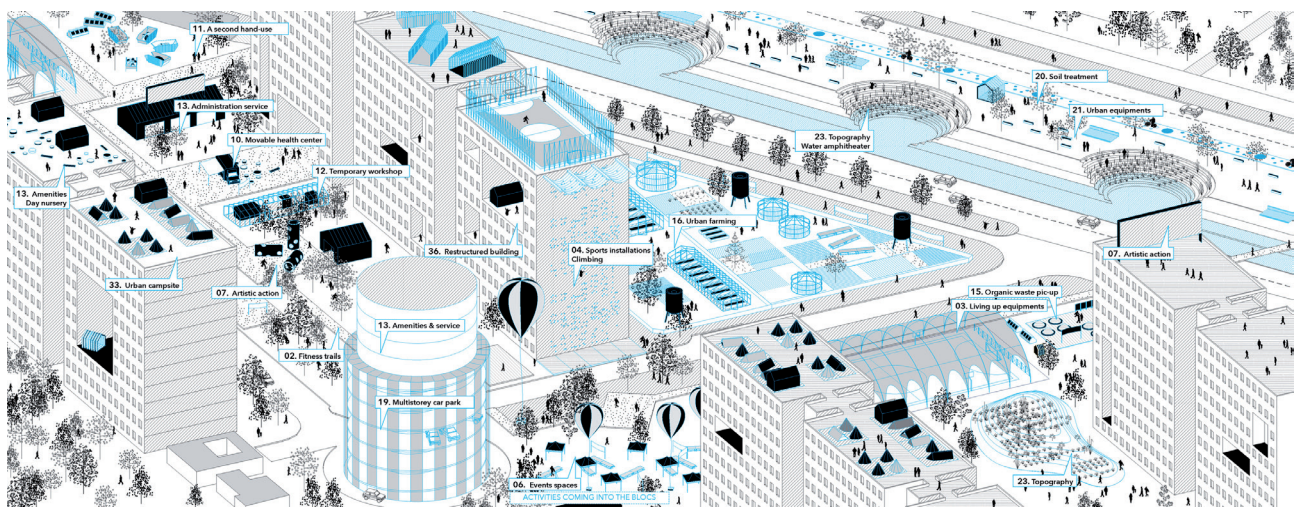


Fig. 9. Strategy of intensification by providing a menu for public space usage: "Manual towards a Clumsy City" project (Drawing by Romain Granoux, Francois Justet, Margaux Minier) [21]

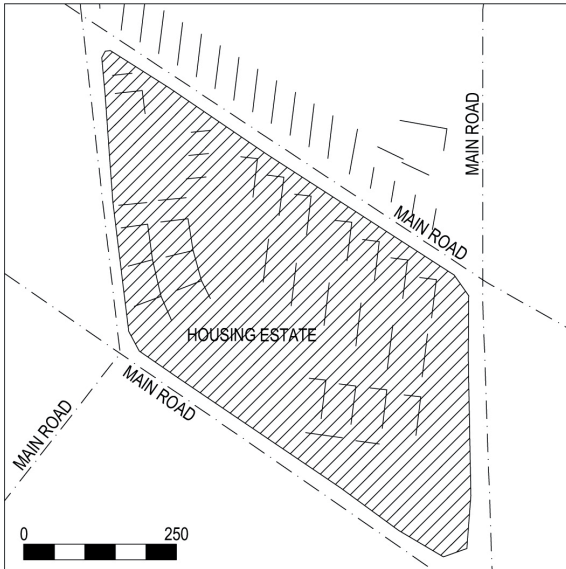


Fig. 10. Underused zones (hatched area) in Augustenborg / Malmö and the surrounding urban elements (figure by Judit Skaliczki)

Thomas H. Cahill, in his book on Low Impact Development and sustainable stormwater management, delineates a comprehensive approach to sustainable site development. [14] He emphasises that the crucial issue is to fit a design proposal to the topographical conditions of the site and simultaneously to take advantage of landscape conditions. Thus, the implementation of such a blue, hydrological network within the area could be a reference to history and to the present site conditions and a way of emphasising a new identity for the area. This hydrological network can consist of various water elements, which will be in conjunction with the built environment, green areas and communication routes. Most of them can be recharged by stormwater runoff from roofs and other impervious surfaces. It is essential to adjust them to the existing site conditions, thus to provide diverse water solutions. The use of rain gardens, canals, ditches, filtration basins and wetlands can provide new functions within existing green areas. From empty, in-between spaces, they can be transformed into attractive green areas of different functions. However, there are further advantages of this green and water

approach to urban design. The implementation of stormwater solutions can improve the environmental conditions of the area. By the use of wetlands, the water quality can be improved. Wetland plants can absorb specific metals, which could be a significant issue in a post-industrial area with contaminated soil.

In addition, the use of different landscape elements for stormwater management can provide new habitats for flora and fauna. Diversifying the terrain with these tools provides habitats for species needing different moisture and sun exposure levels, thus increasing the biodiversity within the area. [15]

In the city of Copenhagen, at the Nordhavnen redevelopment project of the former harbour area, where a future sustainable district will be created on the small islets, hydrological management is a major tool for generating spatial cohesion and identity for the place. The use of water is one of the six themes that frame the development strategy. The overall future layout is based on a sequence of small islets that are the result of divisions and subdivisions of the existing structure. These land sections are interwoven with canals and basins that form a blue network so water will be present in every part of the district. [16] The approach of providing new water elements in a new development area and connecting them to the existing natural ones is a major element of the strategy of Water-Sensitive Urban Design. It is an approach for land use planning, focussing on the integration of rivers, streams, lakes and wetlands with the whole landscape to achieve sustainable ecosystems. [17] Nevertheless, hydrological strategy should incorporate not only inland waters, but also stormwater. The integration of stormwater and the Green Area Factor strategies are the most innovative schemes included in redevelopment plans for the sustainable redevelopment of various districts. They refer to the use of natural, permeable surface covers to enable the stormwater drainage, and at the same time, to provide wildlife habitats. [13]

Proposing such an approach, where the presence of water within the area is clear could be a reference to historical times, when those water elements contributed to the character of the wider area of the site.



Fig. 11. Strategy of requalifying public space by hydrological design: The Blue-green renewal of the eco-city Augustenborg / Malmö (Photo by Arpad Szabo)

## Integrated adaptable approach

In the Thematic Development Programmes framework of the Municipality of Budapest, amended in 2014, the programme to develop brownfield areas of the city lists the Gas Works area as a place with recultivation tasks and as the location of a future cultural centre developed using the built heritage of the factory. The programme, in its short description, talks about the protection of the valuable buildings of the former Gas Works, the utilisation of open and green spaces, and the development of interior and exterior infrastructure, including the redevelopment of the riverside promenade. [11] The programme already contains the notion of dealing with intermediate spaces and external landscapes. However, this has to incorporate a more open approach towards the environment as a complex entity, and should involve the publicly owned transitory landscape of the area as well as the edges of housing zones.

The protection of monuments and built heritage should not only mean the reuse of the stationary built elements but should also take into consideration all the mobile elements and the cultural heritage of the site. [7] The complex socially, economically, environmentally sustainable rehabilitation of the areas are only viable in this way.

It is nevertheless true that there is no single ultimate strategy for solving all the visual integrity issues of the site. If we want to create an adaptable answer that can react to the needs of the neighbourhood and the temporal challenges of a continuously transforming future, we have to provide a flexible framework with adaptable approaches. The three approaches described in the article have the potential of being integrated into one concept and can react to the social and topographical issues raised by the site. An open, integrated and adaptable approach will not fix the components, but with its flexibility will raise the resilience and the adaptability levels of the area.

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