

SPATIAL DEVELOPMENT OF REGENSBURG/RATYZBONA TOWARDS THE CITY OF "GREEN" HOUSING ESTATES

Bogusław WOJTYSZYN¹

University of Zielona Gora, Zielona Góra, Poland

A b s t r a c t

This article raises important issues related to global threats to the urban environment and methods of its protection on a scale from urban planning to architectural design. The research undertaken in this respect was conducted on the selected medium-sized German city of Regensburg/Ratyzbona. This is a city that has for many years been implementing a spatial development policy in line with the principles of sustainable development. The research results obtained present very interesting design solutions for the way they have been implemented in order to constantly improve the ecological effect of urban development. The basic element strongly associated with the sustainable development of Regensburg's buildings is its Urban Greenery System that takes into account the natural and cultural heritage of the city and its suburban areas. This system is, as the research has shown, legally protected and, in a model-based way, expanded both on the scale of the city and of each housing estate. The presented results of research on this type of ecological project also relate to pilot analyses of the construction projects of the "green" Burgweiting-Mitte housing estate and reconstruction together with the restoration of the historic "green" Ganghofersiedlung housing estate.

Keywords: sustainable city development, sustainable urban development

¹ Corresponding author: University of Zielona Góra, Faculty of Civil Engineering, Architecture and Environmental Engineering, Institute of Architecture and Urban Planning, ul. Prof. Z. Szafrana 1, 65-516 Zielona Góra, e-mail: wojtyszyn_b@wp.pl, phone: 605 620 208

1. INTRODUCTION

1.1. Purpose and subject of research

This article presents the results of subsequent studies carried out by the author on a scale from urban planning to architectural design. The main purpose of research relate to the chosen direction and methods used for the introduction of principles of sustainable development in one of the European cities in Germany. The studies of urban and architectural designs carried out for the benefit of sustainable urban spatial development refer to the medium-sized German city of Regensburg/Ratyzbona. Planning data thereof are as follows [3, 5, 6]:

Location: Country – Germany; federal state – Bavaria; region – Upper Palatinate; district – Regensburg/Ratyzbona; city with county status – Regensburg/Ratyzbona, located on the Danube at the mouth of the rivers Naab and Regen.

Population: The city with an area of about 81 km² is inhabited by about 168,000 people, including about 140,000 persons of German nationality, and about 28,000 students who are educated at three universities.

City function: Regensburg/Ratyzbona is a historic city with great industrial potential, including automobile production, semiconductor manufacturing, turbine machinery, and the electrotechnical industry. There is a large inland river transshipment port.

The described research results present, among other findings, interesting innovations and pro-ecological solutions, applied both at the stage of urban planning as well as architectural and greenery design. These innovations and solutions also apply to the methods of realization as utilized by the administrative and private sector in Regensburg.

1.2. Description of the method and scope of research

In the field of research on sustainable development of the city of Regensburg, the following analyses were carried out:

- Analysis of the historical background of the city's development, explaining the significant impact of its development on the current socio-economic, cultural, and environmental conditions and the related selection of methods for implementing sustainable development principles in that city;
- Analysis of on a city-and-housing-estates scale the planned environmental, spatial, economic, socio-cultural, and environmental measures for sustainable development;
- Analysis of the implementation methods used, projects planned for the city and housing estates, and sustainable development projects;

- Analysis of the intended and obtained pro-ecological effects as a result of the implementation of projects for sustainable development on a city-and-housing-estates scale.

2. RESULTS AND DISCUSSION

2.1. History of the free city of the Reich

Regensburg (Ratyzbona) is one of the oldest German cities, whose Polish name comes from the Celtic name of the settlement from about 400 years B.C. Radasbon. The historical part of the city lies within the borders of the former Rome camp of Emperor Marcus Aurelius, founded by the Third Legion in the 2nd century B.C. In the 4th century A.D., the city became the official capital of Bavaria and the residence of the Bavarian dukes of Agilofings. Regensburg is also one of the oldest Catholic dioceses still in existence in Germany. It was founded in the 8th century by St. Boniface, governor of the Roman Catholic Church, archbishop of Mainz Bonifatius. During the Middle Ages, Regensburg was one of the richest and most populous cities of Germany (about 10,000 inhabitants), as evidenced by the rich Romanesque and Gothic architecture, still dominant in the Old Town section of the city. Living testimonies to the economic and political power of Regensburg during that era Regensburg also enjoyed the status of being a free city of the Reich (until 1803) are:

- The Stone Bridge, constructed in the 12th century a model of medieval architectural art for many bridge builders at that time and the only bridge on the Danube between Ulm and Vienna then.
- The magnificent Gothic Cathedral of St. Peter, whose construction began in the 13th century but was not completed until the 19th century,
- Medieval Old Town with the 15th century Town Hall with the Hall of the Reich of the first German parliament and the tower of the 13th century. Although Regensburg became an Evangelical city in the mid-16th century, it still belonged to the cities of the Holy Roman Empire up to the 19th century. Meetings of the German Sejm (Reichstag) were held here in the Reich Hall of the Old Town Hall, as were the proceedings of the Perpetual Sejm of the Holy Roman Empire from 1663-1803. The period of the Napoleonic Wars initiated the economic collapse of the city and the loss of former privileges, such as economic and political independence in Bavaria.

In the second half of the 19th century, the city, thanks to the construction of a railway connection with Munich and Nuremberg, again revived economically and strengthened its importance both in the region and in the country. The first

half of the 20th century saw further dynamic development and an increase in the city's importance, along with the expansion of the aerospace industry and the rise of the National Socialists German Workers' Party (NSDAP). They, exerting propaganda pressure on the city, forced the implementation of the so-called National Socialists housing program, which took the form of garden estates. During the Second World War, 28 bombing raids were carried out on the city by the anti-Hitler coalition countries. These bombardments inflicted enormous damage. The worst devastation occurred primarily in the suburban areas, where Messerschmitt's plants (including the largest aircraft factory in Europe at the time) were located. Due to the fact that the city surrendered without a fight in 1945, the historic buildings of the medieval Old Town, inscribed on the UNESCO World Heritage List in 2006, were preserved.

Currently, the largest German industrial concerns operating here Siemens AG, Infineon, and BMW are the main economic pillars driving the development of the city and its region. It should be added that the active economic participation of Regensburg in integrating Europe was recognized in 1997 by the European Union, which awarded the city with the Europe Prize [3].

2.2. Sustainable City Development Plan

The spatial development of Ratyzbona/Regensburg depends to a large extent on the physiographic conditions shape of valley Danube river with the mouth of the Naab and Regen rivers. The structure city is characterized by city compact buildings, the development of which is strongly limited from the north. It is therefore a city of short distances, whose expansion was forced primarily in the south-west direction, and from 1976, also in the south direction. The vast Danube Valley on the southern side of Regensburg has become the basic space for the subsequent development plans of the city for the largest construction projects related to the creation of new housing estates and the renovation of old housing estates existing in the historical city part.

According to Agenda 21 'act locally, think globally', a new City Development Plan was created in 2005, formulating the main principles of sustainable urbanization in Regensburg [5]. Its implementation with the possibility of making successive changes is planned for the period until 2020. Priorities of Sustainable Urban Plan is included:

- Increasing the economic importance of the Old Town through conservation and innovation activities on a large and small scale, using the implemented projects.
- Development of recreational and cultural infrastructure in open and closed spaces.

- Development of a sustainable urban transport system with accompanying municipal infrastructure that provides space for the construction of new residential and commercial areas.
- Renewing and expanding urban social infrastructure as the main flywheel of the city's development.

Implementation of investment tasks is carried out through competing extension plans and pilot projects recognizing socioeconomic conditions within the scope of the possibility of sustainable development of housing estates in areas covered by urban spatial development plans. The City Development Plan provides for increasing the quality of life of its inhabitants through decentralization, extension, and approximation of basic living and health care services in estates as necessitated by the effect of the increase in the number of elderly people in the city as well as throughout Europe. However, the planned development of new housing estates in the city is to be directed toward functional, spatial, and architectural diversity. The new spatial development plans for residential and commercial areas provide for development in degraded, post-industrial areas as well as in places requiring functional and spatial additions. Nonetheless, the new buildings under development in the south of the city within the Burgweinting district are being erected in accordance with the environmental guidelines of the City Development Plan, in concentrated form and harmonized with the natural landscape of the Danube Valley. The Plan does not allow for the creation of chaotically dispersed suburban buildings that would destroy both the landscape and natural environment. It is worth noting that in the Regensburg district of Burgweinting there is a development area that is exceptionally important for the city. This area was included in one of the most extensive development programs in Germany [4]. This program was implemented over an area of 400 ha (hectare), of which 190 ha was allocated for business and industrial high-technology functions (the modern "green" jobs), and about 210 ha for sustainable housing functions. Hence, the buildings of Burgweinting in the 1990s developed first toward the southwest district (Süd-West), and are currently being developed in the central (Mitte) and northwestern part, according to the new urban plans (Nord-West I, Nord-West II, and, until the end of 2013, Nord-West III).

Great importance in the Regensburg Plan is also attached to the development and protection of the landscape and natural **values of the virgin open areas** and built-up green areas. The city greenery system is developed in a wedge-ring arrangement, softly inscribed in the historically shaped concentric-peripheral structure of urban buildings (Fig. 1.). This system performs six core functions in the city: a. Drinking water reservoir. b. A safety zone for protected fauna and flora. c. Regulation of microclimate and air quality. d. A place for both active and passive recreation. e. A place for ecological education. f. A flood protection

zone, consisting of embankments, polders, and retention. In individual elements of the city's greenery system, such as green wedges of open areas, greenery complexes of built-up areas, and strings of greenery within communication areas, greenery development projects for protection plans for Natura 2000 areas are implemented and also social educational and cultural programs [5, 10]. Interesting examples of the city's care for the development and quality of greenery in built-up and newly inhabited areas are evident in the southern district of Regensburg, where can be found model solutions for housing development (Siedlungsmodell) with designed greenery inside (Grüne Mitte). Other impressive locations include, among other similar sites: newly built housing with greenery throughout the estate Siedlungsmodell, Burgweiting-Mitte, and the renovated, old building with greenery adorning the historic estate Ganghofersiedlung.

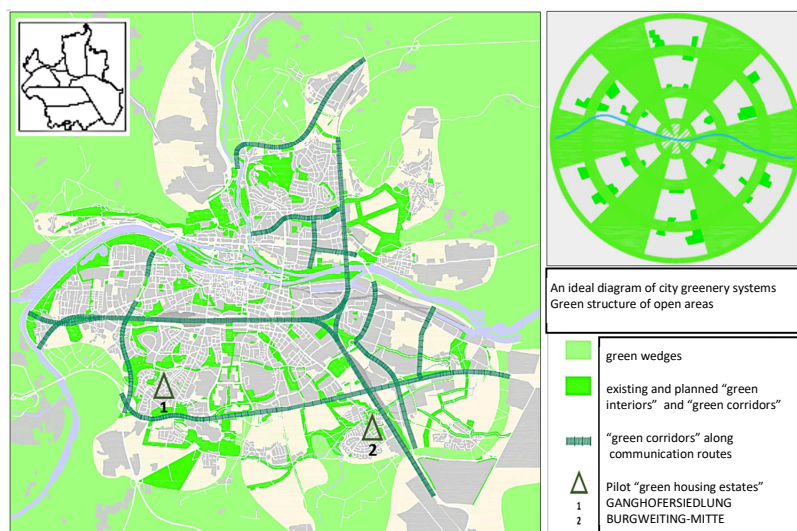


Fig. 1. Presentation of the drawings of the Regensburg Development Plan 2005 from chapter 3.2. The structure of open areas (board 14, p. 27), regarding the City Green System, together with the location of pilot projects implemented for the "Green Estates" models [5, 10].

2.3. Pilot models of "green" new housing estates and renovated old ones

A. The model "green" housing estate Burgweiting-Mitte was implemented in the middle part of the Burgweiting-Harting district according to the project awarded the first prize in the Implementation Competition in 1997. The authors of the project are the A2 Architekten Office, from Regensburg (block building design) and the landscape architect Johann Berger, from Freising. This project was included in the register of projects at the World Exhibition EXPO 2000 in

Hanover as one of the "green" concepts, exemplifying what is expected to be the prototypical future city-housing estate, which was showcased under the slogan "Model Settlement the future development of Bavaria." In the surroundings of the peripheral block buildings from 1998, in the newly created, for 950 apartments, of the Burgweinting-Mitte housing estate, there are arranged modern-style backyard greenery areas – "Grüne Mitte". An interesting example of such a greenery arrangement is the Lichtgrün Bureau, developed in 2004 and completed in 2007, which features an arrangement of greenery in a backyard garden on the surface of 4,200 m² [1].



Fig. 2. Urban planning structure rendering of the development area of the Burgweinting district together with a fragment of the design of the "Grüne Mitte" adjacent greenery area, surrounded by the peripheral block buildings of the "Green" of the Burgweinting-Mitte housing estate (Design: Office of Landscape Architecture "Lichtgrün") [1, 4], (photo B. Wojtyszyn)

Along the two apartment blocks at the corner of Friedrich-Viehbacher-Allee/Rudolf-Schlichtinger-Strasse, a home garden in a banded arrangement for 64 apartments was fashioned. The private garden area adjoining with terraces to the loggia of apartments on the ground floor is separated from, and at the same time connected to, the common part of the garden by pedestrian pathways running alongside the buildings. A garden elevator for disabled residents of the estate was installed in the corner. Additionally, easy-to-fold beds for invalids in wheelchairs were installed on the terraces of private gardens. These beds can also act as screens that shield the private part of the garden from the common area, akin to greenery masking the protruding ventilation shafts of an underground parking lot. In the lane of the common part of the garden intended

for children, there are sandboxes, swings, balances, and willow tunnels that have been designed to facilitate safe and fun playtime. Among the longitudinally arranged decorative greenery made of prairie perennials and fruit trees, original benches and seats are installed. And, in the north corner of the entrance and entry zone, greenery embellishes an artistic installation.

B. The historic "green" housing estate Ganghofersiedlung is located in the southern district of Kumpfmühl-Ziegetsdorf-Neupüll. Restoration and renovation work on the historic estate has been carried out in accordance with the City Development Plan since 2008. [5]. The estate, in almost intact condition, was inscribed on a list of monuments in 1999 as an example of Nazi settlement policy. Completed in 1939, on 21.4 ha, it became a "self-sufficient" garden estate for 3,000 employees of the then-large Messerschmitt aviation plant.



Fig. 3. Plan for the revaluation and renovation of the historic "Green" housing estate in Ganghofersiedlung, Regensburg, together with a system of modular expansion of the residential space in the reconstructed free-standing buildings (Project: Götze & Hadlich, Architekturbüro, München) [2], (phot. B. Wojtyszyn)

As the decades elapsed, the historic building complex from the previous century underwent significant deterioration. Inhabited chiefly by low-income tenants, Ganghofersiedlung was a socially difficult area in which to implement an ambitious renovation plan. Changes of ownership, which occurred in 2008, were necessary prerequisites to launching the implementation of this plan, both in terms of the housing estate itself and the people who were affected, with a direct

impact on individual plots of single-family and multi-family housing. The reconstruction and modernization of historic houses and their surroundings, executed by Architekturbüro Götze & Hadlich from Munich, required consideration of both conservation guidelines and the individual needs of property owners [2].

In order to increase the sustainable urban standards of a historic residential estate in terms of housing, transport, and environmental conditions so that at least 70% of the tenants of the renovated properties can return to the estate, the following actions were taken:

- The share of "Grüne Mitte" greenery in the estate was increased through a comprehensive replacement of degraded, old flora, maintaining the older trees in accordance with conservation protection; the introduction of additional arranged and public greenery in demolition-treated and merged areas after the purchase of undeveloped plots of land; and the planting of greenery along the communication routes, optically blocking the private gardens from offering a view to or from the street.
- Protection of residents against car-noise pollution was enhanced by and the addition of soundproofing layers added to the walls of houses on Boelckstrasse Street and the application of noise barriers along Augsburgstrasse Street.
- The population density of the housing estate has been reduced by implementing a modular system for expanding residential or garage space in free-standing buildings in accordance with the requirements of conservation protection.
- The safety of residents on the roads has been increased through designing pavements and roadways in accordance with applicable technical requirements.
- Environmental safeguards have been increased through the use of healthy, ecological building materials and installation devices of the highest technology, utilizing geothermal energy (RES – Renewable Energy Sources), reducing the cost of heating apartments by up to 40%, and allowing the estate residents to be independent of external energy supplies i.e., fossil fuels such as gas, oil, and coal.

3. CONCLUSIONS

The results of research and the scope of analysis of the plans to sweepingly revamp a city's infrastructure based on implementation of adjustments involving housing scale, pro-ecological, spatial-economic, socio-cultural, and environmental measures for sustainable development, show that the foremost principles of sustainable urbanization of Regensburg/Ratyzbona have been

established in order to improve the quality of the urban environment and are primarily focused on the development and protection of the Urban Green System through full integration with the city's building structure while respecting its cultural and natural heritage. On the other hand, the results of research in the field of analysis of the methods used to implement the planned actions on the scale of the city and housing estates development confirm that one of the most commonly used methods, systematic implementation, by the urban community of Regensburg/Ratyzbona, the outlined principles of sustainable urbanization of the city, is implementation of the post-competition expansion plans and pilot projects recognizing the socio-economic opportunities for sustainable development of housing estates. The obtained research results, within the scope of the analysis of the intended and achieved pro-ecological effects of the implemented actions for sustainable development on the scale of the city and housing estates, present innovative urban and architectural solutions that reduce environmental risks while reducing construction and operating costs, with evidence of these enhancements manifesting via the examples of pilot projects such as the construction of the "Green" Burgweiting-Mitte housing estate and the reconstruction along with the revaluation of the historic "Green" housing estate in Ganghofersiedlung.

REFERENCES

1. Fehrmann, R 2008. *Burgweiting-Mitte, Regensburg Neubau Außenanlagen im sozialen Wohnungsbau. Barrierefrei zum „Platz an der Sonne“*, Projektdokumentation – Lichtgrün, Landschaftsarchitektur, Deutsch, Marc, /55-Burgweiting-Mitte.pdf/, 1- 4.
2. Ittlinger, P 2013. *"Grüne Mitte" - Die Ganghofersiedlung in Regensburg. Regionalkonferenz „Die besonders erhaltenswerte Bausubstanz in der Stadtentwicklung“*, Deutsch, Ludwigsburg, Mai, 14, /Ittlinger-Messerschmittsiedlung-regensburg.pdf/, 1-17.
3. Stadt Regensburg – Deutsch 2020. Rathaus, Wirtschaft, <https://www.regensburg.de/rathaus, wirtschaft>.
4. Stadt Regensburg, Planungs- und Baureferat 2000. Regensburg Burgweiting-Mitte: offensive Zukunft Bayern – Siedlungsmodelle, Stadt Regensburg, 17-34.
5. Stadt Regensburg, Planungs- und Baureferat 2005. Regensburg-Plan 2005, Leit ziele zur Stadtentwicklung. In: Amt für Wirtschaftsförderung/Stadtplanungsamt (redaction) Regensburg plant und baut. Stadt Regensburg, /Regensburg-plan-2005.pdf/, 9-94.
6. Statistical Information System of the city of Regensburg/Stadt Regensburg – Abteilung Statistik 2020. <http://www.statistik.regensburg.de>.

7. Wojtyszyn, B 2014. *Modernization of Madrid's Carabanchel district in the aspect of sustainable development of the city*. Scientific Notebooks of the University of Zielona Góra. Environmental Engineering **153 (33)**, 82-92.
8. Wojtyszyn, B 2015. *Ecological implementation of the city of Solarcity as an investment in the future of sustainable urban development in Austria*. Scientific Notebooks of the University of Zielona Góra. Environmental Engineering **160 (40)**, 28-37.
9. Wojtyszyn, B, Żarska J 2016. *Ecological directions of modernization of urban areas in Poland*. Scientific Notebooks of the University of Zielona Góra. Environmental Engineering **161 (41)**, 68-77.
10. Wojtyszyn, B 2016. *How to combine the city's economic development with the sustainable development of the natural and cultural environment in the city? Debate on the new study of "The Great Zielona Góra" (Stage I - Planning issues environmental protection)*. Association for the Development of the City „The Perspectives of Zielona Góra”. Poland, Zielona Góra, September,21,
[/https://zielonogorskieperspektywy.files.wordpress.com/2016/09/prezent-debata_stud-_zielona-gc3b3ra-2016.pdf](https://zielonogorskieperspektywy.files.wordpress.com/2016/09/prezent-debata_stud-_zielona-gc3b3ra-2016.pdf) /, 1-11.

Editor received the manuscript: 02.03.2020