Development of Waterfronts in Small and Medium-Sized Cities in the View of the Idea of Sustainable Development: Selected Examples

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Abstract. The development of waterways is one of the key factors influencing the perception of the city by its residents and people visiting them. The unique value of these areas in the urban structure often results due to the short distance from the historic city center. An important factor is the layer of cultural values. For the sake of the rich traditions of many urban centers, it seems necessary to draw attention precisely on the aspects related to the connection of the waterfronts areas with historical tissue of the city. However, due to the continuous development of the cities, we have to deal also with the areas that have been invested today - often in recent years, and this process is still continuing. Often we faced with problems That have been created in recent years as a side effect incompetently policy planning. Legal documents such as the Water Law Act stipulate that "When designing, making and maintaining water facilities, the principle of sustainable development should be followed, in particular maintaining good water status and characteristic biocenoses, the need to preserve the existing relief and biological relations in the water environment and in wetlands ". Unfortunately, these records are often not taken into account during the transformation of watercourse channels - especially in urbanized areas. In fact, the priority is to get the maximum protection against flooding and to bear the lowest possible economic costs. So we can assume that the appearance and spatial order in the areas of waterfronts are primarily connected with the consistently implemented measures in line with the ideas of sustainable development, as well as thought-spatial policy pursued by the city authorities.

1. Introduction

Analysing the way of management of waterfront areas in small and medium-size cities one may observe a tendency to copy the solutions that have already been implemented in large cities. The problem, however, consists in the historical background, which is different for every city. Moreover, large cities, which frequently are or used to be leading industrial centres, try to do their best to revitalize or even renaturalize post-industrial areas – especially those which are situated in the direct vicinity of water courses.

Economic changes which have taken place in recent years, not only in Poland, but also throughout the world, resulted in a change of the way in which urbanized areas are managed. Production centres used to be situated in the direct neighbourhood of rivers, which resulted from the specifications of technological processes. As years passed, not only was the technology perfected but also industrial centres were relocated. The demand for large-surface objects serving non-production purposes turned out to be insufficient. Those objects quickly underwent the process of degradation, and the areas
occupied by them were taken over by vegetation in the process of natural succession. Also inland waterway transport lost its importance, as a result of which the reason for the existence of numerous engineering objects related to inland waterway transport and water management was questioned. Some of these objects had to be protected from flooding on multiple occasions. Is such cases the frequently utilitarian character of the construction does not meet today’s standards implemented in flood alert solutions. Industrial areas, including inland ports, were supported by efficient systems of road transportation. As years passed, the road network as well as the areas where the production was situated were included in the structure of cities. This led to the situation in which city authorities had to face numerous new challenges, both spatial and economic.

2. Existing situation
At present it often happens that residential districts are situated in waterfront areas which used to be industrial. This tendency is growing all the time. Multi-family housing of high intensity is in this case treated as a city-forming factor [1]. What is more, looking at the solutions implemented in post-industrial areas in Poland one can clearly see that they considerably differ from the principles shaping residential areas in better developed countries [2]. It has been noticed in many countries that a high culture of shaping urbanized space consists above all in efficient space management [3]. New residential areas should not only provide living comfort but also meet high architectural requirements regarding passive house standards or the so-called “ecological architecture” [4]. Intelligent solutions, such as heat recovery, biologically active green roofs (usually covered with extensive greenery) are considered standard.

Transformed areas or newly invested spaces are shaped in accordance with the thinking that they are a structure which functions in a multifaceted way. Elements which are situated between buildings are far from being a coincidence. A significant amount of greenery not only makes in this case public or semi-public spaces more attractive but also constitutes a fully-fledged material ultimately shaping the city space. The structure created in such a way also needs smooth blending of spaces of different degrees of privacy. It was noticed many years ago that the strict segregation of functions or ways of spatial management results in the unbalanced functioning of different areas in different periods of time.

The context in which the above-mentioned areas are situated is an extremely important aspect related to the transformation of waterfront areas. At present post-industrial areas are very frequently situated not far from a historical city centre. In Poland, unfortunately, in most cases the context of the surroundings is not taken into account at a design stage. This frequently refers to housing projects situated in post-industrial areas (also in the neighbourhood of rivers). This is mostly due to the fact that the mechanisms of spatial management often do not include sufficiently precise instructions for investors responsible for particular areas, which would force them to take into account to a larger degree the surroundings of the land on which they are realizing an investment project.

3. Tendencies observed in large cities – selected examples of the so-called “good practice”
Numerous projects have recently been realized whose aim is to bring back the possibility for the inhabitants to use waterfront areas in cities. One of such realizations is the transformation of the Toronto waterfront. This is one of the most important areas for the city not only due to its location but also thanks to the fact that numerous companies are based there, thus creating a certain kind of a city district with a financial character. The project aiming at the restoration of public spaces in this area was initiated in 1999 in a decree of the mayor. It was titled "Our Toronto Waterfront, the Wave of the Future" [5]. The successive year was spent on preparing further resolutions as well as the detailed economic project which was intended to financially support the initial phase of the transformations. The municipal authorities budgeted for this purpose 1.5 billion dollars. Additionally, public debates were scheduled in order to involve also the city inhabitants in the works on the concept. The designers working on the project aimed to make the inhabitants identify themselves with the newly created space. A significant part of the area was transformed into recreational space. The designers decided to
make the design more attractive by introducing changes to such obvious elements, when it comes to their appearance and function, as footpaths and bridges. It was necessary to undertake radical steps due to the fact that the existing structure was neglected and disorganized to a significant degree.

![Figure 1. Plan of transformation of areas in Toronto [5]](image1)

Intensive road traffic was reduced by half. The problem of public transportation was solved by introducing changes to transportation means, e.g. by introducing and modernizing the system of railroad transportation as well as promoting cycling and walking. Tramways became the leading transportation means in this area. At the same time, intensive campaign was launched to promote the use of bicycles as a means of transportation. Also a new network of cycle lanes was included in the project in order to establish the bicycle as the only permitted means of wheeled transportation in this area at the initial stage of the project. Foot bridges 6 metres in width, and at some place even wider, were designed for pedestrians. Their wavy shape gives the space an interesting and original appearance, and also by differentiating heights makes it possible to observe the same place from different perspectives. The foot bridges were made of wood with increased resistance to atmospheric conditions, so that the new public space would preserve its attractive visual appearance for a long time. The designers strongly emphasize the connection of the project with the TOD idea (Transit Oriented Development), not only because of the fact that one of the main railroad stations is situated nearby, but also thanks to the improvement of the system of public transportation. Green spaces were not overlooked in the design. Numerous squares and tree alleys constitute an integral part of the project. Many green areas in combination with natural finishing materials encourage the use of the new space.

![Figure 2. Visualization illustrating the way of transformation of public spaces in Toronto [5]](image2)

![Figure 3. Photograph illustrating the way of transformation of public spaces in Toronto [5]](image3)
Changes begin slowly to be implemented also in Poland. There are examples which certainly deserve to be mentioned here, such as “The operational spatial development plan for areas: Łasztownia, Wyspa Grodzka, Kępa Parnicka, Wyspa Zielona and Wyspa Jaskółcza” in Szczecin [6]. It covers areas situated in the neighbourhood of the city centre as well as those at the Odra river channel bifurcations. This place has always been an important place in the structure of the city. Additionally, this area is situated at the meeting place of territorial waters and the zone of inland waterways. The above mentioned project was commissioned by the city authorities. The changes taking place in the neighbouring countries of the European Union obviously constitute an important incentive. The need for changes in the way of management of post-industrial areas has already become one of the basic issues related to the realization of spatial policy in many cities. The benefits resulting from undergoing changes have been noticed as well. The location developed in the project possesses a significant potential. The text of the elaboration also mentions the benefits “resulting from the historical location, composition and the exceptional waterfront position” which, let us hope, will not be used only as a bargaining chip in negotiations with investors. At the same time, attention has been drawn to the issue of the importance of the connection between the city and the water, and the necessity for its proper development.

![Image](image_url)

**Figure 4.** Operational spatial development plan for areas: Łasztownia, Wyspa Grodzka, Kępa Parnicka, Wyspa Zielona and Wyspa Jaskółcza in Szczecin [6]

The dominant functions in the new spatial development plan include residential, commercial and service, recreational, leisure and culture-forming ones. However, it has been noticed that it is not possible for them to function properly without an efficient transportation system. The new network of connections will comprise not only roads for wheeled transportation but also footpaths, cycle lanes, and the system of public transportation whose existence may considerably relieve the system of transportation. The development of areas offering an opportunity to practise water sports as well as their combination with newly created green areas were also assumed. In order to increase the clarity of the complete system covered in the elaboration as well as to improve the conditions of land use, many functions which are burdensome for the inhabitants (among others the ones related to industry) were moved to less exposed locations. To make this possible it became necessary to introduce a new ownership structure in these areas.

It was decided that the most important elements worth preserving were such features as the individuality and the character of the city, as well as its cultural, historical and landscape values. The

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1 The time of building reinforcements of this stretch of the Odra River is considered the beginning of its connection with the rest of the urban layout, which resulted in its inclusion in the city defense system. The importance of the area additionally increased when the panorama terraces and public utility facilities were built at the turn of the 19th and 20th centuries.
municipal authorities assume that the creation of a new image of Szczecin will be based on three programmes:
- "reconstruction and restoration of the inner city area as well as homogeneously shaped settlement areas;"
- "transformation of the post-industrial and post-military waterfront zone;"
- "construction of new spatial structures and shaping of public spaces".

Their implementation is to ensure a smooth course of the restoration process of the city urban fabric. It seems to be important that the document text refers to the significance and even necessity “for the cooperation between the local government, owners and users of the area when it comes to searching for investment partners”.

4. Water as element unifying the city structure
In many cities water together with areas in its vicinity constitute an important element unifying the urban fabric. More and more frequently such a function may be observed above all in the most important urban settlements. One of such examples may be "The Blue Ribbon Network" in London. This term is used to refer to the realization of the integration of the Thames with its tributaries and canals with the remaining elements constituting the city. This network is of considerable importance not only due to the functioning of many areas but also through the building of the city image. This activity is fully compatible with the idea of sustainable development of the metropolis by limiting the negative impact on the environment, or its biodiversity. The organization of the Olympic Games in London became an important incentive for initiating this type of activities. During the construction of numerous facilities construction materials were transported by inland waterways which were reopened especially for this purpose.

A similar situation takes place in a number of important cities, such as Copenhagen [7], which in recent years has been considered one of the most dynamically developing cities in Europe. The same mechanisms are applied with reference to the management of the realization of key investments for the urbanized area. In spite of drawing attention to the most important locations in the urbanized area, one does not neglect the significance of the need for reconstruction of the existing public spaces. At the same time, activities are undertaken to limit the scattered housing through the revitalization of large already invested areas (in this case, of post-port character). It is important to simultaneously shape green areas as a network penetrating through the structure of the city. Thanks to this an alternative form of passageways for pedestrians or bicycles is possible as people are able to move between important locations without the use of a car, at the same time enjoying the visually attractive scenery.

Alexander Christopher successfully postulates that attention should be focused on the above-mentioned problems in his book “A Pattern Language” [8]. In patterns entitled “(25) Access to Water”, or also “(60) Accessible Green Space” he emphasizes the importance for the inhabitants to enjoy free access to greenery and water, as values fundamentally connected with the human nature. “(42) Industrial Ribbon” deals with the necessity to preserve diversity in the structure of the city. One can observe that these principles are being introduced into design since only such activities can offer the appropriate balance between the comfort of using the city facilities by its inhabitants and the degree of the transformation of natural environment. In the pattern “(64) Ponds and Streams” described in the above-mentioned publication the author emphasizes the importance of biodiversity in urbanized areas. Similar records can be found in currently binding legal regulations [9, 10, 11], such as Water Resources Law [10, 11]. Article 187.1 of this document reads that “Design, construction and maintenance of water facilities should be governed by the principle of sustainable development, and particularly by the preservation of the good condition of waters and their characteristic biocenosis, by the need to preserve the existing landscape and biological relationships in the aquatic environment and

2 Text and titles of elaborated programmes originate from “Operational spatial development plan for areas: Łasztownia, Wyspa Grodzka, Kępa Parnicka, Wyspa Zielona and Wyspa Jaskółcza”
wetlands” [11]. Unfortunately, these laws are often disregarded at the stage of the transformation of watercourses – especially in urbanized areas. In reality the maximized protection against flooding and minimized economic costs become the priority. In such cases the idea of the protection of biocenosis or the respect for the existing landscape are only of secondary importance. As a result of the implementation of such a spatial policy, reinforcements are built which eliminate local inhabitants’ contact with water and the river is transformed from an element of the natural environment to an engineering one.

5. Dependencies observed during the implementation of solutions applied in large, small and medium-size cities

Observing transformations taking place in large cities one can notice that attempts have been made to bring back certain values which were lost during the process of the city development [12]. By contrast, in small and medium-size cities one can frequently observe attempts aiming at the maximum city development in order to equalize the urbanization level in small and medium-size cities with the level represented by large cities. These activities are carried out in many fields. In small and medium-size cities the authorities try very hard to regulate and reinforce watercourse banks, thus frequently changing their natural looks to resemble a concrete drainpipe, while in large cities watercourses are renaturalized. It is similar to the issue of introducing large area commercial facilities to city centres. Leading cities are moving away from such solutions as large facilities serving commercial functions generate car traffic of high intensity and push out pedestrians. In turn, small and medium-size cities go to extreme measures to develop in the way the largest cities do, even at the price of making the same mistakes related to spatial development and the resulting necessity to incur considerably higher expenses to correct these mistakes.

![Figure 5. Aerial view of revitalized area in the Sola river bend in Zywiec](Source: Mirosław Stecyk /www.zywieconline.pl)

It frequently occurs that areas which are very attractive for the city are restored for use in the degree which is contrary to logic and the principles of sustainable development. A great number of supermarkets with large-area parking lots have been built in recent years in the bend of the Sola river in Zywiec. Not very intensive post-industrial area was transformed into large commercial facilities and a significant number of green areas were transformed into asphalted car parks [13, 14, 15].

Also the transportation system underwent transformation, but it still does not solve the problem of traffic jams in the city. Investments of this type practically resulted in an irreversible loss of valuable riverbank areas. This situation shows that revitalization does not always yield beneficial results. At the same time new transportation system elements led to the elimination of a part of flood alert facilities
and a considerable transformation of riverbank green areas, to a large degree consisting in the elimination of vegetation in this area.

Frequently expectations of “inhabitants – municipal authorities – investors” are not compatible. One of the reasons for such a situation is the fact that the transformations of public spaces are financed from the city budget, whereas the profits resulting from the transformations influence beneficially, above all, the budget of external investors, e.g. developers. The value of the real estate frequently increases due to the fact that the investment is situated close to green areas the preparation of which was not at all financed by developers. Participation in the costs of restoring the use of the revitalized area could be a solution.

As opposed to the above example, the areas of the Portuguese city of Lagos\(^3\) are characterized by a high degree of respect for aesthetics and functionality of the public space. In spite of its tourism-oriented character, the city offers public spaces and streets not jammed with cars. This is possible thanks to the developed system of underground parking, with the help of which one avoided building of extensive parking lots on the ground. Entrances are situated in the vicinity of the main promenade which is just a few centimetres above the water level, in this case the outlet of the Rio Bensafrim to the Atlantic Ocean. Parking underground is not a typical solution in areas situated in the direct vicinity of water reservoirs. Using the above facilities is possible even in the times of considerable car traffic. Lagos is famous for its port situated in the direct vicinity of the historical centre. Water also constitutes an important compositional element of the main public space, which is Praça Infante Dom Henrique.

\(^3\) Lagos – a city in the south of Portugal. Founded in the first millennium BC. At present the city population amounts to 31,048, and the population density amounts to 146 people per km\(^2\).
It appears that precisely such patterns should be implemented in small and medium-size cities in Poland. Respect for tradition and awareness of the necessity of preserving high-quality urbanized spaces lead to maintaining spatial harmony. This also leads to a decrease in the economic resources which are necessary to solve numerous problems resulting from inappropriate spatial management.

Attention paid to the preservation of the historical character can be observed in many cities. One of such examples is the island of Burano\textsuperscript{4}, which is considered one of the top ten most colourful places around the world. This is largely due to the consistently applied spatial policy. Before painting their houses inhabitants must obtain a permission from a local government official to apply a particular colour. Thanks to such policies, it is easy to control the colour schemes applied throughout the city. A unique character of the city space in this case constitutes an added value. This example clearly demonstrates that it is frequently possible to obtain perfect results related to management of the city space without an investment of considerable financial resources, and at the same time with the application of clever realizations.

6. Conclusions

It appears that the leading slogan for carrying out an efficient spatial management policy should be the statement: “consistent action as a method to achieve success”. Activities described in the above paper are not isolated as similar transformations take place in many Polish cities. One can notice the absence of a method consisting in the protection of natural resources with a simultaneous use of their hidden potential.

Attention should be focused on the preparation and realization of concepts intended to enable inhabitants to take advantage of riverbank areas. They should assume that these places will be available for public use in the most natural form. At the same time, it is necessary to build the awareness of the society, and it should both exert positive pressure on investors and react when the conducted investments lead to disadvantageous solutions for not only the city but also its inhabitants. The above-mentioned concepts should at the same time assume the combination of complementary functions the selection of which is justified for a particular location and economic means at the disposal of investors. One such solution could consist in including more precise guidelines in documents such as Local Spatial Development Plans. One of the most important problems in Poland is making attempts intended to solve all problems of a given (frequently very large) location with the help of one investment.

\textsuperscript{4} Burano – one of Italian islands situated in the Venetian Lagoon. It is situated 7 km away from Venice. Its population amounts to 4,000.
Ultimately it often happens that numerous problems have not been solved, and the project itself exceeds the financial capacity of an investor. This results in lowering the quality of the final realization and frequently also in decreasing the area on which revitalization processes are carried out.

The quality of the realized facilities and the accompanying spaces is also important. Only an attractive form together with an interesting function are capable of attracting new users. The necessity to ensure appropriate functionality of the city public space is another issue.

As far as flood alert facilities are concerned, patterns should be drawn from foreign cities of different sizes, in the case of which the policy aiming at limiting the transformation of watercourses to a minimum is being realized at present. Frequently flood alert facilities are built only on one bank, whereas the other one is left in its natural form.

References
[1] B. Domański, "Transformations of post-industrial areas in the Śląskie and Małopolskie voivodships - regularities and conditions. Problems of changes in industrial structures in the process of implementing market economy rules" (Przekształcenia terenów poprzemysłowych w województwie śląskim i małopolskim – prawidłowości i uwarunkowania. Problemy przemian struktur przemysłowych w procesie wdrażania reguł gospodarki rynkowej), Komisja Geografii Przemysłu, 2001.
[2] B. Domański, "Restructuring of brownfield sites in cities. Revitalization, rehabilitation and restructuring - renovation of cities" (Restrukturyzacja terenów poprzemysłowych w miastach. Rewitalizacja, rehabilitacja i restrukturyzacja – odnowa miast), Instytut Gospodarki Przestrzennej i Komunalnej Oddział w Krakowie, 2000.
[3] J. Lee (ed. L Uje), "dle 1001 - Waterfront - Resewing the City - Plaza and Square in Europe", pub. C3, 2010, ISBN 978-89-86780-85-7, 2010.
[4] A. Mengual, "ViA Arquitectura 16V Climas Climates", ViA Arquitectura, ISSN 1137-7402, 2006.
[5] http://www.waterfronttoronto.ca, online: 05/2018.
[6] http://www.bip.um.szczecin.pl, online: 05/2018.
[7] M. Ibler (Ed.), "Global Danish Architecture #3 Sustainability", Archipress M, ISBN 978-87-91872-03-7, 2008.
[8] A. Christopher, "A Pattern Language. Towns - Buildings - Construction" (Język Wzorców. Miasta - Budynki - Konstrukcja), translation: A. Kaczanowska, K Maliszewska, M. Trzebiatowska, prof. J. K. Lenartowicz; Gdańskie Wydawnictwo Psychologiczne sp. z o.o., 2008.
[9] Directive 2000/60/WE of the European Parliament and Board of 23 October 2000 determining the framework for EU activities in the area of water resources policy (Official Journals WE of 2000).
[10] Water Resources Law – resolution of 18 July 2001.
[11] Water Resources Law – resolution of 20 July 2017.
[12] Z. Greplowska, "Effectiveness of flood protection measures and their impact on the condition of water ecosystems" (Efektywność środków ochrony przed powodzią oraz ich wpływ na stan ekosystemów wodnych), Czasopismo Techniczne, vol. 2-A/2009, Wyd. Politechniki Krakowskiej, 2009.
[13] Spatial Development Plan of the city of Żywiec of 2011.
[14] Spatial Development Plan of the Silesian Voivodeship of 2004.
[15] Study of Conditions and Directions of Spatial Development of the city of Żywiec.