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Doctoral dissertation

Circular economy in the regeneration of degraded areas of cities

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1. State of the art with justification for the choice of topic

Nowadays, urban centers face many challenges, and a significant part of the problems are the result of linear economic models based on *the take-make-waste*[1] model, which does not allow cities to respond to the challenges related to resource scarcity and environmental pollution. In this context, in a broad sense of the need to reduce the causes and effects of urban degradation, the functioning of cities as production and consumption systems implementing goals based on linear models poses a threat to sustainable development processes[2]. This can be fixed by increasing their productivity and innovation, as well as by trying to find optimal solutions for building the resilience of cities and strengthening their independence from external factors. This requires an integrated approach to urban policy, which should not only promote sustainable development, but also become the basis for repairing those areas of cities that can no longer perform the function they need, which should be prioritised[3]. The answer may be the circular economy model, which closes the loop of resources and minimizes waste, offering solutions that can bring both environmental and economic benefits. The inclusion of circular economy solutions that support the way cities function seems to be crucial not only to increase control over development processes, but also to reduce the costs of their operation while reducing the waste of resources and ensuring good living conditions. Among the literature describing the results of research and research and development works aimed at improving business models, special attention is paid to those that allow for the inclusion of eco-innovative solutions, on which *circular economy strategies are based*, in the processes of urban development.

Such a process in Polish conditions is revitalization, which, although it is an optional task of municipalities, has been arousing interest for years as a process enabling the conduct of repair processes to solve the problems of cities. The need to support cities in this area often results from the lack of control over their development or investment negligence, which is why there is an increasingly widespread awareness that it is necessary to take care of the already existing resources, including existing urban areas.[4] Revitalization should be treated as a holistic process focused on restoring or introducing a new quality of degraded areas, which is to foster revival while improving the condition of space and its physical elements[5]. In the Polish literature on the subject, the first attempts to search for a relationship between revitalization (in a holistic

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[1] Which can be translated as: take (raw material) - produce (product) - throw away (waste).

[2] Williams, J. (2019). Circular Cities: Challenges to Implementing Looping Actions. Sustainability, 11(2), 423. https://doi.org/10.3390/su11020423

[3] Nowakowska, A., Legutko-Kobus, P., & Walczak, B. M. (2019). Chapter I. Revitalization in historical and theoretical terms. From Rehabilitation to Social Inclusion: A Contemporary Approach to Revitalization Processes, 7–134.

[4] Nowakowska, A., Legutko-Kobus, P., & Walczak, B. M. (2019). Chapter I. Revitalization in historical and theoretical terms. From Rehabilitation to Social Inclusion: A Contemporary Approach to Revitalization Processes, 7–134.

[5] Drobniak, A., Szafranek, E., & Dembicka-Niemiec, A. (2016). The impact of revitalization projects on economic competitiveness on the example of municipalities of the Opole Voivodeship. Problems of Urban Development, 13(4), 75–84.

view of this process) and circular economy were made in 2019[6]. The paper is a continuation of the above considerations, focusing on verifying the possibility of including the circular economy in the revitalization of Polish cities, also examining the openness and susceptibility of local governments to the use of such an approach. Making good use of these opportunities and integrating them into urban policies and development strategies can bring real benefits for both the environment and local communities.

The study was based on the analysis of the processes taking place in the group of cities belonging to medium-sized cities[7] losing their socio-economic functions[8] and carrying out revitalization activities in response to the problems of degradation. As Śleszyński points out, these cities, being centres subjected to the processes of weakening the economic base as a result of political and socio-economic transformation, are indicated as requiring strengthening in the network of cities in order to ensure more stable development bases, and in solving their problems, the effectiveness of the development policy methods used so far is insufficient. The policy of supporting these centres should be associated with exceptional involvement of the local governments of these cities in diagnostic processes, rational planning of strategic activities, which may result in a particular potential for the implementation of new, innovative solutions.

2. Subject of research, objectives and research questions

The circular economy is an evolving concept, it is considered a necessary and pragmatic solution to reconcile the relationship between growth rates and pressures on environmental resources. Many definitions of the circular economy are used in the scientific literature and professional journals. The circular economy can be understood as an idea and an ideal in the face of the increasing limitations of the Earth's natural resources, facing limitations as a new way to transition to production and consumption for sustainable development. The essence of including circular strategies in the management processes of cities struggling with the problem of the availability of resources necessary for development is to move away from linear management models implemented in the *take-make-dispose*[9] formula towards circular models, allowing cities to increase their independence from external resources, reduce the pressure of these cities on the environment, while reducing the costs of their operation. Such an approach brings the expected results, as shown by the processes involved in the inclusion of circular strategies as a solution supporting the recovery of degraded areas from the crisis. Revitalization processes included in the system of managing the development of Polish cities have a similar goal. Revitalization is seen as an opportunity to minimize the scale of urban degradation, restore

[6] Nowakowska, A., Legutko-Kobus, P., & Walczak, B. M. (2019). Chapter I. Revitalization in historical and theoretical terms. From Rehabilitation to Social Inclusion: A Contemporary Approach to Revitalization Processes, 7–134.

[7] It is assumed that these are cities with more than 20,000 inhabitants, excluding provincial capitals and cities with a population of 15,000-20,000 inhabitants that are county capitals, and this group actually includes several large cities with a population of over 100,000 inhabitants (Śleszyński, 2016, p. 2)

[8] Śleszyński, P. (2016). Delimitation of medium-sized cities losing their socio-economic functions.

[9] Which can be translated as: take (raw material) - produce (product) - throw away (waste).

values, as well as reuse resources that have ceased to perform their function and have lost their usable properties, which makes it impossible to meet current social needs.

The starting point for the research process was the desire to find connections between the circular economy and the revitalization carried out in Polish cities, both in terms of the problems solved and the tools for improving the condition of cities that can be used. In particular, the subject of interest is the assessment of the circularity of processes carried out in cities. The basis for formulating the research problem is the assumption that nowadays the problems of degradation of urban areas are significantly related to their functioning in linear economic models. It was also assumed that, as a rule, the revitalization processes carried out in Polish cities take into account the implementation of circular economy activities, and the representatives of local government conducting revitalization at the local level treat this process as one that takes into account the improvement of the quality of urban resource management.

The main objective of the dissertation (CG) is to assess the state and possibilities of implementing circular economy solutions as part of revitalization processes carried out in Polish small and medium-sized cities. The main objective is accompanied by the following specific objectives (CS):

1) specific cognitive objectives:

CS.1: Identification of the causes and effects of degradation of Polish cities in the context of the possibility of applying circular economy solutions;

CS.2: Inventory of circular economy activities and projects implemented in revitalization areas in Poland;

CS.3: Identification of the state of knowledge and awareness of circular economy and the possibilities of its implementation in revitalization.

CS.4: Defining barriers limiting the implementation of circular economy solutions in the revitalization of Polish cities.

2) Specific methodological objective:

CS.5: Development of a synthetic measure: the Revitalization Circularity Index enabling the preparation of a ranking of cities from the point of view of the state of implementation of circular economy solutions in revitalization;

3) Specific practical objective:

CS.6: Developing a package of recommendations for circular revitalization.

The following research questions were formulated:

PB.1: What are the causes of urban degradation indicated in revitalization programs leading to disturbances in urban development?

PB.2: What circular economy activities are being implemented in revitalisation areas?

PB.3: Do representatives of local government at the local level treat revitalization as a circular process?

PB.4: Which of the activities carried out as part of the revitalization implement, in the opinion of local government representatives, the assumptions of the circular economy?

PB.5: What are the barriers limiting the implementation of circular economy solutions in the revitalization of Polish cities? PB.6: How can the circularity of revitalization be assessed?

PB.7: What actions should be taken to intensify the implementation of circular economy solutions in revitalization?

The study was based on the analysis of revitalization processes carried out in Polish cities belonging to the group of small and medium-sized cities, focusing primarily on those aspects of implementation within revitalization processes where it is possible to include *the circular economy* in the processes of repairing degraded urban areas. It was analysed what is the relationship between the problems of cities, indicated in the documents constituting the basis for revitalisation, and disturbances in the flow of matter and energy within numerous spheres of its functioning. A relationship between the nature of revitalization activities was also sought, focusing on planned activities aimed at improving the situation of degraded urban areas in the economic, spatial-functional, environmental and technical spheres, verifying the scope of planned activities in the context of their convergence with the principles included in circular strategies. In this case, the analyses were based on the framework of circular systems constituting the basis for the analyses described in foreign literature. It should be emphasized that for the purposes of this study, the focus was mainly on the material aspects of revitalization. The social aspects of the process, due to the nature of the study, were analysed on the basis of the accounts of people planning and conducting the processes, who are representatives of local government units.

3. Research methods and tools, sources of information

The process of research proceedings aimed at seeking answers to the research questions posed was carried out with the use of triangulation of research techniques, which allowed for a broad view of the study phenomenon. In the case of the subject matter of the *innovative circular economy*, the possibility of supplementing qualitative techniques with quantitative ones was crucial to obtain a full picture and better understand both the state of affairs and the attitudes and opinions of the participants of the processes. Thus, the data on the basis of which the study was conducted are complete and reliable, and their completeness is sufficient to draw conclusions for the purposes of the dissertation.

The theoretical part of the work is based on the qualitative method - *desk research,* which allows for the presentation of the results of literature studies and critical analysis of existing data. They concerned both the study of the importance and role of environmental resources in economic theory - from the analysis of the effects of the impact of the economy based on linear models on the environment, the genesis of the development of economic models aimed at transformation towards solutions aimed at closing the loop of resources, to the search for circular economy solutions used in urban revitalization processes. As part of the literature studies, an attempt was also made to describe the problems of urban degradation as being the result of a linear approach to the management of their resources. In particular, an attempt was made to search for the relationship between the causes and effects of urban degradation and disturbances in urban metabolism. Analyzing the conditions for planning and conducting the

revitalization process in Polish conditions, the relationship between revitalization, which is a process whose main goal is to restore values and goods, and the possibility of including circular economy solutions in the processes of repairing degraded urban areas, was sought. A review of the literature in terms of areas of possible inclusion of these solutions in revitalization processes allowed to prove the existence of their strong correlation as circularity-based urban development processes - concerning the processes of loss of value, utility and attempts to restore them, most often in an improved formula. The analysis of the transformation processes of problem areas described in the foreign literature, implemented as part of the urban revitalization processes of the Netherlands, Great Britain and Sweden, made it possible to explain both the method of preparing circular urban revitalization strategies and to understand the mechanisms of their inclusion in the processes of creating policies at the local level. The case studies described in the paper, which are the result of comparative considerations, also provide conclusions on the effects of these processes, as well as the methods and scope of involving local communities in them, which applies to both initiating circular transformation and co-creating solutions for urban areas requiring improvement of operating conditions. The scope of the analysis has been adapted to the scope of the information sought, allowing for a comprehensive description of the issues being the subject of the study.

For the purposes of the empirical part, qualitative methods have been supplemented with quantitative research. In the first place, the process of analyzing the content of the documents constituting the basis for the revitalization of Polish cities was carried out, in order to verify information on the causes and effects of urban degradation, in relation to the effects of their functioning based on linear models. For this purpose, the degradation factors described in the revitalization programs were verified in order to indicate those that directly relate to the disorders of the city's metabolism or resulting from these disorders, such as: energy and matter flows related to the production sphere, construction, energy transformation, the size and structure of consumption and services. The method of analysis was inspired by the catalogue of forms of metabolism indicated by Mizgajski[10] , supplemented by the author of the study. The following forms of degradation were assessed as indicated in the programs: construction metabolism, energy metabolism, water and sewage metabolism, production and service metabolism, communication metabolism, natural metabolism, metabolism of space use and metabolism of residents, i.e. resulting from the living and living needs of people living in a given urban ecosystem. This approach allowed for the assessment of which of the indicated reasons for revitalization result from linear models of functioning of urban areas.

Then, an inventory of circular economy activities that are carried out as part of revitalization was made, which allowed to determine the degree of implementation of the principles supporting the transformation towards a circular economy and constituting the basis for creating circular strategies in the revitalization processes of the surveyed cities. The above assessment was made on the basis of information obtained in the process of analysis of the content of documents constituting the basis for the revitalization of the group of surveyed cities and the

[10] Mizgajski, A. (2000). Determination of the desired features of ecologically sustainable development of Poznań, directions of improvement of the urban environment and giving the improvement a permanent character. Bulletin of the KPZK, 192, 221–244.

content conducted with representatives of these cities who are local leaders of revitalization in-depth interviews (IDI).[11] In order to obtain answers to research questions about knowledge and awareness of *the circular economy* and the possibilities and barriers to its inclusion in revitalization processes, the PAPI survey [12]was used, carried out in the form of auditorium surveys, during meetings with representatives of local government units.

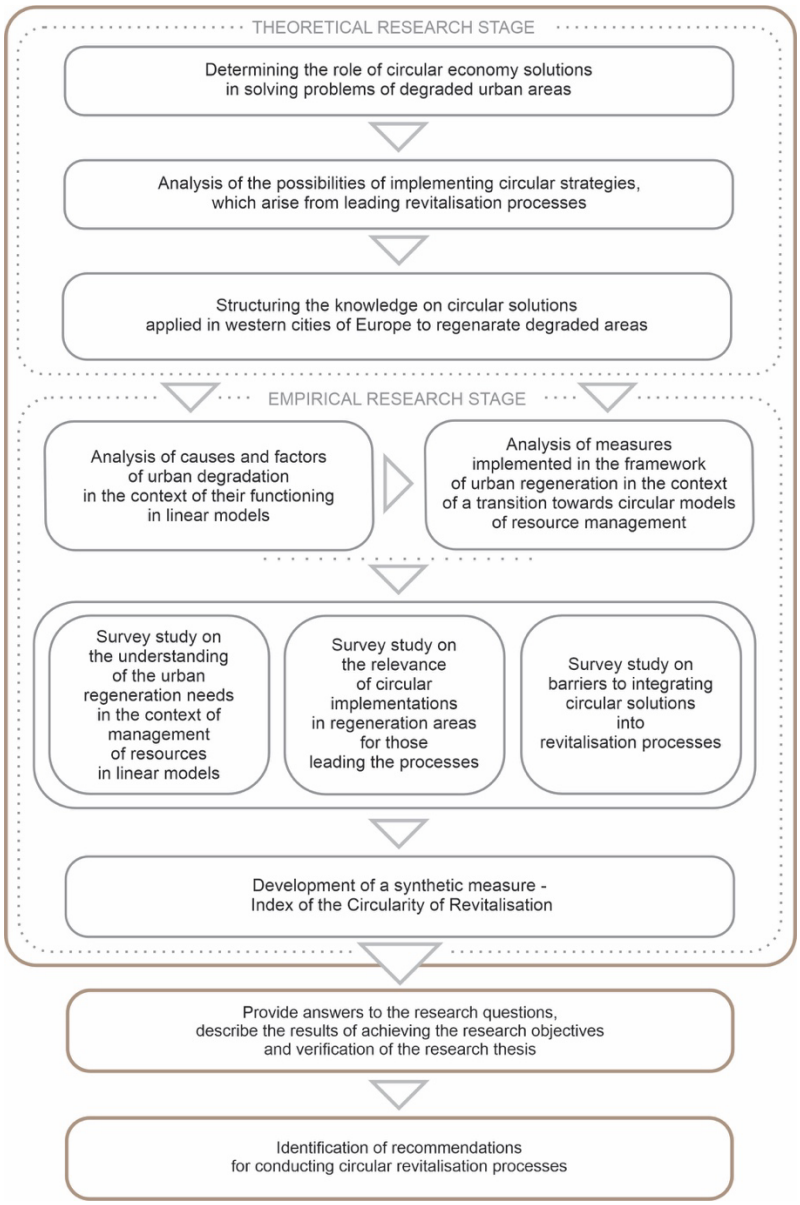
The determination of the degree of circularity of the revitalization of the surveyed cities was based on the construction of a synthetic measure - the Revitalization Circularity Index, as well as the analysis of its calculated values for the years 2016 and 2020, i.e . in the period of planning and validity of the document constituting the basis for revitalization. In addition, an attempt was made to identify those component ratios that significantly affected the value of the Index.

4. Structure of research work

The research that is the subject of this dissertation is based on two planes of analysis: the theoretical plane (chapters one, two and three) and the empirical plane (chapters four, five and six). In the empirical part, a method of measuring the degree of circularity of revitalization of Polish cities was also proposed using a developed measure, allowing to study the method of conducting revitalization as well as its impact on shaping the space of cities and their functioning, i.e. the Revitalization Circularity Index. At the end, the study was summarized and recommendations were presented to improve the circularity of urban revitalization processes carried out in national legal and organizational conditions. An integral part of the work are Appendices (from 1 to 5), placed in its final part, as well as lists of terms used in the work, abbreviations, lists of sources, graphics, tables and charts.

The first chapter, which begins the theoretical part, presents the development of the concept *of circular economy*, from the model for the functioning of industry to the model constituting the basis for creating strategies for the functioning of cities. The chapter describes the history of research on the relationship between environmental resources and the functioning of economic systems, draws attention to the increase in awareness of limiting the availability of resources over the years, and finally shows the essence of problems resulting from the functioning of the economy in the linear model. Further on, the history of shaping the concept of circular economy is described, the diversity of concepts and the complexity of the issue is presented, with a significant focus on the role of circular solutions in the processes of improving resource management in urban areas and reducing the effects of their negative impact on the state of the environment in global terms.

[11] The interviews were conducted from July to October 2022. For the purposes of the study, 9 interviews with revitalization leaders were conducted.
[12] The survey was conducted between July and November 2022 on a group of 93 respondents.



Structure of the research process
Source: Own study.

The second chapter describes the essence of urban revitalization as a process that allows for eliminating the effects of their functioning in linear models. It presents a description of the conditions for the revitalization of Polish cities, from legal and institutional, through financial and social. It describes the revitalization tools at the disposal of process leaders, focusing on those that allow for the inclusion of circular economy solutions in both planning and conducting processes. Both chapters are the starting point for creating the concept of circular revitalization, which is one of the aspects of the study.

The third chapter describes how circular solutions for cities are planned and implemented. In order to illustrate the diversity of approaches and describe the solutions already used, selected cases of cities in the Netherlands, Great Britain and Sweden were analyzed. Thus, this chapter is a catalogue of solutions for improving the condition of cities focused on changing the

approach to designing multifunctional districts, public spaces, including green spaces, planning urban technical infrastructure or buildings. It also discusses the diversity of approaches to integrating circular solutions into the strategic planning processes of cities, largely resulting from national conditions.

Chapter 4 presents the results of the analysis of the causes of degradation of urban areas, which were presented in the documents constituting the basis for its conduct. The analysis verified the causes of deterioration of the condition of cities, described in the revitalization programs, which were the basis for the delimitation of degraded areas, and then verified them in the context of connections with disorders of construction, energy, water and sewage, service, communication, natural metabolism, space and metabolism of residents. The analysis was an attempt to search for relationships between the diagnosed problems of urban degradation and their functioning within linear models of resource management.

Chapter 5 presents the results of the evaluation of basic projects planned for implementation as part of the revitalization of the surveyed cities, made on the basis of the method of examining the relationship between their results and the principles allowing for the inclusion of circular economy strategies in the conducted activities. For each of the cities, the assumptions of projects aimed at reducing degradation factors in the economic, environmental, spatial-functional and technical spheres were analyzed, in reference to the framework for creating circular RESOLVE systems developed by the Ellen MacArthur Foundation, as well as nine circular strategies according to the framework promoted by the Metabolic Foundation.

The content of chapter 6 is the results of a survey conducted among people involved in planning and conducting revitalization in the surveyed cities, showing how they perceive revitalization as a process implementing circular strategies, the need to use circular economy solutions in revitalization, as well as the barriers to circular implementations that they perceive. The second part of the chapter proposes a methodology for developing the Revitalization Circularity Index to study the impact of revitalization on the inclusion of circular solutions in activities carried out in degraded urban areas.

At the end, the study was summarized, and recommendations were presented at the national and local level regarding the improvement of circularity of urban revitalization processes carried out in national legal and organizational conditions.

5. Summary

The experiences of cities analysed in the course of the study also show what factors guarantee the success of circular implementations. They mainly concern openness to an innovative approach in process planning and the selection of solutions. Managing the process of urban repair by cross-sectoral urban teams, incorporating *circular economy* principles into public procurement, using innovative financial models in revitalized districts, introducing experimental solutions not only with the participation of the area's residents or future users, but also in cooperation with the scientific community are methods that allow for monitoring the effects of implementations and correcting the decisions made. about organizational openness to activities that can contribute to supporting the effectiveness of circular implementations.

The analysis of the causes of degradation of Polish cities of the study group allowed to achieve the first cognitive goal (CS.1: Identification of the causes and effects of degradation of Polish cities in the context of the possibility of applying circular economy solutions). The study included the search for the causes of urban degradation, which was indicated in the urban revitalization programs of the study group, which lead to disorders of their development (PB.1). The results of the analysis indicate a cross-sectional nature of problems, with the largest number of those related to urban space and the condition and function of buildings. Spatial problems include the disharmony of buildings and their inadequate, unsuitable functions, which prevent their effective use. The second cognitive goal (CS.2: Inventory of circular economy activities and projects implemented in revitalization areas in Poland) was achieved through the analysis of revitalization projects in the respondents, which showed that to varying degrees, however, they implement circular economy strategies. The study included the search for circular economy activities *that* are implemented in revitalization areas (PB.2). The first group of projects analysed focuses on the conservation and enrichment of natural capital. The second group of projects intensifies the use of urban resources. The third group of projects focuses on maintaining the quality of elements of the urban structure for a longer period of time. The last group of projects supports the efficiency of the system by eliminating negative externalities. Examples of projects include improving transport infrastructure, upgrading buildings and introducing economic initiatives that contribute to the development of local communities and economies.

As a result of the study conducted with the participation of representatives of the local governments of the surveyed cities, the third cognitive objective was achieved (CS.3: Identification of the state of knowledge and awareness of circular economy and the possibilities of its implementation in revitalization). At this stage of the study, the question was sought whether representatives of local government at the local level treat revitalization as a circular process (PB.3). The results of the research conducted for the purposes of this work, aimed at identifying the state of knowledge and awareness in this area, indicate that revitalization, according to people conducting these processes, supports sustainable development policy, although it is also a source of financing activities planned in cities, not necessarily in line with this policy. The understanding of the specificity of Polish revitalization is reflected in the declaration that the social aspect is crucial, offering the opportunity to improve the social situation and professional activation of residents. In addition, it was verified how, in the opinion of the respondents, the activities carried out as part of the revitalization implement the assumptions of the circular economy (PB.4). The survey in this section found that respondents mostly see value in innovation that reduces environmental pressures and improves the quality of life in cities. Initiatives such as increasing the participation of residents in the revitalization process, increasing the number of grassroots initiatives and environmental education are seen as key to the implementation of eco-innovative strategies as part of revitalization activities. Respondents point to elements that contribute to building circular strategies, such as reducing air pollution, rainwater management, land reclamation and creating new green spaces, as very important. It is also important to improve pedestrian and bicycle communication. More than half of the respondents pay attention to the technical aspects of revitalization, such as the energy efficiency of buildings, considering them important. An important part of the survey was to

verify the opinions of representatives of local governments and their opinions on the barriers limiting the implementation of circular economy solutions in revitalization. The study also allowed to achieve the fourth cognitive goal (CS.4: Defining barriers limiting the implementation of circular economy solutions in the revitalization of Polish cities). The analysis of the responses revealed that the main problem is insufficient knowledge of this issue and the dominance of traditional models of operation ("*business as usual*") instead of a circular approach. Although respondents are aware of the potential for eco-innovation projects, the lack of standards and good practices in this area and the lack of available data to prove the effectiveness of such projects are serious barriers to their implementation. An additional limitation is the higher cost of eco-innovative solutions compared to traditional methods and the lack of support, especially for the private sector, in the implementation of these innovative projects. Although the implementation of projects in partnership could reduce the scale of these problems, there are formal concerns from both the local government and private sectors. It is also important that only a small group of respondents consider improving the management of the city's resources as a goal of revitalization, and an even smaller group admits that reducing environmental costs is not a priority in planning and implementing revitalization investments. In order to achieve the methodological goal (CS.5: Development of a synthetic measure: the Revitalization Circularity Index enabling the preparation of a ranking of cities from the point of view of the state of implementation of circular economy solutions in revitalization), a review of the measures used to examine the state of circular economy implementations in cities around the world was carried out, and then they were related to the specificity of revitalization activities carried out in Polish conditions. An attempt was made to answer the question How can the circularity of revitalization be assessed (PB.6). The development of the Index is the first attempt to treat revitalization as a circular process, so the set of indicators is not a model set, but rather an attempt to examine the availability of data and the possibility of obtaining them in the city halls conducting revitalization. Due to the need to obtain data on the revitalization area (and not the entire statistical unit such as the city), collecting data required additional involvement of the office employees and was not an easy task. The method requires verification, also with the participation of people who can provide such data on behalf of cities. The indicator proposed in the form presented in the study made it possible to measure the circularity of the revitalization of selected Polish cities. Moreover, the proposed method allows you to update and expand the set of indicators. It seems reasonable that the method of monitoring revitalization circularity should be an element of revitalization planning, the components of the index should be adapted to both revitalization needs and their scale, as well as revitalization goals. The proposed measure allowed to answer the question about the circularity of revitalization carried out in Polish cities, sufficient for the purposes of the study. The results developed during the research procedure allowed for the development of a package of recommendations for circular revitalization, which was the practical goal of the work (CS.6). In response to the question of what actions should be taken to intensify the implementation of circular economy solutions in revitalization (PB.7), a package of the following guidelines has been formulated that can contribute to giving revitalization the character of a process using the assumptions of circular economy.

List of cited sources:

1. Drobniak, A., Szafranek, E., & Dembicka-Niemiec, A. (2016b). Wpływ projektów rewitalizacyjnych na konkurencyjność gospodarczą na przykładzie gmin województwa opolskiego. Problemy Rozwoju Miast, 13(4), 75–84.
2. Mizgajski, A. (2000). Określenie pożądanych cech ekologicznie podtrzymywalnego rozwoju Poznania, kierunków poprawy środowiska miejskiego i nadania poprawie charakteru trwałego. Biuletyn KPZK, 192, 221–244.
3. Nowakowska, A., Legutko-Kobus, P., & Walczak, B. M. (2019). Rozdział I. Rewitalizacja w ujęciu historycznym i teoretycznym. Od rehabilitacji do włączenia społecznego - współczesne ujęcie procesów rewitalizacji, 7–134.
4. Śleszyński, P. (2016). Delimitacja miast średnich tracących funkcje społeczno-gospodarcze. http://rcin.org.pl/igipz/Content/98319/PDF/WA51_114731_pdf-r2016_Delimitacja-miast.pdf
5. Williams, J. (2019). Circular Cities: Challenges to Implementing Looping Actions. Sustainability, 11(2), 423. https://doi.org/10.3390/su11020423