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Review paper

PROCESS OF URBAN REGENERATION OF MULTI-FAMILY HOUSING AREAS – COMPARATIVE ANALYSIS OF THE BEST PRACTICES FROM EUROPE

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Abstract

Every city has pockets of underutilized land, underdeveloped urban areas, or areas that are currently in a state of disrepair. Such spaces weaken the image of the city as well as the living conditions. Also, in addition to the shortcomings of the physical structure, one of the main problems of the multi-family housing areas (MFHA) is caused by individual residents, or rather its social structure, which is primarily affected by the occurrence of vandalism. Any aspiration and any attempt to change the urban landscape is a complex process. However, today there are a large number of positive examples of the regeneration of certain areas. With that, the term regeneration and transformation of small and large cities, complexes and other open areas became even more striking and resonant, and the term regeneration itself became more convincing and significant for the people and the executive authorities. The goal of the work is based on the presentation of the urban regeneration of MFHA with a focus on promoting ecological, social and spatial well-being. In the first part of the paper, the concept of MFHA regeneration is defined and three selected examples of the best practice from Europe are analyzed that show the entire course of its realization. Rosenhøj in Aarhus and Buchheimer Weg in Köln, were selected as examples of the best practice. In the second part of the paper, a comparative analysis of two examples is performed and the best definition of the process of urban regeneration.

Key words: *urban regeneration, multi-family housing areas, comparative analysis, Rosenhøj, Buchheimer Weg*

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1. INTRODUCTION

Urban areas are complex and dynamic systems in which a wide range of activities are carried out every day and which are increasingly populated due to the constant urbanization that is present in the XXI century. They are daily subjected to various influences and challenges that are reflected in environmental, social and economic aspects. Urban regeneration can be seen as a result of the interactions between the mentioned influences and as a response to the mentioned challenges. Although the aspiration and attempt to bring about changes in the urban landscape is a complex process, today the term of regeneration and transformation of smaller and larger urban areas is increasingly sound and significant for the people and the executive authorities. There are a growing number of examples of positive regeneration in the world, both in areas with multi-family housing and areas with mixed functions, as well as brownfield areas, central city cores and coasts.

The paper focuses exclusively on areas with multi-family housing (MFHA), on the analysis of selected examples of good practice in Europe - Rosenhøj in Aarhus and Buchheimer Weg in Cologne. The aim of the paper is a comparative analysis of the regeneration of both examples. This includes the analysis of their appearance and the problems that existed before the initiation of the regeneration, the analysis of the objectives, the types of applied measures and activities defined by the regeneration project, the overview of the initiators and actors and the analysis of the effects after the regeneration itself.

2. PRESENTATION OF THE BEST PRACTICE EXAMPLES OF URBAN REGENERATION OF MFHA

Examples from Europe - from Denmark and Germany - were selected to show adequate urban regeneration of MFHA.

2.1. Rosenhøj, Aarhus, Denmark

2.1.1. Analysis of the state before regeneration

The MFHA Rosenhøj was built between 1968 and 1970 and consists of twenty-seven four-story buildings. It is located in the city of Aarhus in Denmark (Figure 1). It represents a typical post-war MFHA, built as part of the southern Jutland plan, developed by the Ministry of Housing. The designer of the MFHA was Børge Kjær, and it was intended for mass, prefabricated construction across the country [1]. The main emphasis was on the spatial organization of the interior of the space, which was treated as flexible with the possibility of different spatial organization depending on the needs of the tenants. Very little attention was paid to the organization and design of the exterior space.

Figure 1. The position of MFHA Rosenhøj in Aarhus, Mette Mechlenborg, 2019

The plan envisaged buildings of regular geometric shapes arranged in parallel tracts (Figure 2a). One of the characteristics of the complex was the planning of the infrastructure designed to create an independent neighborhood with shops and related functions along with housing. Over time, these qualities contributed to the separation of the area from the rest of the city. Recognized shortcomings of the settlement are reflected in the design and layout of residential buildings, which were characterized by concrete facades and the same typology of all units, which resulted in a monotonous environment composed of identical units. Poor organization of the infrastructure, where certain streets were designed as dead ends (Figure 2b), resulted in inefficient movement of cars within the settlement. The open spaces in the complex were poorly organized (Figure 2c), and the contents included large undefined and unsightly green areas and large parking spaces. This way of restricting open areas could not offer tenants a variety of content that would satisfy their basic needs for gathering, relaxation and recreation.

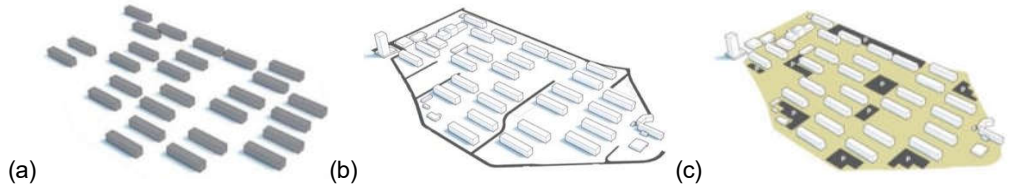


Figure 2. Schematic representation of the disposition of housing units, cul-de-sacs and the contents of open spaces, https://www.effekt.dk/

Despite the good intentions of the original plan, more socio-economically developed families gradually moved out of the complex, and in later years this area experienced problematic development. Years ago, the settlement was characterized by social challenges, insecurity and a bad reputation. The settlement was accompanied by a bad social image, a high crime rate, low incomes, an unfavorable educational structure of the inhabitants and a high concentration of emigrants. The complex became marginalized and neglected. Due to the aforementioned shortcomings as well as development in the wrong direction, it was decided to start the process of regeneration of the residential area.

2.1.2. Urban regeneration process

- **Project initiators**

The reason why the settlement is considered a symbol of the Danish ghetto is the frequent riots that took place during 2005. As a direct response to the national ghetto policy of 2004, the municipality of Aarhus presented its local strategy in 2007 with the aim of creating lasting positive changes in the Rosenhøj neighborhood. The process of forming the strategy involved large public investments as well as political engagement [2]. This program represents the cooperation between the municipality and the housing association, with the municipality as the main initiator of the program. Until May 2011, the housing association carried out targeted engagement of tenants by holding general meetings, city walks, as well as individual meetings with families whose homes are planned for demolition, if the renovation is approved. Tenants had a part in making the decision to start the regeneration phase of the complex. After preparations that lasted a couple of years, an architectural competition for the regeneration of this residential complex was announced in the summer of 2010 [1].

- **Project goals**

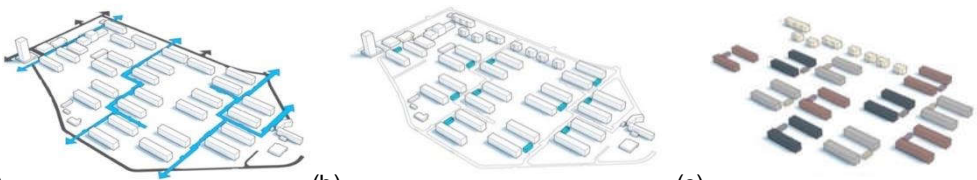
The main reasons for starting the process of urban regeneration of the Rosenhøj residential complex were to restore the lost reputation of the settlement, to prevent the emigration of tenants and to provide a higher level of quality of life in this area [3]. The urban regeneration plan of the MFHA meant solving defined problems by achieving the intended goals. The main goals can be grouped into goals for improving the physical and socio-economic structure, and among them we recognize the following: infrastructural improvement with the reorganization of traffic connections; improving the visual-aesthetic image of the MFHA while solving the problem of monotony and uniformity of the MFHA; remodeling of open areas; creating better visibility of the block with interventions on individual buildings; creating a better connection between the interior of the block and the peripheral areas; improving the energy efficiency of residential units; adaptation of the block to the elderly and persons with disabilities and solving basic social problems while implementing measures that will prevent the emigration of residents and the settlement of new categories of population.

The regeneration project involved working at different levels to achieve predetermined goals. The fact that today this area has a significantly higher level of population speaks about whether the goals were achieved and the problems solved.

- **Types of measures applied**

The urban regeneration project of the Rosenhøj MFHA in Aarhus, Denmark included the implementation of measures to improve the physical and socio-economic structure.

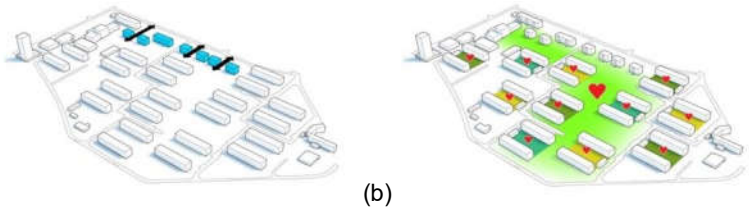
As part of the measures to improve the physical structure, the infrastructural separation of the entire complex into three units is recognized, along with the introduction of newly formed vehicular communications (Figure 3a), to provide users with a clear connection to the surrounding roads. Along these communications, evenly distributed parking spaces were formed, so that each residential unit has faster and easier access to the parking space [3]. Newly built semi-detached houses were added to the existing structure (Figure 3b) so that with two existing residential units each they form 11 smaller sub-units (Figure 3c). In this way, the goal of obtaining a more dynamic structure of individual and multi-family housing was achieved.



(a) (b) (c)

Figure 3. Schematic representation of newly built road connections, semi-detached houses and formed sub-units, https://www.effekt.dk/

In order to provide the location with better visibility and connection with the surrounding area, four residential units on the perimeter of the location were crushed along with the formed penetrations, so that seven smaller of a different structure (Figure 4a). The interior of the block is connected by a communication network to the primary and secondary schools located on the perimeter. The open spaces are organized in such a way that, in addition to common public spaces, there are also 11 smaller semi-public "gardens" on the site, which provide residents with greater privacy compared to other public spaces (Figure 4b).



(a) (b)

Figure 4. Schematic representation of the fragmentation of residential units and representation of the organization of open areas, https://www.effekt.dk/

Entire open spaces are equipped with a variety of content for outdoor recreation, gathering and relaxation. A student dormitory, a home for the elderly, an office building with premises on the ground floor can also be considered social measures with the aim of attracting new categories of the population to the MFHA. The characteristic concrete facade of all 27 residential units was transformed with the aim of visually grouping the buildings into "horseshoe" formations. Also, thermal insulation with a thickness of 20 cm, a mechanical system for ventilation and heating was applied, the carpentry was replaced, and solar cells were applied on the roofs of the buildings. Aluminum panels, concrete slabs and slate slabs were used as facade cladding [1]. Balconies were added on the southern facades. In order to adapt the housing complex to persons with disabilities, every fourth housing unit is adapted to this category of users. The real transformation of the residential area is yet to come.

- **Types of actors and interest groups represented**

The new Rosenhøj was created in close cooperation between the Aarhus area and the residents. The architects of MFHA project were Børge Kjær [1] and Arkitema, an architecture company that enhances the appearance and characteristics of Scandinavian cities while also taking into account sustainability, beauty and economy. The main and responsible engineers of the project were the employees of Vigo Madsen. Architects and engineers worked closely together on renovation solutions. One of the project collaborators was the Center for Sport and Architecture, UiWE (Urgent Agency) [4]. The design team consisted of 17 people who worked on the project. The entrepreneurs of the project were the construction companies Enemaerke og Petersen A/S and Wicotec Kirkebejg.

- **Funding sources represented**

The construction costs, including the regeneration of the housing project, amounted to 950.000.000 Danish kroner [5]. Residents gave a huge mandate for the renovation. The Rural Development Fund supported the project.

2.1.3. Sublimation of regeneration effects

The social change as well as the regeneration of the neighborhood itself, which lasted between 2014 and 2017, made the Rosenhøj more attractive to live in and created the conditions for a better life in the city. "In 2017, the share of insecure residents was halved, and the share of residents with trust in their neighbors increased by 37% compared to 2008. There are fourteen times more citizens on the waiting list for housing today than in 2010. Evictions from settlements decreased by 2.7% from 2015 to 2017." [6] Also, the facades of residential buildings were renovated to create greater diversity and better energy efficiency (Figure 5a). Green areas and recreational areas are further enhanced by the installation of plinths and wooden decks. (Figure 5b). Now they are characterized by lawns, meadow flowers and other plants [7]. The space now has new furniture chosen by the tenants and outdoor activities, such as an outdoor gym, football, children's play area, etc. (Figure 5c).

Rosenhøj has become accessible to users with special needs. The MFHA is now open to the immediate surroundings, integrating the area into the city. Also, the new infrastructure and pairing of blocks two by two created new types of open spaces and communal courtyards.

Figure 5. Appearance of the site after regeneration, (a) https://renover.dk/, (b) http://www.vibysyd.dk/, (c) https://www.arkitema.com/dk

The regeneration of the MFHA Rosenhøj on an area of 7,1 hectares received the following awards: the 2017 Aarhus Municipality Architecture Award, the RENOVER Award that rewards the best transformation in Denmark in 2017 and the highest review score from the Danish newspaper Politiken. The project was also nominated for the VAN award for a social housing solution. The new Rosenhøj is a real example of how it is possible, through adequate renovation and transformation, to "raise" a dilapidated residential area into an attractive residential area.

2.2. Buchheimer Weg, Köln, Germany

2.2.1. Analysis of the state before regeneration

The MFHA Buchheimer Weg was created in the period from 1954 to 1958, as part of a program to remove bunkers at the beginning of the war-torn metropolis of the Rhine. A total of 1037 social housing apartments were built, many of which were modernized from 2002 to 2011 (Figure 6) [8].

Figure 6. The position of Buchheimer Weg in Köln and a view of its immediate surroundings, https://www.gag-koeln.de/

MFHA had important advantages: good lighting, surrounding greenery and a certain urban spaciousness. The buildings in this residential area were in very poor condition. Between the residential units in the three-story building in a row, mostly with regular foundations, there were poorly organized green spaces, without adequate furniture for the tenants' activities. The apartments were small in square footage, mostly without balconies. In urban terms, this was a monotonous space without clearly defined boundaries.

2.2.2. Urban regeneration process

- **Project initiators**

The future of the MFHA Buchheimer Weg was considered by the owners of the complex, in fact there was a debate whether to keep and renovate this complex or to demolish it. Buchheimer Weg is owned by the non-profit construction organization GAG Imobilien (Gemeinnützige Aktiengesellschaft) [9]. This association has announced a competition for the proposal of a conceptual solution project for the regeneration of this MFHA. In the competition in 2005, ASTOC Architects&Planners. After the competition, two years later, the first phase of construction began. The owners of Buchheimer Weg initiated the renovation of this residential complex, while ASTOC architects and planners designed the entire project.

- **Project goals**

The main reasons for initiating urban regeneration were to enable a better quality of life in the settlement, to prevent the emigration of residents and to provide apartments for residents with low incomes through a cheap construction method. The goals that initiated the entire regeneration process can be divided into goals related to the improvement of the physical-economic structure and the socio-economic structure. The regeneration process is defined by achieving certain goals such as: increasing the population density and forming housing units for low-income residents, reorganization of the contents and renovation of open areas, ensuring a better quality of life for the residents of the residential complex, enabling greater safety for residents and visitors. The project itself involved a lot of work in order to achieve the established goals. The motive of the entire project is to enable a better quality of life for the residents of this settlement.

- **Types of measures applied**

The concept of urban regeneration project of this MFHA was designed to adequately achieve the defined goals and give the entire complex a new look. MFHA has an extremely favorable location, there are railway and bus stations nearby, and it can be said that the traffic connection is very favorable. With the new project, it was necessary to preserve all the advantages of the settlement, and one of them is the favorable orientation, good ventilation and lighting.

Considering the settlement itself, the plan was to renovate the existing buildings, however, looking at the overall costs, it was decided that the first measure would be the demolition and construction of new ones in the same place. One of the measures focused on the new, more innovative design of Buchheimer Weg, which focused on creating a unique green color but in different shades of facades that will be the main feature of this neighborhood. These colors are pleasant and not at all boring and at the same time contribute to the feeling of novelty and a new beginning. Four-story buildings with two to three apartments at the base are designed that basically bend at irregular angles. The very entrance to the building is emphasized with a concrete canopy and brightly colored panels. By designing a diverse structure of apartments, this complex was adapted to different structures of residents. On the higher floors, the apartments have their own balconies, which did not exist before. The next measure is the creation of public and dynamic spaces that are formed based on the shape of the buildings. Each building individually shapes the exterior space and makes it unique in a meaningful way (Figure 7). At the very corner of the site, four buildings form one large central public space. It is defined for different purposes and contains playgrounds for children, gardens and basketball courts. Private courtyards are formed next to the buildings and are intended exclusively for

tenants. One of the measures was the creation of a wide network of pedestrian paths that connect the entire area, but also connect it to a large park nearby.

Figure 7. The orientation of buildings and public spaces, https://www.gag-koeln.de/, https://astoc.de/de/

In order to differentiate pedestrian and motor traffic and to achieve safety, the measure of relocating the parking lot was implemented. Public areas are entirely intended for pedestrians

- **Types of actors and interest groups represented**

The entire regeneration process was led by the housing company GAG Immobilien (Gemeinnützige Aktiengesellschaft), [9] which contracted with ASTOC architects and planners to renovate and upgrade the housing complex in the Ostheim district of Cologne. The concept of the ASTOC company represents a model solution for the reconstruction of this settlement and allows its character to survive, with the application of numerous design elements that adapt to the environment. The facades of the residential units were designed by Hans Karl Burgeff, a German sculptor and art professor. Landscape architects also participated in the project [10].

- **Funding sources represented**

The construction was financed by the non-profit housing company GAG Immobilien (Gemeinnützige Aktiengesellschaft), (https://www.deutsche-digitale-bibliothek.de/). Compared to similar social housing projects, this project is one of the more successful. Gross construction costs amounted to about 28.000.000 euros.

2.2.3. Sublimation of regeneration effects

The regeneration project on an area of 5.16 hectares was successfully implemented. Today, there are 18 buildings in which there are a total of 434 apartments, which are intended to accommodate a heterogeneous population. The Buchheimer Weg MFHA now offers its residents a significantly higher quality of life. Careful urban planning of buildings, differentiated but socially safe open spaces, enable this neighborhood to meet the needs of users in the long term, and thus improve the urban quality of the settlement. Organizing the settlement around a central area that is slightly more than one hectare in area, and also providing smaller courtyards for each building, gives the residents enough opportunities to relax outside the apartment (Figure 8). There is no motorized traffic in the central part. Parking is provided along the street itself, as well as in smaller lots next to the road. Parking is also available in two underground garages.

Figure 8. Spaces for gathering, recreation and relaxation, https://www.gag-koeln.de/

The residential area now also includes a cafe for residents, office space nearby and a hall of residence for people with disabilities and dementia. The concept of care and support for these residents relies on the activation and participation of citizens who come together to form a civil-legal partnership so that they can care for each other as a community. GAG Immobilien is dedicated to the activities of tenants in the settlement. A successful example is the days of culture, which are held every spring. GAG Immobilien together with the tenants' council and the youth center offered many original practical activities. A music workshop was formed, stone reliefs were carved, and together with the tenants' council, large planters were planted and gardens were arranged. The flowers were later nurtured and grew over the years, while ceramic mosaics still adorn the neighborhood. This was very well received by the residents, so culture days are still held. From this it can be concluded that the social structure in the settlement has risen to a higher level. As for heating, certain measures have been implemented with the aim of achieving energy efficiency.

Facade materials, such as mineral-based plaster, clad the buildings and are painted in green tones that vary throughout the complex (Figure 9a). Residents appreciate the unique choice of color, which makes the neighborhood easily recognizable, and besides, green is the color of optimism, so pleasant tones contribute to the feeling of novelty. The accentuated entrances of residential units (Figure 9b) are very characteristic, and the access to the buildings is designed with two entrances located on both sides of the building.

Figure 9. Buildings after regeneration, (a) https://www.gag-koeln.de/, (b) Brown, 2019

In 2012, GAG Immobilien was awarded the German Construction Award in the categories "New Buildings" and the "Open Space Design in Housing" award.

3. DISCUSSION - COMPARATIVE ANALYSIS OF URBAN REGENERATION OF SELECTED EXAMPLES OF THE BEST PRACTICE

The urban regeneration projects Rosenhøj in Aarhus and Buchheimer Weg in Köln have a sufficient number of specific points in the previous appearance and the very process of project realization according to which it is possible to compare them, i.e. to carry out the necessary analysis of their urban regeneration. At the very beginning of the analysis, it is necessary to

point out the fact that the urban regeneration of MFHAs is in question. Both are identical in size, but the Rosenhøj housing estate in Aarhus, Denmark occupies a larger area.

When comparing the previous conditions of residential areas, Rosenhøj in Aarhus was characterized by a poor social structure, the existence of criminal groups and a sense of insecurity among residents. In the example of Buchheimer Weg in Cologne, there were no such problems. Both examples were characterized by poor organization of open spaces, insufficient use and appearance of greenery, inadequate and insufficient furniture for children's recreation, gathering and play, as well as the appearance of "gray" ie. identical facades of residential buildings.

As far as the initiators are concerned, here, also in Aarhus, the main initiators were the inhabitants of the settlement, that is, the residential community, together with the municipality of the city as well as the city itself. In Buchheimer Weg, the future of a multi-family housing complex was considered by the company that owned it.

The urban regeneration projects of the presented examples are characterized by very similar goals that led to the final results. Both examples of urban regeneration projects are characterized by the implementation of goals aimed at improving the physical and socio-economic structure of residential complexes. The objectives of improving the physical structure with the aim of achieving better energy efficiency of residential units, as well as the reorganization of the interior of residential units with the aim of adapting to different user structures, which are characteristic of the Rosenohøj and Buchheimer Weg neighborhoods, were recognized. In the case of both settlements, the goals of the regeneration project were aimed at the reorganization of open areas, but also at adapting housing units to different population structures, creating better connectivity and improving the aesthetic image of the complex. The selected examples of urban regeneration are characterized by goals that would lead to the improvement of the social structure by encouraging the population to live together in open areas with the newly formed content of open areas. The common feature of these projects is reflected in the basic motive for launching the initiatives for the urban regeneration project, which is to solve the basic social and physical long-term problems in the settlements.

Within the measures applied in both cases of urban regeneration projects of residential complexes, we recognize the application of measures to improve the physical and socio-economic structure. The residential complexes were subjected to regeneration measures that included the reorganization of open areas, the relocation of parking spaces, and the creation of better connectivity of the location. A clearly visible common characteristic of the settlement regeneration project, within the applied measures, is reflected in the application of the measure that contributed to the improvement of the aesthetic appearance of the location. Both examples are characterized by a new look of residential units with clearly emphasized entrances, however, the Buchheimer Weg neighborhood underwent the demolition of existing residential units and the construction of new units of a specific form with a characteristic facade in a green shade. Each of these two examples of the urban regeneration project includes the implementation of a series of measures related to the improvement of the social structure, which is manifested through the encouragement of mutual gathering, socializing and recreation of tenants in the open areas of the residential complex with newly formed content. In the Rosenohøj settlement, the improvement of the social structure was also achieved through the improvement of the functional structure by diversifying the accompanying

contents in addition to housing with the planned projects of a student dormitory, a home for the elderly and a business building, which will attract various structures of the population. Recognized measures to improve the economic structure of projects of urban regeneration of residential complexes are reflected in the improvement of facades with the aim of reducing excessive energy consumption in order to save funds intended for heating and cooling residential units.

4. CONCLUSION

MFHAs built during the second half of the last century exist today as witnesses of time and lifestyle. Old and neglected complexes are not attractive enough and attract only those groups of residents who do not have the opportunity to provide themselves with a better place to live. Complexes like this are neglected, unmaintained and very often the target of problem residents. In recent years, we have witnessed the realization of numerous urban regeneration projects motivated by the idea of solving perceived problems and restoring these complexes to their lost reputation.

The observed problems are recognized on several levels, and concern both the physical and functional, as well as the socio-economic structure. Such complexes, built according to the standards that corresponded to the period in which they were built, today cannot satisfy the needs of the users of the complex, which have changed over time and adapted to new circumstances. The analyzed examples of MFHAs today exude a new look, have a higher utility value and attract a larger number of users. The process of urban regeneration has contributed to making these complexes no longer monotonous and gloomy, and to the fact that an increasing number of residents are choosing to live in precisely such settlements. It can be concluded that the processes of urban regeneration, based on the analyzed available literature, have exclusively positive aspects both on the regenerated complex itself, and on the entire environment and the city in which they are located.

ACKNOWLEDGMENTS

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