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Cichocki, Michał; Chruściel, Klaudia

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Michał Cichocki¹, Klaudia Chruściel²

The potential of blue-green infrastructure in spatial revitalization – application in Municipal Revitalization Programs

Abstract

Opposing the spatial degeneration of cities requires a wide range of efforts which combine, among others, activities related to blue and green infrastructure (BGI). This paper examines the scope and manner of using BGI to revitalise space in municipal revitalisation programmes (MRP). In the first part of the study, the theoretical framework for the studied issues has been outlined based on subject literature. The manner of understanding BGI and revitalisation in the current legal system has been defined. The analysis covered 60 MRPs from 2016 to 2021 in accordance with the methodology set out in the second part of the study, based on how often BGI appeared in key MRP sections such as in-depth diagnosis of revitalisation area, the objectives and directions of the process, and the revitalisation projects. The last part of the paper describes the results of analysis and their evaluation. One of the main conclusions of the work we conducted is that BGI elements appear quite frequently in revitalisation programmes; however, their full potential remains untapped. The projects carried out in the studied area have rarely had the form of complex urban projects. The main method of using BGI in MRPs is currently the technical dimension that focuses on improving the quality of existing resources. To a lesser extent,

¹ Institute of Urban and Regional Development, Revitalisation Advisory Centre, e-mail: mcichocki@irmir.pl, <https://orcid.org/0000-0002-8265-0044>

² Institute of Environmental Protection – National Research Institute, National Climate Change Centre, e-mail: klaudia.chrusciel@ios.edu.pl, <https://orcid.org/0000-0003-4430-5079>

revitalisation projects that use the BGI concept are reflected in the social and occasionally in the natural dimension.

Keywords: urban renewal, space shaping, urban degraded areas, green areas, nature-based solutions, urban revitalisation projects, urban resilience

JEL Classification Codes: Q01, Q26, R58

Potencjał błękitno-zielonej infrastruktury w rewitalizacji przestrzeni – zastosowanie w gminnych programach rewitalizacji

Abstrakt

Przeciwdziałanie degradacji przestrzennej miast wymaga szerokiego pola działań łączących m.in. rozwiązania z zakresu błękitno-zielonej infrastruktury (BZI). Praca bada zakres i sposób wykorzystania BZI w rewitalizacji przestrzeni w gminnych programach rewitalizacji (GPR). W pierwszej części opracowania, w oparciu o literaturę przedmiotu określono ramy teoretyczne dla badanych zagadnień. Określono sposób rozumienia BZI oraz rewitalizacji w oparciu o obowiązujący system prawny. Analiza objęła 60 GPR z lat 2016–2021, zgodnie ze sformułowaną w drugiej części pracy metodyką, opierającą się o ocenę występowania BZI w kluczowych elementach GPR takich jak: diagnoza pogłębiona obszaru rewitalizacji, cele i kierunki procesu oraz przedsięwzięcia rewitalizacyjne. Ostatnia część pracy stanowi opis wyników analizy i ich ocenę. Jeden z głównych wniosków przeprowadzonych prac wskazuje na stosunkowo częstą obecność elementów BZI w rewitalizacji, jednakże pełny potencjał BZI pozostaje niewykorzystany. Realizowane przedsięwzięcia w badanym zakresie rzadko przyjmowały formę przedsięwzięć o kompleksowym charakterze urbanistycznym. Głównym sposobem wykorzystania BZI w GPR jest obecnie wymiar techniczny skupiający się na poprawie stanu istniejących zasobów. W mniejszym stopniu przedsięwzięcia rewitalizacyjne wykorzystujące koncepcję BZI mają swoje odzwierciedlenie w wymiarze społecznym oraz sporadycznie przyrodniczym.

Słowa kluczowe: odnowa miast, kształtowanie przestrzeni, miejskie tereny zdegradowane, tereny zieleni, rozwiązania oparte na przyrodzie, urbanistyczne przedsięwzięcia rewitalizacyjne, odporność miejska

Kody klasyfikacji JEL: Q01, Q26, R58

Revitalisation forms an important part of the process of development of today's cities. For many years, it has been conducted via local revitalisation programmes (LRP) based on the Municipal Self-Government Act (Journal of Laws of 2023, item 40). In 2015, the Revitalisation Act (Journal of Laws of 2021, item 485, Journal of Laws of

2023, item 28) entered into force, defining revitalisation as “the process of recovering degraded areas from a crisis condition, conducted in a comprehensive manner through integrated activities on behalf of the local community, space and economy, territorially focused and managed by revitalisation stakeholders based on a municipal revitalisation programme.” As noted by a team led by Szlachetko and Borówka (2017), the main objectives of these activities include recovering degraded areas from a crisis condition in the social aspect, while other activities, for example spatial, functional and environmental, have an auxiliary character. However, this process is noted to be complicated and expected to take into account a wide spectrum of activities, including spatial ones. The ultimate method of carrying out revitalisation based on the act are municipal revitalisation programmes (MRP).

A similar idea of comprehensive approach to space shaping is seen in the concept of blue and green infrastructure (BGI). Hence, its use in the revitalisation process and careful introduction of BGI elements may contribute to improving the quality of life and become part of activities that recover the revitalised area from a crisis condition, in particular in the environmental aspect. Currently, a fundamental circumstance for wide-ranging application of BGI is the need to adapt to climate change. Degraded areas should be reckoned among those particularly susceptible to threats, for both social and nature-based reasons.

The purpose of this paper is to define the scope and method of using BGI for space revitalisation in MRP documents. Former studies of this issue have focused primarily on theoretical assumptions and effects of implementing the process, citing case studies of completed investments. Hence, this paper rounds out our knowledge on this topic for the revitalisation programming stage.

The article contains a review of literature that introduces the BGI concept and MRP assumptions essential for this study, a description of the method of analysing the research material (60 MRPs passed in 2016–2021) as of August 2022. Study results were subsequently analysed and evaluated to formulate conclusions and contrasted with the previous state of research.

Review of literature

The place of blue and green infrastructure in revitalisation

Faced with the changing climate, cities all over the world are and will continue to be tackling the escalating consequences of this change. Actions undertaken to counteract the degradation of cities should be focused on aspects related to urban

resilience. For this reason, one of the most important tasks faced by local governments and the key factor in further city development is adapting to these changes which have an impact on the quality of life. This, according to the definition laid out by the Intergovernmental Panel on Climate Change, is a process of adjustment to actual or expected climatic conditions so as to minimise their negative consequences or, equally importantly, increase their potential benefits (IPCC, 2014). Przewoźniak and Czochoński (2020) additionally point to the issues of adaptation in the space-shaping context, noting that adaptation to global climate change consists in adjusting the forms of developing and using space to new and projected climate conditions and their consequences. This applies in particular to organisational, technical and nature-based solutions.

One of the solutions for climate change adaptation which is rooted in nature is implementing the BGI concept, also called the blue and green or green infrastructure. The BGI concept is a relatively new idea that arose in the early 21st century. Due to its complexity, its definitions vary. A review of approaches to and methods of defining this concept has been conducted by Szulczewska (2018). One of the best-known definitions was offered by McMahan (2000), who describes BGI as an interconnected network of vegetation-covered areas which serve to protect the value and functions of natural ecosystems and are beneficial for human populations. On the other hand, the UK National Planning Policy Framework offers a definition of BGI as a network of multi-functional green spaces (vegetation-covered areas), both urban and rural, which is capable of delivering environmental benefits and affect the quality of life of local communities (MFCLG, 2012). Based on the examples of already existing solutions, Szulczewska (2018) notes that it is possible to shape green infrastructure at various spatial scales (continents, regions, localities or sites).

Considering the local character of the revitalisation process, BGI elements most often identified or introduced at that scale include city or district parks, social gardens, forest parks, pocket parks, botanical gardens, lakes, ponds, canals, meadows, recreational areas, rivers with floodplains, wastelands, street greenery, home gardens, gardens next to multi-family residential buildings, green roofs or façades (Rall et al., 2015).

According to the definition cited above, BGI may, depending on the kind and layout of its constituent elements, provide a number of functions beneficial to people, the economy and nature. The European Environment Agency report (EEA, 2011) on the green infrastructure concept lists the basic functions as:

- biodiversity protection;
- climate change adaptation;
- climate change mitigation;
- air purification;

- preventing soil erosion;
- water management;
- food production;
- positive impact on land values;
- improvement of quality of health and life;
- culture and recreation.

Among the functions listed above, in addition to the environmental aspect in the revitalisation process, a major role is played by the social element achieved through BGI. The first example, related to the quality of life of inhabitants, relates to the impact on human physical and mental health. Greenery injects a feeling of orderliness in the urban fabric, leading to improved mood and better productivity of people (Puzdrakiewicz 2017). Green areas, which are a haven for pure and moist air, contribute to mitigating the harm to health caused by summer heat waves. Green infrastructure is often a place of doing sports and recreation (including tourism) which contribute to improving physical fitness and resistance to disease.

In the cultural context, BGI has an essential role in processes occurring in society – social contacts, building local identity, integration, inspiration, art in public spaces. An example are green areas in housing estates, often managed by local communities. Work on planting or caring for these areas fosters social contact. As a result, the locals are more tightly tied to the place they live in, which contributes to their level of satisfaction and quality of life (Puzdrakiewicz 2017).

The impact of shaping public spaces, including green areas, on processes occurring in society has been described in a report on the state of Polish cities (Dawid et al. 2019). The authors of the paper note the principles of integrated and sustainable approach to revitalisation which considers not only the physical and spatial but also, importantly, the social and environmental sphere by carrying out properly planned and designed investments of an infrastructural nature, including investments related to renewal of public spaces. The social dimension of revitalisation does not have to consist in increasing the share of soft projects. A suitably designed (green) public space is able not only to enhance the general aesthetic value of a site or improve its spatial functionality, but also contribute to resolving a number of social problems, from increased security through impact on promoting social interactions to fostering conditions for the creation of new jobs or social activism by involving the inhabitants in selected tasks related to space renewal.

Nyka et al. (2018) also note a trend in many European programmes dealing with revitalisation which put more weight on the role of space which is important for its nature qualities. The authors clearly stress that revitalisation of cities based on the nature-based urban solutions paradigm introduces solutions that result from using

nature as a component characteristic for cities. Moreover, introducing innovative nature-based solutions in cities may lead to measurable environmental, social and economic benefits.

The noted trends and other benefits resulting from integrating the revitalisation process with the involvement of BGI allow us to cast a wider look on the possibilities brought about by revitalisation. An effective and integrated space renewal using BGI can contribute to improving the quality of residence of local communities, enhance the spatial and functional structure of an area, and thereby allow a city to achieve resilience to consequences of climate change.

Municipal Revitalisation Programme – a tool to implement the revitalisation process

The entry into force of the Revitalisation Act allowed municipalities pursuing revitalisation policy to conduct their activities in a systematic fashion. The MRPs, which must be designed in this process, are characterised by a standard structure that is a direct outgrowth of their legal basis. Pursuant to Article 15, item 1 of the act, an MRP should consist of, among others:

- a detailed diagnosis of the revitalisation area,
- revitalisation objectives and the corresponding directions of activity,
- a description of revitalisation projects,
- a graphical appendix showing the basic directions of spatial and functional changes of the revitalisation area.

The basic aspect of the process which gives rise to subsequent revitalisation activities is a social crisis. The revitalisation area is a location that, in addition to numerous social problems, is also affected by a combination of negative technical, economic, spatial, functional or environmental effects which the MRP customarily classifies as spheres. The presence of BGI should therefore be sought mainly in the environmental, spatial and functional sphere.

The first step to conduct revitalisation activities is a detailed diagnosis of the area which provides a deeper understanding of previously discovered general information on the occurrence of negative factors. The diagnosis notes the local circumstances of the revitalisation process which, in addition to problematic issues, also include potentials. The effectiveness of subsequent corrective actions requires a reliable and comprehensive diagnosis (Szlachetko and Borówka 2017). This part of the MRP should formulate a list of revitalisation needs which serves as a basis for determining the objectives and directions of a future revitalisation policy. This is an important component of operationalising the path towards the envisioned condition of the revital-

isation area (Szlachetko and Borówka, 2017). The strategic objectives of the process are carried out through revitalisation projects aimed at recovering the area from degradation. The projects identify among others the scope of works undertaken as part of the MRP, note their location, the expected results and the demand for funds to finance them. The undertakings should be consistent with the vision of changes outlined in the objectives and directions, while the latter should respond to the problems and threats identified in the diagnosis (Jadach-Sepioło 2018).

Revitalisation is assumed to be a holistic process that integrates multiple dimensions of activity (Nowakowska, Legutko-Kobus, Walczak 2019). In addition to the social nature of changes, a revitalisation intervention has the potential to impact spatial transformations. Activities in this respect are aligned with spatial integration that assumes animating and consolidating the degraded city fragment to ensure its proper operation (Nowakowska, Legutko-Kobus, Walczak 2019). The presence of such changes is to be demonstrated in the obligatory graphical appendix that includes the directions of spatial and functional changes in the revitalisation area. The appendix illustrates investment activities and projects resulting from the descriptive part of the MRP (Szlachetko, Borówka 2017), taking into account the need to trace out the directions of changes against existing circumstances (Jadach-Sepioło 2018). The appendix therefore also helps to use local potentials and overcome a crisis in a holistic and integrated way.

In the revitalisation process, use of tools that go beyond individual activities and improve the functioning of space as an urban whole is a must. As noted by Ossowicz (2019), an urban project is an agreed objective concerning spatial development transformations together with a set of mutually coordinated activities to achieve this objective. The wide range of problems related to degraded areas requires blanket and complex activities which also include spatial changes, naturally leading to the need to implement BGI or its components as one of the ingredients of intervention aimed at comprehensive improvement of quality of life. Using urban projects thus contributes to improvements in, among others, technical and social infrastructure systems, public spaces and spatial compositions (Spadło, Grotowska 2022). Integrating the BGI concept with urban projects in degraded areas is therefore a key factor in building the resilience of cities to threats related to changing environmental conditions and the general crisis prevention.

Materials and methods

Assumption on the interpretation of blue and green infrastructure in municipal revitalisation programmes

Before analysing the MRPs, evaluation criteria (described later in this paper) have been identified that allowed to state how many documents contain revitalisation-related issues in the spatial aspect which are rooted in the BGI concept. Because MRPs are not studies which deal primarily with nature-based issues, it was assumed that they might interpret the idea of BGI in various ways. For the sake of analysis, this paper has therefore assumed a very wide definition of BGI: a continuous network of vegetation-covered areas at a local and/or site scale that provides multiple benefits to nature and society. It was also assumed that the manner in which the BGI concept is realised in the MRP may meet this definition only partially.

Materials

The research material includes MRPs designed for towns with more than 30,000 inhabitants, a total of 154. The authors decided to select towns from this group based on their general potential (finances, human resources, varied developments and a wide range of stakeholders) compared to smaller towns. It was therefore assumed that the MRPs of these towns are more likely to contain a wide and varied set of activities undertaken in revitalisation processes and therefore chances are greater that projects related to the studied topic will be present. At the same time, a research sample of 60 MRPs allowed to obtain a pool of centres representing large and medium Polish cities. The analysed documents were drafted from 2016 to 2021, with a decided majority (44) passed in 2016 and 2017, and the remainder (16) from 2018 to 2021.

Method

The first stage of the study included analysis of the presence of BGI in the detailed revitalisation area diagnosis. The sphere to which BGI-related issues were assigned was verified, since it might belong to either the spatial and functional or environmental area. Spatial analyses were used as a tool for in-depth diagnosis. Such analyses may present, for example based on cartographic materials, issues related to the availability of greenery areas or the natural system of an area. Our work verified the use of such studies. A factor taken into account in the MRP is the voice of the local

community. While studying the diagnostic section, we checked whether inhabitants raised issues concerning the condition and potential lack of BGI constituents and whether such opinions were considered when defining the problems and potentials of the revitalisation area. The above components were identified by interpreting MRP passages according to the BGI definition mentioned above.

The other analysed component were the objectives and directions of revitalisation activities. In that section, contents related to set objectives and directions of actions have been verified, considering the presence of issues related to the implementation and development of BGI. As in the case of detailed diagnosis, spheres to which these elements had been assigned have also been taken into account.

The final component of the analysed documents was the section on planned revitalisation projects. While analysing MRP passages referring to projects, the presence of BGI in the scopes of particular tasks as a component of crisis prevention was identified. Three main categories were then adopted to define the basic characteristics of projects related to greenery and water resources, which included:

- the technical dimension, characteristic for projects focused on activities improving or developing infrastructure,
- the social dimension, characteristic for projects focused on activities improving or developing the quality of life, including integration and social activation,
- the nature dimension, characteristic for projects focused on activities improving or developing the state of natural resources.

In case of projects that encompass more than one dimension or many undertakings with a varied character, their combination was noted.

An additional element of the analysis was evaluating the undertakings for the presence of mutual concepts and spatial connections demonstrating that the investment has been considered in a wider urban development concept, outside a single investment. It was assumed that transformations in the spatial aspect, especially those related to public spaces, should be characterised by mutual consistency, which in case of the BGI concept means the requirement of a two-way connection between the BGI and the urban surroundings. As regards picturing the BGI spatial concept, a useful role (in addition to descriptions of projects) is played by the graphical appendix which shows the basic directions of functional and spatial changes of the revitalisation area and allows a better interpretation of the planned activities as regards spatial changes.

Study results

Based on the analysis of 60 MRPs, it can be stated that the BGI appears in the majority of documents; however, the degree varies depending on the MRP component under consideration. As regards detailed diagnosis of the revitalisation area, the BGI is present in 31 MRPs. In most cases, it takes the form of a description, with varying level of detail, of current greenery resources in the revitalisation area. In 7 documents, the BGI has been placed in the spatial and functional sphere, in 13 in the environmental sphere, and in 4 in both spheres simultaneously. For 7 documents, no clear distinction between the spheres has been noted. It should be emphasised that this division is mostly the result of categorisation used in the MRP. The content placed in various spheres is very similar. 17 MRPs contained a spatial analysis of BGI presence in the revitalisation area. The MRPs noted mostly the location of greenery areas within the revitalisation area and in rare cases mentioned more complex analyses, time, or distance to the greenery. In addition, 19 documents had the BGI issue as a major factor mentioned by stakeholders during social consultations. The inhabitants noted deficiencies in access to BGI and the untapped potential related to existing greenery areas which could be used for social purposes.

In the section devoted to objectives and directions, the BGI concept is present in 28 MRPs. Typically, it appears as a component related to the expansion of greenery areas or improvement of quality of life based on development of riverside areas. In some cases, a reference to the quality of natural resources and the quality of environment can also be found. In 10 documents, this reference has been located in the spatial and functional sphere, in 4 documents in the environmental sphere and in 2 documents in both. 12 documents were found not to contain a clear distinction between these spheres.

As regards revitalisation projects, the BGI concept or its partial scope was taken into account in 40 MRPs. A total of 37 documents contained the technical dimension of undertakings, focusing mainly on infrastructural development which aimed at improving the availability or quality of existing greenery areas or establishing new ones. In 32 documents, BGI was present in the social dimension, focusing mainly on activating and integrating inhabitants based on activities taking BGI or the development of recreational areas into account. 10 documents contained a nature dimension that saw environmental issues in conducted undertakings mainly through revitalisation of natural resources. The nature dimension for the most part appeared together with the other dimensions – 8 times with the technical and social, once with the social – and once on its own.

In the majority of cases, the presence of BGI had a multi-dimensional character. When two dimensions were present, the BGI occurred 22 times in the technical and social dimensions and once in the technical and nature dimensions. In 8 MRPs, projects existed that related to all three analysed dimensions. These activities combined the development of infrastructure and improvement of the quality of social life with preserving the condition of nature. In addition, in 13 documents the BGI took the form of urban projects whose realisation considered ties to other revitalisation projects and the existing urban surroundings.

As regards the presence of BGI in each studied component of the MRP, 17 documents mentioned it in the diagnosis, objectives and directions, and revitalisation projects, and therefore in all three studied sections of the document. In another 17 documents, the projects appeared only in the diagnosis or objectives and directions section. Thus, the existing status of BGI resources and its potentials and shortcomings have not been described in detail or defined as essential objectives and directions of the process. In 6 documents, the existing undertakings were not mentioned in the objectives and directions or detailed diagnosis.

Table 1. Presence of blue and green infrastructure in studied components of municipal revitalisation programmes

Studied component of municipal revitalisation programmes	Number of municipal revitalisation programmes
Detailed diagnosis of the revitalisation area	31/60
Objectives and directions	28/60
Revitalisation projects	40/60

Source: own research.

Table 2. Blue and green infrastructure in studied components of municipal revitalisation programmes (divided into spheres and dimensions)

Studied component of municipal revitalisation programmes	Number of municipal revitalisation programmes
Blue and green infrastructure in the detailed diagnosis of the revitalisation area	
Spatial and functional sphere	7/31
Environmental sphere	13/31
Both spatial and functional and environmental sphere	4/31
No distinction	7/31
Blue and green infrastructure in objectives and directions	
Spatial and functional sphere	10/28
Environmental sphere	4/28
Both spatial and functional and environmental sphere	2/28
No distinction	12/28

Studied component of municipal revitalisation programmes	Number of municipal revitalisation programmes
Blue and green infrastructure in revitalisation projects	
Technical dimension	6/40
Social dimension	2/40
Nature dimension	1/40
Technical and social dimensions	22/40
Technical and nature dimensions	1/40
Technical, social and nature dimensions	8/40

Source: own research.

Table 3. Additional components of municipal revitalisation programmes taking blue and green infrastructure into account

Components taking blue and green infrastructure into account	Number of municipal revitalisation programmes
Spatial analyses	17
Social consultations	19
Projects of an urban nature	13

Source: own research.

Discussion

Based on the results of the study, it must be stated that the presence of BGI in MRPs is relatively frequent (40 out of 60 documents). At the same time, it should be stressed that the presence is very varied in degree and scope, and therefore its potential is not fully tapped. A comprehensive approach to the studied issue can be said to occur in only a few cases (17/40) which include rooting BGI in the diagnosis, objectives and directions, and the resulting revitalisation projects. MRPs are dominated by projects of an individual nature and technical specifics, i.e., renovations and restorations of existing resources. The aspect of improving the quality of life, which includes the development of recreational areas, is also mentioned relatively frequently. Most often, this involves projects aiming at animating riverside areas. The activities resulting from MRP and aimed at restoring the appeal of riverside areas focus mostly on developing the waterfront and providing new services, bicycle trails and other recreational areas. An example of such approach is the Bydgoszcz MRP which focuses its activities in the vicinity of rivers. The programme is also characterised by spatial purposes, which is demonstrated by the inclusion of a layout of public spaces together with blue and green areas.

The nature dimension has a low share in conducted projects. The reason for this state of affairs should probably be sought in legal provisions which treat the nature

sphere mostly through the lens of exceeding environmental quality standards (Article 9, item 1, point 2 of the Revitalisation Act), as well as the basic focus on social issues in revitalisation. The presence of projects taking nature components into account is therefore strictly optional, even though revitalisation objectives contain proposals referring to protection of nature. Hence, completed projects that match the environmental sphere objectives are related for example to replacing heat sources in order to limit air pollution. Examples of cities that take into account nature aspects outside the typical statutory scope include Łódź (“Improve provision of blue and green infrastructure allowing adaptation to climate change”) (Łódź Municipal Office 2016) or Cieszyn (“Growth of ecological awareness, more intense nature protection and better use of the landscape potential of the revitalisation area”) (Cieszyn Municipal Office 2017).

At the same time, one should note the clearly noticeable connection between BGI components and the spatial and functional sphere as well as the importance of nature areas as far as social needs are concerned. This argument is supported by greenery-related proposals raised in social consultations. The revitalisation process stakeholders often point to the improvement of availability or development of new greenery areas in public spaces as one of the most important issues that should be achieved by MRPs. Support for this argument can likewise be provided by the increased importance and share of the spatial sphere in the objectives and directions or revitalisation compared to the diagnosis section. In the in-depth diagnosis, greenery is nevertheless an issue analysed in the nature sphere, while on the level of objectives and directions of actions it is often recognised as a component of the spatial sphere, which leads to its increased importance in the strategy section of the MRP. At the same time, it should be noted that for the majority of towns, BGI does not currently play a major role in comprehensive development of space in revitalisation areas. Wider mutual spatial connections between revitalisation projects that take BGI into account can be found only in 13 documents. This is, however, a general trend of predominant use of individual projects.

Revitalisation as commonly understood is often equated with activities that develop urban space, focusing on renovating squares or buildings. Activities of this kind should undoubtedly be included in the MRP, since the act mentions “urban solutions that do not match the changing functions of an area” (Article 9, item 1, point 3 of the Revitalisation Act) as one of the factors proving that an area is degraded. The spatial and functional aspect in revitalisation processes is a complex issue that combines buildings, streets, parks or water areas into a single urban whole. Complex prevention of degradation that takes place at the stage of implementing the revitalisation process requires an early identification of needs and potentials and outlining

a suitable vision of changes in the form of urban solutions that affect the entirety or part of an area. This is demonstrated by few examples: in Żyrardów (“increasing the surface of green areas and biologically active surfaces (e.g. by introducing green roofs and bus stops), capturing and managing rainwater (including minor retention), developing and protecting ecological and aeration corridors, adjusting greenery areas to recreational and leisure functions”) (Żyrardów Municipal Office 2021) or in Łódź (“renaturalisation of watercourses and/or feeding them with rainwater and melting water after suitable pre-cleaning, removing concrete and planting greenery by, among others, setting up façade gardens, green walls, rain gardens or minor retention solutions”) (Łódź Municipal Office 2016). Introducing the solutions mentioned in the above examples leads to improving the general quality of life and the aesthetics of revitalisation areas, while the implemented revitalisation projects are characterised by greater synergy.

The revitalisation process has considerable potential to initiate changes in degraded areas. Hence, it is possible to properly direct the transformations according to the needs of a specific location already at this early stage. The majority of revitalisation projects describe their assumptions in general terms, but often lack BGI components, mainly because they have no direct connection to nature areas. Of course, this does not rule out taking BGI into account at the project implementation stage; however, the lack of guidelines may cause this issue to be omitted. Noting general purpose guidelines for space development projects at the early stage of the process may save such space from unnecessary functional degradation, for example cutting down of trees. The decided majority of MRPs implement the guidelines solely in individual projects. An example of different practices can be found in Wołomin and Lębork. In both towns, in addition to standard components, revitalisation programmes include an appendix entitled “Guidelines for good public space standards” which contains general suggestions taking into account, among others, the use of BGI and stressing the importance of high-quality public spaces in the revitalisation process (Lębork Municipal Office 2017, Wołomin Municipal Office 2017).

The BGI concept should be based on providing a wide palette of functions. Accordingly, the added value is including one of the most important functions of BGI, that is the preservation and protection of biological diversity and mitigation of negative consequences of climate change, in relevant projects. The issues noted above have been taken into account in both objectives and projects of MRPs, for example in Słupsk through the “Słupsk green wedges – arranging green areas within the city of Słupsk” (Słupsk Municipal Office 2020) and in Łódź, in which an objective called “Improve provision of blue and green infrastructure allowing adaptation to climate change” has been noted. This objective is being achieved through the “Popularisation

of blue and green infrastructure” undertaking, whose assumptions encompass the revitalisation area and locations which have a major impact on that area for hydrological and environmental reasons (Łódź Municipal Office 2016).

However, in order to successfully implement the BGI concept as part of revitalisation programmes, it is not enough to assume “restoration” or “renewal” of greenery in relevant projects. As already mentioned, the majority of undertakings carried out in the MRP have a technical character, while environmental values are rarely taken into account. To implement the BGI idea, taking into account all its dimensions and functions, the nature of initiated projects should consider the aforesaid factor of biological diversity protection, regulation of microclimate, or retention or rain-water. The conducted undertakings should have a comprehensive character, in particular take into account the environmental aspect. These activities should not cancel each other out but rather be mutually complementary. This topic can be observed in projects that transform urban wasteland into greenery areas having a social function. An example can be found in the Kołobrzeg MRP (Kołobrzeg Municipal Office 2018), which provided for developing a green wasteland while preserving the “partly spontaneous” character of the location. Importantly, this proposal was the result of social consultations with inhabitants. Realising such a project therefore answers the basic objective of revitalisation: improving the quality of life of the local community.

Comparing these results with other studies, it should be pointed out that the issue of revitalisation is dealt with in multiple countries, but the process is strongly rooted in national legislation and therefore the manner in which it is carried out and the scope of the issues dealt with have a very individualised character. Considering the above, the studied issue should be referred to Polish conditions. Currently, the number of review studies of MRPs as regards the use of BGI is small. One example is *Opracowania tematyczne z zakresu BZI w procesach rewitalizacji* (Basińska, Spadło 2020a, 2020b), which cites projects implemented as part of revitalisation activities as case studies related to issues tackled in this paper. The topics dealt with in these publications relate to cities such as Łódź, Bydgoszcz or Gdańsk, for which the conducted activities are the result of the revitalisation policy set out in the MRP. Hence, projects present in the MRP are implemented and have an actual impact on reality.

On the other hand, the list of domestic studies which deal specifically with the issue of green areas in revitalisation is much longer. The topics discussed in these publications deal with issues related among others to the role of urban parks in the revitalisation process (Wilkosz-Mamcarczyk 2017, Sochacka-Sutkowska 2016). Similarly, the major role of greenery in the revitalisation process of cities is described in the doctoral dissertation of the previously mentioned Wilkosz-Mamcarczyk (2015). Another publication, in turn, notes functional and spatial continuity as one of the

factors defining a park's revitalisation value. That study also underlines the essence and potential of spatial integration of degraded areas based on green infrastructure (Kazimierczak 2017). It can therefore be generally assumed that the theses of these authors are to some degree similar to the results of analyses found in this paper. It should, however, be stressed that the studies mentioned above do not deal directly with the policy pursued by the MRP, as they are general thoughts on the issue of revitalisation in the context of greenery. It appears reasonable to study this topic further as regards BGI-related activities implemented by local government units.

Summary

Analysing the contents of the studied documents demonstrates that issues related to BGI appear relatively frequently; however, their full potential remains untapped. One can note the varying assignments of BGI to basic spheres found in MRP documents. This issue can be found in both the spatial and functional and the environmental sphere.

The presence of BGI appears to be somewhat inconsistent on the level of diagnosis, objectives and directions, and projects. BGI is present more often on the level of projects than on the other two levels. This might mean that the issue is not fully included in implementation of the revitalisation process or that the potentials and shortcomings in this respect are not accurately defined. The projects implemented as part of MRPs are for the most part individual investments not closely connected with the urban surroundings. BGI-related activities are most frequently projects of a technical nature that involve improvements of infrastructure, and only slightly less frequently projects related to the social dimension that involve, among others, recreation or social integration. Both aspects are very often found coexisting in a single document. The nature dimension related to improving the quality of environment is encountered much less frequently in implemented projects. Even when this dimension appears, in the decided majority of cases it coexists with the other two dimensions and is implemented through projects of an urban character.

This work does not treat the studied topic in an exhaustive manner, sketching issues for further study as regards:

- studying the issue of BGI in delimitation diagnoses;
- studying the characteristic perceptions of BGI as part of revitalisation spheres;
- studying the characteristic BGI-related undertakings completed as part of MRPs;
- comparative analyses of variously conducted revitalisation processes in terms of BGI.

Considering the analysed problems and the rising wave of environmental threats, the potential offered by the BGI concept in revitalisation may grow in importance in subsequent years. It should therefore be remembered that degraded areas will, in addition to social or economic crises, increasingly often face challenges related to the consequences of changes occurring in the natural environment.

Statement about the contributions of each author

All authors contributed to the writing of this paper and approved the submitted version. The share of authors in reviewing literature, designing the study methodology, conducting the study and describing the results is: 50% MC and 50% KC.

Statement about conflict of interest

The authors declare that this study has been conducted without any commercial or financial ties which might be interpreted as a potential conflict of interest.

Statement about the availability of study data

This study has analysed publicly available sets of data. A list of source data references can be found at: <https://docs.google.com/spreadsheets/d/1l6XBsfaVzFXtUqr2a9VPR3Y6h0Zan8kVb3QHVEQRqnI/edit?usp=sharing>

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