

# PATHOLOGIES OF THE RIVERSIDE BUILT ENVIRONMENT VERSUS SUCCESS INDICATORS OF FUNCTIONAL PERFORMANCE

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## Abstract

The paper focuses on the downtown built environment (downtown waterfronts) and also on individual architectural objects which have an important function in such a space. The quality of the built environment affects its surroundings not only in a physical but also in a social way. To find the most appropriate ways of preventing the occurrence of the built environment pathologies in downtown areas, the study used the diagnostic technique of functional performance understood, among other things, as the ability to satisfy the stakeholders' needs and the impact of stakeholders' actions on their living environment. During the research, a comparative platform was found for the functional performance, the imperative of sustainable development and the ecosystem services of rivers and reservoirs. The investigations resulted in the creation of success indicators illustrated by examples of six voivodeship capital cities in Poland which have the strongest connection with the downtown built environment in waterfront areas, namely: Gdańsk, Szczecin, Warszawa (Warsaw), Kraków (Cracow), Wrocław and Poznań.

**Keywords:** Built environment pathologies; Ecosystem services; Functional performance; Success indicators; Sustainable development; Voivodeship capital cities; Waterfront.

## 1. INTRODUCTION

Recent years have witnessed a growing interest in the architecture focused on ecology and environmental aspects. Architects and urban planners are paying more and more attention to the projects and designs connected with waterfronts, waterfront woonerfs, or multi-functional public buildings located on the river banks as well as by the canals and water reservoirs [1]. To develop waterfront areas in harmony with nature as well as economic and cultural aspects the designers seek after exemplary activities and implementations. In the scope of urban planning, more and more designing activities concentrate on the development of downtown waterfronts. Such activities usually encompass selected fragments of urban tissue. A holistic approach to the proper development of downtown waterfront areas is extremely rare. In Poland, many

studies are concerned with degraded post-mining areas or widely-understood post-industrial sites. However, it should not be forgotten that many districts where factories ceased to operate are located on the riverbanks or lake shores. The river flowing through the city means not only enclaves of greenery in unregulated sections, but also flood protection and water retention aspects, which constitute part of the ecosystem services of rivers (discussed further on).

This study concentrates on the research issue of built environment pathologies in Polish cities having strong connection with riverside areas, with the emphasis laid on specific architectural objects located in such areas. First, it was analyzed to what extent Polish voivodeship capital cities are connected with downtown waterfronts. Next, a definition of a downtown area was provided, as this notion is ambiguous in Poland (e.g. in terms of the size of the downtown areas subject to

comparison). To determine the typology, a diagnostic technique of functional performance was used. The technique consists of success indicators, such as: economic, environmental and social factors.

## 2. MATERIALS AND METHODS

The initial phase of analyses made use of the qualitative research, which constitutes an invaluable source of the knowledge of buildings and the surrounding space. The qualitative research enables the improvement of designing processes as well as the adaptation of buildings and their surroundings to the users' needs. The initial qualitative analysis encompassed waterfront (riverside) areas in 14 capital cities of Polish voivodeships (provinces), such as the cities of Białystok, Bydgoszcz, Gdańsk, Katowice, Kielce, Kraków (Cracow), Lublin, Olsztyn, Opole, Poznań, Rzeszów, Szczecin, Warszawa (Warsaw), Wrocław. Two voivodeship capital cities – Łódź and Zielona Góra – were excluded due to their weak connotations with waterfront areas. Having reduced the data scope, special attention was devoted to the waterfronts in downtown areas. The paper explains how the term 'downtown' is understood in Poland due to different interpretations. The next phase of the research included investigations into the extent and degree of connection of particular voivodeship capital cities with large reservoirs and main rivers on which they are located. The cities were listed in the following order: from the most connected with water in downtown areas to the least connected.

The subsequent stage of the research was based on a *method of logical argumentation*, which seemed the most adequate in the studied context. The method of logical argumentation is understood as the search for a theoretical interpretation of events using a logical description of the reality based on analysis and synthesis. The present paper came into being thanks to the recent intensified research efforts in the scope of gathering information about the waterfronts of Polish rivers and reservoirs located within urban tissue. Since January this year, own in-situ investigations have been conducted. They include several voivodeship capital cities which are connected with waterfront areas to the greatest extent. The investigations included studies of the subject literature, iconographic and cartographic materials, review of local plans of spatial development of administrative districts, preparation of own photographic documentation and diagnosis of the current condition. The research owes additional inspiration to an article by Anne Taufen

and Ken Yocom concerning transformations of urban waterfronts (published in January 2021), which constitutes "(...) a call to scientists, planners, academics, and waterfront activists to expand urban waterfront research from an indicator and benefits model to incorporate three conceptual tools for the better understanding of key dimensions of waterfront reclamation within the context of green infrastructure research: urban hybridity, functional performance and hierarchies of access)" [3]. This paper is to some extent a response to such a call and invitation to do research on urban waterfronts with reference to functional performance, which constitutes a part of the notion of *urban hybridity*.

To find the most appropriate methods of preventive actions with reference to the built environment pathologies in downtown areas, the diagnostic technique of *functional performance* was applied. *Functional performance* is understood, among other things, as the ability to satisfy the stakeholders' needs and the influence of their actions on their living environment. The paper does not focus on individual architectural objects but on a wider context of the downtown built environment, understood as a separated area of urban space created as a result of a building process. The quality of the built environment affects its surroundings.

### 2.1. Definition of the research scope

The main scope of the research described in this paper is the *built environment* in downtown waterfront areas, in other words, downtown waterfronts. *The built environment* is understood as a separated area of urban space developed as a result of a building process [3]. This paper discusses the areas of the built environment in the context of both degraded and "repaired" waterfront areas, i.e. the areas located in the closest vicinity of water, over water or floating on its surface.

In the article written by Anne Taufen and Ken Yocom, *functional performance* in the context of *urban hybridity* and the research on waterfronts is elucidated as follows: "we define performance as a set of measures selected and formalized to determine the effectiveness with which actionable solutions to a problem contribute to the effective sustainability of that purpose. It is the operational frame that permits us to characterize the component human and non-human actors, their relations, and predominant patterns of urban waterfront and waterway arrangements)" [4]. To measure *functional performance*, it is necessary to use the

so-called indicators of success. Anne Taufen and Ken Yocom cite the following example of indicators: “In the Puget Sound Region of the USA where Tacoma is located, an example of a common indicator for success in design is in the linear meters of waterfront reconstructed to provide near-shore habitat for fish and other aquatic species” [4]. *Functional performance* may be referred to the above-discussed *imperative of sustainable development*, because it assesses typological configurations of the results in accordance with similar categorization: economic (trade, sea and river navigation, tourism), environmental (biological health, species diversity) and social (docks, routes, open shorelines, parks).

In aid of the cities come ecosystem services of rivers and reservoirs bringing measurable advantages for the society, such as supply, regulating and cultural services [5]. People “borrow” riverside areas from the nature. Later, such waterfronts make up a spatial and functional structure of the city, however, they still depend on both advantages (ecosystem services) and disadvantages (risk of flooding). The awareness of the advantages is growing at an international level. As a result, actions aiming at the removal of weirs and re-introduction of natural processes in rivers are being undertaken world-wide.

### 3. RESULTS

#### 3.1. Polish voivodeship capital cities

The notion of the waterfront built environment is very broad and may encompass areas located on the shores of lakes, rivers, marshes or groups of small water reservoirs. Each of the above-mentioned types of reservoirs differs in terms of architectural objects constructed there. The lake shores mainly feature recreational objects, whereas marshes have flora and fauna observation platforms. The author decided to focus on riverside areas due to the fact that they, out of all other waterfront places, feature the biggest number of public utility buildings built in downtown areas.

The initial phase of the research encompassed the analysis of 14 voivodeship capital cities: Białystok, Bydgoszcz, Gdańsk, Katowice, Kielce, Kraków (Cracow), Lublin, Olsztyn, Opole, Poznań, Rzeszów, Szczecin, Warszawa (Warsaw), Wrocław. Two cities, namely Łódź and Zielona Góra, were not included due to their weak connotations with waterfront areas. The fact of narrowing the analysis down to Polish voivodeship capital cities resulted from the restrictions imposed by the Covid-19 pandemic which banned international travel. In-situ investigations

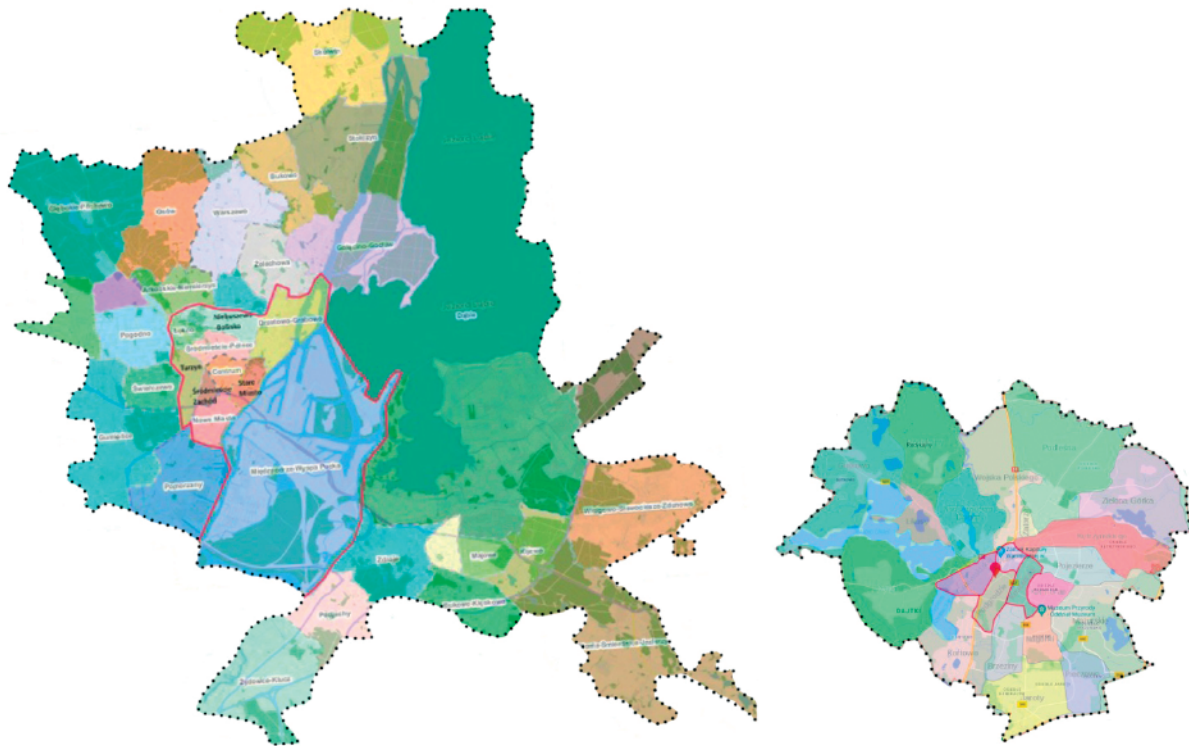
and taking photographs of the current state of architectural objects were possible only in author's home country. A full collection of data, made in the form of a table, encompassed the most interesting architectural implementations and degraded objects located on the riverside. The data were collated with reference to rivers and large reservoirs situated in the areas within urban boundaries. Each object was provided with a short description explaining detailed aspects of the object's connotations with the waterfront area. In view of the fact that the collected data were too extensive (around 250 items).

#### 3.2. Downtown areas

Having reduced the amount of data, the attention was paid to downtown waterfront areas. Having conducted own analysis, the Author ascertained that, in practice, in different voivodeship cities, “downtown” means something different and is interpreted in non-identical ways (Fig. 1). In large capital cities of the voivodeships (provinces), “downtown” means a district which encompasses many housing estates, which have their separate names (e.g. in Bydgoszcz, Gdańsk, Katowice, Szczecin, Warszawa (Warsaw)), whereas in smaller voivodeship cities, “downtown” (in Olsztyn, Rzeszów) or “the centre” (in Białystok, Kielce) means the central areas of these cities. In some cities, two areas have been distinguished, one designated as “old town”, the other as “downtown” (e.g. in Lublin, Opole, Wrocław). In two voivodeship capital cities of strong historic significance, the central municipal area is just called the ‘old town’ (e.g. in Kraków (Cracow), Poznań).

#### 3.3. Connotations with waterfront areas

The next phase of the research included investigations into different degrees of connection that individual cities have with larger reservoirs and main rivers flowing through them. The table below (Table 1) shows cities that were segregated according to a degree of their connection with water in downtown areas, from the most connected cities to the least connected ones. The highest place in the table was taken by Gdańsk and Szczecin due to their extraordinary location, at the seaside and on the deltas of the biggest Polish rivers – the Wisła (Vistula) and Odra (Oder) rivers. Further cities with strong connection with riverside areas include: Warszawa (Warsaw), Kraków (Cracow), Wrocław and Poznań. The foregoing cities are characterized by interesting waterfront development and a multitude of water-



**Figure 1.** Downtown area of the city of Szczecin (surface area of the whole city 300.55 km<sup>2</sup>) in comparison with the downtown area of Olsztyn (surface area of the whole city 88.33 km<sup>2</sup>). Maps in the same scale, elaborated by E. Latusek on the basis of Google Maps

front buildings. The downtown waterfront areas in Lublin, Bydgoszcz, Olsztyn, Rzeszów and Opole have considerably smaller building development; partly due to the fact that they are relatively smaller cities in terms of urban surface. In Białystok, Katowice and Kielce there are rather small lakes or ponds, whereas rivers, which were canalized in the past, are gradually undergoing revitalization.

### 3.4. Pathologies of the built environment and a diagnostic technique

Quoting the definition: “A degraded area is a site where the state of crisis has been identified. In the urbanized areas on a scale of districts and also of the entire cities there is accumulation of negative phenomena of a social, economic, spatial and environmental nature” [8]. It can be assumed that the state of “degradation” is one of the most frequent pathologies of the built environment. Within the scope of research on the pathologies of such environment, the above-mentioned *functional performance* seems to be a proper *diagnostic technique*. The *functional performance*, as defined earlier in the paper, is understood as: ability to satisfy the stakeholders’ needs as well as

the impact of their activities on their place of residence; set of measures defining the effectiveness with which actionable solutions to a problem contribute to the effective sustainability of the purpose; operational framework enabling the definition and characterization of the elements, relations and dominant patterns of the arrangements of urban waterfronts and waterways. Knowing the boundaries of downtown cities areas as well as understanding the significance of the built environment and the diagnostic technique, we can move on to discuss examples of repair actions undertaken in the previously degraded waterfront areas.

#### Gdańsk

The diagnostic technique of *functional performance*, defined as a set of measures determining the effectiveness, efficiency and durability of the proposed goal, has been successfully applied in the city of Gdańsk. The most degraded downtown area in this city was the Granary Island (Wyspa Spichrzów). This is a historic site of a great significance to the city as the first granaries of the Main City were built there around 1330. The heavily-degraded island has been subjected to thorough regeneration in recent years.



**Table 1.**

**Polish voivodeship capital cities in the context of rivers and reservoirs in the downtown areas, elaboration by E. Latusek: downtown areas [6], population density of 31.12.2020 [7]**

location on the sea shore				
strong connection				
weak connection				
canalized				
no connection				
Name of the City	Density (person /km <sup>2</sup> )	Downtown Areas	Areas Neighbouring with Downtown Areas	Rivers and Reservoirs within Downtown Areas
Gdańsk	1787.1	Downtown Areas: Stare Przedmieście (Old Suburb), Główne Miasto (Main City)	Spichrzów Island, Ołowianka Island	River Motława and River Nowa Motława (New Motława), Stępka Canal, Radunia Canal, Motława Channel
Szczecin	1325.1	Downtown Areas: Stare Miasto (Old Town), Nowe Miasto (New Town), Dzetowo-Grabowo District	Zielona Island, Kępa Parnicka Island, a part of the Łaszownia Island, Grodzka Island	River Odra Zachodnia (West Oder), Duńczyca (old mouth of the River Oder), Grodzki Canal, Mieleński Canal (Przekop Mieleński)
Warszawa (Warsaw)	3469.0	Downtown Areas: Nowe Miasto (New Town), Stare Miasto (Old Town), Districts of Powiśle, Solec, Ujazdów	Districts of Nowa Praga (New Praga), Stara Praga (Old Praga), Kamionek, Saska Kępa	River Wisła (Vistula), Stawy Łazienkowskie (Łazienki Ponds), Staw Belwederski (Belvedere Pond), Piaseczyński Canal, Czerniakowski Port, Praski Port
Kraków (Cracow)	2386.3	Old Town: Stare Miasto (Old Town), Districts of Stradom, Kazimierz	Districts of Dębniki, Ludwinów, Stare Podgórze (Old Podgórze), a part of Zabłocie District	River Wisła (Vistula), River Prądnik
Wrocław	2192.2	Śródmieście (Downtown), Stare Miasto (Old Town)	Districts of Krzyki, Psie Pole	Morskie Oko (Eye of the Sea Lake), River Odra (Oder), Navigation Canal, Flood Canal, River Stara Odra (Old Oder), Municipal Canal, Municipal Port in Wrocław
Poznań	2038.2	Stare Miasto (Old Town), Ostrów Tumski Island	Districts of Święty Roch, Piotrowo, Śródka, Zawady, Winogrody	River Warta, River Cybina
Lublin	2302.8	Stare Miasto (Old Town), Śródmieście (Downtown)	Districts of Kalinowszczyzna, Bronowice, Tatary, Dzielnicza za Cukrownią (District behind the Sugar Plant)	River Bystrzyca, River Czechówka
Bydgoszcz	1955.2	Śródmieście (Downtown)	Districts of Babia Wieś, Wilczak, Okole	River Brda, Stary Kanał Bydgoski (Bydgoszcz Old Canal)
Olsztyn	1945.6	Śródmieście (Downtown)	Districts of Grunwaldzkie, Podgrodzie, Kościuszki	River Łyna
Rzeszów	1525.0	Śródmieście (Downtown)	Districts of Mieszka I, Pobitno	River Wisłok
Opole	859.2	Stare Miasto (Old Town), Śródmieście (Downtown)	Districts of Nadodrże, Nowa Wieś Królewska	River Odra, Młynówka Canal, Lake Kamionka Piast
Białystok	2907.6	Centrum (City Centre)	Housing Estates: Sienkiewiczza, Bojary	River Biała, Serce Pond
Katowice	1772.2	Śródmieście (Downtown)	Districts of Koszutka, Bogucice, Housing Estates of Paderewskiego-Muchowiec	River Rawa
Kielce	1763.9	Centrum (City Centre)	Housing estates surrounding the city centre	River Silnica, Podzamecki Pond
Łódź	2292.2	Śródmieście (Downtown)	---	---
Zielona Góra	507.6	No division into districts	---	---



Figure 2.

Pathologies of the built environment and repair measures, Gdańsk: (a) Photo of the ruins of granary of 11 June 2014 [10]; (b) Daleka Droga (Long Way) Granary, photo by E. Latusek of July 2021



Figure 3.

Pathologies of the built environment and repair actions, Szczecin: (a) Photos of the Bridges of the Castle Route (Trasa Zamkowa) over the West Oder River (Odra Zachodnia) of 28 July 2013 [11]; (b) Riverside Embankment of Piastowski Boulevard (Bulwar Piastowski) with the Sailors' Avenue (Aleja Żeglarzy), photo by E. Latusek, dated January 2021

Architectural designs of the new buildings on the island were brought up in broad debate on how such building development should be reconstructed or replicated. At present, the second stage of the regeneration of the Granary Island (Wyspa Spichrzów) is being implemented. The most interesting and the most visible object on the island is a former granary called Daleka Droga (Long Way Granary) (Fig. 2). In 2013, there were only fragments of its outer walls, which had to be secured during the regeneration of the River Motława waterfronts around the island. In 2016, a design of the reconstruction of the granary and the construction of new modern buildings in the closest vicinity was presented. Nowadays, the complex serves the purpose of the hotel [9]. *Functional performance* manifests itself here as the ability to transform the built environment to satisfy the stakeholders' needs. It can be stated that the above-mentioned expectations were met and the regeneration of the previously pathological environment was successful even before it was completed.

Gdańsk is an extraordinary city, also thanks to its strong connection with the cities of Gdynia and Sopot. The above-mentioned cities form the so-called "Tri-city". In the city of Gdynia, which is as big as Gdańsk, there are currently major transformations in downtown waterfront areas. Such changes include the construction of Sea Towers in 2009 and a residen-

tial complex Yacht Park built in 2020. Due to the fact that they are seashore investments, they were not taken into consideration or elaborated on as the paper focuses on the riverside built environment and accompanying objects.

### Szczecin

In the city of Szczecin, the areas located on the riverside embankments of the River Odra, the second longest river in Poland, such as: Chrobry Boulevard (Bulwar Chrobrego), Piastowski Boulevard (Bulwar Piastowski) and the Sailors' Avenue (Aleja Żeglarzy) are worth paying attention. The first of the above-mentioned riverside embankments, namely Chrobry Boulevard, still awaits regeneration. On the other hand, Piastowski Boulevard (Fig. 3) is a new riverside investment of the Szczecin authorities. The whole project has been a success and enjoys great popularity [10]. The enterprise has popularized the waterfront as a nice walking area among Szczecin inhabitants and tourists alike. Adequate lighting makes it possible to walk along the promenade also at dusk. Along the whole length of the riverside boulevards there is a paved walking route equipped with benches. There is also a cycling path. The whole area is accessible to the disabled. Piastowski Boulevard is approximately 900 metres long, with many bistros, restaurants and cafes located along it. In addition, the Sailors'

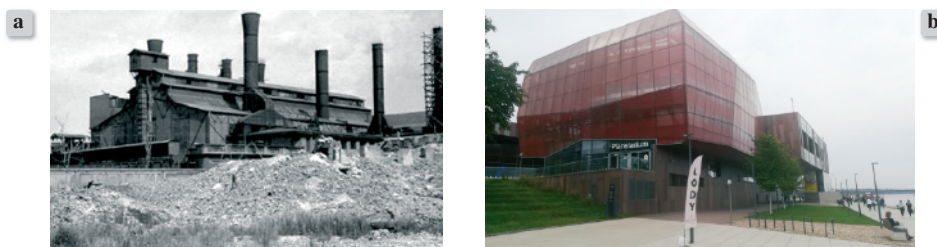


Figure 4.

Pathologies of the built environment and repair actions, Warszawa (Warsaw): (a) Photo of the former Powiśle Power Plant taken most probably from the site of the contemporary Copernicus Science Centre (Centrum Nauki Kopernik) [14]; (b) Copernicus Science Centre (Centrum Nauki Kopernik), photo by E. Latusek, dated August 2021

Avenue (Aleja Żeglarzy) on the riverside embankment (within Piastowski Boulevard) reminds the passers-by of major sea expeditions and voyages. The creation of additional attractions on the empty riverside promenades contributes to the realization of goals connected with *functional performance*. This time, however, it is not a mere satisfaction of the stakeholders' needs, but the anticipation of the local community's needs and the desire to commemorate local history.

#### Warszawa (Warsaw)

The capital of Poland, Warsaw, also has interesting riverside embankments in its downtown area, along the street called Kościuszkowskie Riverside (Wyrzeże Kościuszkowskie). In 2010, the Copernicus Science Centre (Centrum Nauki Kopernik) (Fig. 4) was opened on the site just in front of the former Powiśle Power Plant (towards the River Vistula (Wisła)). The new building broke the alignment of the building development in this fragment of the riverside embankment. The street of Kościuszkowskie Riverside was concealed underneath the new object and under a part of the embankment. That concept made it possible to avoid collisions of pedestrians and cyclists with vehicles travelling on the road of high traffic capacity. In addition, the city was drawn closer to the river, which was cut off from the city by a dual carriageway "Wisłostrada" in the 1970s. The design of the Copernicus Science Centre by Jan Kubec, the founder of the RAr-2 Laboratory of Architecture (RAr-2 Laboratorium Architektury), was based on a landscape approach. The architect spoke of the assumptions of his design studio in the following way: "we make very conscious decisions as regards the choice of designing projects, both at home and abroad; we choose such projects in which we could meet the challenge of the subject of the utmost interest to us, namely the landscape, the waterfront (where land meets water) and the public space" [12].

The design of the Copernicus Science Centre (Centrum Nauki Kopernik) obtained numerous awards. Until July 2017, it was visited by over 7 million visitors [13]. The creation of this type of a building proves how big an impact may be exerted on the built environment by the proper implementation of a well-designed space into urban landscape. As far as *functional performance* is concerned, the alignment of the existing building development was broken by shaping the object in the form of eroded boulders, which seem to blend with the surroundings. In this case, the actionable solution to the problem, namely the building of the Science Centre along with its surroundings, contributes to the effective durability of the purpose, i.e. the reinforcement of the quality of the usable urban space.

#### Kraków (Cracow)

The area worth paying attention to in Cracow is the waterfront located on the opposite riverbank in relation to the Old Town and the Royal Castle, namely the district of Ludwinów – Podwawelskie Housing Estate (Osiedle Podwawelskie). This area features a degraded building of the former 'Forum' Hotel, which in the 1990s was one of the most modern and most computerized, four-star hotels in Europe (Fig. 5). The system of reservation and service was based on American NCR computers. Hotel guests had at their disposal the following facilities: a swimming pool, saunas, SPA, a solarium, a tennis court, two restaurants and several conference rooms. However, the hotel was closed down in 2002 due to the soaking of the foundations and flooding of the basements and garages as a result of a structural failure [15]. Since that time, the building has been deserted and the surroundings have been gradually deteriorating. The building has changed its owners, but the height of its storeys is too low, according to modern building standards, to once again accommodate hotel rooms there. In 2010, architects were look-





Figure 5.

Pathologies of the built environment and repair actions, Kraków (Cracow): (a) Photos of the former Forum Hotel of 22 March 2010 [16]; (b) Riverside Embankment on the Vistula River with a view of the hotel in the background, photo by E. Latusek, dated 2021.



Figure 6.

Pathologies of the built environment and repair actions, Wrocław: (a) Former, 19<sup>th</sup>-century, town house on the Słodowa Island [19]; (b) Concordia Design Wrocław [19]

ing for a solution how to protect the building of the Forum Hotel against demolition. The battle for the preservation of this building has been fought by the aficionados of the contemporary architecture of Kraków (Cracow) for quite a few years now and has produced some interesting solutions recently [16].

The former hotel building is inundated with social initiatives. The building is now covered with the largest billboard in Poland and has become a hipster and fashionable place recently. The building houses the Forum of Spaces (Forum Przestrzenie). Next to the building there is, among other things: a hot-air balloon (providing viewing experience), a whotel (hotel on water) [17], an amusement park, a beach, restaurant barges, a vast green riverside area suitable for walking and a view of the Royal Castle on the Wawel Hill (Zamek Królewski na Wawelu) on the opposite riverbank of the River Vistula (Wisła). There are many events organized in the closest vicinity of the Forum Hotel, such as concerts, exhibitions, food trucks rallies, fairs, markets, festivals and even open-air cinema in the summer [15]. In the city of Szczecin, the waterfront boulevards were filled with pre-designed attractions. On the other hand, in Cracow, the surroundings of the Forum Hotel have

become fashionable. The area is attracting bigger and bigger crowds and the very object, in spite of its ugliness, has become the icon of this place. The Historic Preservation Officer of the Małopolska region has justly remarked that, currently, on the Vistula riverside embankments – chaos prevails in this particular area [17]. However, such a municipal phenomenon should be seriously taken into consideration as it features *hybrid urbanism* due to the fact that more and more users of this space download into the Internet (by means of their smartphones) a multitude of photos with the description: #forum #kraków (cracow) #przestrzenie (spaces), etc.

### Wrocław

Similarly to the city of Gdańsk, in the city of Wrocław the attention was paid to an island; this time the Słodowa Island (Malt Island). After the Second World War, the Słodowa Island was a place of leisure [18], especially liked by the youth. In the 1990s, the area was tidied up and provided with walking paths. At present, the island plays a function of a recreational place, mainly for the youth and students who like having barbecues there. In addition, the city



organizes some open-air events on the island. In 2018, restoration of the only major building on the island began. The object in question was a historic town house located on the Słodowa Island (Fig. 6). Initially, local activists wanted to take it over and create a venue for social and artistic activities. However, the building was sold by the city to Pro Design company from Poznań.

Over a period of one year and a half, the object was expanded, creating thus a new place for local business. The requirements of the tender stated that the building, apart from business activity, should also include cultural, social and gastronomic functions [19]. The new object, called Concordia Design, was designed by architectural studio MVRDV in 2021 and was awarded the title of the “Building of the Year” in a contest organized by the international architectural portal ArchDaily. The investment was deemed the best in the world in the category ‘offices’ [20]. The design studio decided to partially restore and expand the 19<sup>th</sup> century town house as well as adapt the building to contemporary needs, which is the most desirable designing solution in terms of functional performance. What distinguishes this building from other objects is a huge open terrace with a view over Wrocław. Moreover, the present-day built environment on the Słodowa Island, along with its flagship object of Concordia Design, is simply besieged with young people.

### Poznań

Following the period of two World Wars, Polish cities witnessed the implementation of many extraordinary investments. The cities destroyed in the war became places where ambitious engineers and architects could spread their wings. The city of Poznań had been regularly flooded for centuries, that is why in the 1960s the municipal authorities decided to implement controversial plans of filling in the existing channel of the River Warta. Such plans had existed since the beginning of the 20th century, when Poznań was under Prussian partition. However, it was not until 1964 that the filling-in works began on the Chwaliszewskie river bend and the dredging of the “relief” channel between the area of Chwaliszewo and the Ostrów Tumski Island was carried out [21].

In 2012, an idea came up that the old channel of the River Warta should be excavated. This is how the whole process was imagined: “Dumper trucks taking away thousands tonnes of soil, ubiquitous diggers and dozens of people committed to the formation and

reinforcement of the riverbanks. (...) First, a channel of a depth of 8 metres should be dug on the site of the river bend. Why so deep? Because that is the exact difference between the river bed and the crown of the floodbanks” [22]. A year later, however, a different concept saw light. The design studio “1050 Pracownia Architektury” designed a park called the River Warta Old Channel Park (Park Stare Koryto Warty) (Fig. 7). Since 1908, this area has bordered on the former, no-longer-used Old Gasworks (Stara Gazownia – located on the former Grobla Island on the River Warta). The architects working for the design studio 1050 Pracownia Architektury designed the building of New Gasworks, called currently the Pavilion [23]. This object gave the park a cultural character, whereas the square, being an entrance zone to the park, provided space for holding exhibitions, happenings and artistic events. The former floodbank was adapted and became an amphitheatre with the panorama of Poznań old town in the background. A bicycle route running over the former filled-in river channel was connected with the bicycle route running along the River Warta, called the River Warta “Highway” (“Wartostrada”). The architects designed also some roofing from the side of “Wartostrada”, which provides protection in case of bad weather. The park features many groves, a meadow with flowers, a fountain, a children’s playground and gym equipment. All of this, in accordance with the idea of functional performance, has a positive influence on the living environment. In addition, a radical decision of filling in the old river channel protected local residents from regular flooding.

To conclude, repair actions in the selected voivodeship capital cities contribute to the appearance of some indicators of success, which are directly linked to the imperative of sustainable development:

- Economic indicator: Gdańsk – regeneration of Granary Island (Wyspa Spichrzów) caused the influx of stakeholders with their own capital, increased the number of tourists and visitors using new hotels and gastronomic establishments as well as stimulated local yacht navigation; Wrocław – the building of Concordia Design, which was awarded the title of the Building of the Year 2021 in the “office” category, has attracted new users to the meeting and conference zone, causing thus a bigger interest in the island in students and other young people;
- Environmental (ecological) indicator: Warszawa (Warsaw) – Copernicus Science Centre (Centrum Nauki Kopernik) created additional usable spaces



Figure 7.

Pathologies of the built environment and repair actions, Poznań: (a) The area of the old channel of the River Warta prior to the implementation of the park [22]; (b) River Warta Old Channel Park (Park Stare Koryto Warty) with the Alley of the Order of the Smile and the Pavilion in the background, photo by E. Latusek, dated July 2021

(planes) on the riverside embankment, causing no degradation of the existing area; the busy road of high traffic capacity was concealed under the object and the space was claimed back by inhabitants and nature; Poznań – filling-in of the old river channel protected the neighbouring area against regular flooding; a large downtown area was not built in, as a result, a green park area was created;

- Social indicator: Szczecin – the city created additional attractions and sightseeing routes on the waterfront promenades, deepening thus the relations between the community and waterfront areas; Kraków (Cracow) – the area of the former Hotel Forum has become a fashionable venue which is attracting more and more people; the place has great potential to gradually become an area of hybrid urbanism.

### 3.5. Success indicators

In accordance with the above-cited article by Anne Taufen and Ken Yocom, the fundamental assumption should be the application of a critical idea of *urban hybridity* as a conceptual tool in the deliberations on the complexity of urban waterfronts. To investigate this subject more thoroughly, the diagnostic technique of *functional performance* with its *success indicators* should be used. They can be applied to variable conditions and unpredictable research results. Therefore, *functional performance* evaluating typological configurations of economic, environmental and social results translates directly into basic aspects of sustainable development: economic, ecological and social.

After years of neglect of the waterfront areas and buildings, ecosystem services of rivers and reservoirs

are coming to the cities' aid. The above-mentioned ecosystem services bring measurable advantages for the society by providing: supply, regulating and cultural solutions (Table 2). There is a growing awareness of such benefits at an international level. The communities worldwide undertake actions to remove weirs and reintroduce natural processes into rivers. "The European Union and its member states should also introduce proper legislation and increase the scale of activities aiming at the improvement of the condition of rivers in Europe" [5].

Table 2.







Concurrence of notions: indicators of success within the scope of functional performance, imperative of sustainable development and ecosystem services of rivers and reservoirs, elaborated by E. Latusek

Sustainable Development:	Functional Performance:	Ecosystem Services:
Economic aspects	Economic results	Supply services
Ecological aspects	Environmental results	Regulating services
Social aspects	Social results	Cultural services

#### 3.5.1. Economic indicator (supply services)

One of the measurable advantages of the *ecosystem services* of rivers is supply services. As it is in the case of sustainable development aspects, they directly refer to economic benefits, for instance: creation of new business capabilities, an increase in the real estates value, provision of renewable energy as well as water transport and supply of water. As far as economic and tourism factors are concerned, municipal authorities are trying, in various ways, to attract, visitors, workers and investors. For instance, the city of Las Vegas is known as the entertainment city, Paris enjoys a repu-

**Table 3.****Economic indicator and related supply services of rivers in downtown areas, elaboration and photos by E. Latusek.**

Economic Indicator	
Photo	Description
	<p><b>Gdańsk, Water Tram</b></p> <p>Water trams providing transport services on the rivers Martwa Wisła (Dead Vistula) and Motława are a well known tourist attraction [24]. Thanks to them, it is possible to reach your destination more quickly by water, avoiding congestion caused by holiday traffic in tourist resorts. Additionally, more and more often, in the river canals, one can see means of water transport powered by solar panels mounted on top of the boats.</p>
	<p><b>Szczecin, Port Szczecin</b></p> <p>This trading sea and river port handles bulk and general cargo transport. Polish legislation deems the sea ports in the cities of Szczecin and Świnoujście to have a fundamental role in the Polish national economy; the trans-shipment and handling of goods exceed 20 million tons per year [25].</p>
	<p><b>Warszawa (Warsaw), Restaurants</b></p> <p>In the years 2015-2019, the project of the left riverside embankment of the Vistula (Wisła) was implemented, in the section starting from the district of Powiśle to Podzamcze [26]. Since the completion of the project, the riverside promenade has been called a new 'salon' of the city. The waterfront located within the downtown area used to be the spot with many rafters' inns (river sailors' inns), and in the 19<sup>th</sup> and 20<sup>th</sup> centuries with many different bars and bistros. This tradition has been preserved and the contemporary riverside embankment features a lot of gastronomic establishments, which are a fashionable and profitable meeting place</p>
	<p><b>Kraków (Cracow), Residential Buildings</b></p> <p>The whole new housing estates are built in the degraded post-industrial areas located on the waterfront. This concept is more and more often used and implemented by developers (this tendency can be clearly noticed not only in Cracow). For instance, in the district of Zabłocie, there is Atal Residence, Garden Residence Apartment and 'Lofts in the Mill' (Lofty w Młynie) - a residential object in a converted old mill [27].</p>
	<p><b>Wrocław, Exclusive Aparthotel Marina</b></p> <p>The object of Exclusive Aparthotel Marina is the first apartment building constructed literally on and over the river. It has an underwater garage and terraces suspended over the water. The building constitutes a part of the prestigious Marina complex, which includes a downtown marina located in the vicinity of the University Bridge (Most Uniwersytecki) and popular restaurants [28]. A unique location and the vicinity of a prestigious marina are a magnet attracting tourists.</p>
	<p><b>Poznań, Old Port</b></p> <p>In Poznań, the infrastructure of the Old Port (Stary Port) is being built. This investment will enable a better use of the river and economic revival of the local working environment. So far, a pavilion has been built. It is a part of a greater investment. A yacht marina on the River Warta will eventually become the central port (marina) for ships in Poznań.</p>



**Table 4.**  
**Environmental indicator (ecological) and related regulating services of rivers in downtown areas, elaboration and photos by E. Latusek.**

Environmental Indicator	
Photo	Description
	<p><b>Gdańsk,</b>  <b>Stepka Canal</b></p> <p>The Stepka Canal (Ciesielski Canal) was dug in 1576. For many years, boatyards were situated along the canal [29]. Nowadays, the canal is an enclave of greenery, however, some ideas of re-canalization have been put forward. A complex of residential and services buildings “Riverview” was built in this area. It was the first housing design in the Tri-city (the metropolitan area of three cities: Gdańsk, Sopot and Gdynia) to obtain the LEED and meet the requirements of sustainable building engineering.</p>
	<p><b>Szczecin,</b>  <b>Grodzka Island [30]</b></p> <p>In 2008, the city of Szczecin presented a long-term strategy of implementing “Floating Garden 2050”, which would play the role of the city’s “brand”. In accordance with this policy, the objective to build “a floating garden” was chosen [30]. The plans concern, among other places, the Grodzka Island, whose land is mainly occupied by allotments. A marina and urban summer zone have already been implemented there. Further development of the island is still under discussion and its fate is being decided.</p>
	<p><b>Warszawa (Warsaw),</b>  <b>Nature 2000</b></p> <p>In Warsaw, one riverbank, belonging to the downtown area, is urbanized. However, the other riverbank was left in its natural state, as it was included in the European Union environment protection programme Nature 2000 “Valley of the Vistula Middle Course” (Dolina Środkowej Wisły). The riverside green areas can be admired thanks to a viewing platform located on the downtown Vistula River embankments, in the section stretching from the district of Powiśle to Podzamcze.</p>
	<p><b>Kraków (Cracow),</b>  <b>Development Directions for 2030</b></p> <p>Document entitled “Directions of Development and Management of Green Areas in Cracow for the years 2017-2030” (Kierunki rozwoju i zarządzania terenami zieleni w Krakowie na lata 2017-2030) formulates a coherent, deliberate and long-term policy on the development of green areas in the cities. The document was prepared in the participatory and expert form by the Cracow Municipal Office, experts from Cracow universities and inhabitants within the framework of two-phase consultations [31]. The prepared document may constitute a model for the development of riverside embankments (boulevards) and urban waterfronts.</p>
	<p><b>Wrocław,</b>  <b>Opatowicka Island</b></p> <p>Around 1917, in the city of Wrocław, a new navigation canal was constructed in order to provide a straight-line shortcut by water to the city centre. In this way, an island was created. Before WW1 the place served as a leisure spot. In addition, an amphitheatre was built there. At present, the island is protected as a nature and landscape park, within the framework of the Szczytnicki Nature and Landscape Park (Szczytnicki Zespół Przyrodniczo-Krajobrazowy). For instance, there is a complex of a protected plant called <i>Galanthus Nivalis</i> – the Snowdrop in the park.</p>
	<p><b>Poznań,</b>  <b>“Wartostrada” – The River Warta “Highway”</b></p> <p>“Wartostrada” (the River Warta ‘Highway’), in the city of Poznań, is a project aiming to improve the accessibility of riverside areas. For years, this walking and cycling route has been extended. Thanks to this route, the inhabitants of Poznań may access green areas from the crowded downtown area within a couple of minutes. “Wartostrada” has been provided with recreational places, well hidden in the greenery, such as: climbing walls, riverside beaches or municipal exhibitions, e.g. “Land Art Exhibition”.</p>



**Table 5.****Social indicator and related cultural services provided by rivers in downtown areas, elaboration and photos by E. Latusek**

Photo	Social Indicator
	<p align="center"><b>Gdańsk, Ołowianka Island</b></p> <p>Successful regeneration of the previously ruined, post-industrial building development on the Ołowianka Island constitutes a part of the project “front towards the river” (frontem do rzeki) [29]. The island has become an elegant cultural place. The facilities of the former Heat and Power Station “Ołowianka” was adapted to become the Polish Baltic F. Chopin Philharmonic (Polska Filharmonia Bałtycka im. Fryderyka Chopina). The island also houses the Central Marine Museum (Centralne Muzeum Morskie) and the 17th-century Royal Granary (Spichrz Królewski) turned into the Hotel Gdańsk - Boutique.</p>
	<p align="center"><b>Szczecin, “Cranosaurs” (Dźwigozaury) on Łasztownia Island</b></p> <p>Local foundation “My Łasztownia” (Moja Łasztownia) organizes events which attract city dwellers to the Łasztownia Island [33]. For instance, during the event “Days of Zbożowa street” (Dni ulicy Zbożowej) the festival of colours was held. The festival included music and light shows with the participation of historic harbour cranes, which acquired their own name of Cranosaurs (Dźwigozaury) – as they clearly resemble and are associated with dinosaurs. Such actions organized by citizens reinforce community bonds within waterfront areas.</p>
	<p align="center"><b>Warszawa (Warsaw), Multimedia Park of Fountains</b></p> <p>At the foot of the Royal Castle in Warsaw (Zamek Królewski w Warszawie), at the square where a water reservoir was located in the past, a complex of four fountains was built. In the evenings, from May to September, there are 30-minute multimedia shows using lasers and LED floodlights. The fountains are the source of cooling, whereas dispersed mist suspended over the water creates a water screen. Animated stories about the history of Warsaw and local legends are displayed on the above-mentioned water screen.</p>
	<p align="center"><b>Kraków (Cracow), Cricoteka</b></p> <p>In 2017, portal Architizer published a list of ten buildings in Poland which change cultural identity of the place where they are located [34]. This list included the Centre for the Documentation of the Art of Tadeusz Kantor (Ośrodek Dokumentacji Sztuki Tadeusza Kantora) “Cricoteka”, which was opened in 2014. The new object designed by Wizja and nsMoonStudio [35] twines its arms around two buildings of the former power plant, which was built in the district of Podgórze in 1900. The River Vistula (Wisła) and its banks were treated by the architects as ‘props and the setting’ which may take part in the social urban play.</p>
	<p align="center"><b>Wrocław, Xawery Dunikowski Boulevard [36]</b></p> <p>Riverside embankment called Xawery Dunikowski Boulevard (Bulwar Xawerego Dunikowskiego) underwent repair in 2016 [36]. Open-air events, picnics and community events uniting all generations are organized there. There is also a mooring point enabling access to the waterfront amphitheatre (Przystań Amfiteatralna) and mooring sites for ships Rusalka (Water Nymph) and Viking. Amphitheatrical steps offer a panorama of the Ostrów Tumski Island and attract numerous visitors. It is a bustling place with continuous river traffic during summer months.</p>
	<p align="center"><b>Poznań, ICHOT – The Gate of Poznań – Brama Poznania</b></p> <p>Interactive Centre of the History of the Ostrów Tumski Island (ICHOT) is a state-of-the-art museum built on the ruins of the former Polygonal Fort [37]. The whole complex consists of a museum suspended over a floodbank and a restored stronghold of the former Cathedral Lock (Śluza Katedralna). Both elements are connected by means of a glazed flyover (footpath) suspended over the River Cybina. The connection of the new with the old is to remind how important the Ostrów Tumski Island is for the history of Poznań.</p>

tation of a refined and sophisticated place, whereas Berlin an artistic one. A very good example of creating an 'urban brand' is the city of Bilbao in northern Spain. By building completely new, iconic, architectural objects, the city has attracted crowds of tourists and, what is more, new residents. One of the first objects constructed there was the Guggenheim Museum, situated on the River Bilbao's estuary. The building has attracted a massive number of people to this urban waterfront. In Poland, new buildings of large cubature are rarely and cautiously built in the waterfront areas. However, there are some examples in the above-mentioned voivodeship capital cities, where some activities in the scope of the built environment may be considered to be economic indicators concurring with the supply services of rivers in downtown areas (Table 3).

### 3.5.2. Environmental indicator (regulating services)

Rivers flowing through cities are something more than just enclaves of greenery located in unregulated river sections (Table 4). *Ecosystem services* provided by rivers include also regulating services: flood buffering, regulation of air and soil quality by ecosystems, protection against diseases, sewage treatment, retention, a decrease in pollution and disposal of the excess of nutrients from the waters. Similar issues are mentioned in the ecological aspect of the sustainable development: protection of natural resources, a decrease in CO<sub>2</sub> emissions, a small environmental footprint, application of local materials including recycled materials. For instance, grouped areas of urban greenery contribute to a decrease in temperature and thus reduce heat islands. Revitalized and renaturalized rivers and reservoirs improve the protection against the erosion of soil and flooding.

### 3.5.3. Social indicator (cultural services)

*Ecosystem services* of water flows also encompass cultural services of rivers, which bring immaterial benefits, through the human contact with nature: spiritual and cognitive development, reflection, recreation, aesthetic experiences, immaterial benefits, non-consumption use. For instance, the reinforcement of community cohesiveness is a cultural service obtained as a result of an increase in visual qualities and attractiveness of the living environment, provision of open spaces serving different purposes, greater accessibility of the river, protection of the cultural heritage of canals, locks and adjacent buildings, recreation on land and water along with an increased public security.

The above-listed issues are in concurrence with the social aspect of the *imperative of sustainable development*, which emphasizes the importance of health and user-friendly surroundings. A question concerning the formation of community bonds was posed earlier in this article. How to establish social bonds within waterfront building development if, usually, such places serve the purpose of only walking, circulation and traffic services? It was illustrated earlier in the article by the examples of Polish cities where some spaces can be deemed local centres. In accordance with the conclusions drawn on the basis of spatial analyses and activists' opinions contained in the "Conceptual Study of the Local Centres in Warsaw" (Studium koncepcyjnym dotyczącym centrów lokalnych w Warszawie) [32], it can be stated that urban local centres: include an element of commonly accessible public space; are multi-functional (with the exchangeability of functions depending on the season of the year or the time of the day); are located in the vicinity of the place of residence (a walking distance of 10-15 minutes); serve the purpose of commercial, intellectual and social exchange; offer programme for various age and community groups; connect and unite people, establish bonds and build local community; have a pleasant and beautiful urbanistic form, unique character, which form local identity. The above-mentioned features are worth reinforcing not only within urban local centres, but also in the waterfront areas (Table 5).

## 4. DISCUSSION

### 4.1. Significance of results and contribution to the field development

Application of the diagnostic technique of *functional performance* as a conceptual tool to ponder on the complexity of downtown waterfronts leads to some conclusions connected with the term of well-being. In the text written by E. Leporelli and G. Santi, we can read that one of the major goals of the contemporary society and international research is the improvement of physical and mental health as well as well-being of people, especially those living in urban space [38]. The word 'well-being' is more and more often quoted in scientific studies and elaborations. This word is connected not only with economic or environmental aspects, but also it is more and more frequently used in relation to activities in the scope of architecture and urban planning.

There are Polish and international studies related to well-being in connection with waterfronts. These are

investigations conducted on different scales with various types of methodology, for instance “The Restorative Health Benefits of a Tactical Urban Intervention: An Urban Waterfront Study” [39]. The described research is based on a small but ever growing number of analyses (conducted mainly in Europe), which show health benefits arising from the contact with waterfronts, rivers and canals – described in the subject literature as “blue health”. The above-discussed indicators of success, developed on the basis of Polish voivodeship capital cities, may be used in the well-being analyses in the context of using urban waterfronts. They may also serve the purpose of creating a certain model for the designing of downtown waterfront spaces.

Applying a more global approach, one can give an example of the study entitled: “The Fit of Urban Waterfront Interventions: Matters of Size, Money and Function”, where a systematic review of unsuccessful interventions on the waterfronts was included [40]. The article entitled “Regeneration Criteria for Adaptive Reuse of the Waterfront Ecosystem: Learning from the US Case Study to Improve European Approach” resorts to similar rhetoric in a contemporary debate on the revitalisation of cities and environment. The researchers took a closer look at weak points of waterfronts, for instance susceptibility to flooding, which provides an opportunity of regeneration of waterfront ecosystems [41]. Application of the diagnostic technique of *functional performance* and the search for *success indicators*, illustrated by examples of good practice, can be treated as “opposite” or “reverse” research, which is

equally promising and contributes to the development of the field of architecture and urban planning.

## 5. CONCLUSIONS

This paper is to some extent a response to such a call and invitation to do research on urban waterfronts with reference to functional performance, which constitutes a part of the notion of urban hybridity. *Functional performance* evaluating typological configurations of economic, environmental and social results translates directly into basic aspects of sustainable development: economic, ecological and social. After years of neglect of the waterfront areas and buildings, ecosystem services of rivers and reservoirs are coming to the cities’ aid. The above-mentioned ecosystem services bring measurable advantages for the society by providing: supply, regulating and cultural solutions. The investigations resulted in the creation of success indicators illustrated by examples of six voivodeship capital cities in Poland which have the strongest connection with the downtown built environment in waterfront areas, namely: Gdańsk, Szczecin, Warszawa (Warsaw), Kraków (Cracow), Wrocław and Poznań. The paper includes determination of the boundaries of the discussed downtown areas, significance of the built environment and the diagnostic technique. While summing up the repair actions in selected voivodeship capital cities, the author found the indicators of success connected directly with the imperative of sustainable development and ecosystem services.

Elimination of undeveloped spaces, may lead to the

**Table 6.**

**The most significant success indicators of functional performance on the basis of the conducted investigations, own elaboration by E. Latusek**

Functional Performance Success Indicators		
Economic results	Supply ecosystem services	<ul style="list-style-type: none"> <li>the provision of municipal transport by water trams,</li> <li>maintenance of harbour activities (e.g. Port Szczecin),</li> <li>designing gastronomic, residential and hotel zones as well as water transport (e.g. marines) in downtown waterfront areas</li> </ul>
Environmental results	Regulating ecosystem services	<ul style="list-style-type: none"> <li>the creation of long-term management strategies (e.g. ‘Floating Garden 2050’, ‘Directions of Development and Management of Green Areas in Cracow for the years 2017-2030’),</li> <li>preservation of renaturalised character of river canals and artificial islands (e.g. Stęпка Canal, Opatowicka Island),</li> <li>improvement of the accessibility of riverside areas for pedestrians and cyclists (e.g. Wartostrada – the River Warta ‘Highway’)</li> </ul>
Social results	Cultural ecosystem services	<ul style="list-style-type: none"> <li>regeneration of the post-industrial building development on downtown islands (e.g. Ołowianka Island),</li> <li>organization of events attracting inhabitants to the waterfronts (e.g. Dźwigozaury – ‘Cranosaurs’ on the Łasztownia Island, Multimedial Park of Fountains, the Xawery Dunikowski Boulevard),</li> <li>reinforcement of cultural identity by erecting iconic buildings (e.g. Cricoteka, The Gate of Poznań – Brama Poznań)</li> </ul>

improvement of safety of downtown waterfronts. Application of the diagnostic technique of functional performance and the search for the indicators of success using the examples of good practice may be treated as opposite research (opposite to the reviews of unsuccessful interventions and weak points of downtown waterfronts) and contribute to the development of the field of architecture and urban planning. The above-discussed indicators of success may be used in the analyses of well-being in the context of using urban waterfronts. They may also serve the purpose of creating a certain model for the designing of downtown waterfront spaces.

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