Architectural classification of downtown riverfront buildings in Poland

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Abstract. Scientists from all over the world have been warning about global warming, thawing of glaciers and rising levels of ocean waters. In recent years, there have also been many floods on a large scale in Europe. Meanwhile, more and more buildings are being built on the waterfront areas. Urban development is coming closer and closer to the water, whereas the water 'is getting closer' to us. Many architects believe that we must prepare ourselves for the new reality, that is why the downtown riverfront architecture is gaining more and more importance. Around the world, there are a lot of plans of transforming the waterfront land development. Many architectural bureaus, such as Bjarke Ingels Group or Snohetta, create so many designs related to vast urban waterfront areas that they are beginning to specialize in this subject. Many factors contribute to the quality of good riverfront architecture. In order to notice its qualities, one should pay closer attention to the morphology of space, involving a broad analysis and classification of basic spatial forms. In the preparatory phase of the paper, the researchers came across graphic schemes, appearing in many books and publications, presenting the silhouette of the riverfront building development in cities, but only in terms of urban planning. Contemporary subject literature does not provide enough information on the classification of downtown riverfront buildings seen from an architectural angle. That is why the research problem discussed in this article is concerned with the classification and evaluation of downtown riverfront buildings. This study encompasses the classification of downtown riverfront buildings on an architectural scale – falling between urban planning and single examples of buildings usually described by means of a case-study method. The research was divided into worldwide classification and the national classification encompassing Poland. The analyses on a global scale concentrated on characteristic repeatable building bodies designed by architects all over the world. The classification of architectural objects built in Poland focused on the following aspects: location of the buildings in relation to the river, their characteristic functions or the axiom of the building solids. During the analysis of Polish riverfront buildings, the researchers noticed that many remarkable concepts are continually created, such as 'periscopes'. These are ideas worth subjecting to further analysis in order to promote the designing of interesting buildings in the downtown riverfront areas.

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1 Introduction

Scientists from all over the world have been warning about global warming, thawing of glaciers and rising levels of ocean waters. In recent years, there have also been many floods on a large scale in Europe. Meanwhile, more and more buildings are being built on the waterfront areas. Urban development is coming closer and closer to the water, whereas the water 'is getting closer' to us. Around the world, there are a lot of plans of waterfront land development [1,2]. Many architectural bureaus, such as Bjarke Ingels Group or Snohetta, create so many designs related to vast urban waterfront areas that they are beginning to specialize in this subject. Many architects believe that it is necessary to prepare for the new reality. That is why the architecture of downtown riverfront building development is growing in importance.

Many factors contribute to the quality of good riverfront architecture [3]. In order to notice such qualities, one should pay closer attention to the morphology of space, involving a broad analysis and classification of the applied basic spatial forms [4]. This article undertakes the task of classification of downtown riverfront buildings – working from whole to part. On a global scale, one may recognize, with greater or smaller awareness, axioms of geometric solids of buildings, repeated by architects all over the world. Also in Poland there have been numerous outstanding and unconventional ideas as well as implementations of architectural objects correlated with watercourses, such as 'w-hotels' (water hotels) or 'periscopes'. These are concepts worth subjecting to a thorough analysis in order to promote designing thought connected with characteristic urban waterfront areas. To this end, the authors of this article searched for factors influencing the atypical shaping of the buildings' bodies or the formation of the building's functions. A comparison was conducted both on a global and national scale (i.e. in Poland). In the preparatory phase of the paper, the researchers came across graphic schemes, appearing in many books and publications, presenting the silhouette of the riverfront building development in cities miastach [5-7]. They show the skyline of the riverside municipal building development, but only from a perspective of urban planning. Contemporary subject literature does not provide enough information on the classification of downtown riverfront buildings seen from an architectural angle.

In few publications related to the above-mentioned classification, their authors discuss this subject matter on an urban-planning scale and then go on to an architectural scale [8]. For instance, the book „River in the Cityscape' ('Rzeka w krajobrazie miasta') by Alina Pancewicz provides '*a specification of types of views over floodbanks and floodwalls in Cracow*', however, it still refers to urban landscape rather than to the analysis of bodies of architectural objects. On the other hand, the article '*River-City Recreational Interaction: A Classification of Urban Riverfront Parks and Walks*' includes the transition from an urban-planning scale to an architectural scale, but the majority of the text refers to the issues of urban development and landscape [9]. Many studies focus solely on an architectural point of view and present numerous investigations based on the *case study* method. In general, there is a lack of a holistic approach involving and linking the urban-development issues to the analysis of individual buildings.

2 Methodology

The research problem discussed in this article is concerned with the classification and evaluation of downtown riverfront buildings. Apart from that, it also has a diagnostic character. It classifies buildings on an architectural scale adopting a new approach which marries urban planning with examples of individual buildings (usually described by means of the *case study* method). Systematics – a division into groups in accordance with an adopted system [9] – is present here both as a research tool and the aim of scientific cognition; it has a qualitative character and mostly makes use of a descriptive narrative supplemented with

tables and diagrams. The elaboration combines theoretical and methodological issues with the analysis of specific examples of architectural objects. A single building or a complex of buildings were adopted as a classification unit. The research was divided into worldwide classification and national classification encompassing Poland. The analyses on a global scale concentrated on characteristic repeatable building bodies. The classification of architectural objects built in Poland focused on the following aspects: axiom of the building solids, location of the buildings in relation to the river and their characteristic functions (Table 1).

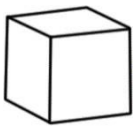
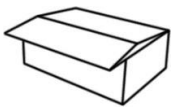
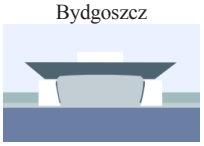
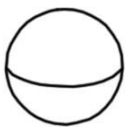
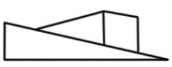
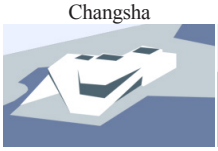
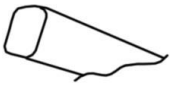
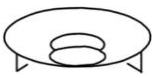
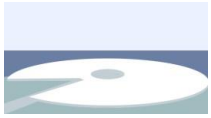
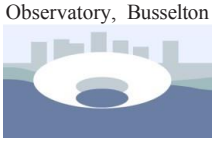
Table 1. Architectural classification of urban riverfront buildings. A classification unit is a building or a building complex (acc. to the main utility function), own elaboration by E. Latusek.

Aspects	Division
Building location in relation to the river	- riverfront marinas - former river ports - large compact bodies located in the immediate vicinity of the river - mixed-use buildings located in the immediate vicinity of the river - buildings located on the riverside embankments - buildings permanently fixed on the river - buildings with an over-river-bridge element - buildings with a periscope overlooking the river - buildings floating on the river
Axiom of the building body	- global: geometric solids - local: shapes related to the location on the riverfront
Building purpose [10]	- residential - commercial - gastronomic - private - work-related - other

3 Global trends

There is no such thing in architecture as casus of one proper solution. Designing is always a process, whose effects may amaze us in different ways and on different levels. Both worldwide and in Poland there is a growing tendency to construct multifunctional architectural objects which have extraordinary character and interesting architectural forms [11]. A special case, classified in the table below, is large-scale mixed-use waterfront buildings (Table 2). They usually include mixed functions, such as a congress centre, museum, or office rooms. The tendency to build such objects in the waterfront areas can be observed all over the world (Vltava Philharmonic Hall in the Czech Republic, Culture and Congress Centre in Lucerne in Switzerland, The Royal Library in Denmark, James Simon Galerie in Germany, V&A Dundee in the UK, Kaohsiung Pop Music Center in Taiwan).

Table 2. Graphic comparison of waterfront multiscale and mixed-use objects on a global scale.

Axiom of the solid	Characteristic body of the building	Riverfront	Lakefront	Seafront
				
		Asian CrossRoad Over the Sea, Fukuoka	Nordic Haven, Bydgoszcz	Lankuaikei Agriculture Development, Shanghai
				
		Culture and Congress Centre in Lucerne, Lucerne	Royal Danish Opera, Copenhagen	Bahrain National Theatre, Manama
				
		Palau de les Arts Reina Sophia, Valencia	Meixihu International Culture and Arts Centre, Changsha	Qintai Art Museum, Wuhan
				
		Vancouver Convention Centre West, Vancouver	Oslo Opera House, Oslo	Vltava Philharmonic Hall, Prague
				
		Restaurant Under, Lindesnes	Salt Formation Center, Alexandria	Underwater Observatory, Busselton
				
		Pujiang International Convention Centre, Pujiang	World Memorial to the Pandemic, Uruguay	Lunar, Shenzhen

[a] Own elaboration by E. Latusek, based on photos from: B. Majerska-Pałubicka, E. Latusek, Archdaily, Wikipedia, Amazing Architecture, Arch2O.

Looking at the selected designs, one may notice that the building bodies refer to the axioms of basic geometrical solids in architecture. All the below-mentioned buildings or building complexes are located in downtown waterfront areas and have their main external squares integrated with the city space. All of them are also multifunctional (mixed-use)

because they combine and integrate different uses (residential, commercial, cultural, institutional and entertainment-related) creating thus local city centres encased in one vast body. The observation of such characteristics of waterfront buildings on a global scale resulted in the authors' research on a local scale within the scope of downtown riverfront buildings.

4 Aspects of classification

4.1 Location of the building in relation to the river

The notion of the waterfront built environment is extensive and may refer to lakefront or riverfront areas as well as areas located in the vicinity of marshes or groups of water reservoirs. Each of the above-mentioned types of water reservoirs is different in terms of architectural objects constructed there. Lakefront areas usually feature recreational objects, whereas marshes viewpoints for the observation of flora and fauna. Rivers themselves have numerous functions, which can be classified for instance on the basis of ecosystem services: supply-related, cultural, regulatory [12]; or on the spatial-functional basis: transport, traffic, power engineering [8,13].

The authors decided to choose riverfront areas due to the prevalence of downtown public buildings often constructed on the riverfront. The architecture of the above-mentioned riverfront buildings constitutes the leading theme of the doctoral dissertation and related investigations undertaken by co-author E. Latusek under the supervision of co-author prof. dr hab. B. Majerska-Pałubicka. The location of a building means its place in relation to the surroundings [14]. The differentiation of buildings on the grounds of their location in relation to the river was classified as follows: riverfront marinas, former river ports, large compact bodies located in the immediate vicinity of the river, mixed-use buildings located in the immediate vicinity of the river, buildings located on the riverside embankments, buildings permanently fixed on the river, buildings with an over-river-bridge element, buildings with a periscope overlooking the river, buildings floating on the river (Fig. 1).

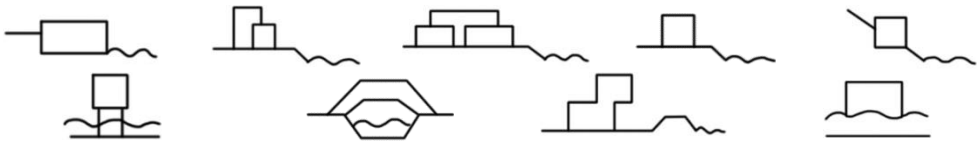


Fig. 1. Building location in relation to the river, own elaboration by E. Latusek.

4.2 Purpose of the building

Polish legislation differentiates three groups of buildings with regard to their purpose: ZL – residential, collective housing and public utility buildings; PM – manufacturing and warehouse buildings as well as IN – livestock housing [15]. Architects often adopt a division based on the leading function of the building, such as: gastronomic, hotel, etc. In the case of public utility buildings or mixed-use buildings (e.g. a residential building being at the same time an office and a hotel) the classification is made according to the main form of use [16].

There are also building law regulations in Poland and detailed 'Classification and Construction Regulations of Stationary Floating Objects' ('Przepisy klasyfikacji i budowy stacjonarnych obiektów'), which take into account, among other things, the purpose of the building and therefore distinguish: residential, gastronomic, commercial, work- related, private and other buildings. This elaboration makes use of this division [10], however, in the

above-mentioned documents and regulations there is no clear classification of types of downtown riverfront buildings.

4.3 Axiom of the building's body

Architectural designing is a process of building a new reality. A portfolio including examples of design concepts and implementations by a given architect is considered to be an important element of his/her career. A draft design is often ambiguous and relatively general, but its objective is to precisely convey the designing thought and concept. This article discusses axioms of building bodies in the form of a graphic comparative analysis of the studied architectural objects, in which the designs are presented as the process of a creative thought. Investigations based on visual aspects enable better understanding of ideas created by the authors of the buildings. Looking at the selected mixed-use objects coming from all over the world, it is possible to notice, in their bodies, the references to axioms constituting the basic geometric shapes in architecture.

In the case of the Asian CrossRoad Over the Sea from Fukuoka, the pyramid constituting its base was cut from the top and its designer Emilio Ambasz added two significant elements to it, which gave an extraordinary character to the building body. Jean Nouvel, the author of the concept of the Culture and Congress Centre in Lucerne, flattened the cuboid (out of respect for the low-rise building development of the city of Lucerne) and added an extensive flat rooftop reaching far beyond the building outline. The architectural studio Zaha Hadid Architects, while designing the Meixihu International Culture and the Arts Centre in Changsha, adopted a most visual and non- linear approach by giving a 'fluid' oval shape to the building body [17].

Similar simplifications were searched for in the examples of architecture built in Poland. However, the investigations focused on the shapes related to the riverfront location.

5 Classification of Polish riverfront buildings

Examples of architectural objects in the classification table below include: historic buildings after renovation and change of the leading function as well as new buildings and concepts to be implemented in the nearest future (Table 3). The authors of this paper decided to provide three examples corresponding to each type of location in relation to the river. In most cases more examples could be given, except for: riverfront marinas, buildings with a periscope overlooking the river and buildings with an over-river-bridge element. These are forms of objects that are only beginning to emerge and are still concepts to be implemented in the nearest future.

In Poland, river and riverfront infrastructure facilitating sailing and water transport is slowly improving, however large-size *riverfront marinas* are still 'the melody of the future'. There are many plans to extend the offer of river yacht marinas by supplementing them with recreational and educational functions. At present, Polish marinas have a small size, however, new ambitious concepts are appearing to build large facilities for the mooring of yachts and motor boats, providing at the same time access to the utilities (electricity, water, washing and toilet facilities). At the Faculty of Architecture, at the Silesian University of Technology in Gliwice, many students cyclically undertake this topic and present their own concepts of the extension of the functioning of the Gliwice Marina, which additionally shows the importance and necessity of construction of such facilities.

City districts taking place of *former river ports* are becoming attractive places for living [18], working and spending leisure time; not only due to picturesque locations, but also thanks to their cultural and entertainment offer. Poland witnesses the development of more and more housing estates having the word of 'port' in their names (Port Popowice in Wrocław, Port

Płaszów in Cracow (Kraków), Old Port - Stary Port in Poznań). It is happening because degraded post- harbour areas are regenerated and urban tissue is filled with new housing development. The advantage of such a location is the immediate vicinity of watercourses or water reservoirs and the adjacent waterfront areas which are being developed in accordance with the idea of blue-green urbanism [19-21]. All this is part of the strategy of the river restoration and 'giving it back' to the city and its inhabitants – the strategy carried out by local authorities. Buildings classified as mixed- use usually have one prevailing commercial function with minor supplementary functions, i.e. gastronomic and work- related functions. Post-industrial harbour areas all over the world are gaining new municipal functions. The locations of this type abound in complex groups of buildings with compact bodies reminding more of typical urban development rather than sophisticated architecture with at least one characteristic elevation facing the water.

Large-scale riverfront music buildings – their numbers are growing in Poland, following the global tendencies and attracting crowds of users. At the same time, they create local centres of culture located on the riverfront. These types of commercial buildings often have additional accompanying functions, for instance a congress centre or conference rooms. The riverfronts in Poland have witnessed extraordinary cases of architectural transformations, such as the transformation of an old power plant (doomed to liquidation) into the Gdańsk Music and Congress Centre – The Baltic Philharmonic (Gdańskie Centrum Muzyczno-Kongresowe – Filharmonia Bałtycka) – the brainchild of the-then director of the Philharmonic, Professor Roman Perucki [22]. The bodies of the facilities of this type in Poland always look picturesque, are composed of many cohesive parts with vast elevations reflected in the surface of water. The effect of reflection in the water deepens the impression of vastness and originality of the architectural objects, in this case the buildings dedicated to art and music.

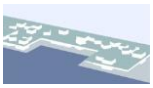
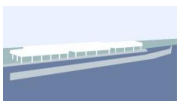
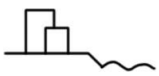
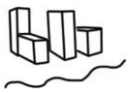
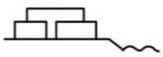
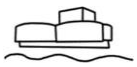
A slightly different situation occurs in the case of *mixed-use buildings located in the immediate vicinity of the river* - whose numbers are also growing in Poland. It can be stated that they are the most similar local counterparts of large-scale mixed-use waterfront buildings discussed above in the context of global trends. The buildings of this type frequently turn into local city centres, or even replace them, as they meet the criteria of public accessibility and multifunctionality. Serving commercial, intellectual and social purposes, they build the local community [23]. Such architectural objects have recognizable characteristic bodies, usually designed by renowned design studios which won architectural contests for the building's design and implementation. One of the most known riverfront buildings of this type in Poland is the Copernicus Science Centre in Warsaw (Centrum Nauki Kopernik w Warszawie) [24]. Architect Jan Kubec broke the line of the building development in the section of the riverfront boulevards. A street with heavy traffic was hidden under the architectural object and under a section of the riverfront. Thanks to that, 'the city came closer to the river'. The construction of this building shows how big an impact on the built environment may be created by the proper introduction of a well-designed space into the cityscape.

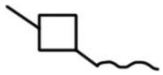
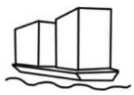
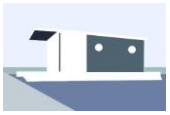
Buildings located on the riverside embankments, due to their unique location, look majestic and stand out against a background of the riverfront cityscape. No doubt, this fact contributes to prevailing, in this case, commercial activity. Many such buildings have direct connotations with watercourses, which results from their original functions, as in the case of Warmia Brewery (Browar Warmia) in Olsztyn, a former water mill [25]. Buildings of this type are usually of a smaller scale than the buildings listed in the two above-mentioned categories, however, they also have equally remarkable shapes and forms. Contemporary implementations of buildings in such locations have distinctive features such as flowing lines of the elevation and bodies reminding of gentle waves.

Buildings permanently fixed on the river make an impression as if they did not fit into the municipal land area as they go beyond this area onto the river. However, their location was

chosen on purpose, as it is in the case of Exclusive Aparthotel in Wrocław, which simultaneously plays a function of a marina [26]. However, the objects located in such a way usually have residential functions. In addition, the buildings' bodies, which are partly suspended or permanently fixed over the water surface, are closely adjusted to the shape of islands or embankments. They usually have simple bodies with glazed elevations resulting from their functions.

Table 3. Architectural classification of urban riverfront buildings.

Building location in relation to the river	Building purpose	Axiom of the solid	Example 1	Example 2	Example 3
	Harbour authorities' seat, marina				
Riverside marinas	Commer cial, work- related	Marina	Harbour authorities' seat 'Bosmanat' in the Czerniakowski Port, Warsaw (Warszawa), River Vistula (Wisła)	Centre of Tourism and Water Education, Gliwice, River Kłodnica	Marina Kraków, Cracow (Kraków), River Vistula (Wisła)
	District, housing complex				
Former river ports	Residential	Post-harbour	City Port, Wrocław	Docks District (Doki), Gdańsk	New Port (Nowy Port), Bydgoszcz
	Opera, the centre of music, the museum of song				
Large compact solids located in the immediate vicinity of the river	Commercial	Large-scale, related to music	Opera Nova, Bydgoszcz, River Brda	Gdańsk Music and Congress Centre – The Baltic Philharmonic, Gdańsk, River Motława	Polish Song Museum, Opole, River Oder (Odra)
	Science centre, museum				
Mixed-use buildings located in the immediate vicinity of the river	Commercial	Mixed-use, large-scale	Copernicus Science Centre, Warsaw (Warszawa), River Vistula (Wisła)	Maritime Science Centre, Szczecin, River West Oder (Odra Zachodnia)	Museum of Underwater Archeology (in construction), Łeba, River Łeba

Building location in relation to the river	Building purpose	Axiom of the solid	Example 1	Example 2	Example 3
	Museum, marina, restaurant				
Riverside on-slope buildings	Commercial	On-slope	Warmia Brewery, Olsztyn, River Łyna	Bydgoszcz Harbour, Bydgoszcz, River Brda	Manggha Museum, Cracow (Kraków), River Vistula (Wisła)
	Hotel, residential apartments				
Buildings permanently fixed on the water	Residential	On-water	Exclusive Aparthotel Marina, Wrocław, River Oder (Odra)	NordicHaven Apartments, Bydgoszcz, River Brda	Polish Headland (Polski Hak), Gdańsk, River Motława
	Residential, cultural institution				
Buildings including an element in the form of a bridge over the river	Commercial	Bridge buildings	Maria Mill, Wrocław, River Oder (Odra)	Gate to Poznań (ICHOT), Poznań, River Cybina	Water Pavilion, Poznań, River Warta
	Centre of art documentation, a single-family house				
Buildings with a periscope overlooking the river	Commer cial, residential	Periscope	Cricoteka, Cracow (Kraków), River Vistula (Wisła)	Worm House (Dom Robak), Zabłocie, River Vistula (Wisła)	Open House (Dom Otwarty), in the vicinity of Warsaw (Warszawa), River Narew
	Hotel,a single-family house				
Buildings floating on the water	Residential	Floating	Kamila Zaremba's House on Water (Dom na wodzie), Wrocław, River Oder (Odra)	Water House Vohouse (Dom Na Wodzie), Gdańsk, River Motława	New Port - Hotel on the Vistula River, Cracow (Kraków)

[a]Own elaboration by E. Latusek, based on photos from: B. Majerska-Pałubicka, E. Latusek, Archdaily, Wikipedia, Amazing Architecture, Arch2O

The term 'bridge' means a structure which spans two river banks and enables the passage [14]. *Buildings with an over-river-bridge element* show the idea of 'bridging' not only in a formal aspect, but also in a conceptual sense, spanning the river with the city, old with new,

architecture with nature. The objects of this type, similarly to the buildings located on the riverside embankments, have been built for centuries. Such objects are usually dedicated to one leading, uniform, commercial function, such as cultural institutions or hotel and residential buildings. They come either in enclosed or open versions of bridges, connected with buildings which are larger in scale and situated on the river banks. In Poland, the only object of this type is the so-called Gate to Poznań (Brama Poznania) – the complex of buildings including a new exhibition hall suspended over the floodbanks of the River Cybina and a renovated stronghold on the bridgehead of the former Cathedral Lock (Śluza Katedralna) [27].

What to do if an investor is dreaming of a house with a river view, but the plot is divided from the river by means of a floodbank or another type of an obstacle obscuring the view? The solution that comes to mind is a *periscope* – a concept of a building enabling the observation of the riverside areas located beyond the desirable field of vision [12]. These types of buildings usually have dimensions and functions of single-family houses. A model example of such development may be the Periscope House (Dom Peryskop) [28], however, it was not included in this classification due to its location on the lakefront. Another example of a riverfront, this time art-related, building which evokes connotations with various primal forms of solids is the Centre for Documentation of the Art of Tadeusz Kantor - Cricoteka - in Cracow (Ośrodek Dokumentacji Sztuki Tadeusza Kantora - Cricoteka - w Krakowie). As the author of the concept of the object says '*Any time I manage to make something genuinely new, it is made of well-known elements of the surrounding reality'*. [29]. The new building is 'suspended' or 'hovers' over a historic building of a former power plant, offering scenic views of the River Vistula (Wisła) and over its opposite urbanized riverfront.

The last category of the adopted classification includes monofunctional architectural objects located beyond the riverfront, i.e. *buildings floating on the river*. This group encompasses atypical w-hotels and houses on the water. W-hotel is a term coined by putting together 'water' and 'hotel', i.e. a hotel on the water. Nowadays, it is a fashionable topic. There is a growing offer of water hotel services and floating water houses on hire – having a small size but offering outstanding views directly over the water surface. Houses of permanent residence floating on the water are rather rare, partly due to the fact that numerous non-standard procedures have to satisfied. Kamil Zaremba, the owner and author of the concept of the House on Water (Dom na Wodzie) in Wrocław, says that more effort needs to be made to implement such a water house than in the case of a standard house on the land, for instance, the designing of an atypical structure of the floating building, a permit for mooring, proper arrangements with authorities and offices, the lease agreement of the grounds covered by water, or a proper connection to the municipal utilities of the object which is not permanently linked to the ground [30].

6 Conclusions

The research resulted in the creation of the classification on an architectural scale. The classification and evaluation encompassed downtown riverfront buildings and took into consideration the following aspects: building's location, function and body. Selected examples of architectural objects included: historic buildings after renovation and change of the leading function, new buildings and concepts to be implemented in the nearest future. Downtown riverfront locations have distinctive specific features. The buildings situated there usually have four elevations like any other buildings, however, only three of them are surrounded, in a classical way, by the context of the existing housing development. The fourth elevation of waterfront buildings faces a non-standard context of broad open space in the form of a vast water surface. It is very often the case that buildings with ordinary residential, commercial or office functions gain extraordinary open space in front of them,

which has been previously reserved only for the public buildings serving the community, such as municipal offices, theatres or large sports facilities. It may seem that the above-mentioned open-space asset is always noticed and increases the architectural value of waterfront objects. However, the analysis of numerous riverfront buildings (apart from the buildings listed in this classification) reveals that the majority of architects somehow evades this aspect laying the emphasis on the creation of 'standard urban architecture' – this issue may be subjected to further analysis in the future.

During investigations an interesting global phenomenon was observed, namely that more designing freedom is allowed during the creation of large-scale waterfront objects of the mixed-use type. In the dense downtown tissue architects have to pay attention to the strong urban context. In the case of waterfront mixed-use buildings, the context usually brings more freedom – due to the open character of the riverside landscape and a long distance of the discussed objects from the dense urban tissue. Because of this, more and more sophisticated building bodies are being constructed on the river banks and architects are competing to give the riverfront buildings original shapes.

Despite this, some characteristic patterns can be distinguished. The final classification of Polish buildings in terms of their location in relation to the river distinguishes 9 types: riverfront marinas, former river ports, large compact bodies located in the immediate vicinity of the river, mixed-use buildings located in the immediate vicinity of the river, buildings located on the riverside embankments, buildings permanently fixed on the river, buildings with an over-river-bridge element, buildings with a periscope overlooking the river, buildings floating on the river.

The study made use of the division described in the 'Classification and Building Regulations of Stationary Floating Objects' ('Przepisy klasyfikacji i budowy stacjonarnych obiektów pływających'), which distinguishes, among other things, the purpose of the object: residential, gastronomic, commercial, work-related, private, other. The vast majority of the discussed buildings has commercial and residential functions. This is a very general classification and the buildings having such functions occur in big numbers in downtown areas. The riverfront location of the discussed buildings determines the shape of their bodies to a great degree. A cross-section approach (using the cross sections of architectural objects) is in this case the best form of a sketch simplification, because it presents not only the position of a building in relation to the water surface, but also its situation in relation to the river bank (it shows whether it is a floating object, or not). In the case of the above-listed objects from all over the world, the architectural objects have axioms of solids which can be presented as basic geometric forms. On the other hand, the selected Polish buildings bring associations with shapes related to the riverfront location: marina, post- harbour, large-scale, music, mixed-use, on-slope, on-water, bridge-buildings, periscope, floating. The applied graphic symbols (simplifications) helped to understand and classify the forms of riverfront buildings.

The ability to 'read' the physical environment is an evolving set of skills at processing information, which has been developed by the human brain over the centuries thanks to direct experience. Investigations within the scope of architecture and urban planning continue to provide information on the possibilities of improvement of the surroundings thanks to classifications and evaluations of the factual state. Architecture in its all forms must be based on structural rules occurring in the physical world, however, the architect builds their own paradigm on which further designing decisions will be based. Riverfront buildings, in spite of their non-standard location, a complicated functional system or cubature scale, may be composed of conceptually cohesive solids satisfying the users' needs to a proper degree and simultaneously avoiding the degradation of riverfront areas in accordance with the idea of sustainable development.

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