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EXPERTS' PERSPECTIVE TOWARDS SMART MANAGEMENT IN THE POST-WAR RECONSTRUCTION OF THE CITY OF MOSUL

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ABSTRACT

Motives: Urban developers around the world have been using smart management systems in redeveloping cities. This strategy allows a sustainable long term approach, built on scientific findings. Accurate data and information are key in achieving smart management in the reconstruction of post-war areas. Having the right information at the right time helps government officials, service providers and residents themselves make better choices when it comes to the reconstruction of post-conflict areas.
Aims: This paper explores the role of resident experts' contribution and how they can aid officials make more educated choices when it comes to urban decision making. It also addresses the ambiguity of the impact of using the expertise of local urban planners and architects in urban decision making in the reconstruction process as one of the strategies to achieve a smart city. The Old City of Mosul was selected by the authors as a case study in the post-war regeneration process. Therefore, the paper attempts to reach a scientific decision in selecting the best approach towards the urban regeneration of the Old City of Mosul.
Results: The paper signifies the role of the local community experts in urban decision making as a bottom to top approach, and recommendations were made based on the research findings.

Keywords: local experts, smart cities, urban regeneration, post-war strategies

INTRODUCTION

Engaging the local community in urban decision making is one of the main strategies in achieving a smart city. The term "smart" here is not only associated with high technology but includes other dimensions especially the social dimension through engaging residents and local institutions during the selection of appropriate strategies and solutions and at different levels.

The implementation of smart cities must be a fundamental part of a long term strategy, which takes into consideration the social, environmental and economic aspects. Smart city strategies enable taking educated decisions in prioritizing development procedures. Therefore, these strategies must be implemented in government plans and policies. The concept of smart cities has not yet received the significant attention needed from government officials. Although it delivers many advantages in developing public affairs, development policies

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and communities. It has still yet to be implemented in planning and designing stages. The features of smart cities allow local communities to engage in, and react to development plans and proposals. Decision makers, designers and citizens can all exchange data through this platform which will help later on in improving the quality of life and empower local residents (Hussein & Mohammed Salih, 2018). This is one of the strategies that leads to good governance, and good governance increases the capacity of the urban system to deal with risks and improves resilience (Irani & Rahnamayiezekavat, 2021).

The city of Mosul is one of Iraq's biggest cities in the north of the country (Fig. 1). Mosul went through devastating circumstances both during the ISIS occupation who took control of the city in June 2014, and during the war that liberated the city ended in June 2017. A war which left both the city's infrastructure and community torn apart and ruined. For this reason, involving residents in the regeneration process becomes more and more significant. The findings of this paper were determined after carrying out a questionnaire of predetermined responses. A sample of individuals were selected to participate based on certain criteria which included their area of expertise and their knowledge regarding the city of Mosul. The questions involved certain strategies, mechanisms and indicators which can guide the regeneration of Mosul towards providing better quality of life and a more sustainable city.

Fig. 1. Mosul location
Source: adapted from Google maps (2022).

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LITERATURE REVIEW

Urban decision making: community participation in the smart city

Recent scholars have discussed the rapidly growing international tendency towards engaging residents in policy-making and public interest decisions (Blondiaux, 2008). Usually political decisions concerning public good come as top-down innovations. While this strategy can be necessary, at times it fails to meet certain needs and aspirations of the local community. Consequently, residents may reject these forced innovations leading to a gap in understanding between decision makers and the community.

Governments all over the world have started implementing this new approach of public participation in many aspects. These strategies allow residents to take part in the shaping, realization, monitoring and evaluation of public policies. After Arnstein's landmark study in 1969 entitled 'Ladder of citizen participation', which is one of the most cited studies on democratic public participation, researchers have classified different levels and stages of community engagement in political decision making according to the objective and the degree of involvement in the final degree (Rowe & Frewer, 2005).

Among scholars in this particular area, many strategies of "the crowd" participation have been used. A new concept of "citizen scientists" has emerged among researchers. Onyago et. al foresee that urban governance is going through a metamorphosis with a including citizenry in the process of decision making (Onyango et al., 2021). One of the disadvantages of this methodology is its reliance on volunteers whom may not grant the issues at hand the appropriate analysis and interpretation they need (Cohn, 2008). The volunteers here become more of a tool than research collaborators. Despite this new concept's popularity, there have been many disparagements regarding the efficiency and relevance of its findings. One of the main challenges of this approach is the indifference and negligence, not to mention low technology capabilities, of most residents and the under estimating of the potential that individuals may have in policy-making (Dagnino, 2007). Eventually, the samples used in collecting the appropriate information may not be representative of all community sections. For this reason, scholars started using a different means of data collection. This is where the importance of information, communication and technology (ICT) came forth. Scholars believe that ICTs can be used to obtain the accurate information needed in decision making, relying on efficient, accurate and complete data sets (Ishikawa, 2002). They are also cost effective by relying on smart phones as the main means of communication, which facilitate participation anytime, anywhere (Marres, 2012). ICTs also allow individuals to participate through different means of communication and expression which enhances their role in public affair decision making (Muhlberger et al., 2011).

For the mentioned reasons, Giffinger et al. (2007) defined a smart city as "a city which takes advantage of ICT in order to ensure its growth and attractiveness". In their studies they also determined six specific constituents of a smart city, which were: smart economy, smart mobility, smart governance, smart environment, smart living and smart people. In this article, the authors focus on the role of smart people in participatory decision making.

Decisions are made in smart cities depending on information gathered by high tech databases, which allow analysis of this information, planning in accordance, and performance reviewing. For example, ICTs provide data that can be used to inform a final decision or what may be called an "urban democracy decision" by engaging local communities. Therefore, smart cities rely on smart people allowing them to express their needs and aspirations. Of course their role can be enhanced by technical support and training and by advocating social awareness (Hussein & Mohammed Salih, 2018).

After reviewing the previous works of literature, the paper findings stress on the significance of utilizing the (down-top) approach and engaging the local community experts in reaching a more beneficial

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strategy for rebuilding the city. This strategy can help guide decision makers, designers, and residents in achieving their goals. And according to these findings, this research applies this theory in the post-war reconstruction of the Old City of Mosul.

The reconstruction of the Old City of Mosul

The case of the city of Mosul is very complex. Mosul was already suffering from terrorist attacks and insurgents before the reign of ISIS. This lead to a fractured community and an underdeveloped urban structure. After the liberation war against ISIS, and according to (Rudaw, 2017), the destruction on the right bank (the western side of the city) of Mosul as a result of the war on ISIS was 30 times higher than the eastern side of the city. And it is still being renovated by locals only, some home or business owners are rebuilding their properties with the aid of NGOs alone. There has still been no major intervention by governmental authorities regarding housing or infrastructure redevelopment. Painfully, the western side of Mosul is where the historical city of Mosul lies and approximately 40% of this historical urban fabric was completely demolished (Antonelli & Cossu, 2021). The satellite images in Figures 2 and 3 show the level of devastation post war.

Achieving urban sustainability in post-war cities can be a major challenge for decision makers in urban renewal and regeneration procedures. Many priorities arise to the surface, one of them being saving heritage which reflects the sense of belonging.

Fig. 2. The right bank of Mosul pre and post-war – a) November 2015, b) July 2017
Source: Lubitz & Griffiths (2017).

Fig. 3. The bridge leading to the historical city: a) in November 2015 (top), b) in July 2017
Source: Lubitz & Griffiths (2017).

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In post-war development of cities, losing the local identity or weakening the sense of it becomes an imminent fear due to the many interventions and changes to the original urban layout. Other challenges facing developers and policy makers are both social and economic circumstances, the destruction of the infrastructure which leads to the deactivation of certain areas of the city (Hussein et.al., 2019). Al-Samurai and Al-Qaraghuli found that a major importance lies within the social and environmental dimensions to achieve sustainability in the reconstruction of the city of Mosul (Al-Samurai & Al-Qaraghuli, 2021).

Therefore, it can be stated that the urban decision in the reconstruction of the Old City of Mosul cannot be a central decision. The research was based on engaging experts from the local community by responding to a questionnaire which addresses the main issues in reconstructing the city. The goal was to reach the best approach and put it in the hands of decision makers.

There have been many initiatives and attempts, among the people of Mosul, to raise their voices to be heard as part of the decision making procedure. One of these initiatives is a personal blog by Mosuli Historian Omar Mohammed named 'Eye on Mosul'. This anonymous blog, at the time, was one of the few ways the world could hear about everyday life events in Mosul during the ISIS occupation, and played a major role in transferring information towards the liberating troops during the liberation war. However, the historian has now shifted his efforts towards the advocacy of social initiatives of the people of Mosul (Mohammed, 2021). The success of this initiative impels the great role the Mosuli community can have in deciding their own destiny.

MATERIALS AND METHODS

The methodology of this paper, which attempts to reach a scientific decision in selecting the best approach to urban regeneration in the Old City of Mosul, is based on studying previous works of literature in urban decision making, and highlighting the role of modern technology and local community experts' participation as main "smart city" strategies. This was implemented by interviewing selected respondents (a focus group) with a predesigned wet of questions, as shown in Figure 4 and appendix (a). After collecting the participants' information, the interview questions focused on prioritizing the urban regeneration from 3 main aspects: strategy, choosing the most appropriate

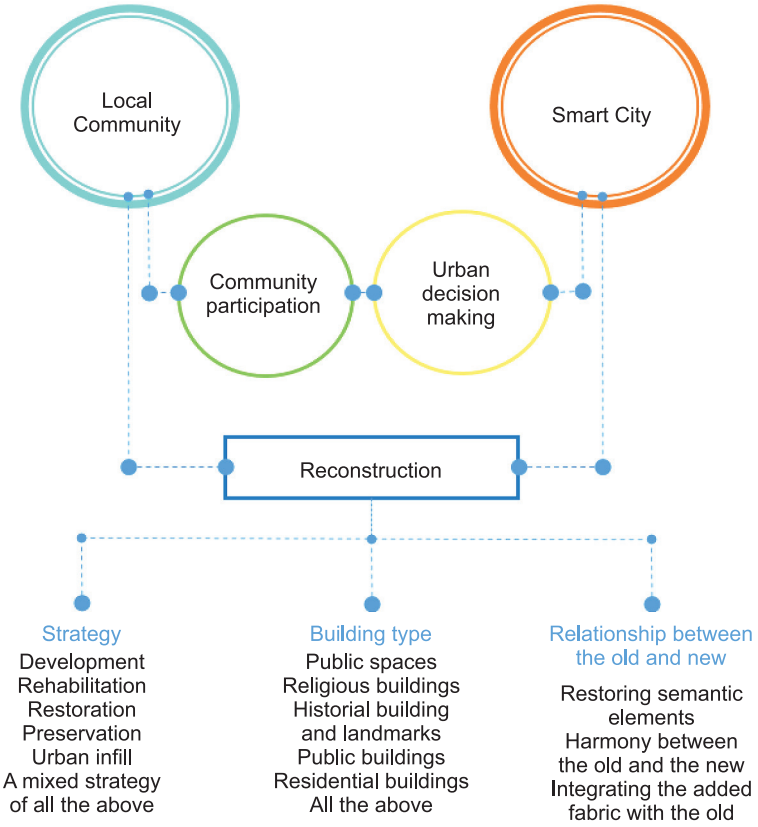

Fig. 4. Methodology illustration
Source: own preparation based on Author (2020).

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strategy for reconstruction; building type, prioritizing which building types to start with; and finding the applicable relationship between the old and the newly added fabric.

INTERVIEW QUESTIONS RESULTS' ANALYSIS

A set of questions about the reconstruction of Mosul was distributed among a focus group containing 21 architects and urban planners, who either live in the city of Mosul or have lived there in the past, therefore have sufficient knowledge regarding the nature of the city and its social and cultural characteristics, and due to their backgrounds, can make educated decisions regarding the reconstruction, fuelled with their local backgrounds and cultural pertinence.

Research Sample Information

The first few questions requested information about the interviewees, to help shed a light on the educational background and experience of the 21 participants. The participants were a small group of qualified individuals with certain experience especially in construction, urban planning and post-war redevelopment. In addition to the limitation of either having lived in or studied the urban attributes of the city of Mosul.

It was found that 38% of the participants held a Master's degree, another 38% held a Ph.D. and 24% of them held a BSc degree in either Architecture or urban planning. A little over half of the participants were men, where the rest were women. The major age group of the recipients were 30–40 years of age, 29% were 40–50 years and 15% were over 50 with a few participants under 30.

As for the academic and professional domains of the focus group, 90% were specialized in architecture and 10% were in the urban planning and design domain. Most of whom were academics with a few architects working in the local private sector.

As mentioned earlier, the focus group were individuals with certain experience in the urban history and fabric of Mosul. Therefore, 67% had lived there their whole lives, and over 14% had lived in Mosul for over 5 years and just over half of them had visited the Old City of Mosul after the war.

The reconstruction of Mosul

After collecting the appropriate information regarding the participants, certain questions were asked to understand the priorities of the appropriate people when it comes to post-war redevelopment of Mosul, especially the old part of the city. The authors proposed a number of reconstruction strategies: development, rehabilitation, restoration, preservation, urban infill or a mix of all strategies. The participants were asked which strategies they see appropriate according to the condition of the city at the time of the paper, and taking into consideration the nature of this ancient city and its history, culture and social qualities. Most participants preferred a mix of all proposed strategies, by studying the old city building by building and then deciding individually which approach would be more beneficial. Whereas over a quarter chose development as a main strategy, 19% mentioned rehabilitation and 10% preferred restoration of the devastated buildings. The term restoration refers to degraded areas and restoring the values and characteristics the space once had (Biegańska et. al, 2019). Urban infill and preservation were also among the proposed strategies to kick start the post-war reconstruction of the city, see figure (5).

The other issue tackled in the set of questions was redeveloping building type priority. The authors asked which building type should be prioritized in the first phases of the regeneration of the Old City of Mosul. Over half of the experts considered residential buildings the most important and critical when it comes to initiating the redevelopment strategy. Of course this is highly understandable due to the thousands of houses demolished during the war on ISIS. The second building type to be given priority,

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by about 20% of our participants, was vital public buildings. The rest of the answers were either historical buildings and landmarks or giving all building types the same level of attention after initiating emergency solutions for the displaced families, see figure (6).

The final question dealt with the relationship between the old and the new. Participants were asked to choose the strategy they preferred to be used while dealing with both old and new buildings. Almost half of the experts found that the integration of both

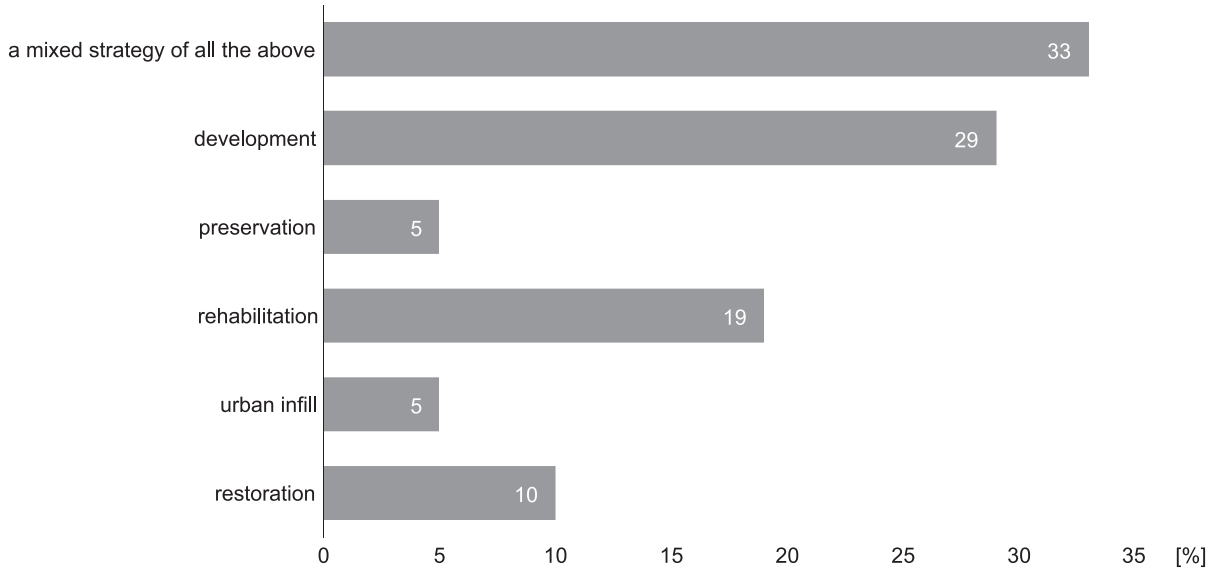

Fig. 5. Questionnaire results: Preferred strategy in the redevelopment of the city of Mosul
Source: own preparation.

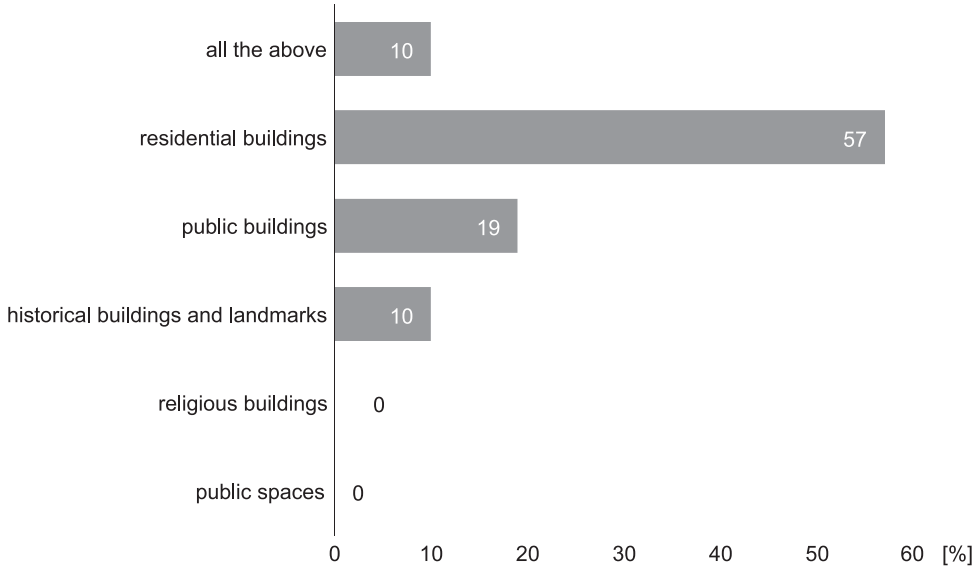

Fig. 6. Questionnaire results: The building type which should be treated with utmost urgency in the regeneration of the Old City of Mosul
Source: own preparation.

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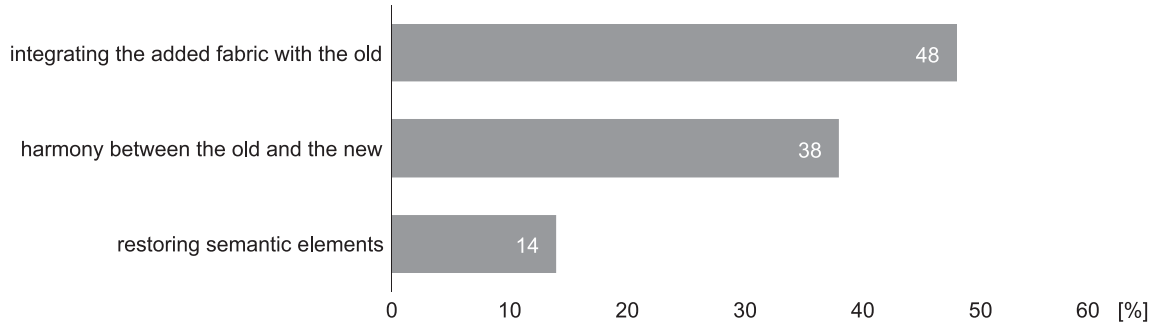

Fig. 7. Questionnaire results: Preferred relationship between the old and the new
Source: own preparation.

the old and new urban fabrics is the best approach. 38% recommended harmonizing the new with the old. And the rest preferred restoring the traditional semantic elements in the buildings, see figure (7).

CONCLUSIONS

The study attempts to implement the strategy of activating local community experts as 'smart people' in urban decision making in the reconstruction process as one of the strategies to achieve a smart city. Focus was on smart people and their potential role in bottom to top decision making, opposing central decisions which are normally distant from the public and their needs.

The authors started with interviewing a focus group of local experts in urban planning and architecture, with a previously designed set of questions regarding prioritizing reconstruction in the Old City of Mosul. The findings can be presented to stake holders and decision makers to help educate their decisions in the direction of the people adhering to them.

This research applies this method in the post-war reconstruction of the Old City of Mosul. According to the findings, this paper recommends:

1. A mixed strategy of development, rehabilitation, preservation, restoration and urban fill; in the post-war reconstruction of the Old City of Mosul, emphasizing on development as the main urban regeneration strategy.

2. Prioritizing residential buildings in the first place and public buildings in the second place, while reconstructing the city, this seems logical due to the high degree of displacement the residents of the Old City of Mosul suffered during this period.

3. As for the relationship between the old buildings and fabric and the newly built ones, the findings indicate that integrating the old within the new is the best strategy.

After addressing the final findings of this research, which are general indicators to commence the reconstruction process, it can be concluded that local community participation is key to achieving a smart and thriving future city environment.

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APPENDIX

Reconstruction of Mosul questionnaire:
You are kindly invited to respond to the following questionnaire as part of a scientific research regarding the post-war reconstruction of the Old City of Mosul. Responding should not take more than five minutes of your time.
Email address _____.

1. **Educational background**
   - o BSc
   - MSc
   - Ph.D.
2. **Gender**
   - Male
   - Female
3. **Age**
   - Under 30 years of age
   - Between 30–40 years of age
   - Between 41–49 years of age
   - 50 years and above
4. **Scientific field**
   - Architecture
   - Urban planning
   - Other
5. **Place of work**
   - Academic institution
   - Professional institution
   - Private business
   - Other
6. **Time spent as a Mosul resident**
   - Permanent residency
   - A few days visit
   - A few months residency
   - Less than 5 years residency
   - More than 5 years residency
7. **Have you visited the Old City of Mosul after the war?**
   - Yes
   - No
8. **Which is the best strategy to start with upon reconstructing the Old City of Mosul?**
   - Development
   - Rehabilitation
   - Restoration
   - Preservation
   - Urban infill
   - A mixed strategy of all the above
9. **Which of the following buildings should be prioritized in the reconstruction of the city?**
   - Public spaces
   - Religious buildings
   - Historical buildings and landmarks
   - Public buildings
   - Residential buildings
   - All the above
10. **Which is your preferred strategy towards the relationship between the old and the new?**
    - Restoring semantic elements
    - Harmony between the old and the new
    - Integrating the added fabric with the old

Please add any remarks or extra information below
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Thank you for your participation.

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CITIES' URBAN RESILIENCE IN THE FACE OF URBAN SPRAWL CHALLENGES

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ABSTRACT

Motives: The research deals with the issue of urban sprawl on agricultural lands. It is an urban problem caused by rapid urbanization and poor planning. It is considered one problem that threatens cities with environmental and health disasters. It also threatens agricultural life and the green belt surrounding cities. Changes in urban sprawl on agricultural land are associated with complex processes that lead to multiple social, economic, political, and environmental risks and thus pose a threat and an obstacle to the sustainability of cities.
Aim: The research aims to study and evaluate the reality of the city of Baghdad and the extent of its ability and flexibility to withstand the disaster of urban sprawl on agricultural lands. The research also the aim of this research to identify the gaps and the reasons that led to this disaster and reach solutions that may reduce this phenomenon that burdens the economy and the Iraqi people who suffer from difficult economic conditions. In addition to raising awareness about the effects of urban sprawl on agricultural lands and the environment, clarifying the role of participation and the limits of responsibility that can be entrusted to government and academic agencies at all levels, individually or collectively, to participate and find solutions to the risk of extensive urban sprawl.
Results: In assessing the reality of the study area, the research relied on the city resilience scorecard, which the United Nations Office for Disaster Risk Reduction (UNDRR) and with the support of United States Agency for International Development (USAID) and the European Commission. Field surveys and the opinions of specialists were relied upon to study the reality of the city of Baghdad to determine the extent to which it was affected by the disaster of encroachment on agricultural lands.
There are gaps between planning and contemporary challenges among the most important research findings. Planning is increasingly decoupled from the contemporary urban challenges associated with rapid urbanization. The results of the practical study showed that the division of land uses in the city of Baghdad is not deep and incomplete. Also, it is not regularly reviewed according to the map of the expected risks, including the state of urban sprawl on agricultural lands in the city. Consequently, the city's inability to withstand the disaster resulting from urban sprawl and the problems that result

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from it in the environmental, health, or social aspects. Based on the results, the research reached a set of recommendations, including the need for continuous updating to detect urban sprawl on agricultural lands. This is done using the latest remote sensing data and taking quick precautions against these expansions, in addition to the importance of updating building controls and standards regularly (or periodically) to take the changing data and evidence about risks to enhance the city of Baghdad's ability to withstand the disaster of the decline of agricultural lands.

Keywords: flexibility, disaster, risk, agriculture land use, urban sprawl

INTRODUCTION

Agricultural land is an essential resource for the sustainability and security of human food systems, environments, agro-industries, and livelihoods. Sustainably managed agricultural land provides invaluable ecosystem services, such as wildlife habitat, carbon sequestration, water regulation, and amenity value (Power, 2010). Moreover, although the technology in the world is getting more and more complex every day, no technology has been able to replace the unique qualities of the major agricultural lands that have developed over time.

The issue of agricultural land as an indispensable natural resource is witnessing great interest on several levels, represented by organizations and conferences and books and research. The American Farmland Trust (AFT) is a national group that aim to stop the loss of farmland and promote farming practices that lead to farmland conservation due to its economic, environmental, and social role. As well as the cultural significance and landscapes that connect individuals to the natural world (Vinge, 2018).

The United Nations Global Goals for Sustainable Development 2030 included several goals related to the importance of agricultural land with direct and implicit goals. Goal 2 referred to "eradicating hunger, achieving food security, improving nutrition, and promoting sustainable agriculture". Goal 12 referred to "ensure sustainable consumption and production patterns". Agriculture is a sector where these objectives can synergize (Plastun et al., 2021). For this reason, preserving agricultural lands and developing investment tools have become important for countries to achieve sustainable development goals related to the agricultural sector (Havemann et al., 2020). According to studies conducted by the Food and Agriculture Organization (FAO), the International Fund for Agricultural Development (IFAD), and the World Food Program (WFP), the amount required to achieve these goals is estimated at 265 USD billion annually by 2030.

With urbanization and economic growth, the urban areas increased, and the cities expanded dangerously. This expansion changed land use and, in most cases, reduced the area of productive agricultural land around these cities. Agricultural land is increasingly under threat from social, physical, and climatic factors (Vinge, 2018). The issue of preserving agricultural lands for current and future generations has become a global issue that must be urgently addressed as it constitutes an urban disaster that most countries are unaware of. It is rapidly reaching its peak in conjunction with the urban disasters of recent years represented by natural hazards, equipment accidents, public health events, and terrorist attacks. All of them lead to an escalation of economic and human losses and threaten sustainable urban development (Lizarralde et al., 2015).

The main gist of this paper emerges from the recognition that land is a valuable natural resource that must be protected for the benefit of current and future populations. The encroachment on agricultural land is an urban disaster that cities must address so that they can continue and recover quickly. The research problem is represented by: the absence of a clear perception of the gaps and the reasons that led to the decrease of agricultural lands in a country where agriculture is the main livelihood resource for many of its residents. Society is accustomed to taking land for granted, and until recently, no attempts have been made

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to generate public interest in "monitoring" land use. The research aim to study and evaluate the reality of the city of Baghdad and its ability to withstand the disaster of urban sprawl on agricultural lands, identify the gaps and reasons that led to this disaster, and reach solutions that may contribute to limiting this phenomenon that burdens the economy and the Iraqi people who suffer from difficult economic conditions. As well as raising awareness about the effects of urban sprawl on agricultural lands and the environment and clarifying the role of participation and the limits of responsibility that can be entrusted to government and academic agencies, individually or collectively, to find solutions to the risk of extensive urban sprawl.

This paper suggested relying on the City's Resilience Scorecard, established by the United Nations Office for Disaster Risk Reduction (UNDRR) and supported by (USAID) and the European Commission. Field surveys and the opinions of specialists were relied upon to study the reality of the city of Baghdad to determine the extent to which it was affected by the disaster of encroachment on agricultural lands.

Methodology

To achieve the goal of the research, the study methodology consisted of two sides, the theoretical side and the practical side.

The theoretical side

The theoretical side of the research relied on the qualitative approach in collecting multiple sources and data from the literature related to the urban sprawl disaster on agricultural lands to understand and analyze this phenomenon by classifying these sources and data on four main axes. The first axis included studying the concept of risks and disasters in the urban environment and its most important characteristics and classifying them into several types, such as environmental and economic risks, social and cultural risks, capital risks, and institutional political risks. The second axis included a study of the concept of urban sprawl and its risks on agricultural lands and the most important effects resulting from this disaster, such as the economic, environmental, and social effects. The most important reasons that led to the urban sprawl disaster on agricultural lands and their relationship to the ability of cities to combat these risks were identified. The third axis touched on the ability of cities to find ways to combat disaster risks and the classification of international frameworks and conferences that dealt with this aspect. The fourth axis dealt with the resilience of cities. Within this axis, the resources related to urban resilience frameworks were classified into cross-sectoral and sector-specific frameworks. The cities resilience scorecard developed by the United Nations Office for Disaster Reduction, part of the cross-sectoral framework, was selected. This card was analyzed, and the necessary sources and data were collected for understanding and then applied to the functional study area.

The practical side

The practical side relied on the quantitative analytical approach for the study area, represented by the city of Baghdad, to determine the extent of the city's ability to withstand the catastrophe of urban sprawl on agricultural land. Methods of collecting data about the study area included three main methods:

1. Using the remote sensing system (aerial images and satellites) with examinations and field surveys and a comparison between the map of the city of Baghdad for agricultural use within the basic design maps and the change that occurred in the city of Baghdad due to the phenomenon of urban sprawl on its agricultural lands.

2. Choosing the fourth basic (the application of urban designs capable of being resilient) from among the ten basics proposed in the card for measuring the resilience of cities prepared by the United Nations.

3. Making a questionnaire to measure the main indicators branching from the fourth basic of the city's resilience card and then distributing the questionnaire to a sample of specialists in the relevant departments and institutions (Ministry of Planning, Ministry

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of Housing, Municipality of Baghdad, municipalities that make up the city of Baghdad). The selected sample consists of 20 specialists from the fields mentioned above.

The answers were calculated using the Likert scale, and then the results were analyzed and presented in the form of tables and graphs to discuss these results and reach conclusions.

THEORETICAL FRAMEWORK

Hazards and disasters

Many studies have indicated that there is no such thing as a disaster, but disasters often follow dangers. Thus, it can be said that the danger becomes a disaster when human settlements are exposed to it and development is affected by it as disasters are sometimes considered external shocks (Bansal et al., 2013). Disaster risk is defined as a combination of the intensity and frequency of danger, the number of people and assets at risk, and their exposure to harm. Intensive risks are the disaster risks associated with low-probability and high-impact events, while broad risks are associated with high-probability and low-impact events (UNDRR, 2015). Thus, it can be said that disasters result from the interaction of hazards and weak conditions and thus are a product of social, political, and economic environments. When disaster risks affect cities or urban areas, they are referred to as urban disaster risks, and thus the research will address the concept of disaster risks and their characteristics, focus on urban disaster risks, and the relationship of cities to those risks.

The concept of disaster risk

Disaster risk is widely recognized as the interaction between hazards and the characteristics that make people and places vulnerable. Schipper et al. originally defined disaster risk as to the probability of a natural event multiplied by its outcomes (Schipper & Pelling, 2006). The disaster risk is a process of accumulation and that its effects have led to significant imbalances in different countries (O'Keefe et al., 1976), "urban vulnerability to hazard is a function of human behavior, and describes how urban social and economic systems and physical assets are either vulnerable or resilient to natural hazards" (Rashed & Weeks, 2003).

Characteristics of disaster risk

Disaster risks have many characteristics that can be summarized as follows (Bansal et al., 2013):

1. Forward-looking: at the probability of loss of life, destruction, and damage in a given time.
2. Dynamic: can increase or decrease according to our ability to reduce vulnerability.
3. Invisible: consists of not only the threat of high-impact events but also low-impact recurring events that are often hidden.
4. Unevenly distributed around the earth: Hazards affect different regions, but the pattern of disaster risk reflects the social construction of exposure and vulnerability in different countries.
5. Emergent and complex: Many processes, including climate change and globalized economic development, create new and interrelated risks.

It is clear from the above that the characteristics of disaster risks overlap between several dimensions represented by the spatial and social dimensions, which are directly or indirectly reflected in the city. Therefore, the research had address the risks of urban disasters and their relationship to the city since it represents the political and economic center.

Urban disaster risk

Research has traditionally expressed disaster risk as the probability of future loss due to three factors, risk (the probability of a potentially harmful physical event such as a hurricane, earthquake, or drought), exposure (the population or assets – including human settlements, infrastructure, crops, and livestock – at risk) and vulnerability. (Exposure to loss, associated with a combination of physical, social, economic, and other characteristics of the exposed items). The risks are defined as follows Figure 1:

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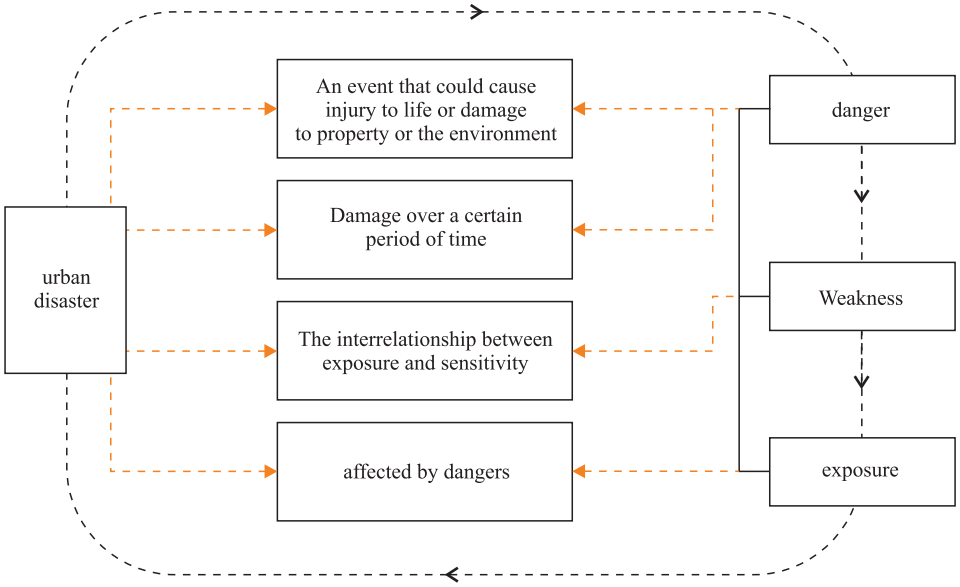

Fig. 1. Urban disaster
Source: researchers based on Serje & Team (2011) and Taubenböck et al. (2008).

1. Hazard is a phenomenon or event that can cause injury to life or damage to property or the environment (e.g., flood, hurricane, volcanic eruption, earthquake, landslide, or man-made hazard). The magnitude of the phenomenon, the probability of its occurrence, and the extent and severity of its impact may vary. In many cases, these impacts can be anticipated or estimated, and thus people and the environment are vulnerable to disaster because of the risks (Serje & Team, 2011).

2. Risk is the probability of damage occurring during a certain period. They include the potential effects of interrelated (socio-economic impacts on employment, production, etc.) or induced effects (effects of hazardous industries, dam collapses, fires and explosions, etc.) and a human or social dimension (demographic, socio-organizational, political, educational and cultural) (Taubenböck et al., 2008).

3. Vulnerability is the interrelationship between exposure, sensitivity (system stress), and adaptive capacity (system potential) to reduce the impact of danger (Taubenböck et al., 2008).

4. Exposure is another component of disaster risk and refers to the vulnerability to hazards such as people and property.

City and disaster risk

Since the twentieth century, disaster risks, economic losses, and people affected have increased dramatically in cities worldwide. Cities as centers of politics, economy, and culture have provided many job opportunities and other characteristics such as population concentration, a large number of buildings, and different types of infrastructure. These characteristics allow cities to function normally and become livable. However, it also revealed the emergence of new and ever-changing disaster risks. The characteristics of new disaster risks differ from traditional disaster risks in that they are extreme, unknown, and often high in destructive power, which may cause serious human losses, property damage, and social unrest in the country or regions (Mercer et al., 2010a). Moreover, these characteristics make it difficult to predict new disaster risks. Thus, it can be said that the development of cities, to a large extent, transformed risks into disaster risks and increased the possibility of these cities being exposed to the risk of new disasters (Jie et al., 2017).

Cities face enormous disaster risks exacerbated by uncontrolled population growth, deterioration

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of the physical living environment, and human actions being a responsible phenomenon. Thus, the meaning of "natural disasters" has constantly changed from a historical point of view (Norris et al., 2008). From the "forces of nature" to the "actions of men". Scientific researchers realized that disasters are no longer the product of purely natural phenomena but rather the result of a combination of natural and human environmental systems (Liu & Wang, 2015). There has been a significant increase in low frequency and high consequences disasters such as climate change, global warming, etc., which have caused unpredictable, unbalanced, and deadly disasters. Thus, human actions cause many problems and increase risks in cities. Various social and environmental trends, from local to global, contribute to increased disaster risk and vulnerability for cities (Ismail-Zadeh et al., 2017). The most important are unplanned expansion, rapid urbanization, inappropriate land use planning, and poor application of building regulations (FH-Köln et al., 2010). Rapid urbanization, combined with urban poverty and widening income and wealth gaps between and within urban areas, often increases the exposure of people and economic assets to the risk and creates new patterns of disaster risk. This makes disaster risk management in urban areas particularly complex (Cutter, 2021). Disaster risks in urban areas are classified into five categories (Bansal et al., 2013):

1. Capital risks: include damage to government buildings and basic facilities. Damage to buildings and services and machinery, equipment, and furniture.

2. Environmental risks: include water and air pollution, biodiversity loss, and noise and light pollution.

3. Social/cultural risks: loss of life, injury, disease, disability, demographic change, loss of cultural and historical resources, and change in the character of residential neighborhoods, which in turn affects the population and exposes them to danger.

4. Institutional and policy risks: include governmental responsibility, eroding society's vision, and undermining other policies.

5. Economic risks: They include the financial loss of the government, the financial loss of business, the decrease in tax and commercial income, the increase in government expenditures, the lack of affordable housing, and the loss of work, which in turn directly affects the increasing phenomenon of urban sprawl as it is a major problem that many cities suffer from. Especially cities that suffer from the absence of planning laws.

It can be said that there is a consensus from many studies since the late nineties on the idea that cities that suffer from urban sprawl are less sustainable economically and socially (Rubiera-Morollón & Garrido-Yserte, 2020). The research will focus on the risks of an urban disaster that cities should consider to achieve resilience in the coming paragraphs.

Urban sprawl

Since the second half of the last century, there has been a dynamic development of cities which have played an increasingly important social and economic role. Changes in the work of urban areas caused a loss of control within some development processes, which led to a disturbance in the functional and spatial structure of each of the cities and their neighborhoods. Therefore, urban sprawl has become an important research problem regarding the conceptual dimension (Lityński, 2021).

Urban sprawl is defined as scattered and inefficient urban growth (Hasse & Lathrop, 2003). Slavati and Morelli reviewed the distinct definition of urban sprawl. Among the definitions, it can be noted that urban sprawl is greedy, selfish, and inefficient in the use of land, which leads to monotonous development without interruption. It is not continuous spatially (Salvati & Gargiulo Morelli, 2014). In the second decade of the twenty-first century, there is consistency in defining urban sprawl as a chaotic change in spatial structure with a low degree of control through spatial politics (Lityński & Hołuj, 2020). Thus, it can be noted that the essence of the term urban sprawl is to understand what is the chaotic change in the spatial structure, which is a question related to morphological features, as urban sprawl is usually described as a loose form of housing, whether on the outskirts of cities or in suburban areas (Galster et al., 2001).

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Urban sprawl takes many different forms, including residential buildings, industrial facilities, infrastructure, etc. It takes many types in terms of encroachment on agricultural lands, highways, archaeological sites, water sources, and sources of biodiversity. Thus, urban sprawl refers to the growth of urban areas resulting from uncontrolled, uncoordinated, and unplanned growth and its continuation leads to a phenomenon, and the phenomenon turns into a problem and then into a disaster. As a result of the increase in the urban sprawl of all kinds globally, the research will focus on encroachment on agricultural lands as a man-made disaster. Being a problem facing the world's agricultural resources is a warning to advocates of fair housing, environmental scientists, land-use planners, and many employers (O'Keefe et al., 1976) trying to resist its effects and recover from them quickly and efficiently.

Since the topic of the research deals with urban disasters and their relationship to the city, the research will address the dangers of urban sprawl on agricultural land and its effects.

Risks of the urban sprawl disaster on agricultural lands

The problem of urban sprawl at the expense of agricultural land is one of the problems that all countries of the world suffer from, especially those characterized by rapid population increases. Human activities, especially urbanization, have led to a great loss of agricultural land (Shi et al., 2016). This phenomenon has become a challenge to most countries of the world. Since the Neolithic period, the transformation of the land by human action has mainly included effects on soil and vital resources. The land transformation has not receded but rather accelerated and diversified. With the onset of the Industrial Revolution, the globalization of the world economy, the expansion of population and technological capacity, forests were cleared, grasslands were plowed, and wetlands were dried up. The global demand for land products will likely continue to grow for the foreseeable future, and thus maintaining the ability of the land to meet this demand will remain of fundamental importance. The level of interest generated by current trends reflects the potential for land conversion to pose a degradation and danger in the near future (Fazal, 2000).

Land converted from agricultural to urban uses can significantly affect broader environmental sustainability and ecosystem functioning and affect the areas of economic and social well-being. The main drivers of land-use change are numerous, including social and economic forces, urbanization, technological developments, and land use policies (Ustaoglu & Williams, 2017). Thus, it can be said that the causes of urban sprawl on agricultural lands are many and varied, and the research will address the most important of those reasons to show the dimensions and the associated and causative bodies of sprawl to determine the risks and to develop solutions that contribute to preserving agricultural lands.

1. Lack of laws and regulations to plan for solutions to reduce encroachment on agricultural lands, as most of the decisions taken by competitors in the private and government sectors are based on expectations that do not meet the requirements or needs of future development.

2. Sometimes urban sprawl occurs due to improper financial costs (such as rough terrain, wetlands, mineral lands, water bodies, etc.), resulting in high financial costs incurred on providing infrastructure services and, in turn, the ease of infrastructure services in a land agricultural (Brueckner, 2000).

3. Farmers are often tempted by the prospect of selling rather than continuing with the farming business. Because the value of the revenue of the built facilities is much better than the value of the land's agricultural production, urban use is often preferred over agricultural use, which leads to the growth of the city and thus urban sprawl (Schipper & Pelling, 2006).

4. Industrialization led to social transformations and changed the traditional view of agriculture. The region's residents tend to work in government jobs and leave work in agriculture, which leads to neglecting agricultural land, and preferring buildings

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instead of farming because building shops and renting provides them with a better income than their income in agriculture (Schipper & Pelling, 2006).

5. The lack of affordable housing for low-income people. Due to the high land prices and the consequent inability of these groups to buy land and build on it (Asif, 2014).

The effects of urban sprawl on agricultural lands

Changes in urban sprawl on agricultural lands are linked to complex processes that lead to multiple social, economic, political, and environmental risks (Rashed & Weeks, 2003). Once agricultural land is paved and built for urban use, it is lost forever to non-agricultural uses. It is an irreversible category. The risks of this disaster are not just about urban sprawl but should be measured concerning the effects and dimensions of this phenomenon, represented by:

Economic effects

Urban sprawl leads to the depletion of major natural resources such as agricultural land, one of the economy's most important components. Consequently, the lower per-capita productive agricultural land in the world and the fact that living in larger and more widespread areas makes public services more expensive in general with the higher cost of providing infrastructure. Reduced food production is a direct consequence of agricultural land conversion, affecting national food security.

Environmental effects

The urban sprawl on agricultural lands has several effects on the ecosystem within the city, as follows, see Figure 2:

1. The United Nations Environment Program defines desertification as the spread and increase

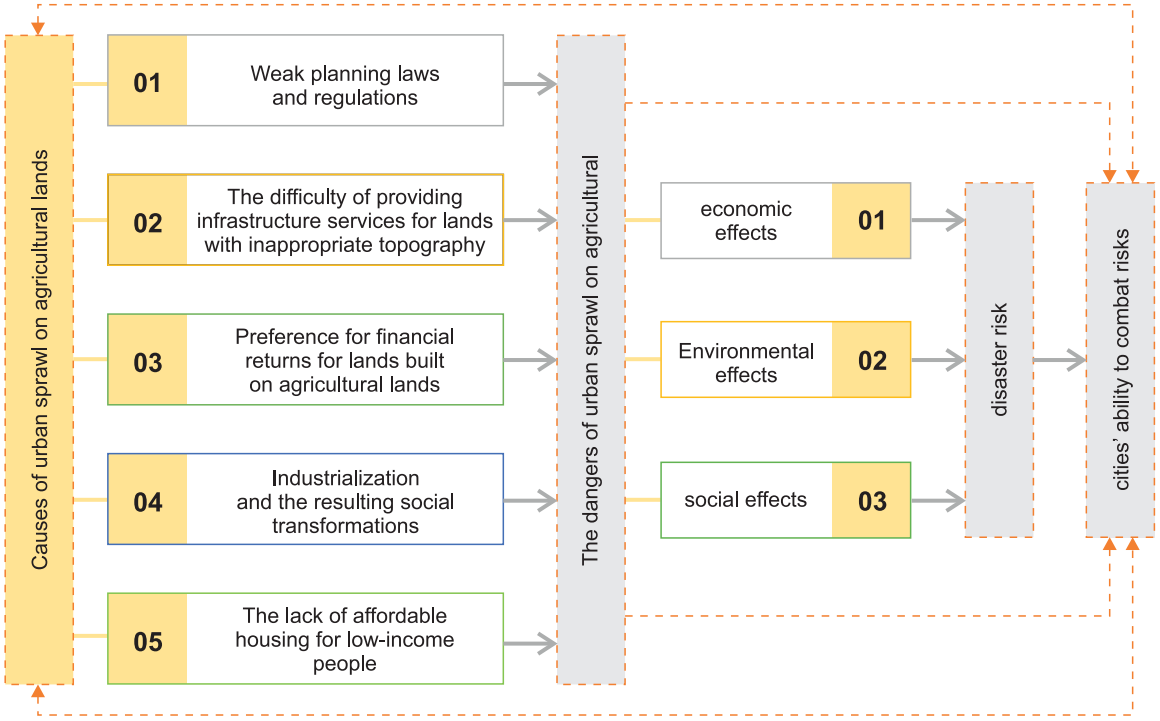

Fig. 2. Causes of urban sprawl on agricultural lands
Source: researchers based on Stone et al. (2010) and Bhatta (2010).

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of desert conditions that decrease the productivity of living matter. Urban sprawl on agricultural lands leads to desertification. This reduces the production of crops, and consequently, the loss of fertile soil and the loss of organic elements needed by the land for plant growth makes it unsuitable for agriculture.

2. In cities with high levels of urban sprawl, rising temperatures have more than twice the number of days with extreme temperatures than in cities with more compact growth patterns (Stone et al., 2010).

3. Increased consumption of fossil fuels and greenhouse gas emissions. Urban sprawl leads to poor air quality through increased housing and dependence on cars, which increases dependence on fossil fuels (Bhatta, 2010).

4. Impacts on wildlife and the ecosystem. In areas where encroachment is not controlled, ecosystem patterns change. Urban sprawl has serious impacts on water quality and quantity. Since a large area of land is covered with impermeable materials such as concrete, there is less leaching of rainwater to reach the aquifers, thus exposing the area to increased flood risks (Bhatta, 2010).

Social effects

Spatial diversity is based on social classes, the disparity in wealth between cities and agricultural areas, and social issues related to the deterioration of urban communities and the quality of life, including the disintegration of society and the lack of social interaction (Taubenböck et al., 2008).

From the preceding, it is clear that the risks of urban sprawl on agricultural lands are a real urban disaster due to the effects resulting from this disaster in its economic, social, and environmental dimensions. It is necessary to shed light on this disaster and indicate the extent of the cities' ability to address it and recover from it. Therefore, the research will address cities' capacity concerning disaster risks.

CITIES' CAPACITY TO COMBAT DISASTER RISKS

The concept of disaster resilience is key to resolving the complex and uncertain interactions between natural and human ecosystem systems (Mercer et al., 2010a). The increasing contradictions in population, resources, and the environment have led to the concept of resilience to disaster risk becoming a basic concept of research in sustainable urban development and a common concern in many disciplines. Aldrich et al. noted that disaster resilience is the ability to respond effectively to disaster disturbances. He defined the concept as "the ability of communities or cities to be resilient to the disruptions of disasters and with a high capacity to combat disaster risks can continue to operate or recover quickly during or after disasters" (Aldrich & Meyer, 2015).

There are both political and economic imperatives for disaster risk reduction. Disaster risks are a common risk. Businesses, the public sector, and civil society participation in its construction and thus, combating disaster risks must be considered a shared value. This, therefore, requires an approach that initially relies on providing risk information as a critical foundation for the ability to combat and manage disaster risk across a wide range of sectors (Norris et al., 2008):

1. In the insurance sector, disaster risk assessment is essential. The capital of most insurance companies other than life insurance is severely affected by their exposure to the risks of natural disasters.

2. In the construction sector, identifying potential risks expected in the life of a building, bridge, or critical facility leads to the creation and modification of building codes.

3. In the land-use and urban planning sectors, robust flood risk analysis similarly drives investment in flood protection and potentially the effects of changes in insurance.

4. At the community level, understanding hazardous events – whether from living memory or oral and written history – can guide and influence

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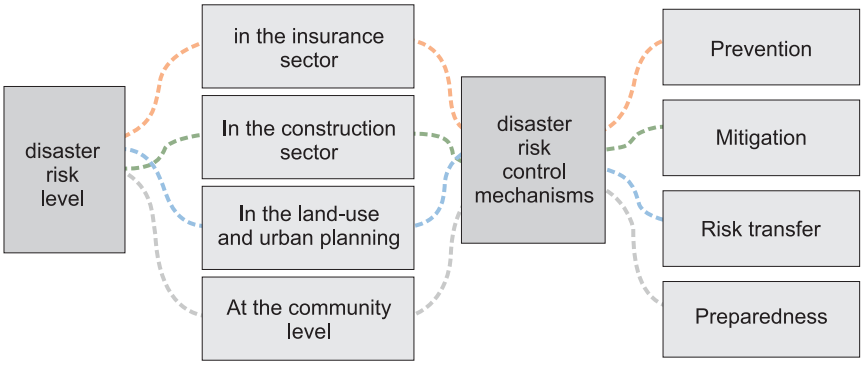

Fig. 3. Disaster risk levels
Source: researchers based on Cutter et al. (2008).

preparedness decisions, including life-saving evacuation procedures and the location of important facilities.

The ability to combat disaster risks contributes to building the capacity of cities and society to anticipate, deal with, resist and recover from disasters through activities related to the following (Liu & Wang, 2015):

1. Prevention: the complete avoidance of the negative effects of related hazards and disasters (often less costly than disaster relief and response).

2. Mitigation from the negative effects of a hazardous event. For example, nature-based flood mitigation can help Mississippi River farmers.

3. Risk transfer is the formal or informal transfer of the financial consequences of certain risks from one party to another. Where the family, community, institution, or state authority will obtain resources from the other party after a disaster has occurred. This is in exchange for current or compensatory social or financial benefits provided to that other party.

4. Preparedness The ability of governments, communities, individuals, and disaster recovery organizations to effectively predict, respond to, and recover from potential, imminent, or current disasters. Cities' understanding of systems and strong governance structures, and political and social participation by stakeholders all influence the ability to reduce disaster risk either negatively or positively (Cutter et al., 2008).

From the preceding, it is clear that the capacity to reduce disaster risks is a participatory building process between several sectors, each with a goal (companies, the public sector, and civil society). Therefore, the research will address the international and global frameworks and conferences that took into account and shed light on the importance of disaster risk reduction in order to extract the most important global common points that contribute to controlling urban disasters Figure 3:

INTERNATIONAL FRAMEWORKS AND CONFERENCES FOR DISASTER RISK REDUCTION

Cities are complex and are made up of several overlapping physical systems, and human societies are prone to disasters to varying degrees (Mercer et al., 2010b). As cities grow larger, they will become more economically productive. In doing so, it acts as a magnet for rural-urban migration. As urbanization continues, more and more people are settling in cities, which leads to urban sprawl and increased density. Urbanization has the potential to make cities more prosperous and countries more developed. However, many cities worldwide are completely unprepared for the multidimensional challenges associated with urbanization. As a result of rapid urbanization, cities are highly vulnerable to threats posed by hazards, often lacking the capacity and resources to deal with the sheer scale of risks. Despite various local coping strategies, urban communities cannot mitigate, reduce or manage the disasters that result from an urban

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development process outside their control (Aldrich & Meyer, 2015). Many international frameworks and conferences have emerged to reduce disaster risks and make cities disaster-proof.

Hyogo framework for action

The 10-year Hyogo Framework for Action emerged from the World Conference held in Kobe, Japan, from January 18–22, 2005. The Hyogo Framework for Action (HFA) is the first blueprint to explain, describe and detail the work required of all sectors and different actors to reduce disaster losses. The Hyogo Framework for Action identifies five priorities for action:

1. Make disaster risk reduction (DRR) a priority.
2. Know the risks and take action.
3. Build understanding and awareness.
4. Reduce risk.
5. Be prepared and ready to act.

The framework provides guidelines and practical means for achieving resilience in the face of disasters. Its goal is to significantly reduce disaster losses by 2015 by building the resilience of nations and societies to disasters (Norris et al., 2008).

Sendai framewor

Outlines the Sendai Framework for Disaster Risk Reduction: 2015–2030 adopted at the Third United Nations World Conference on Disaster Risk Reduction. The priorities for action at the national and local levels are to reduce the deaths and direct economic losses of disasters (including damage to critical infrastructure) by increasing the number of national and local disaster risk reduction strategies by 2020. These strategies should be Available across different time scales, with targets, indicators, and timeframes all aimed at preventing the emergence of risks, minimizing existing risks, and enhancing economic, social, health, and environmental resilience (UNDRR, 2015).

With the adoption of the Hyoko and Sendai Framework for Action and SDG 11 to "make cities inclusive, safe, resilient and sustainable", many efforts are being made to build resilience. Thus, the concept of resilience appeared in urban studies and disciplines related to cities facing disaster risks and emphasizing the concept of resilience for cities and societies in the face of disasters.

RESILIENCE OF CITIES

An effective way to estimate urban disaster risk is to determine how resilient a city is to urban disasters. This will help understand the city's vulnerability and, thus, indirectly discover the risks that urban disasters pose to the city. Definitions and approaches to resilience vary from social systems to engineering to environmental to public health. Despite the subtle differences, there is consistency between views regarding promoting positive social change leading to long-term sustainability. i.e., moving forward to what could have been, not regressing to what was (Mercer et al., 2010a). Leichenko defines resilience in its simplest form as "the ability of a city or urban system to withstand a wide range of shocks and stresses" (Aldrich & Meyer, 2015). Bosher defined it in theoretical research as "the ability of the city and society to use all forces and resources to reduce the risks and effects of disasters, as the internal weakness of urban systems" resilience is an essential ability to predict the effects of disasters and to resist or recover from them (UNDRR, 2015). The National Academy of Sciences (NAS) defines resilience as "the ability to plan, prepare for, absorb, recover from, and adapt to adverse events" (UNDRR, 2015). Teoh and Zadeh provide a different definition. They focus on resilience more as "a measure of the persistence of systems, and their ability to accommodate change and disruption and still maintain the same relationship between population and state variables". Therefore, "essential", as they rely on this definition for resilience. It is "a function of public awareness of the organization's situation, underlying vulnerability and adaptability in a complex, dynamic and interconnected system" (Cutter et al., 2008).

They are often seen as highly complex and adaptive systems as cities continue to grow and address risks

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and challenges. Thus, it can be argued that resilience has emerged as an attractive perspective on cities. It is becoming an increasingly preferred concept for disaster risk reduction.

Flexibility frameworks

A wide range of efforts has been made to develop frameworks and tools for measuring and reporting resilience in recent years. These areas generally fall into two broad areas:

1. Cross-sectoral frameworks: These frameworks can generally be described as high-level frameworks that capture and report resilience in broad areas/sectors (e.g., planning, infrastructure, emergency response, economics, governance, etc.). In many cases, these broad sectors are broken down into more specific indicators that can be used to develop measurement tools. Lisa, Schipper, & Langston have reviewed and compared a wide range of frameworks. This included (Mercer et al., 2010b):

a. ARCAB – Action Research for Community Based Adaptation;
b. CRF – City Resilience Framework from the Rockefeller 100 Resilient Cities Programme;
c. CoBRA – UNDP Community-Based Resilience Analysis Framework;
d. UNDRR Disaster Resilience Scorecard for Cities (based on the "10 essentials");
e. USAID Measurement for Community Resilience.

Their analysis found a variety of resilience measures and that the comparisons were different as each was developed for a different purpose. They also found that many frameworks attempted to apply quantitative or semi-quantitative indicators to resilience criteria. They conclude that indicators should be used with caution, and in some cases, their use may be incompatible with the desire to measure resilience.

2. Sector-specific resilience frameworks: These are generally more detailed assessments that focus on one specific sector, such as infrastructure, ecosystems, economies, or organizations.

Hughes & Healy defined and reviewed infrastructure resilience frameworks in detail. A distinction is made between conceptual (qualitative) and indicator-based frameworks and the frameworks that attempt to scale before or after the event (Aldrich & Meyer, 2015).

They continued to develop a transport resilience framework based on technical (infrastructure) and organizational flexibility. The organizational resilience indicators developed from Resorgs include three main

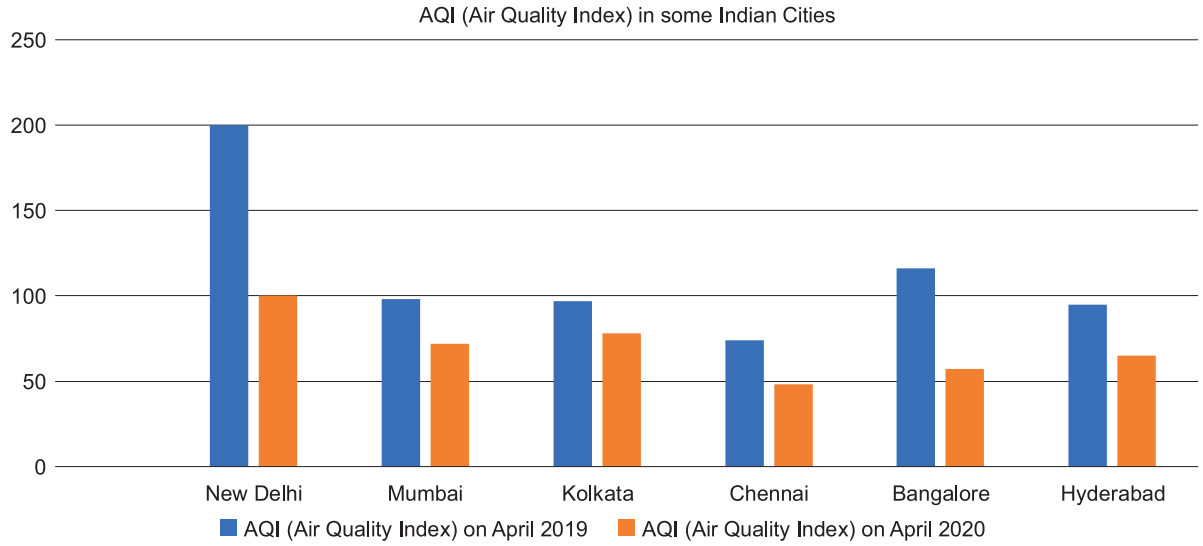

Fig. 4. Flexibility frameworks
Source: own preparation based on UNDRR (2015).

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focus areas: Change readiness, leadership and culture, and networks/relationships (UNDRR, 2015).

In this context, the research focuses on the "Ten Essentials" included within the cross-sectoral frameworks developed by the United Nations Office for Disaster Reduction to promote a greater understanding of local governments and their commitment to disaster risk reduction and making cities resilient disaster risks (Fig. 4).

UNISDR 10 essentials and scorecard

The United Nations Office for Disaster Risk Reduction (UNISDR) launched the Make Cities Resilient campaign in 2010 because of the increased risks associated with global urbanization. This campaign highlights resilience and disaster risk reduction among local governments and urban communities worldwide. To enhance the role of local governments in reducing these risks, the campaign is based on self-motivation and partnership. So does a focus on resilience – the city's ability to plan, mitigate, respond, recover, adapt and grow after disasters in light of its unique physical, economic, environmental, and social conditions (Mercer et al., 2010a).

Although all levels of government are generally expected to be involved in disaster risk reduction, the role and actions of local governments in making cities resilient are critical. Local governments can play a key role in making cities resilient in many ways because they are rooted at the local level where disasters occur. Since its launch, the campaign has collected pledges from more than 3,000 cities. By subscribing to the campaign, local governments are committing to implementing the "10 Essentials" to make cities resilient, a checklist of 10 essentials that guide disaster risk management and good disaster reduction practices.

Given the implementation of the 2030 global agendas, the increasing risks, and future projections of uncontrolled urbanization, there is a need to design the "Ten Essentials" to be more feasible and encourage cities to move towards their implementation. Member States and stakeholders have called for revisions to local indicators, informed by the basics, and the reporting process. These revisions are required in the new framework, including the goals of the Sustainable Development Goals (Aldrich & Meyer, 2015).

The Make Cities Resilient Steering Committee met in September 2014 and developed guidance for the United Nations Strategy for Disaster Reduction to review the Ten Fundamentals. The recommendations included:

1. Create a group consisting of technical agencies, experts, and partners working at the local level to lead the modification and harmonization of the Ten Fundamentals.

2. Involve national and local governments in the process to ensure that relevant linkages are built-in measurement and monitoring; ensure that empirical studies are conducted to take into account the facts on the ground.

3. Focus on action-oriented actions; participation in intergovernmental processes to obtain validation of new fundamentals and indicators.

Then these basics were finalized after further consultations and experiments. These new fundamentals are aligned with guidance provided by the Sendai Framework for Monitoring Disaster Risk Reduction at the local level. Pilot tests of the New Essentials and their indicators and generation of guidance notes were conducted in 20 cities starting in January 2016. The resulting feedback was used in the pilot studies to review the 10 New Essentials and develop final indicators and guidelines. These revisions were then incorporated into the new indicators of the Joint Monitoring and Action Planning Tool for Disaster Risk Reduction at the local level. The main objective of the New Essentials is to be implementable as these 10 New Essentials build on the previous ones, just as outlined in the Post-2015 Framework for Disaster Risk Reduction on the Hyogo Framework for Action (2005–2015), which marks the transition to implementation.

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Implementation of the "ten essentials" and the scorecard

The Ten Essentials define the elements or characteristics of a city to absorb shocks and stresses or recover quickly from them. Indicators that support the fundamentals measure whether or not these characteristics exist and to what degree they are present so that decision-makers can indicate "how a city would perform in the face of shocks and stress".

In some cases, this may require a qualitative approach in evaluating the degree of presence or absence of a characteristic and each basic covering one characteristic. However, to understand to what degree it exists, several sub-indicators are used to reflect the composition of the main characteristic. The sub-indicators must be evaluated, and a qualitative score should be determined with the reasons given. This will provide more detail and substance for each of the main indicators.

This process establishes a "baseline" at multiple levels. Strategically, it provides cities with clear guidelines for prioritizing action while, at the sub-indicator level, it enables the identification of gaps or weaknesses. Thus, remedial actions can build resilience coherently and systematically.

The "Ten Essentials" Figure 5 form the basis of the approach and the structure of the Disaster Resilience Scorecard. The scorecard provides an assessment process that allows for the review and monitoring of cities' resilience in the face of disasters. The Ten Fundamentals cover three main aspects of the Council's disaster risk reduction strategies/plans.

a. Increasing governance and financial capacity;
b. Integrated planning and disaster preparation and, Post-disaster response and recovery.

PRACTICAL FRAMEWORK

1. The research will deal in its practical framework with the following work mechanism.

2. The city of Baghdad as an elected case study and a statement of the reality of urban sprawl on agricultural lands within it using remote sensing (aerial and satellite images). Along with field inspections and surveys to measure the loss of agricultural land due to urban expansion in the city of Baghdad.

3. The fourth basis of the card measures the ability of the city of Baghdad to withstand the danger of urban sprawl on agricultural lands.

4. Apply the scorecard to the elected case.

Fig. 5. Resilience scorecard
Source: own preparation based on UNDRR (2015) and Mercer et al. (2010a).

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Choosing the study area and the reasons for choosing it

The boundaries of the spatial study area include the city of Baghdad, the capital of the Republic of Iraq, the administrative center of Baghdad Governorate, the largest city in Iraq (with an area of 4.6 square kilometers), the second-largest city in the Arab world after Cairo, and the second-largest city in West Asia after Tehran, the capital of Iran. The city of Baghdad acts as an economic, administrative, and educational center in the country (Santos-Reyes, 2010). As a result of its geographical location, it is prevented from having many agricultural lands classified within agricultural use in Baghdad. The study area was chosen for the following reasons:

The state issued laws in successive periods of distributing lands for agricultural use, dividing them for residential use or other uses, and giving building approvals within these lands without paying attention to the basic design and nature of the land uses.

1. Expand the building area of the city of Baghdad tremendously at the expense of the area of agricultural land surrounding it.

2. The entry of slums into the city of Baghdad and the irregular encroachment on the surrounding agricultural lands. This is due to several reasons: the increasing immigration resulting from the

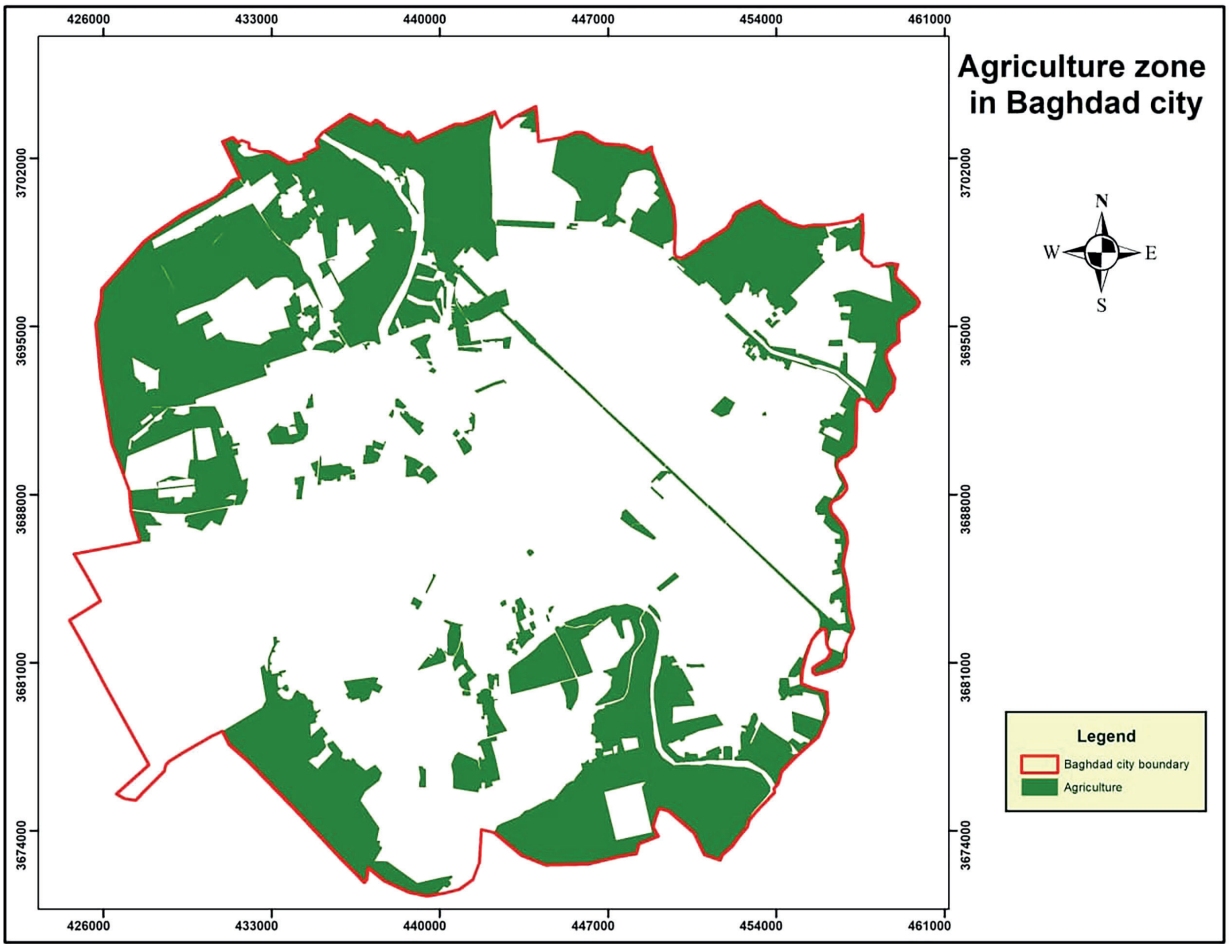

Fig. 6. The urban sprawl on agricultural lands in the Baghdad governorate
Source: own preparation based on Authors (2022).

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security conditions of Iraq in general, the economic situation and the search for work, and other reasons that allowed the encroachment on agricultural lands.

3. The dredging of thousands of orchards in Baghdad, which contains many palm trees and citrus, threatens a serious decline in the environmental reality and the desertification of the surrounding environment (Santos-Reyes, 2010).

The reality of the causes of urban sprawl in the city of Baghdad

Several reasons contributed to the urban sprawl towards agricultural lands within Baghdad, where the area of agricultural use within the city reached 27,453 hectares, as shown in Figure 6. The area overrun by random residential use and other uses amounted to approximately 6987.3 hectares, as shown in Figure 7. The most important reasons that led to this encroachment and transgression can be stated as follows:

Population growth in the city of Baghdad

The ratio of the population of Baghdad to the total population of the whole of Iraq has jumped very significantly in the course of a few decades. This large increase in the population was reflected in stifling overcrowding in many of Baghdad's residential areas, especially in the center of Baghdad. This rapid

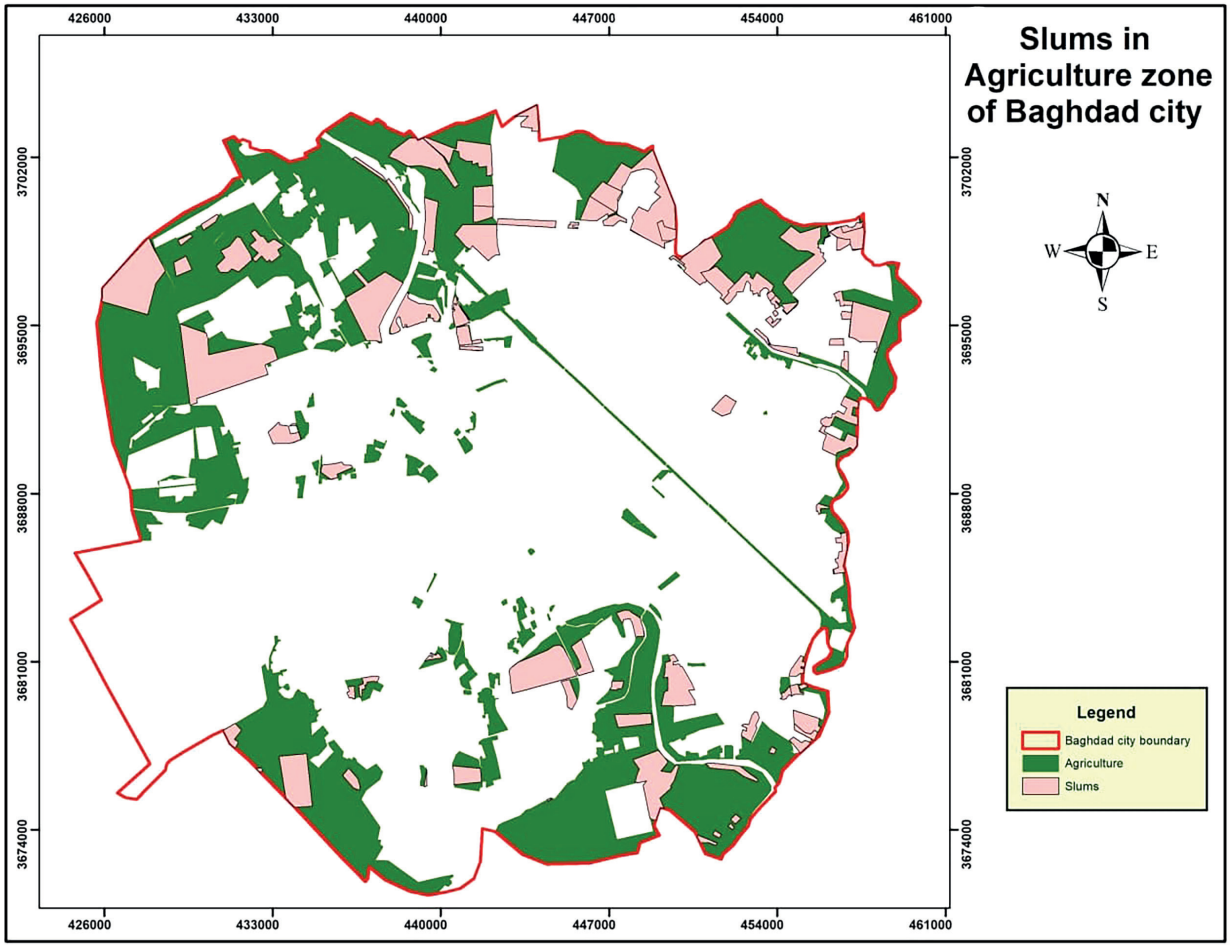

Fig. 7. The area of agricultural land in the Baghdad governorate
Source: own preparation based on Authors (2022).

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urban phenomenon has coincided with a period of unprecedented turmoil in the modern history of Iraq. A severe housing crisis erupted in Baghdad, traffic jams, and the emergence of a widespread deficit in services, as its population reached 7,055,000 people in 2021. Some to low-level or irregular dwellings (slums) and sprawl towards agricultural lands because of their vastness and mean value compared to residential lands Table 1.

Table 1. Change in the population of the city of Baghdad

Year	Population
2021	8,780,422
2020	8,558,625
2019	8,340,711
2018	8,126.755
2017	7,926,847
2016	7,720,001
2015	7,506,105

Source: Ministry of Planning – Central Bureau of Statistics (2021).

Weakness of laws and legislation

Many laws affected the future of the urban plan size of the city of Baghdad and the expansion of the city. And at the expense of the area of agricultural land. Resolution No. 117 of 2000 provides for the ownership of agricultural lands owned purely as a property, or endowed with a valid endowment, or properly endowed, or owned by the state burdened with dispositional rights, or belonging to the Ministry of Finance and at the disposal of agrarian reform destined for non-agricultural uses in accordance with the basic designs of cities and towns and their future expansions, intended to Allocate it to the military and police officers to the Municipality of Baghdad or the concerned municipality (UNDRR, 2015). As for the Supreme Committee for Basic Design decisions during the years 2004–2007, the Supreme Committee for Basic Design exercises its powers in accordance with the Basic Design Law No. 156 of 1971.

The Council of Ministers was approached to activate the committee's work, obtaining approval. Since its formation, the committee has received many requests for changing land uses, especially agricultural and green lands, from their original uses to residential use under the pressure of the need for housing, especially with the efforts of state ministries to provide housing plots for their employees.

Poor urban planning and non-compliance with structural plans

The spatial distribution of land uses almost the main engine for distributing the population and determining the general population densities in the city. Since the spatial trends of cities in Iraq are purely horizontal trends based on urban sprawl at the expense of agricultural lands, which led to the Iraqi cities, including the city of Baghdad, suffer from the problem of urban sprawl on the uses of the land allocated within the basic designs of the city and the lack of commitment to these uses contributed to the large size of the city, It expanded in different directions. An imbalance emerged between the city and its services.

The fourth core of the Baghdad city resilience measurement card

The scorecard is based on ten principles to enable cities to withstand disaster risks, as clarified in the theoretical framework and through a study of the reality of the situation. It turns out that urban sprawl on agricultural lands has become a threat to future disasters as it is linked to several levels (social, economic, environmental, etc.). Therefore, it is necessary to plan and prepare for those disasters. Based on this, the second phase of planning and preparing for disasters was approved. Which includes five basics. The focus will be on the fourth since its indicators are directly related to the risks of the elected disaster, represented by urban sprawl in terms of land use, zoning, and building standards and codes. As well as a questionnaire for planning specialists from the concerned departments about the availability and preparation of policies to reduce the risks of this

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disaster. Within the planning stage and disaster preparedness, the fourth basic (the application of resilient urban designs and development) was chosen, which includes a set of points that will be focused on, as it includes a set of indicators through which the measurement is made, as shown in the Table 2.

Table 2. Likert scale

Likert scale	Range
Severe	3.25 to 4
Moderate	2.50 to 3.24
Mild	1.75 to 2.49
None	1 to 1.74

Source: own preparation based on Authors (2022).

The mechanism of applying the fourth essential to the elected case

To measure the main indicators branching from the fourth basic (the application of resilient urban designs and development), a questionnaire was distributed through the Google Form to a sample of specialists in the relevant departments and institutions: (Ministry of Planning, Ministry of Housing, Municipality of Baghdad, municipalities constituting the city of Baghdad), to indicate and identify the special gaps that can be based on the. All this is made to provide recommendations that should be taken into account to prepare and mitigate the risks of the urban sprawl disaster on agricultural lands. A response was made by 20 people from the various government departments referred to, and the results were calculated. The answers were calculated by a Likert scale and will be relied on. The following values are used to interpret the questionnaire results.

General background about the sample

Through the questionnaire form, the sample was distributed according to the entities in which it works, as follows in Table 3.

As for the specialization of the questionnaire sample, it was distributed in the following Table 4.

Table 3. Distribution of the sample by employer

Sample employer	Repetition	Percentage
Baghdad Municipality	9	45
Ministry of Construction, Housing, and Public Municipalities	7	35
The Ministry of Planning	4	20
Total	20	100

Source: own preparation based on Authors (2022).

Table 4. Sample Specialization

Sample Specialization	Repetition	Percentage
Project Management	1	5
city planning	1	5
Civil Engineering	4	20
geometry space	5	25
Architectural Engineering	6	30
other	3	15
Total		100

Source: own preparation based on Authors (2022).

RESULTS AND DISCUSSION

After the sample was surveyed about the questions related to the fourth basic indicator, this paragraph will analyze and discuss the sample results to reach results that show the city's ability to confront the disaster of encroachment on agricultural lands.

The first indicator: zoning according to land use

Where the sample was asked: Is the city appropriately divided as it takes into account the risks that affect economic activity, agricultural and population centers? The results indicated Table 5, Figure 8: 25% of the sample indicated that there is no clear division of areas, and 45% indicated that this division is not deep or complete and is not regularly reviewed according to the dangers/disasters.

The sample indicated by 25% that the city of Baghdad is divided and interconnected to some extent, with the danger maps and plans to modernize the division not well understood. It is fully

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Table 5. Zoning according to land use

Zoning according to land use	Repetition	Percentage	Mediator
There is no clear division of regions	5	25	2.1
The breakdown is not in-depth or complete and is not regularly reviewed according to risks/risks	9	45	
The city is divided by land use, which is interconnected,) to some extent with maps of hazards and risks) and divisional modernization plans are not well understood	5	25	
The city is divided by land use, which is interconnected, (Fully with the hazards and risks maps) and the division is updated at agreed intervals	1	5	

Source: own preparation based on Authors (2022).

interconnected with the hazard and risk maps, and the division is updated at agreed intervals. The lowest percentage of the sample answers was 5%, indicating that the city is divided according to land use.

By analyzing the sample results, it is clear that the largest percentage of the sample (95%) indicates the existence of gaps that have led to the inability of the city of Baghdad to absorb the danger of urban expansion that causing the disaster of losing agricultural lands. These gaps are represented by the lack of a clear and explicit division of agricultural and residential land uses. In the case of the division of agricultural lands, it is not integrated and is not reviewed with the urban expansion that occurs. As well as updating it according to the decline of agricultural land and its environmental and economic danger; in other cases, the gap lies in the lack of a clear understanding of modernization plans, their mechanisms, and details.

The second indicator: new urban development

Sample question: Are methodologies promoted through the design and development of new urban development to enhance resilience? The results showed Table 6, Figure 9:

One answer out of 20, with a rate of 5%, indicated the availability of a clear policy at the level of the city of Baghdad. The guiding principles are prepared, and the sample agreed by 40% that if the policy exists, the problem lies in the guiding principles supporting it, as they are not appropriate.

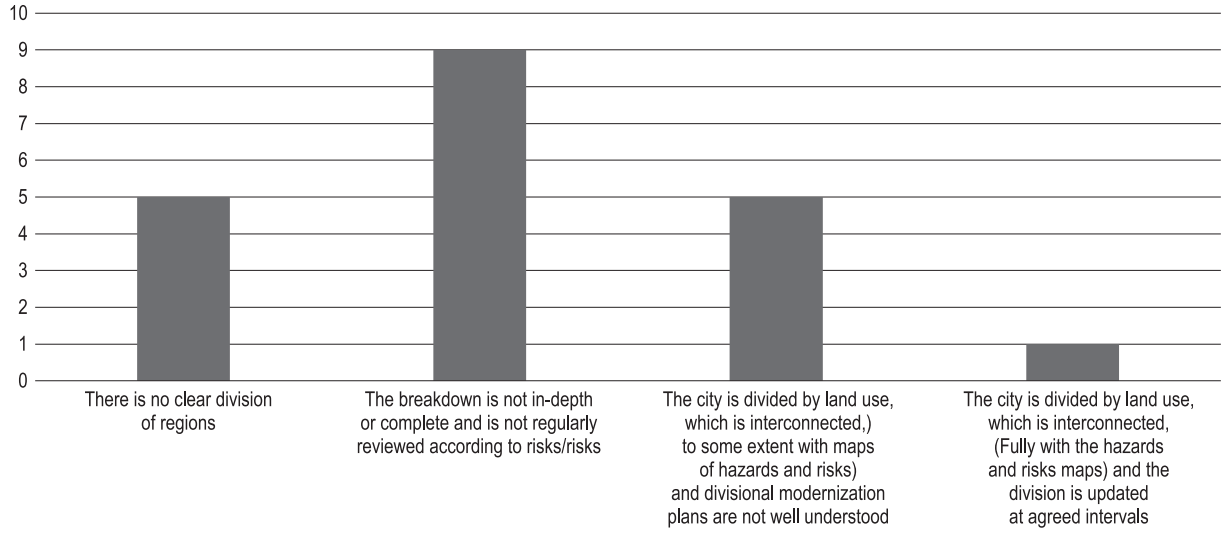

Fig. 8. Division of areas according to land use
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Table 6. New Urban Development

New urban development	Repetition	Percentage	Mediator
There is little or no strengthening of resilience in new urban development	5	25	2.25
Resilience methodologies are enhanced but not consistently and are not based on city policy	6	30	
The policy is in place, but the guiding principles behind it are not appropriate	8	40	
There is a clear citywide policy. The guiding principles have been prepared for a range of practitioners, such as architects, landscape designers, engineers… etc.	1	5	

Source: own preparation based on Authors (2022).

As for enhancing resilience, 30% of the sample indicated that resilience methodologies are being strengthened, but not consistently and not based on city policy. Moreover, 25% have little or no resilience in new urban development.

Analyzing the sample results makes it clear that gaps lead to the city's inability to withstand the disaster of losing agricultural land. The gaps are represented in the lack of clear policies to deal with population increases that lead to urban sprawl on agricultural lands and agricultural land policies. In the case of policies, the gap lies in the lack of proportionality and integration between the policy and the guiding principles. The analysis indicates the existence of a major gap represented in integrating the concept of resilience with its methodologies and mechanisms and its importance towards the city and the preservation of its agricultural lands now and in the future to achieve the concepts of environmental, economic, and social sustainability.

The third indicator: building code and standards

Where the sample was asked: Are building codes or standards available for the city of Baghdad? Are these standards regularly updated? Are you dealing with specific risks known to the city? The results indicated Table 7, Figure 10:

The indicator results "Availability of local building codes and standards" showed that the city of Baghdad

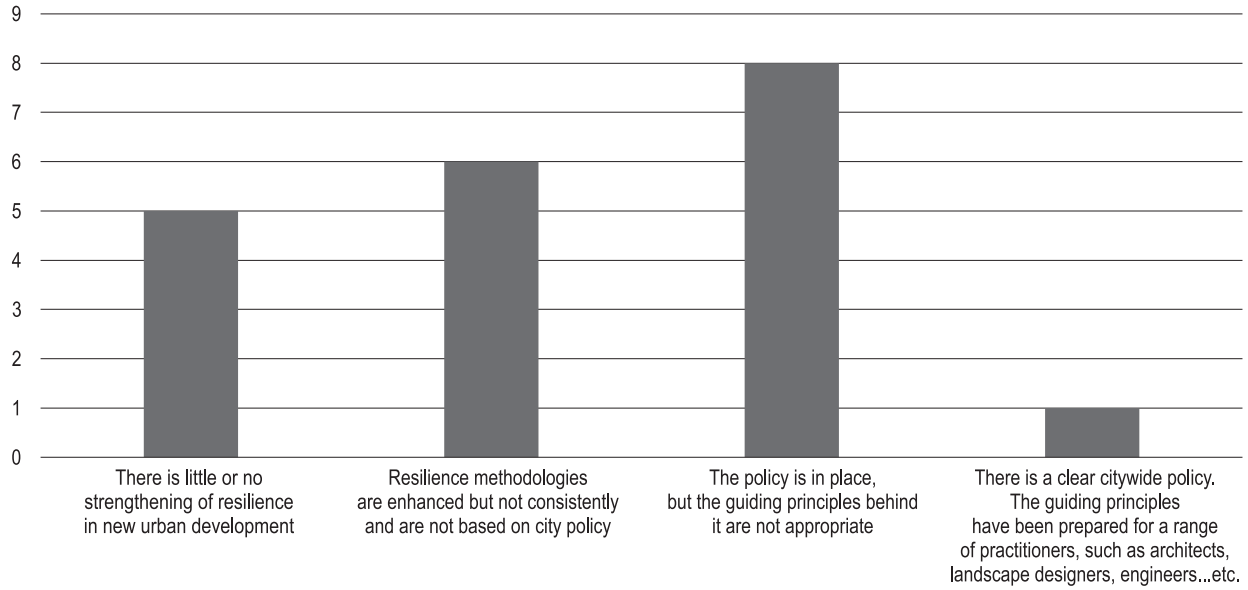

Fig. 9. New urban development
Source: own preparation based on Authors (2022).

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Table 7. Building codes and standards

Building codes and standards	Repetition	Percentage	Mediator
There is no real use of relevant building codes and standards	6	30	1.95
Some codes cover some risks, and there is no clear plan to update the codes	9	45	
Local building codes and standards are in place that deals with major city hazards and are updated regularly	5	25	
Local building codes and standards are available that deal with all known city hazards and are updated regularly	0	0	

Source: own preparation based on Authors (2022).

does not deal with the known dangers of the city by providing local building codes and standards, and they are updated regularly where no response from the sample was recorded for this case. At the same time, 25% of the sample indicated the availability of local building codes and standards that deal with the main dangers of the city and are updated regularly. On the other hand, 45% of the sample indicated the availability of some codes that cover some risks. There is no clear plan to update the codes. As for 30% of the sample, there is no real use of relevant building codes and standards.

Analyzing the sample results clarifies that there are gaps related to the "building codes and standards" indicator, represented by the absence of codes and standards for the risk of urban sprawl and loss of agricultural lands. The codes indicate how they are interconnected with the known and main dangers and their use in a manner appropriate to population and housing changes.

The fourth indicator: the application of zoning and building codes and standards

Where the sample was asked: Are zoning rules, building codes, and standards widely and appropriately applied? And verified? The results indicated Table 8.

The results showed that no percentage of the sample was recorded for the case of the city of Baghdad, that it follows zoning and building codes, and it is 100% applied, enforced, and verified. A small percentage of the sample (10%) indicated that zoning and building codes are applied, enforced, and verified in more than 50% of cases.

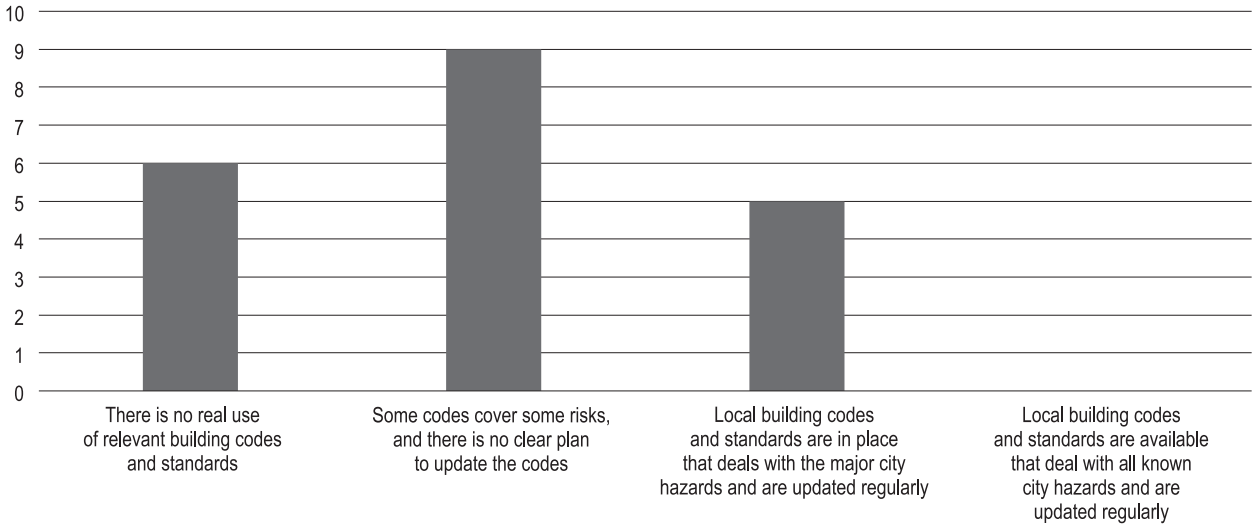

Fig. 10. Building codes and standards
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Table 8. Application, zoning, and building codes

Application, zoning, and building codes	Repetition	Percentage	Mediator
There is no real focus on enforcing zoning and building codes	8	40	1.17
Existing zoning applications and building codes are partial and/or not fixed	10	50	
Zoning and building codes are applied, enforced, and verified in more than 50% of cases	2	10	
Zoning and building codes are 100% enforced, enforced, and verified	0	0	

Source: own preparation based on Authors (2022).

The largest percentage of the sample, 50%, indicated that the current zoning and building codes are partial and/or not fixed. 40% of the sample agree with no real focus on zoning and building code enforcement.

Analyzing the sample results makes it clear that there are gaps related to the indicator "application of zoning and building codes and standards". The gaps are that zoning applications and building codes are patchy and incomplete. There is no real focus on this topic, and its importance in regulating land uses and integration and interconnection between uses to ensure no expansion and overreach.

Finally, by analyzing the results of the four indicators resulting from the fourth basic, it becomes clear that the city of Baghdad is unable to withstand the disaster of encroachment on agricultural lands caused by urban sprawl. This is due to the main gaps in each indicator represented in the lack of a clear plan to update the partition codes and not focusing on imposing zoning and building rules and other gaps mentioned in the analysis. Based on these gaps, many difficulties appear that the city of Baghdad must face in order to be able to absorb pressure and danger at multiple levels, such as the environment, the economy, as well as the social elements. Figure (12) shows the final model according to the sample results related to the four indicators about the city's ability to withstand the disaster of encroachment on agricultural lands concerning the basic "application of urban designs and development that can withstand".

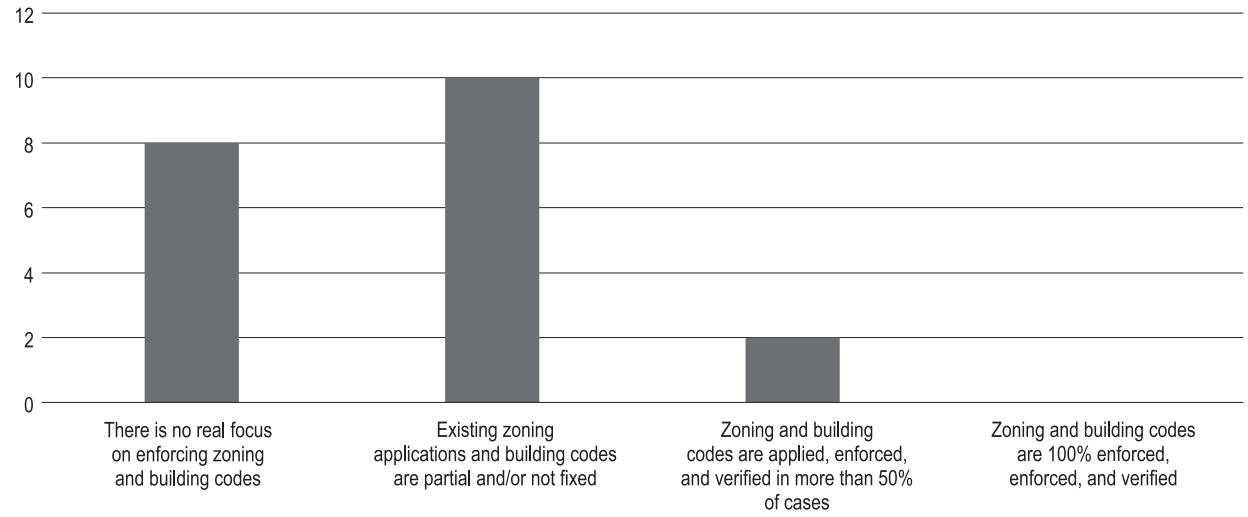

Fig. 11. Application, zoning, and building codes
Source: own preparation based on Authors (2022).

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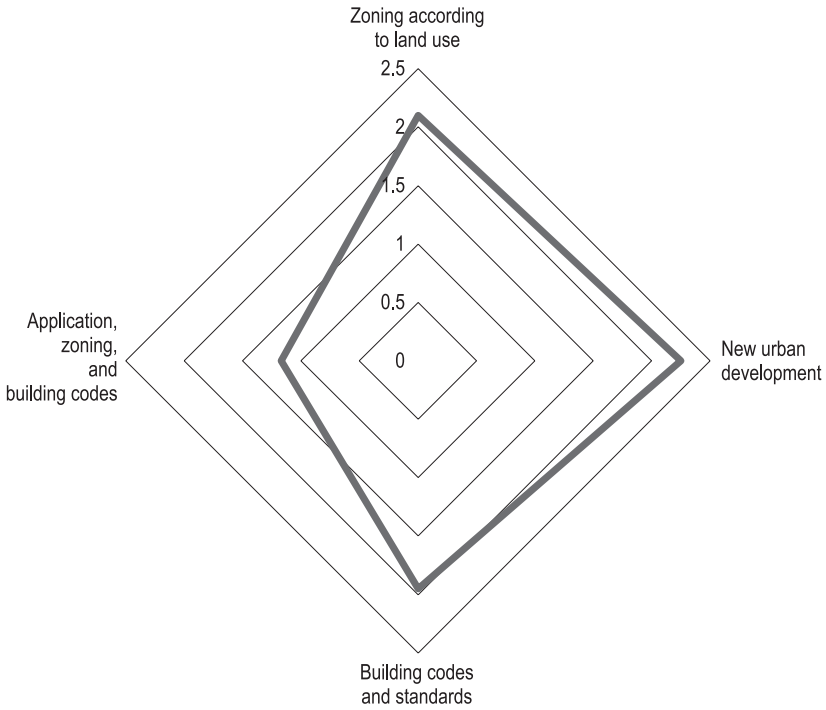

Fig. 12. Apply resilient urban design and development
Source own preparation based on Authors (2022).

CONCLUSIONS AND RECOMMENDATIONS

Although urbanization fuels the economy and contributes to the growth of countries, it can lead to dire consequences if it is not properly managed and controlled. Cities are by their nature complex and consist of several overlapping systems. Cities face enormous disaster risks of varying degrees, exacerbated by uncontrolled population growth, deterioration of the physical living environment, and human actions.

1. Urban sprawl is a serious problem that threatens agricultural life and the green belt surrounding cities. Changes in urban sprawl on agricultural lands are linked to complex processes that lead to multiple social, economic, political, and environmental risks.

2. The concept of resilience is the ability of cities to plan, mitigate, respond, recover, adapt and grow after disasters in light of different circumstances. The urban planning and development process to make cities resilient requires the involvement of multiple stakeholders, including municipalities, local leaders, the private sector, academic or research institutions, and interested institutions, in order to meet the needs and priorities of the various stakeholders involved, to allow for a better quality of decision-making.

3. There are gaps between planning and contemporary challenges as planning in many parts is becoming increasingly separate from contemporary urban challenges associated with rapid urbanization.

4. Cities resilience is not a concept separate from planning concepts and is related to addressing daily events, small and large, through low impact recurrent hazards to extreme events. This will require new approaches to reducing risks.

Recommendation:

1. Zoning and urban growth management to avoid exacerbating risk issues – Identify suitable land for future development.

2. The latest remote sensing data is continuously updated to monitor urban encroachment on agricultural lands. Moreover, take quick precautions against this infringement.

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3. Use of new, existing, or traditional techniques in risk-informed planning.

4. Develop and implement appropriate building codes and use them to assess existing structures for their resilience to potential hazards, and incorporate appropriate safeguards modifications.

5. Regularly (or periodically) updating building controls and standards to take in the changing data and evidence about risks.

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INCORPORATION OF MECHANISMS FOR PROVIDING GREEN ENVIRONMENT POST COVID-19

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ABSTRACT

It has been observed that the damage to the environment caused has grown multi-fold in recent years especially with the exponential rise in population. The sad part of it lies with the fact that no part of earth be it the mountains or oceans or plains have been spared. In order to predict the global climate change, a number of models have been developed over the years. All reliable models clearly indicate the overall deterioration in the quality of air levels. The geographical distribution of precipitation changes at different places leading to changes in water availability. Living a healthy life in a clean environment has soon become a distant dream for the common man. To add to the same, the arrival of Corona virus in the year 2019 has put human life in the doldrums as its contagious and fast spreading nature has put day to day life on hold besides causing deaths and forcing people to throng to hospitals at a rapid rate not witnessed during the recent past. On the other hand, the outbreak of the COVID-19 Pandemic had a positive impact on the environment as most of the highly polluted cities witnessed a clear blue sky. Air Quality Index (AQI) and Particulate Matter (PM2.5) levels in all the major cities improved during the lockdown period. However, with life slowly limping back to normal, there is a dire need to ensure that humans do not go back to their old ways of polluting the environment. The way of work needs to change in each and every type of industry. This paper focuses on mechanisms for providing a green enterprise transformation for some of the commonly functioning industries post COVID-19 times. The research study focused on a specific country in Asian continent, and it can be extended to other countries/continents.

Keywords: COVID-19, air pollution, greenhouse emissions, lockdown effect

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INTRODUCTION

When air pollutants especially carbon dioxide (CO_2) get collected in the atmosphere, they trap the sunlight and absorb a part of the solar radiation escaping into space. Apart from CO_2, the greenhouse gases include Nitrous oxide, Methane, and a few other gases. They play a detrimental role leading to global warming. Prior to 1800, global warming was more or less unheard of owing to lack of industries (Coker et al., 2020; Mathew & Madhavi, 2020; Nikzad & Sedigh, 2017). Since the advent of industrial revolution, there is an increase of 0.007°C every year. However, since 1980, this rate has more than doubled and currently the rise is close to 0.2°C every year. This rate was reduced to half during the year 2020 due to partial closure of a number of industries owing to Corona virus (Mahato et al., 2020).

COVID-19 is a Corona virus disease caused by Severe Acute Respiratory Syndrome Corona Virus-2 (SARS-COV-2), which emerged in Wuhan city, Hubei province of China.Various diseases like Corona virus, Ebola, Nipah etc. are transmitted by wild animals and bats considered as natural reservoir hosts (Cui et al., 2019; Amardeepak et al., 2021). The pathogen SARS-COV-2 is likely to have originated in bats but confirmation is required as to whether SARS-COV-2 infected pneumonia is directly transmitted through an intermediate host or from bats (Jin et al., 2020). The outbreak of the COVID-19 pandemic was declared by the World Health Organization as a public health emergency of international concern on Jan 30, 2020 (Li et al., 2020).

The total number of COVID-19 cases in India and total number of deaths has increased exponentially from 22nd Feb. 2020 onwards with total number of cases accounting to 12,684,477 and total number of deaths 165,132. However, the total number of active cases increased gradually, reached a peak value on 23rd Sep. 2020 at 967,161 which further decreased to 148,882 on 22nd Feb. 2021, and again increased to 788,855 on 5th Apr. 2021.

Ionescu (2021a) carried out an empirical study for evaluating and analysing the relationship between green financial behaviour, climate change mitigation, and environmental energy sustainability. A large sample of four thousand seven hundred data has been considered in order to assess this relationship. She focused on means of reducing carbon emissions by means of Carbon tax imposed. The effect of levying carbon tax in order to bring a behavioural change in individuals have been analysed in detail. As power sector is one of the chief contributors of Carbon emissions, levying Carbon tax on the same provides the desired impact with respect to the reduction in Carbon emissions. She also empirically examined corporate environmental performance, climate change mitigation, and green innovation behavior in sustainable finance. The survey employed statistical weighting procedures to clarify deviations in the survey sample from known population features which was instrumental in correcting for differential survey participation and random variation in samples (Ionescu, 2021b).

Nemteanu and her team (2021a) studied the impact of job satisfaction during covid periods. She observed that remote working was the new norm and found that job satisfaction levels had come down to a very large extent. Feelings of frustration, burnout and anxiety had become increasingly rampant (Saritha et al., 2022). The effects of internal marketing orientation on job satisfaction and the corresponding effect of job satisfaction had been studied in detail. Salih and Hussein (2021) in their work studied COVID-19 effect in cities by enabling social distance and proposed a new model to improve urban immunity. The proposed model is more effective in crowded cities and easy to implement.

Harrower (2020) gathered a large amount of data through an online questionnaire of three thousand eight hundred people for analysing networked and integrated urban technologies in sustainable smart energy systems. Estimates were prepared regarding organizations supporting renewables and using green energy technologies and investment strategies. Nemteanu and her team (2021b) studied the impact of job insecurity and job instability on the levels of job satisfaction. They found that the perceived job instability was found to have a serious impact on the levels of individual job satisfaction and also

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on aspects like supervisor support and promotion opportunities. The danger of losing job post covid played a significant role in the mental wellbeing of the employees.

Pflugmann and Blasio (2020) considered renewable Hydrogen as an alternative to coal. Generation of renewable Hydrogen by electrolysis was carried out and cost of production and usage was compared to that of coal. Besides, logistic issues were also taken into consideration and the overall impact on the environment was considered. It was observed that the reductions in emissions were found to be significant. Nowak et al. (2020) addressed the green information systems and its consequences in the urban and rural areas' green spaces. It is observed that green infrastructure and National Spatial Data Infrastructure are the main important points for urban environment, and to enhance the human quality life. In this work authors are focused to address the problems in urban areas to monitor smart cities which are affected by regional projects.

In this article authors proposed to address the effect of COVID-19 in the environment and its consequences (Elliriki et al., 2021). Although it impacts adversely on human life, it helps to improve the environmental conditions, reduces the pollution effect, and reduced the ozone-holes in the atmosphere. In another point of view, it helped to cure the environmental problems. In this paper are presented, the effect and changes presented in graphical and tabular forms to understand the condition.

MATERIALS AND METHODS

In the decision making, statistical tools play a vital role in the face of uncertainty. It significantly deals with many important real-life problems that arise in arts, management, science and technology (Mamatha et al., 2017; Saritha et al., 2019). A probability formal definition starts with sample space with fundamental axioms. Here, we discuss few of them used in this work.

Let X be the random variable with discrete data values x_i and its corresponding probabilities p_i where i = 1, 2, 3 … n.

Then, for the discrete data the expected/mean value is defined as:

$$\overline{x} = \sum_{i=0}^{n} x_i p_i$$

Corresponding to the discrete data, Variance is defined as:

$$Var(x) = \sum_{i=0}^{n} (x_i - \overline{x})^2 p_i$$

$$\sigma_x^2 = \sum_{i=0}^{n} {x_i}^2 p_i - \bar{x}^2$$

Here σ_x represents the standard deviation corresponding to the given experimental data.

Variance is a quantity further can be expressed in terms of expectation:

$$\sigma_x^2 = Var(X) = E\{(X - \mu_x)^2\}$$

Intuitively, Variance deals the quantity or speed of 'X' variations which holds the following axioms,

i). $Var(X) \geq 0$

ii). $Var(aX + b) = a^2 Var(X)$ and

iii). $Var(X) \leq E(X^2)$

For the two discrete random variables X and Y with corresponding means μ_x, μ_Y the Covariance is defined as:

$$Cov(X, Y) = E(X - \mu_x)^* E(Y - \mu_Y)$$

Correlation: For the two random variables X and Y, the Correlation is defined as:

$$Corr(X, Y) = \frac{Cov(X, Y)}{\sqrt{Var(X)}\sqrt{Var(Y)}}$$

Cumulative Distribution Function: Corresponding to the discrete random variable X, the cumulative distribution function is expressed as:

$$F_X(x) = P\{a: X(a) \leq x\}$$

Here $F_x(x)$ specifically intends to the cumulative distribution and $X(a)$ is the experimental random values to the outcome of 'a' in the sample space S.

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Where the cumulative distribution function follows the given properties,

– For the discrete random variable X with independent value $x = \infty$, we have

$$F_X(x) = P\{a: X(a) \leq \infty\}$$
$$= P(S) = 1$$

This is a case of *certain event*.

– Similarly, if X is independent random variable with value $x = -\infty$ then

$$F_X(x) = P\{a: X(a) \leq -\infty\}$$
$$= P(\Phi) = 0$$

This is considered as *impossible event*.

– With the fundamental properties of probability for independent random variable X the cumulative distribution varies from 0 to 1, i.e.

$$0 \leq F_X(x) \leq 1\}$$

– If x_1, x_2 are two values for independent random variable X, where $x_1 < x_2$ then the cumulative distribution function becomes:

$$F_X(x_2) - F_X(x_1) =$$
$$= P\{a: X(a) \leq x_2\} - P\{a: X(a) \leq x_1\}$$

$$F_X(x_2) - F_X(x_1) \geq 0$$

Mortality rate during COVID period

The number of people recovered in India as on Apr. 5th, 2020, is 11,895,622 with a remarkably good recovery rate at 99% thereby giving a mortality rate of less than 1% (Ali & Islam, 2020). The total number of COVID-19 cases and deaths in India has increased exponentially from 22nd Feb. 2020 onwards with total number of cases accounting to 12,684,477 and total number of deaths 165,132. However,

Table 1. COVID-19 deaths in some Indian States as on 5th April 2021

State	Number of COVID-19 deaths
Andhra Pradesh	7,244
Delhi	11,096
Gujarat	4,580
Karnataka	12,664
Maharashtra	56,032
Punjab	7,155
Tamil Nadu	12,789
Uttar Pradesh	8,894
West Bengal	10,348

Source: own preparation based on data from WHO (https://covid19.who.int/) and Ministry of Health and Family Welfare –Government of India (https://www.mohfw.gov.in/).

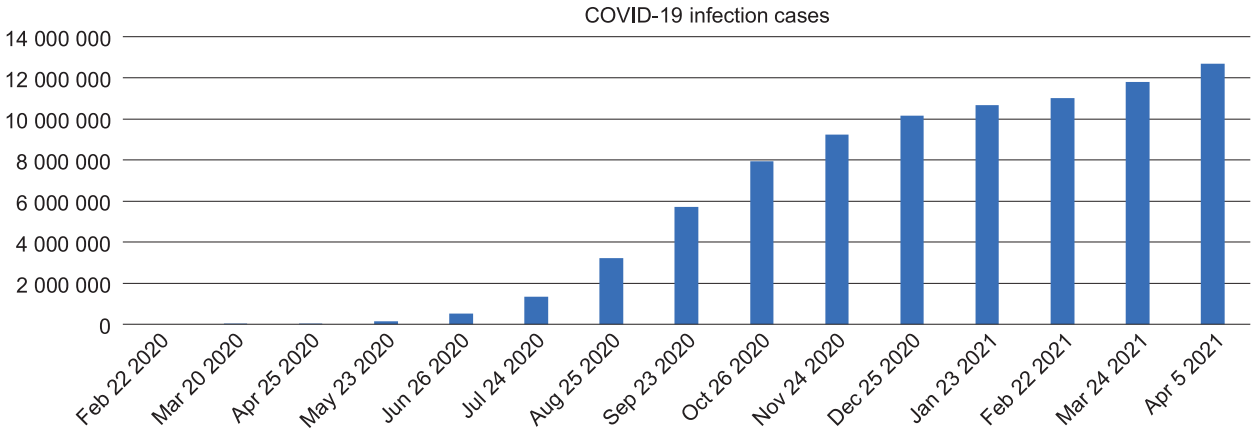

Fig. 1. Day & Year v/s Total COVID-19 infection cases

Source: own preparation based on data from WHO (https://covid19.who.int/) and Ministry of Health and Family Welfare – Government of India (https://www.mohfw.gov.in/).

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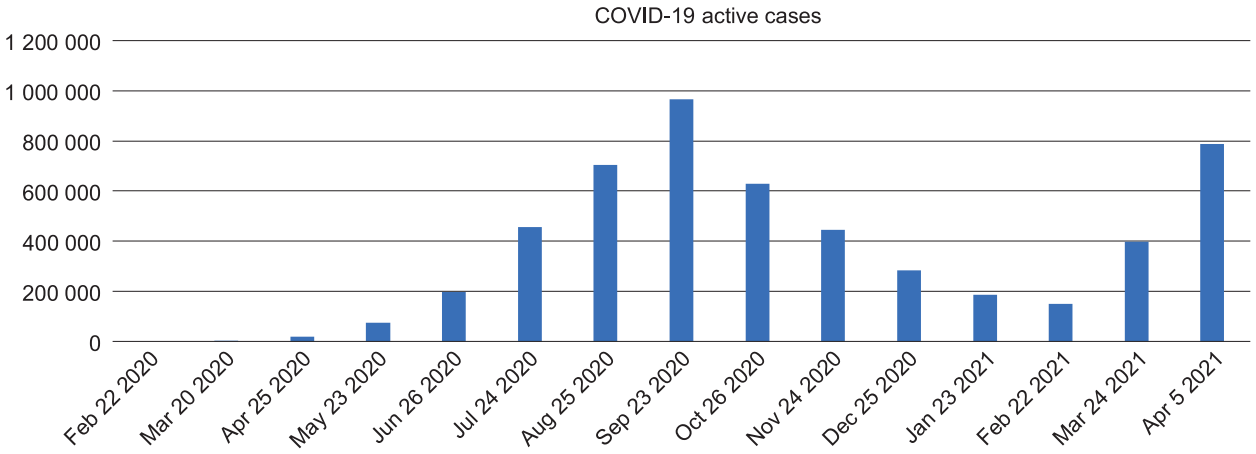

Fig. 2. Day & Year v/s Total COVID-19 active cases
Source: own preparation based on data from WHO (https://covid19.who.int/).

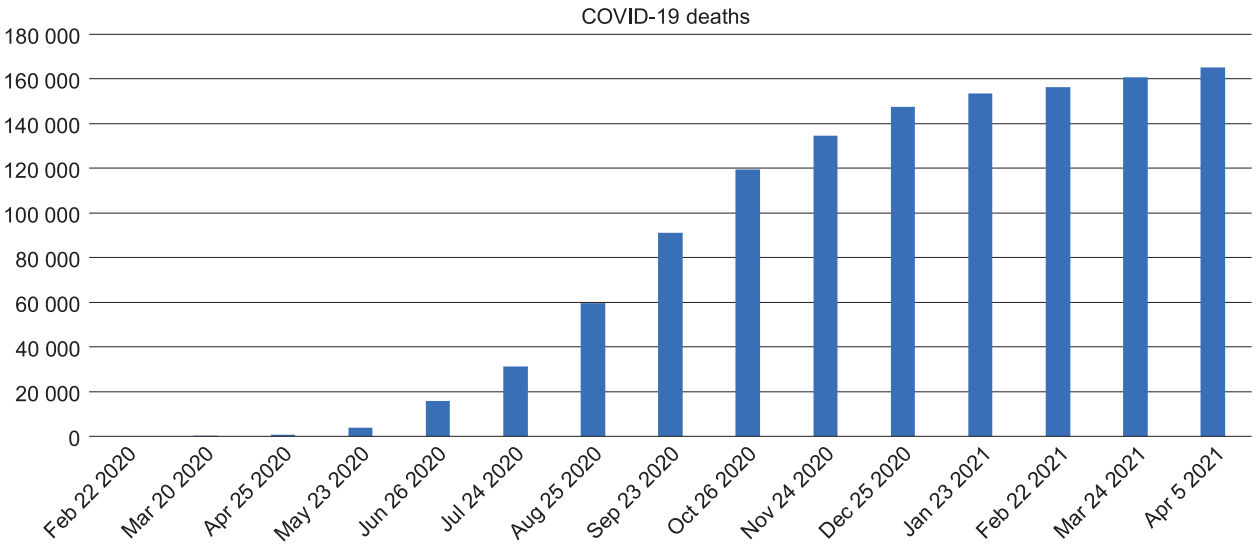

Fig. 3. Day & Year v/s Total COVID-19 deaths
Source: own preparation based on data from WHO (https://covid19.who.int/) and Ministry of Health and Family Welfare – Government of India (https://www.mohfw.gov.in/).

the total number of active cases increased gradually, reached a peak value on 23rd Sep. 2020 at 967,161 which further decreased to 148,882 on 22nd Feb. 2021, and again increased to 788,855 on 5th Apr. 2021. The graphical representation of the total number of cases of COVID-19 infection, total active cases and total number of deaths reported in India is shown in Figures 1, 2 and 3 (source https://covid19.who.int/).

Table 1 shows the number of COVID-19 deaths as recorded on 5th April 2021 in some Indian States.

Air Pollution

Air Pollution is a global problem due to which an estimated 7 million people die annually. AQI stands for "Air Quality Index". AQI level below 50 indicates good air quality. AQI level from 51–100 indicates satisfactory air quality. AQI level from 101–200 indicates moderate air quality. 201–300 AQI means poor and 301–400 very poor air quality. AQI level of 400 and above means the quality of air is severe.

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As per statistical data, there was a significant reduction in AQI level in April 2020 compared to 2019 in major Indian cities. The graphical representation of AQI levels monitored in major Indian cities and is presented in Figure 4. The AQI level recorded in April 2019 & 2020 in New Delhi was 200 & 100 respectively, thereby showing a 50% reduction in AQI level. Other major cities like Mumbai, Kolkata, Chennai, Bangalore, and Hyderabad showed percentage reduction of 27%, 20%, 35%, 51% and 32% respectively. The percentage reduction of AQI levels in the year 2020 is shown in Figure 5. Figure 6 shows the AQI levels recorded in major Indian cities on April 2020 and 2021 and the graphical representation is indicated in the graph. The AQI levels slightly increased in April 2021 due to opening up of all economic activities (Kundu & Bhowmik, 2020). New Delhi recorded an increase in AQI level by (33%), Mumbai (30%),

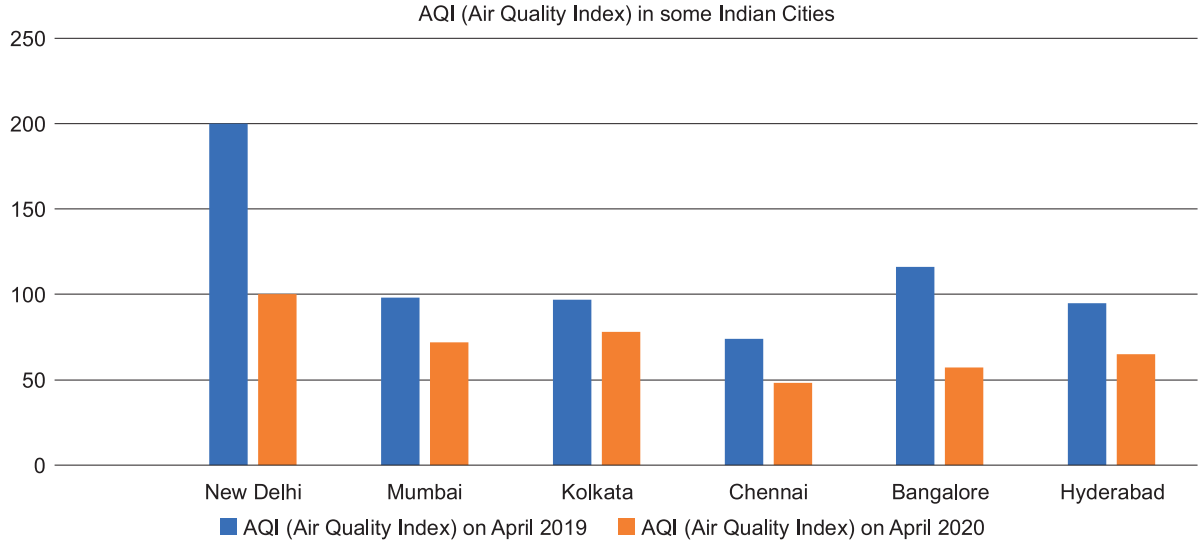

Fig. 4. Air Quality Index (AQI) recorded in major Indian cities on April 2019 & 2020
Source: own preparation based on data from WHO (https://covid19.who.int/) and Ministry of Health and Family Welfare – Government of India (https://www.mohfw.gov.in/).

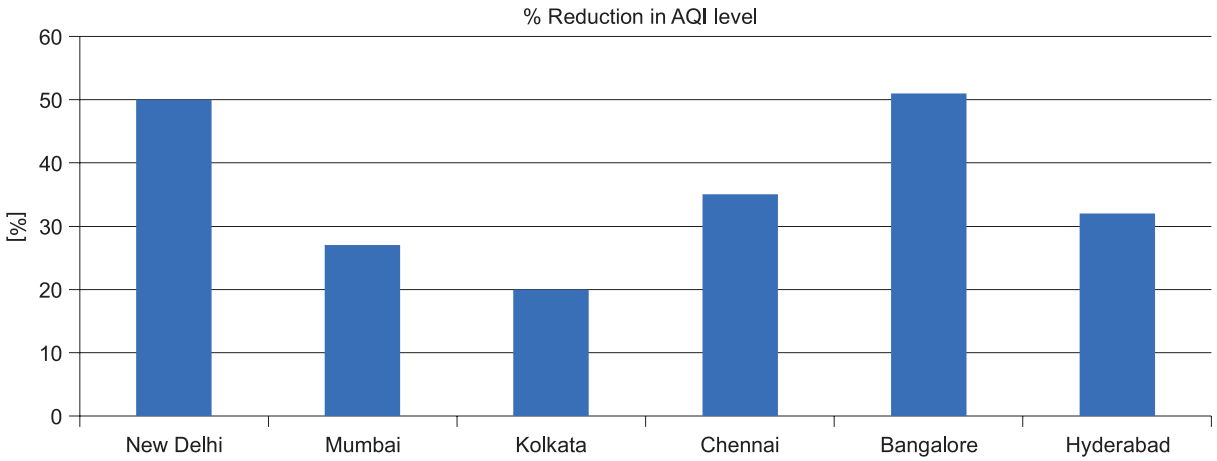

Fig. 5. Reduction in AQI levels in some Indian cities on April 2019 & 2020 (%)
Source: own preparation based on data from WHO (https://covid19.who.int/) and Ministry of Health and Family Welfare – Government of India (https://www.mohfw.gov.in/).

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Kolkata (3%), Chennai (15%), Bangalore (36%) and Hyderabad (42%). The graphical representation of the same is shown in Figure 7.

Particulate matter PM2.5 is one of the major pollutants contributing to air pollution. PM2.5 refers to particulate matter having diameter less than 2.5 micrometers which can enter the lungs and even the blood stream. Prolonged exposure to PM2.5 can lead to deadly diseases including cancer and cardiac problems (Amardeepak et al., 2021). Figure 8 shows PM2.5 level recorded in some major Indian cities and graphical representation. The PM2.5 concentration in New Delhi decreased from 71.4μg/m^3 in April 2019 to 53.6μg/m^3 in April 2020 giving a significant reduction of (24.9%). The percentage reduction of PM2.5 concentration in other cities was Mumbai (22.9%), Kolkata (20.4%), Chennai (37.4%), Bangalore (34.3%) and Hyderabad (12.6%). The results indicate

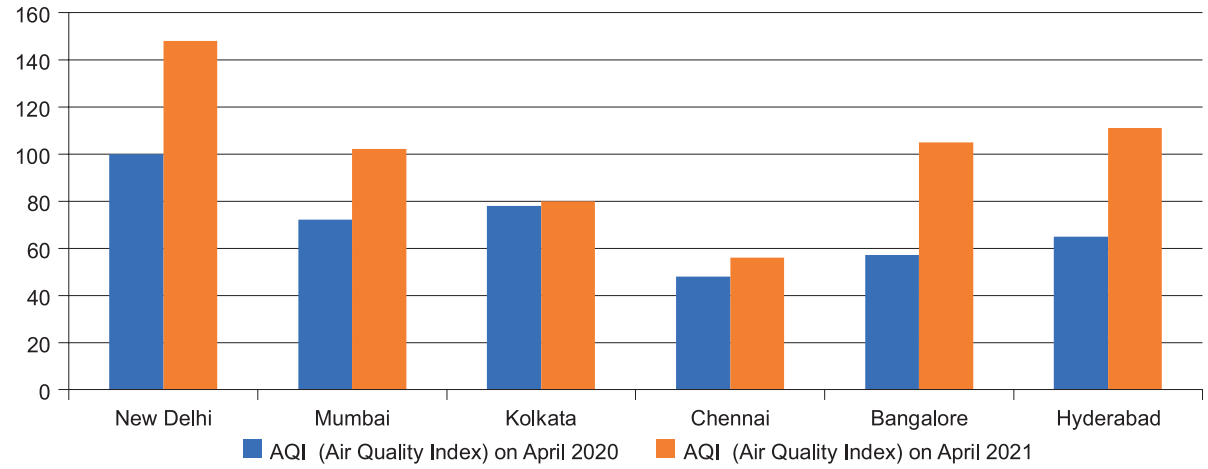

Fig. 6. AQI levels in some Indian cities on April 2020 & 2021
Source: own preparation based on data from WHO (https://covid19.who.int/) and Ministry of Health and Family Welfare – Government of India (https://www.mohfw.gov.in/).

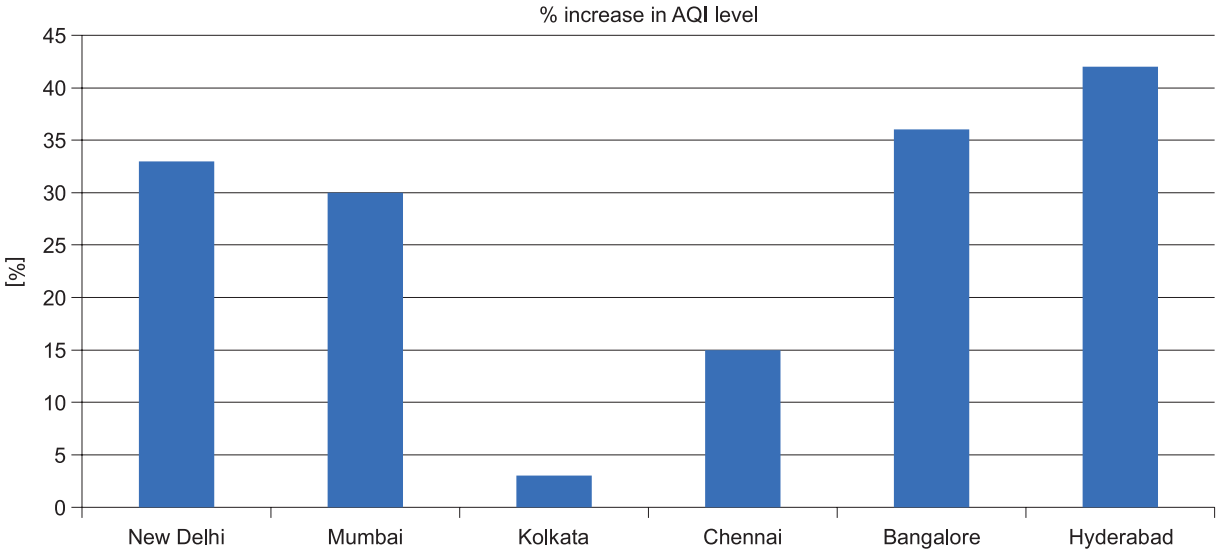

Fig. 7. Air Quality Index (AQI) increase in some Indian cities in April 2020 & 2021 (%)
Source: own preparation based on data from WHO (https://covid19.who.int/) and Ministry of Health and Family Welfare – Government of India (https://www.mohfw.gov.in/).

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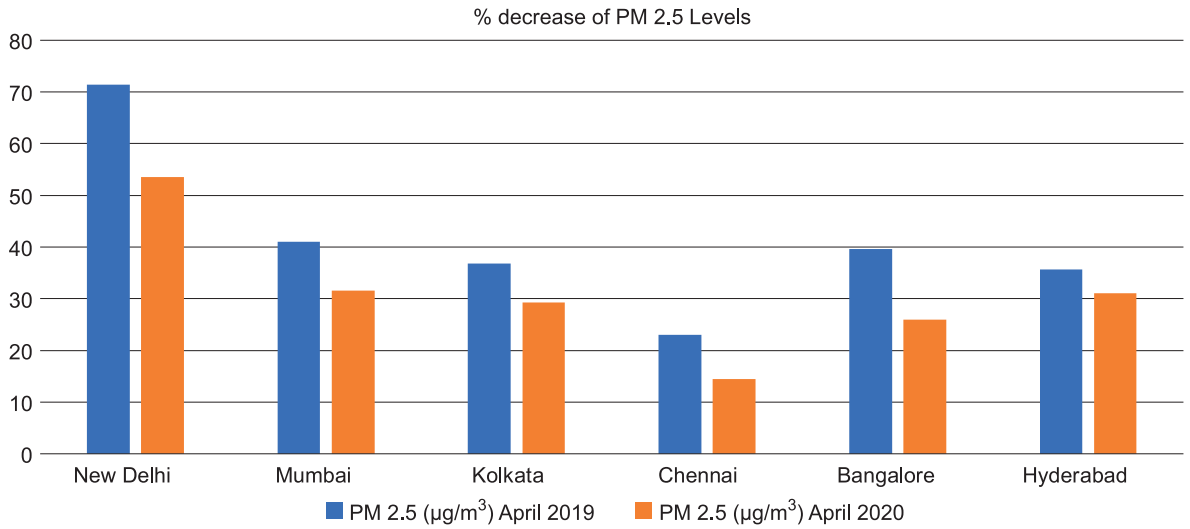

Fig. 8. PM 2.5 levels in some Indian cities on April 2019 & 2020
Source: own preparation based on data from WHO (https://covid19.who.int/) and Ministry of Health and Family Welfare – Government of India (https://www.mohfw.gov.in/).

that there is a significant improvement in Air Quality of all the major industrial cities due to lockdown. The graphical representation of the same is shown in Figure 9. Due to relaxation of lockdown in the last quarter of the year 2020, subsequently followed by restarting of industrial and transportation activities resulted in increase in PM2.5 concentration. Figure 10 shows PM2.5 levels in major Indian cities recorded in April 2020 and 2021 and the graphical representation. A change in PM2.5 level from 53.6 µg/m^{3}in April 2020 to 76.3 µg/m^3 in April 2021 was observed in the national capital, New Delhi, thereby giving a (29.8%) increase in PM2.5 level. The percentage increase in PM2.5 levels in other cities was Mumbai (15.1%), Kolkata (9.6%), Chennai (44.8%), Bangalore (52.1%) and Hyderabad (43.7%). The graphical representation of the results is shown in Figure 11.

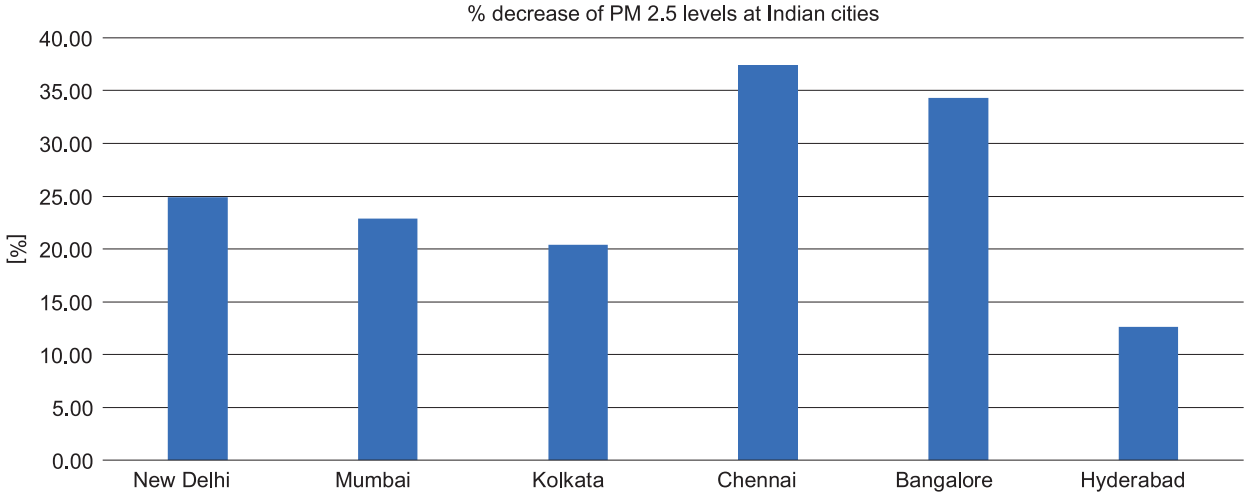

Fig. 9. Reduction of PM 2.5 levels in some Indian cities on April 2019 & 2020 (%)
Source: own preparation based on data from WHO (https://covid19.who.int/) and Ministry of Health and Family Welfare – Government of India (https://www.mohfw.gov.in/).

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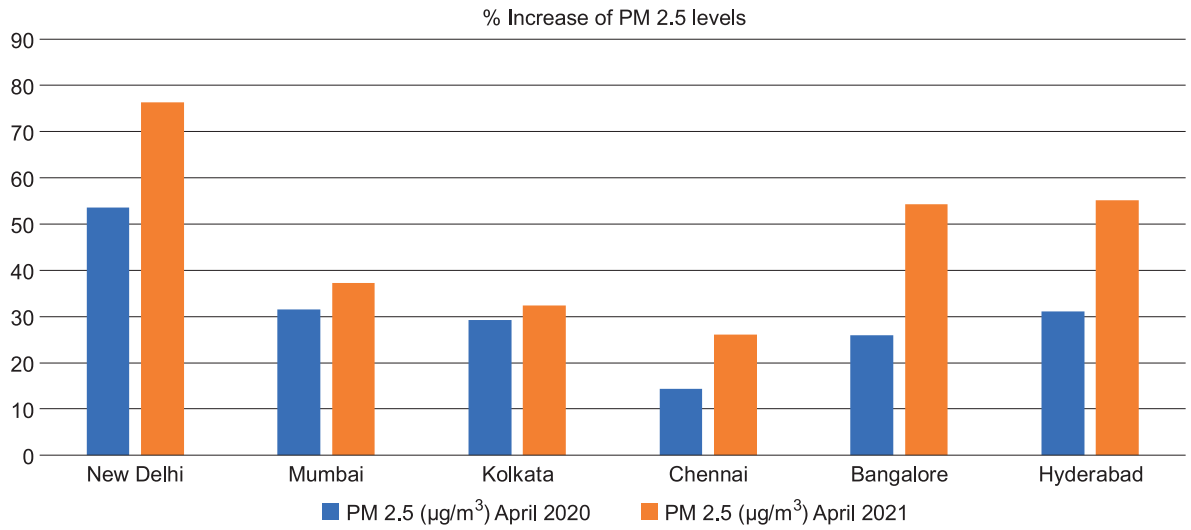

Fig. 10. PM 2.5 levels in some Indian cities on April 2020 & 2021
Source: own preparation based on data from WHO (https://covid19.who.int/) and Ministry of Health and Family Welfare – Government of India (https://www.mohfw.gov.in/).

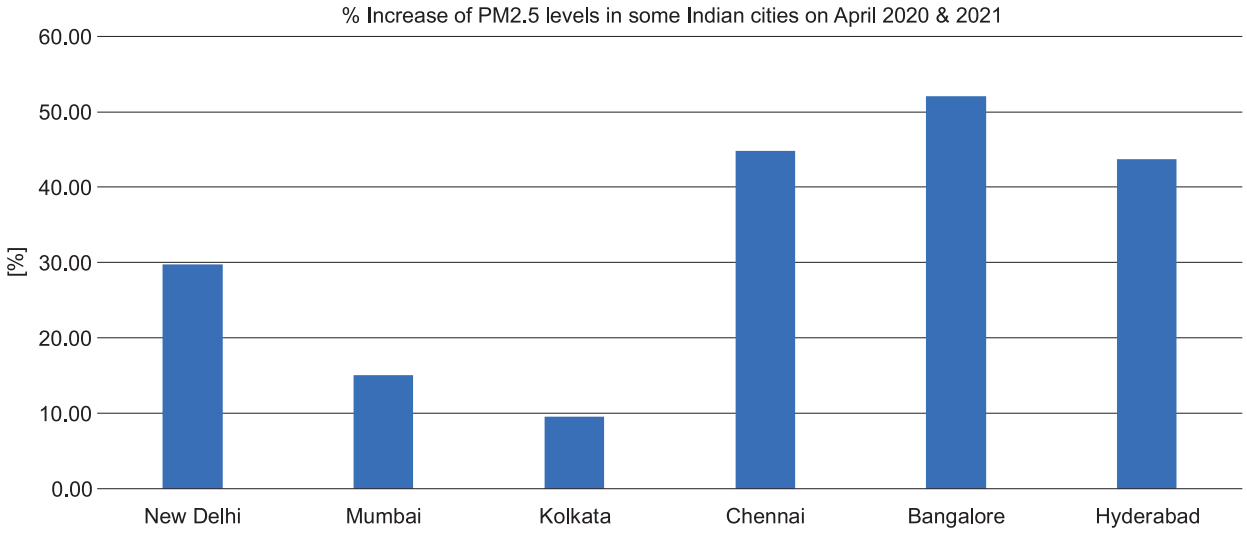

Fig. 11. Increase of PM2.5 levels in some Indian cities on April 2020 & 2021 (%)
Source: own preparation based on data from WHO (https://covid19.who.int/) and Ministry of Health and Family Welfare – Government of India (https://www.mohfw.gov.in/).

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EMISSIONS BY DIFFERENT SECTORS

Various sectors that emit greenhouse gases have been identified and depicted in the Figure 13.

Green Enterprise Transformation

With the passage of time, the world is expected to recover from the adverse effects of the COVID-19 pandemic. But the impact on the environment would likely become more adverse especially with the fully functional industry coupled with the fact that the growth of industry is also likely to be much faster (Malik et al., 2020; Unhelkar, 2016; Anand et al., 2019). A series of mechanisms need to be put in place at the onset in order to make life of the common man worth living. One thing that needs to be kept in mind is that the actions carried out must be beneficial to both the industry and the environment. If the actions lead to heavy expenses, there is a likelihood of industries closing down due to lack of profits. On the other hand, if the growth of the industry has adverse effects on the environment, an emergency situation would arise where the government agencies would serve notice to the industry thereby forcing its closure.

Formulation of green policies may arise due to internal or external pressure.

Internal pressure on green policies may arise due to the fact that the organization has to reduce energy consumption as well as cost. The apparent increase in cost of the green initiatives may act as a deterrent. External pressure may arise due to government rules and regulations or pressure from society.

Other aspects which need to be taken into consideration include self interest and image of the organization. All these aspects have been picturized and shown in Figure 14.

Measurements

Each organization must procure and install a CEMS for measurement and reporting. Smart meters at the end of CEMS can help in automation. A well designed CEMS can also be subjected to auditing processes thereby leading to certification. Besides, the context sensitive nature of the application gives rise to challenges in automation. Care is to be taken to ensure that Green washing is avoided under all circumstances. Green washing refers to the practice of organizations exaggerating their green credentials

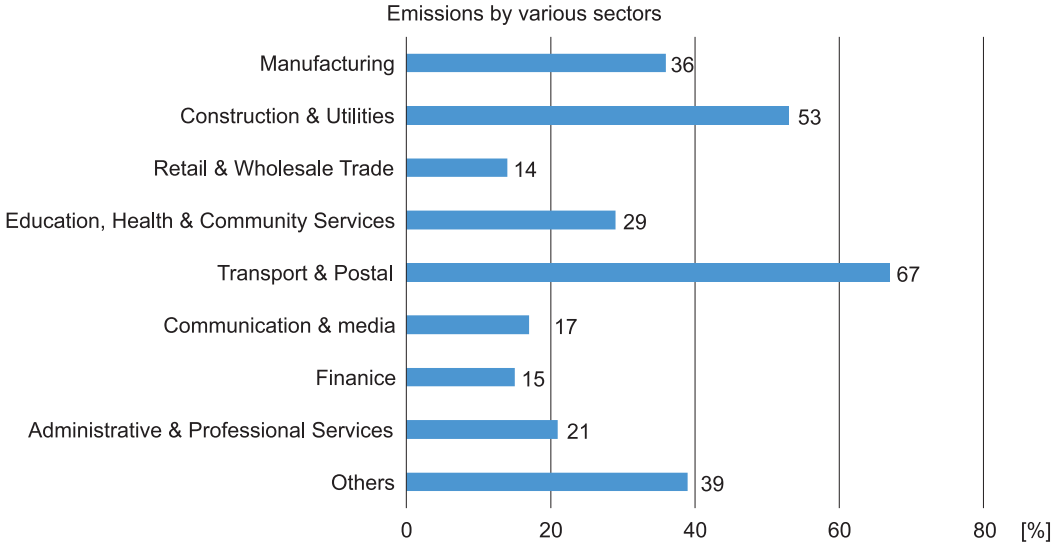

Fig. 12. Different industry sectors that monitors emissions on regular basis
Source: own preparation based on data from World Resources Institute (https://www.wri.org/).

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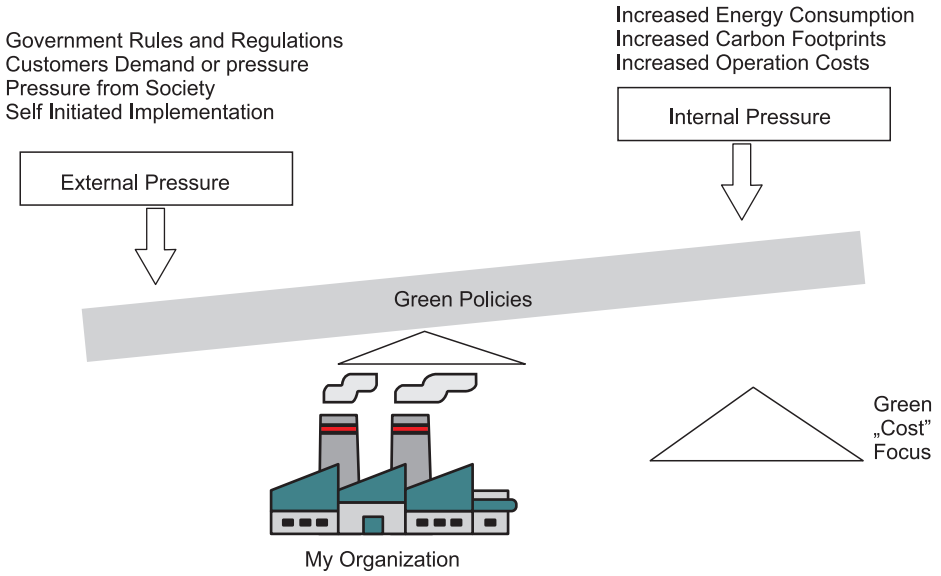

Fig. 13. Formulation of Green Policies
Source: own preparation.

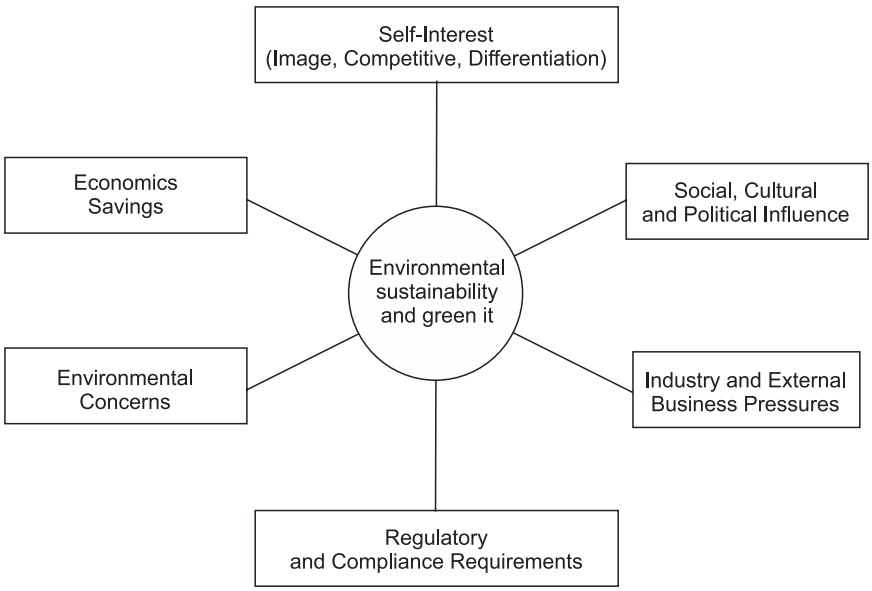

Fig. 14. Aspects to be taken into consideration
Source: own preparation.

and environmental sustainability attributes and making false claims (Leonhard & Murray, 2009). This socially irresponsible and unethical practice misleads customers and the public regarding the company's environmental practices or the environmental benefits of its product or services.

Transformational aspects

Carbon Emissions Management Software (CEMS) is a category of software that helps organizations to manage and report their CO_2 along with other greenhouse gas (GHG) emissions. A collaborative

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effort that integrates all existing packages along with CEMS software is needed. Organizations need to strategize for new CEMS that is exclusively dedicated for storage, analysis and reporting of Carbon data. Based on the same, some key performance indicators have to be checked.

Sample case studies with descriptions and conclusions

CS 1:

There are 20 Air Conditioners each of 1.5 TR rating in a small office complex

Temperature is initially at 20 Deg C

Proposed to reset the temperature of the Air Conditioners at 24 Deg C [4 Deg C temperature increase]

- Avg. power reqd.: 1W/TR
- Electricity Power Saving estimated: 20 * 1.5 TR * 1 W * 24% = 7 W
- Electricity Power Saving = 7 W * 10 hours/day = 70 units every day.
- With the office working for 6 days /week, it would work out to 26 days in a month
- Hence Monthly Electricity Bill saving =70 * 26 = 1820 units
- Carbon Emission reduction = 1820/1000 * 0.84 = 1.5 tons CO_2e/month

CS 2:

A bigger challenge comes in the telecom sector. Here, the end users are not visible. So, collecting data from them is an arduous job. Specific issues related to the telecom industry have to be taken into consideration. A big business will have substantially large numbers of data servers, communication switches and related networking equipment. Besides, it will have large physical buildings spread across the region and multiple communications towers (Krishna et al., 2015a; 2015b). The carbon produced by the organization is primarily through its infrastructure platform and related services. These are large-scale communications services across the region consumed by corporate customers and content providers. Therefore, strategies for carbon measurement, reporting and control need to focus directly on these large-scale infrastructures such as communication towers, telecom switches, wired and wireless relaying equipment's, associated routers, data servers and many IT supporting hardware. In such companies, both the IT systems as well as the data centre needs to be optimized (Datta, 2017). Total Carbon cost of Ownership (TCCO) is an important parameter that needs to be calculated assessed and reduced using green transformational initiatives. Besides, some of the initiatives may be short term while others long term. All these aspects must be taken into consideration.

CHALLENGES AND RECOMMENDATIONS

Enough emphasis has been given on providing a healthy environment for life to carry on without hassles post COVID-19. In order to efficiently incorporate the same, a large number of challenges have to be tackled. A vast majority of the same have been identified. They include the need for formal metrics and associated measurements related to carbon performance of an organization. Besides, the organization must ensure to have the necessary expertise for putting together a measurement and optimization program. Mechanisms must be formulated as to what needs to be done when real time data is insufficient or unavailable. Conflicts may also arise between organizations with respect to agreement over a specific set of standards and regulations. There may be differences in calculations of carbon emissions based on electricity consumed from different sources. The viewpoints of the participating members of the organization must be clearly understood. Problems may also arise with respect to the choice of assumptions being made while carrying out analysis.

CONCLUSIONS

Two areas of concern have been addressed in this paper. The first one deals with the impact of COVID-19 on health of an individual. The effect it has on humans has been statistically dealt with. The statistical results for various parameters such as mortality rate and

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air pollution in India have been presented in tabular and graphical forms. The second one deals with the damage caused to the environment as a result of human attitude. Mechanisms have been designed to ensure that the world is a better place to live post COVID-19 pandemic. There are plenty of diseases with no medicines even in the highly developed present scientific world. The outbreak of the COVID-19 disease has resulted in a severe disaster to human life. The study reveals that the numbers of cases of infection and deaths have grown exponentially during first and second wave and may further increase with the possible occurrence of a third wave as predicted by some medical experts. It is observed that as a consequence of lockdown, industries were shutdown, complete halt to construction and commercial activities. Also due to very little traffic on the roads, AQI and PM2.5 levels improved significantly in all major cities. This was a blessing in disguise to Mother-Nature as people of New Delhi after many decades breathed clean air, witnessed improved visibility with no fog. It can be concluded from this study that the economic growth is required for the prosperity of the nation. At the same time there is a need for enactment of proper legislation for safe guarding the environment.

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TOURIST ATTRACTIVENESS OF RURAL COMMUNES IN THE FUNCTIONAL URBAN AREA OF OLSZTYN – A VOIVODSHIP CITY

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ABSTRACT

Motives: Tourist potential is determined by the presence of tourism-related assets, the level of tourism-oriented development and the transport accessibility of an area. The dominant role in lake zones is played by their natural assets, mainly in rural areas with potential for the development of ecotourism, nature tourism and the implementation of sustainable tourism. A position relative to an urban centre, especially a provincial city, is the decisive factor for development opportunities in rural communes.
Aim: The aim of the study was to analyse and compare the tourist attractiveness of rural communes in the functional urban area of Olsztyn – a provincial city.
Results: The study was conducted by means of multidimensional comparative analysis with synthetic measures. The commune of Stawiguda, rich in natural and cultural assets and with good transport accessibility, proved to be the area with the highest tourist attractiveness (0.662). On the other end of the spectrum, the commune of Dywity achieved the lowest score (0.475) despite the best utilisation of its position neighbouring an urban centre.

Keywords: tourist attractiveness, functional area, rural commune

INTRODUCTION

Tourist potential is determined by the presence of tourism-related assets, the level of tourism-oriented development and the transport accessibility of an area. According to Rogalewski (1974), tourist attractiveness is a consequence of natural and cultural assets and tourism-oriented development. Natural assets play a dominant role in the tourist potential in such regions as Warmia and Mazury. The tourist attractiveness of the voivodship is affected by the landscape: typical of deltas, morainic plains and hills and lacustrine hills, a considerable number of lakes, forest complexes and agricultural cultures. This applies mainly to the region's rural areas, with a considerable portion of nature sites under legal protection and the diversity of their forms, which provides the potential for ecotourism development, nature tourism and implementation of sustainable tourism. However, the area location is a no less important element that determines the tourism development opportunities. A position relative to an urban centre, especially a provincial city, is the decisive factor for development opportunities in rural communes. The aim of the study was to analyse and compare the tourist potential of rural communes in the functional urban area

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of a provincial city – Olsztyn. The following communes were analysed: Dywity, Jonkowo, Gietrzwałd, Stawiguda, Purda.

Przecławski (1997) defines tourism as a psychological, economic, social, spatial and cultural phenomenon. The communes that want to be regarded as ones with tourist attractiveness have to care about their natural and cultural assets and promote them constantly. It is equally important to develop tourism infrastructure and to take actions aimed at improving transport accessibility. Tourism development benefits not only tourists but also the people living in touristically attractive areas. It is not so obvious these days that rural areas must be associated with agriculture. Increasingly large portions of rural area populations decide to diversify their activities, often dealing with tourism. This trend is favoured mainly by city dwellers becoming fatigued and wanting to rest and relax among nature. Every year, there is a growing number of people who choose the country as a place for their holidays, especially near medium-sized towns. There is no doubt that suburban communes are becoming increasingly popular among tourists. Due to the dynamic growth of rural tourism, the areas visited by tourists begin to adapt to increasing numbers of tourists.

LITERATURE REVIEW

The literature on the subject does not provide a universally established definition of tourist potential. It should be made up of components which bring about qualitative and quantitative changes in tourism – now and in future. These include natural and anthropogenic assets, tourist attractions of various types, tourism infrastructure, location of accommodation facilities as well as the availability of various services and products without which tourists would not be fully satisfied. Such understanding of the tourist potential comprehensively covers the conditions for tourism development (mainly strengths and opportunities) in an area (Marciszewska, 2010). All of these features affect the level of tourist satisfaction. The income derived from tourism helps to improve the economic situation at the local and regional levels. However, for it to perform this task and to contribute considerably to improving the quality of life of people living in areas visited by tourists, proper environmental conditions must be fulfilled, referred to as tourist attractiveness (Rogalewski, 1974).

The term "tourist attractiveness" comprises many factors: these include both social-cultural (anthropogenic) and natural features. Universal and relative attractiveness can be identified. An area is universally attractive when its natural, cultural assets and its tourism infrastructure are regarded as attractive by all. Relative attractiveness is determined in terms of various forms of tourism, e.g. conference tourism, business tourism, trade tourism or sailing tourism. Tourist attractiveness can be understood in three ways: as determined by various classifications (ideographic attractiveness), as arising from a specific technique of its assessment and as a result of its subjective perception (Page, 1995). Apart from objective tourist assets and proper items of tourist infrastructure, a significant role in determining the value of an area is played by a psychological factor – the subjective perception of infrastructure elements by tourists, investors and residents (Warszyńska & Jackowski, 1978; Seweryn, 2002; Kaczmarek et al., 2005; Potocka, 2009; Kruczek, 2011; Widz, 2019). Touristically attractive areas may include regions, towns and villages, but also individual objects situated in them or elements of the landscape. They play a great role in attracting tourists to an area or a place, thereby creating a base for tourist activity and the need to satisfy tourists' needs (Kurek, 2007). Apart from the natural and cultural assets, accessibility and a destination's ability to satisfy tourists' needs can be decisive factors in the choice of a place to visit (Hu & Ritchie, 1993; Hall, 2000; Croy, 2005; Formica & Uysal, 2006). Tourism-oriented development should be understood as a combination of functional tourist devices and services in an area, which were created to provide the tourist with access to the natural assets and whose aim is to meet the tourism-related and physiological needs of a person (Cichocka & Krupa, 2017). Transport accessibility can be considered in two aspects: as facilitating or enabling visitors to get to

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a destination or a network of roads or transport connections which facilitate moving around an area of interest to the tourist (Kołodziejczyk, 2012). All of these elements make up the tourist potential, i.e. the diversity of the economic features in an area that affect the development of the tourism economy (Sikora & Wartęcka-Ważyńska, 2010).

In recent years, the burdens of city life have been seen to result in growing fatigue, with city residents increasingly interested in rural areas and migrating to the suburbs. They are attractive due to their natural landscapes, forests and water bodies and different cultural values as well as unused residential potential and labour resources (Hakuć-Błażowska & Krauza, 2017). Rural tourism is becoming increasingly popular. City residents seek peace and quiet and leisure opportunities in the natural environment, far from pollution and noise. Gaworecki (2003) defines rural tourism as organised in rural areas, developed on a small scale, in contact with nature. The development of rural tourism is based on the natural, historical and cultural resources of an area, engaging various entities in the local community and the local economy. Locally, tourism can stimulate economic growth and create an atmosphere that favours the development of services and small-scale commerce. Potentially, it can replace earlier activities in rural areas (Hall, 2005). Rural tourism can be perceived as part of the tourism industry, which can play an effective role in the economic growth of areas visited by tourists. It can help in creating new career paths for rural populations. Rural tourism can create and diversify economic activities and various development trends in rural areas, especially in services (Sznajder & Przezbórska, 2004). Among the most important economic features of rural tourism is its impact on the private sector, especially small businesses, with simple and diverse activities (Holland et al., 2003). Cultural, natural and historical assets in rural tourism can be presented as tourist cultural goods. Rural tourism creates opportunities for economic growth, jobs, development opportunities for commerce and services and, in consequence, it stimulates income growth, both for individuals and local governments. It also helps to develop the regional economy (Sharpley, 2002).

Rural tourism is changing and developing continuously. According to one definition, it denotes tourist activities in areas that are typically agricultural and with valuable natural features. It is adapted to the local conditions and uses the local assets effectively. Rural tourism fulfils the following types of objectives: educational, ethnic, cultural, specialist, social, leisure- and health-related (Matczak, 2015). One of the main issues related to tourism in rural areas is the planning of its development on the regional and local levels and the fact that it depends on the state policy regarding taxes and credits. It has an impact on the risk of conducting business activity, and it can reduce it. The regional authorities focus on defining a direction for tourism using marketing tools, investment in human resources as well as protecting the natural environment and the economic structures of the surroundings. Local authorities make efforts to improve the service quality by investments in technical infrastructure, the proper marking of the terrain, constructing tourist trails, etc. (Gołembski, 2009). The choice of rural tourism as a form of travelling and leisure is based on close relations of tourists with a local community, making use of the assets of a village and its surroundings and the buildings so that the natural environment is preserved as much as possible (Balińska, 2010). The development of rural areas is regarded as the main element of environmental, economic, social and cultural planning. Therefore, rural area development should be an element of local, regional and national development, and it requires coherent and integrated planning, which can identify the major developmental objectives (Strzelecka, 2016).

Tourism in rural areas is also important for the economic growth of communes. It can stimulate employment and, in consequence, improve the life of local communities. To see whether an area is attractive as a tourist destination, one has to look closely at its tourist space. This comprises several elements, such as natural heritage, cultural heritage, tourism infrastructure (accommodation, gastronomic, paratouristic facilities, transport accessibility) and

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people (Włodarczyk, 2011). Determination of the tourist attractiveness of communes should be the basis for further planning of tourism development, assigning land for potential investment and systemising commune data – for the determination of the areas qualifying for regional tourism development (Tucki, 2007). Despite the common availability of attractions, many destinations do not use their tourist potential, as their promotion is not sufficiently effective (Rasoolimanesh & Jaafar, 2016). Local governments, with the participation of residents, should improve the tourist service quality and thereby improve the condition of the economy and the quality of the residents' lives (Szwacka-Mokrzycka, 2012). It is not so obvious these days that rural areas must be associated with agriculture. Increasingly large portions of rural area populations are opting to develop and diversify their activities associated with tourism. This trend is favoured mainly by city dwellers becoming fatigued and wanting to rest and relax among nature. Every year, there is a growing number of people who choose the country as a place for their holidays, and rural communes are becoming increasingly popular among tourists. Due to the dynamic growth of rural tourism, the areas visited by tourists are beginning to adapt to increasing numbers of tourists. The social and economic benefits which may be regarded as the most important in rural tourism and agritourism include: improvement of infrastructure, development of small and medium-sized enterprises, income increase and the goals that can be accomplished by supporting this form of tourism include preserving the traditional rural settlements and maintaining the landscape and ecological function owing to utilisation of the material base of farms and private farmers to earn additional income. Rural tourism means higher income in rural areas, the possibility of creating jobs, revitalisation and improving living standards (Holienčinová & Holota, 2018).

According to a study conducted by Baum (2011), the future tourist potential of rural areas in Poland is limited and often overestimated. Considerable deficits on the supply side and poor financial resources are combined with limited demand. Rural tourism in Poland can develop on a small scale and in niche markets, which require solid market research, regional tourist strategies, intersectoral organisations and partnerships in regions and a high level of interest and initiatives taken by local populations in order to develop creative ideas and overcome many barriers. It does not apply to the areas traditionally regarded as tourist destinations, such as the mountains or those in the vicinity of big cities. When studying tourist attractiveness, one's attention should be drawn to rural areas in the functional areas of provincial cities. Their location provides them with opportunities for development, facilitated because of the vicinity of a big city. According to the OECD (2011), there is a need to develop effective coordination mechanisms for urban areas, where the administrative borders do not coincide with those of functional areas. It is necessary to implement legislation and financial incentives encouraging local governments to cooperate. Urbanisation trends worldwide indicate a transition from administrative to functional areas (Szlachta, 2017).

Functional areas around provincial cities are mono- or polycentric urban agglomerations of proper size, also exhibiting other features of an urban settlement arrangement. Among other things, they are zones with direct everyday impact (jobs and place of residence) and large development potential as well as a large scale of internal functional integration (strong functional links) with a well-developed transport network. According to the National Urban Policy until 2023 (Journal of Laws of 2014, item 1235), provincial cities and their functional areas play a decisive role in the socioeconomic development of individual voivodships, as well as the entire country. Since 2014, they have been beneficiaries of the new instrument of Integrated Territorial Investments, launched as part of Regional Operational Programmes and funded by the European Regional Development Fund and the European Social Fund (Szlachta, 2017). Local authorities interested in tourism development should strive to support its development by preparing development plans for periods exceeding five to ten

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years or supporting actions of public organisations and the private sector (Hakuć-Błażowska et al., 2018). Entrepreneurship in rural tourism has its own specificity. The involvement of local communities and enterprises in tourism development is affected by the goals that the tourists and the entrepreneurs want to accomplish. Visitors want to spend holidays in extraordinary places, linked with nature and traditional values. Rural areas represent these values; they have their own lifestyle, traditions, links with nature, enjoying physical activity, especially among children, full board, etc. Entrepreneurs – service providers – should be aware of these values (Svoradova et al., 2013).

It seems much easier to develop services for tourists within the range of a larger urban centre. It is assumed that the functional areas will be places where sustainable and effective transport will be developed, transport accessibility will be improved, plans for a low-emission economy will be executed, degraded residential quarters will be revitalised, the environment condition will be improved, research and technology development and innovations will be intensified and where towns will be networked with respect to socioeconomic development. It is of key importance to build a culture of partnership and coordination and to improve the management quality in all functional areas. This should weaken the development barriers, help to use the territorial potentials and to strengthen the role of these functional areas in the development process diffusion (Szlachta, 2017). All of these assumptions should be implemented mainly in less developed regions, and the rural communes of functional areas in Warmia and Mazury could benefit greatly by making use of their tourist potential and the opportunities provided by the vicinity of a large city. The rural communes adjacent to Olsztyn analysed in the study subject include: Dywity, Gietrzwałd, Jonkowo, Stawiguda, Purda.

MATERIALS AND METHODS

The Functional Urban Area of Olsztyn was delineated in 2013 in a document issued by the Minister of Regional Development, entitled "Rules of Implementation of Integrated Territorial Investments in Poland", which identifies functional urban areas for all the provincial cities (Rules of Implementation…, 2013). This area is identical with the Strategic Intervention Area – Olsztyn Agglomeration – indicated in the "Strategy for the socio-economic development of the Warmińsko-Mazurskie Voivodship until 2030" as a manifestation of the territorialisation of the developmental goals (*Strategy*…, 2020). In the "Spatial development plan for the Warmińsko-Mazurskie Voivodship" (2018), the Functional Urban Area of the Provincial City of Olsztyn is located in the central part of the voivodship (Fig. 1). It has an area of 1450 km^2 (6% of the voivodship area), of which its core – the city of Olsztyn – occupies a little more than 6% of the FUA area (88 km^2).

Although the concept of the functional urban area of a provincial city was removed from the Spatial Planning and Land Development Act (2003, consolidated text: Journal of Laws of 2021, item 741, 784, 922), according to the Inter-Communal Agreement of 29 January 2021 on cooperation aimed at executing Integrated Territorial Investments in the Functional Urban Area of Olsztyn (OJ of the Voivodship of Warmia and Mazury 2021.473), this area comprises the City of Olsztyn, the urban-rural commune of Barczewo and the rural communes of Dywity, Gietrzwałd, Jonkowo, Purda and Stawiguda (The Inter-Communal Agreement…, 2021).

The principal research method employed in this study required obtaining reliable statistical material and the possibility of comparing the areas under analysis. Therefore, the rural commune was taken as the basic unit. The area under analysis comprises seven administrative units, five of which are rural in nature: Dywity, Jonkowo, Gietrzwałd, Stawiguda and Purda (Fig. 2).

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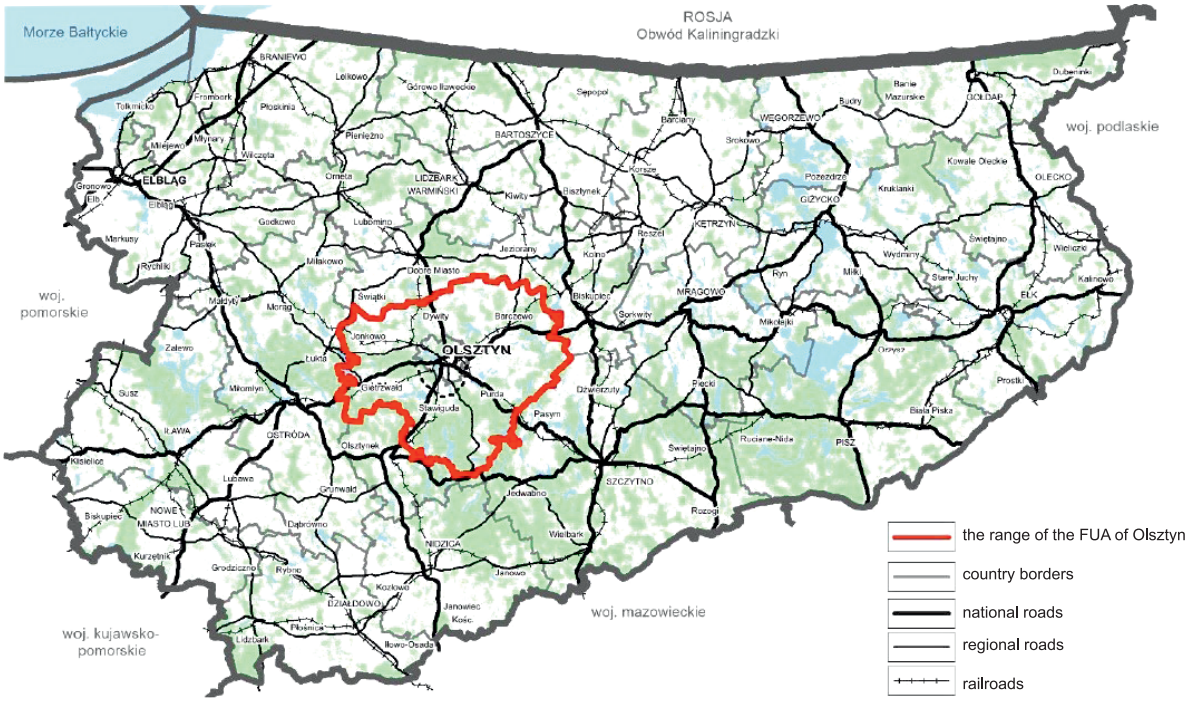

Fig. 1. Position of the Functional Urban Area of Olsztyn against the Warmińsko-Mazurskie Voivodship
Source: *Spatial development plan* (2018).

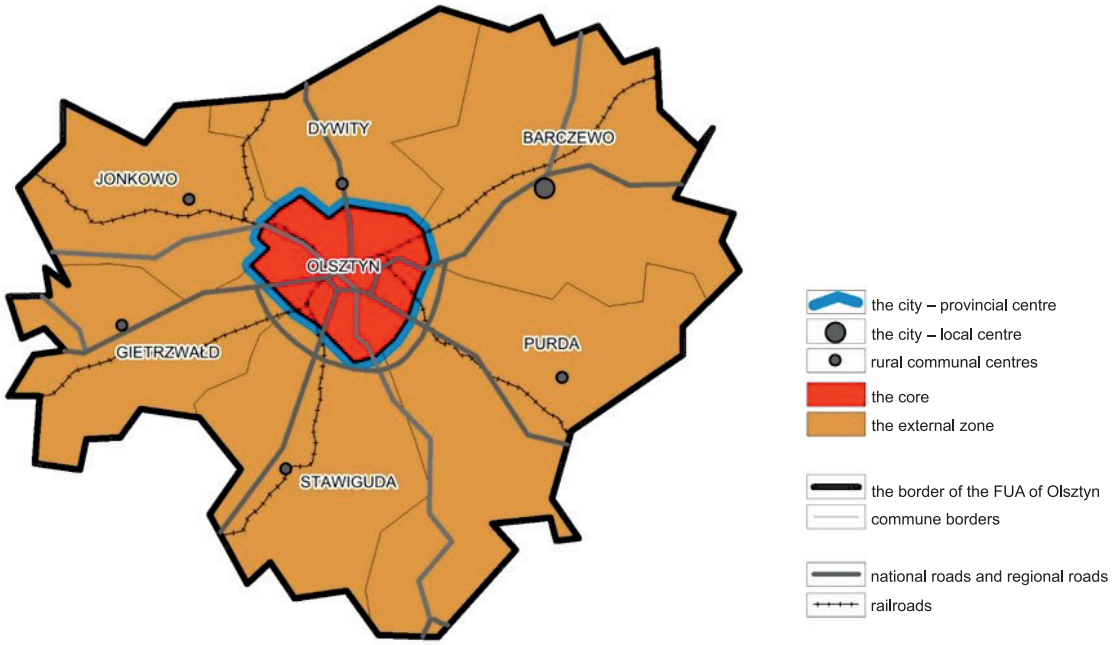

Fig. 2. The Functional Urban Area of Olsztyn
Source: *Spatial development plan* (2018).

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In order to obtain data for the study, a review of strategic and planning documents in communes was performed along with the literature of the subject. The literature study was expanded by information from public information bulletins, commune promotion folders and from Internet websites. Statistical materials used to prepare the dataset were obtained from Statistics Poland, by the author's own studies and from Internet websites.

The tourist attractiveness of the selected communes was evaluated by means of a multidimensional comparative analysis employing the synthetic measure method. This method is applied in many studies, and it allows for ranking and comparing multi-attribute objects (Tucki, 2007). It can be used to study complex phenomena, described by at least two (and usually more) variables (Borys, 1980; Gołembski, 1999; Dziechciarz, 2003; Widz, 2019). The attractiveness evaluation was performed with the use of synthetic indices (values ranging from 0 to 1), obtained as the outcome of the criteria applied. The following communes were analysed: Dywity, Jonkowo, Gietrzwałd, Stawiguda and Purda. The study made use of 15 variable factors (Table 1), classified into four categories: natural assets, cultural assets, tourism infrastructure and transport accessibility. The determinants (attributes) were determined by the methodology applied by Gołembski (1999), Tucki (2007) and Hakuć-Błażowska and Krauza (2017). It was assumed that the indices would help to determine the tourist attractiveness of an area under study. At least three indices were assigned to each group.

The first group, natural assets, includes five indices, i.e. the portion of the commune area occupied by forests and meadows, score points for lakes larger than 25 ha in a commune (Table 2), the portion of the commune area occupied by protected areas, the number of natural monuments per 10 km^2 of the commune area.

The second group – cultural assets – is determined by such indices as the number of historical monuments per 10 km^2 of the commune area, the number of museums or regional chambers per 100 km^2 of the commune area and the number of cultural events taking place in the commune per year.

Table 1. Sections and selected indices of tourist attractiveness in communes under study

Section	Weight	Index	Unit	Weight
Natural assets	0.35	forests	ha/commune area in ha	0.3
		protected areas	ha/commune area in ha	0.15
		natural monuments	number/10 km²	0.1
		lakes	score points	0.3
		meadows	ha/commune area in ha	0.15
Cultural assets	0.25	museums	number/100 km²	0.2
		historical monuments	number/10 km²	0.5
		cultural events	number/365*100	0.3
Tourism infrastructure	0.2	accommodation facilities	number/10 km²	0.5
		sport facilities	number/10 km²	0.15
		tourist trails	km/km²	0.35
Transport accessibility	0.2	national roads and regional roads	km/km²	0.4
		railway stations	number/100 km²	0.2
		bus stops	number/10 km²	0.2
		transport services to the provincial city	number/day	0.2

Source: prepared by the authors.

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Table 2. Score points granted to lakes depending on their area

Lake area	Score points
25–50 ha	1
50.1–100 ha	3
100.1–150 ha	4
150.1–300 ha	5
> 300 ha	6

Source: Hakuć-Błażowska & Krauza (2017).

Three indices are employed in the third group, which characterises the tourism infrastructure: the number of accommodation facilities per 10 km^2 of the commune area, the number of sports facilities per 10 km^2 of the commune area, the length of tourist trails per 1 km^2 of the commune area.

The fourth group describes the internal and external transport accessibility of the areas under study. Four indices were selected: the length of national roads and regional roads in km per 1 km^2 of the commune area, the number of railway stations per 100 km^2 of the commune area, the number of bus stops per 10 km^2 of the commune area and the number of public transport services to and from Olsztyn per day.

In order to make attributes with various units comparable, the quotient transformation was applied, taking the maximum value of the variable as the reference point (Borys, 1980). After all the values were calculated and listed, the indices were normalised, i.e. each index was divided by the reference value. The highest values of each index in the communes were taken as the reference point (Hakuć-Błażowska & Krauza, 2017):

$$n_{ij} = \frac{y_{ij}}{y_j max}$$

where:

n*ij* – normalised value of the *j*-th index in *i*-th commune
y*ij* – value of the *j*-th index in *i*-th commune
y*j max* – maximum value of the j-th index with the stimulant quality in communes

Values of the normalised indices lay within a range from 0 to 1. If the value is 1, it means that the commune under analysis fully meets the criteria of the attribute reference standard under analysis (Gołembski, 1999). The synthetic measure for the section was calculated in the next stage. It is based on the weighted average of the normalised attributes that comprise a given section (Hakuć-Błażowska & Krauza, 2017):

$$Md_i = \sum_{j=1}^{n} w_j \text{ x } n_{ij}$$

where:

Mdi – a synthetic measure for section *d* in the *i*-th commune
wj – weight of the *j*-th index in section *di*
n*ij* – normalised value of the *j*-th index in *i*-th commune

Adequately, the general synthetic measure of the tourist attractiveness of each commune was expressed as the weighted average of the synthetic measures for the sections in a given commune.

RESULTS

Natural assets

The natural environment plays an important role in increasing the tourist attractiveness of an area and in creating good conditions for leisure. The forest cover index in the communes under study varies – from nearly 28% in the commune of Dywity to over half of the area in the communes of Stawiguda, Purda and Gietrzwałd (Table 3). Meadows, associated with an idyllic landscape of the country, account for a small percentage of the area. Naturally valuable sites, especially those under legal protection, are a very important element in evaluating tourist attractiveness. Such sites account for over 2/3 of the commune area in three of those under study, and for nearly 85% of the area of the commune of Stawiguda. The following protected sites are situated in it: the Napiwodzko-Ramucka Forest, the Pasłęka Valley, the Middle Łyna Valley, the Napiwodzko-Ramucka Sanctuary, the Pasłęka River, Pełnik in Ruś, Isles on the Mazurian Lakes, the Prof. Benon Połakowski Warmian Forest,

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the Pasłęka River beaver sanctuary and the Marózka Valley. Moreover, there are 12 natural monuments in the commune of Stawiguda, including the yew in the Muchorowo forest district, "Napoleon's Oak" in the Pluski forest district, a group of 40 oaks in the Stary Dwór forest district and a group of trees in Dorotowo. However, it is the commune of Gietrzwałd that can boast the largest number of natural monuments per unit area (Table 3). The 32 registered objects include mainly large trees – 2 small-leaved limes in the cemetery at the Evangelical church in Łęguty, a sessile oak and a pine tree in the Barduń forest district.

Water bodies constitute a natural asset desired by tourists. The largest number of score points in this category were granted to the commune of Purda, with 13 lakes affecting its tourist attractiveness (with the area exceeding 25 ha). Ranked by size, these are: Wardąg, Czerwonka Wielka, Dłużek, Kemno Wielkie, Silickie, Łajskie, Purda, Patryki, Kuklung, Gim, Klebarskie, Serwent, Kośno. There are such fish as zander, whitefish, eel and pike in Lake Kośno (569 ha) – the largest one in the commune – but fishing is forbidden in it as it is part of a nature reserve. Its shores are steep, nearly completely covered with forests. There are only three lakes in the commune of Stawiguda, but they are large. Lake Łańskie, with the area of 1070 ha, is the largest, followed by Lake Pluszne (867.5 ha) and Lake Wulpińskie, also called Dorotowskie or Tomaszkowskie (683.5 ha). These lakes have a very well-developed shoreline – with many bays, peninsulas and isles. The forests surrounding the lakes provide perfect conditions for mushroom picking and the lake with its fish: bream, burbot, perch, roach, whitefish, vendace, pike and eel – for anglers.

After the indices for individual communes are normalised, the attributes characterising the natural environment in the communes can be compared (Fig. 3).

Table 3. Indices for the natural assets section

Index	Unit	Dywity	Gietrzwałd	Jonkowo	Purda	Stawiguda
Forests	ha/commune area in ha	0.277	0.516	0.391	0.541	0.565
Protected areas	ha/commune area in ha	0.369	0.753	0.274	0.703	0.843
Natural monuments	number/10 km^2	0.434	1.857	0.237	0.438	0.538
Lakes	score points	4.000	15.000	3.000	43.000	26.000
Meadows	ha/commune area in ha	0.162	0.100	0.170	0.100	0.065

Source: prepared by the authors.

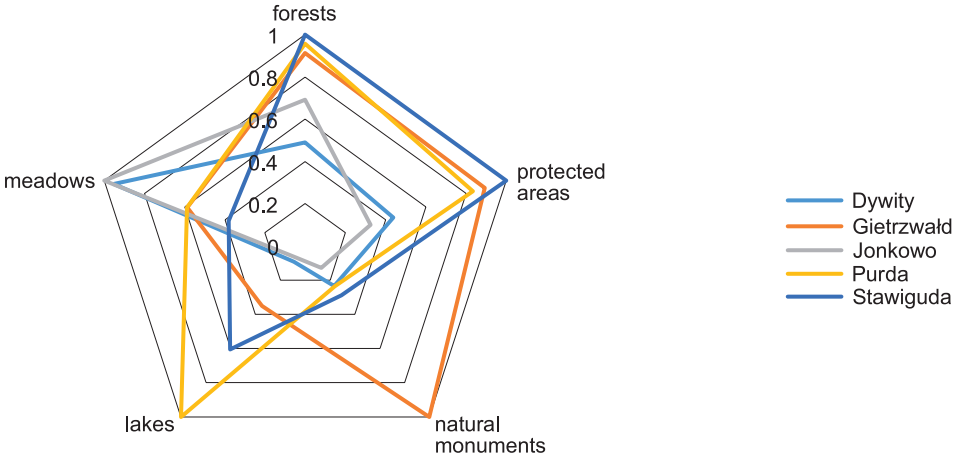

Fig. 3. The normalised values of indices concerning the natural assets in the communes
Source: prepared by the authors.

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There are visible differences between the individual attributes in the communes under study. Two reference values were achieved by the commune of Stawiguda (forests and protected areas) and one value each – the communes of Gietrzwałd, Purda and Jonkowo. Meadows account for large portions of the commune area in Jonkowo and Dywity, which confirms their agricultural character.

Cultural assets

The historical monuments in the communes of the functional area of Olsztyn reflect the rich history of the area. The commune of Stawiguda stands out with its 172 objects listed in the Registry of Historical Monuments. They include churches, church cemeteries, vicarages, roadside shrines, railway flyover and the World War I cemetery in Dorotowo. There are a large number of cultural events, often cyclical, in the commune. However, there is no official museum or a regional chamber in the commune (Table 4).

The commune of Purda is second place in terms of the number of historical monuments. However, since its area is the largest among the communes under study (318 km^2), it is third in terms of the historical monuments per unit area, after the commune of Gietrzwałd, with the *Basilica* of the Nativity of the Virgin Mary in *Gietrzwałd* – a popular destination for pilgrimages. Although there are few museums in the area, the commune of Jonkowo has the largest number (2), with the Jacek Olędzki Living Lavender Museum being the most popular.

After the values of the attributes for cultural assets are normalised, the domination of the commune of Stawiguda becomes visible – even though it has no museums (Fig. 4). The indices for the other communes were comparable and similar.

Table 4. Indices for the cultural assets section

Index	Unit	Dywity	Gietrzwałd	Jonkowo	Purda	Stawiguda
Museums	number/100 km^2	0.621	0.580	1.186	0.258	0.000
Historical monuments	number/10 km^2	0.248	2.611	1.067	1.288	7.718
Cultural events	number/365*100	10.137	6.575	1.918	4.658	19.452

Source: prepared by the authors.

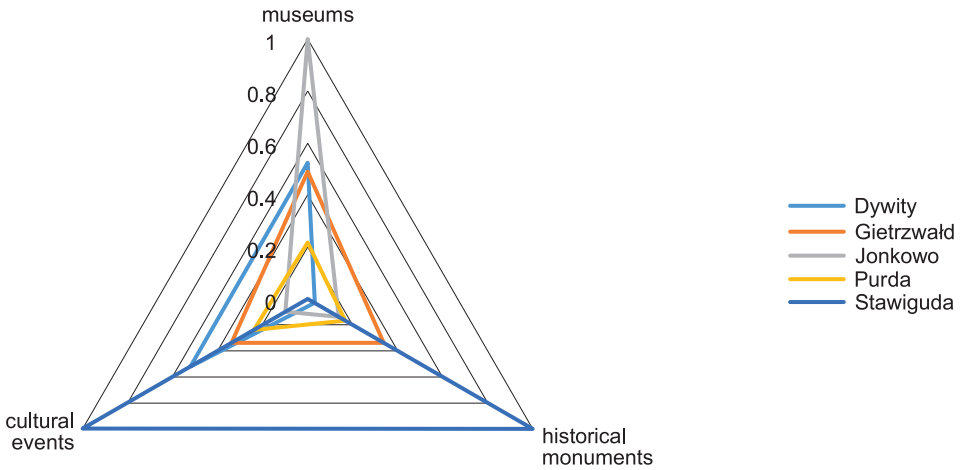

Fig. 4. The normalised values of indices concerning the cultural assets in the communes
Source: prepared by the authors.

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Tourism infrastructure

Tourism infrastructure ensures that tourists can enjoy their leisure in proper conditions. Considering only the official, universally accessible accommodation facilities, their number per unit area in the communes under study is at a good level. The situation is the best in the commune of Gietrzwałd, with 36 such objects. Their number in the commune of Stawiguda is the smallest. However, it probably does not reflect the real accommodation potential in the commune. As it is close to the provincial city, there are many "second homes" situated in the area.

The index for sports facility density is intended to reflect the level of each commune's interest in the development of auxiliary infrastructure. The highest index was recorded for the commune of Dywity, with nearly one sports facility per 10 km^2 (Table 5).

Accessibility of tourist assets that affect the tourist attractiveness is ensured by well-organised and properly marked tourist trails. The trail density is the highest in the commune of Gietrzwałd, where there are six bicycle trails with a total length of 116 km. For example, the blue trail, 10.7 km long, runs from Gietrzwałd, through Woryty, Nowy Młyn, then it crosses the border with the commune of Jonkowo and runs through Stękliny, Porbady, Wrzesina and returns to Gietrzwałd.

The indices related to tourism infrastructure indicate the absence of a direct relationship between the level of the tourist facilities development and the tourist assets in the commune. However, it is noteworthy that the communes with the highest tourist trail density are also those with the highest forest cover index and with a high percentage of areas under legal protection (Fig. 3, Fig. 5).

Table 5. Indices for the tourism infrastructure section

Index	Unit	Dywity	Gietrzwałd	Jonkowo	Purda	Stawiguda
Accommodation facilities	number/10 km^2	1.551	2.089	1.897	0.850	0.942
Sport facilities	number/10 km^2	0.931	0.348	0.415	0.232	0.404
Tourist trails	km/km^2	0.428	0.673	0.296	0.586	0.438

Source: prepared by the authors.

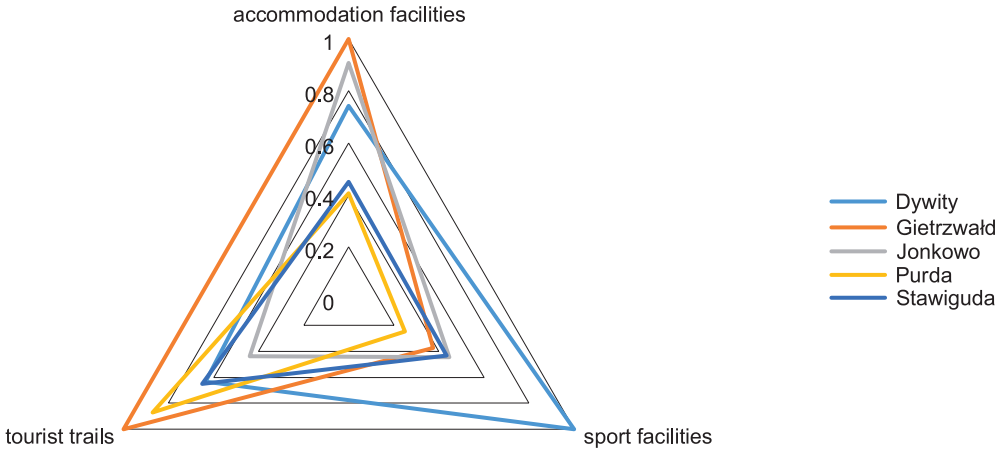

Fig. 5. Normalised indices for the tourism infrastructure section in the communes
Source: prepared by the authors.

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Transport accessibility

Transport accessibility allows tourists to reach their destination and to move around the area that they are visiting. Accessibility by road and railway transport is of the greatest importance at the commune level. Among the communes under study, only Dywity does not have passenger railway facilities, with no railway station or stop in use (Table 6).

A surprisingly large density of the national and regional roads compared with the other communes is recorded in Purda, which also has the largest number of bus stops. The number of bus stops in the commune of Dywity is only slightly fewer, but their density is the highest. Moreover, the number of public transport services to the provincial city is nearly four times larger than in the commune of Purda. It has the best transport accessibility in the functional area of Olsztyn. Public transport services in it are provided by companies from Olsztyn and from the communes as well as by private carriers.

The individual indices for transport accessibility are very similar in three communes (Fig. 6). The communes of Purda and of Dywity differ from them in terms of the number of railway stops. Moreover, the organisation of public transport in the commune of Dywity differs from other communes. With the lack of any railroad transport and a small density of roads ranked higher than county roads, the commune authorities organised efficient road public transport, making use of the organisational capacity of the provincial city and the lower-rank road network.

Table 6. Indices for the transport accessibility section

Index	Unit	Dywity	Gietrzwałd	Jonkowo	Purda	Stawiguda
National roads and regional roads	km/km²	0.059	0.156	0.117	0.182	0.130
Railway stations	number/100 km²	0.000	1.741	2.371	0.515	1.795
Bus stops	number/10 km²	7.508	4.236	4.624	3.684	2.737
Transport services to the provincial city	number/day	108	35	51	29	35

Source: prepared by the authors.

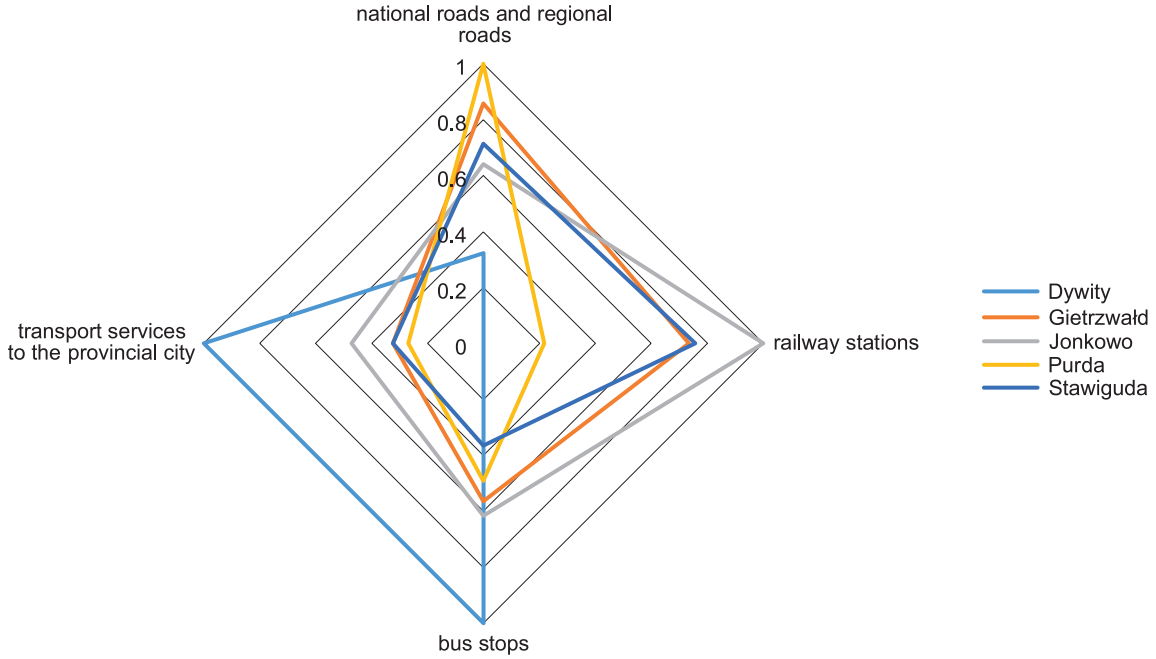

Fig. 6. Normalised indices for the transport accessibility section in the communes
Source: prepared by the authors.

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Tourist attractiveness

The study results using the normalised synthetic measures obtained by document analysis are listed in Table 7 and the graphs show the synthetic measures for each commune and each section and the overall synthetic measure of tourist attractiveness of each of the communes under study.

The first section concerning the tourist assets in the natural environment includes five indices (Table 3). The forest cover in the commune of Stawiguda accounts for its largest portion (56%), whereas in the commune of Dywity it is the smallest (nearly 28%). The protected areas in the commune of Stawiguda also occupy a larger portion than in the other communes (84%), which is only a little more than in Gietrzwałd and Purda. The number of natural monuments per unit area is similar in all the communes under study, except in Gietrzwałd. Water bodies attractive for tourism and leisure can be found in all the five communes under study. The commune of Purda stands out in terms of the number of lakes in it, whereas Stawiguda has the largest lakes, with the most diverse shoreline, which provide ample opportunities for practising water sports and fishing. The fact that meadows account for a large percentage of the Jonkowo and Dywity communes shows and confirms the traditionally agricultural nature of the landscape in those areas. The highest synthetic measure for the natural asset attractiveness was achieved by the commune of Purda, with its high lake- and forest-related indices. Considerable natural assets in the commune include a high percentage of land under legal protection and rather a high index related to the portion of meadows in the commune area. Meadows and forests account for 64% of the commune area.

Table 7. Normalised indices in the communes under study

Section	Weight	Index	Unit	Weight	Dywity	Gietrzwałd	Jonkowo	Purda	Stawiguda
Natural assets	0.35	forests	ha/commune area in ha	0.3	0.490	0.913	0.692	0.957	1.000
		protected areas	ha/commune area in ha	0.15	0.438	0.893	0.325	0.834	1.000
		natural monuments	number/10 km²	0.1	0.234	1.000	0.128	0.236	0.290
		lakes	score points	0.3	0.093	0.349	0.070	1.000	0.605
		meadows	ha/commune area in ha	0.15	0.953	0.587	1.000	0.588	0.381
Cultural assets	0.25	museums	number/100 km²	0.2	0.524	0.490	1.000	0.217	0.000
		historical monuments	number/10 km²	0.5	0.032	0.338	0.138	0.167	1.000
		cultural events	number/365*100	0.3	0.521	0.338	0.099	0.239	1.000
Tourism infrastructure	0.2	accommodation facilities	number/10 km²	0.5	0.743	1.000	0.908	0.407	0.451
		sport facilities	number/10 km²	0.15	1.000	0.374	0.446	0.249	0.434
		tourist trails	km/km²	0.35	0.636	1.000	0.440	0.871	0.651
Transport accessibility	0.2	national roads and regional roads	km/km²	0.4	0.323	0.858	0.641	1.000	0.714
		railway stations	number/100 km²	0.2	0.000	0.734	1.000	0.217	0.757
		bus stops	number/10 km²	0.2	1.000	0.564	0.616	0.491	0.365
		transport services to the provincial city	number/day	0.2	1.000	0.324	0.472	0.269	0.324

Source: prepared by the authors.

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The tourist assets associated with cultural heritage was another section under analysis. Only the commune of Stawiguda has no museums, but this deficit is compensated for by a large number of historical monuments and many cultural and sports events (Table 7). These resources and activities are sufficient to make the commune of Stawiguda the leader in the cultural asset section (Fig. 7). The poor result of the commune of Purda is not the result of a small number of historical monuments, but of its large area. It is nearly twice as large as the communes of Dywity, Gietrzwałd and Jonkowo, which has an impact on the indices related to the commune area.

There are large differences between the indices for the communes concerning the tourist infrastructure (Table 7). However, the synthetic measure values do not show this trend. It is higher than 0.5 in all the communes. The highest result for Gietrzwałd is a consequence of a large number of universally accessible accommodation facilities and the high density of tourist trails in the commune. The lowest values were calculated for two communes with the largest area.

Despite the large differences in the indices for transport accessibility, the synthetic measure for the communes is similar. There is a difference of only 0.138 points between the communes with the highest and the lowest measures. It means that the level of transport accessibility is similar in the rural communes of the functional area of Olsztyn, although they achieve it in different ways.

In the final stage of the analysis of the results for evaluation of the rural commune tourist attractiveness, the overall synthetic measure was calculated for tourist attractiveness and its ranking was made for the communes in the functional area under study.

The analysis shows that the commune of Stawiguda is the most touristically attractive (Fig. 8). It is a consequence mainly of the high quality of the natural environment, a high forest cover index and a high percentage of protected areas, a large number of historical monuments and cultural events. It is followed by the commune of Gietrzwałd. Its high position is a result of the best-developed accommodation base and a network of tourist trails, as well as many natural monuments and a high forest cover index. The communes of Purda and Jonkowo were next in the rankings. The place of the former is a consequence of the presence of many large lakes and the density of the road network, whereas the latter can boast high indices related to the tourist development of the area – its transport accessibility and the accommodation base. The lowest synthetic measure for tourist attractiveness was calculated for

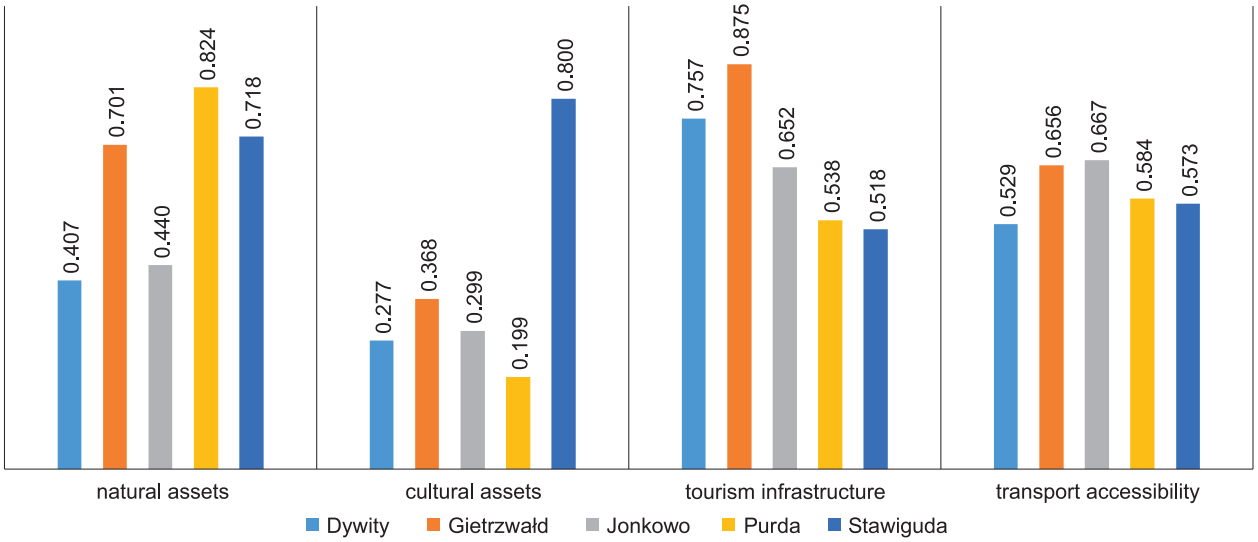

Fig. 7. Synthetic measures for communes in individual sections
Source: prepared by the authors.

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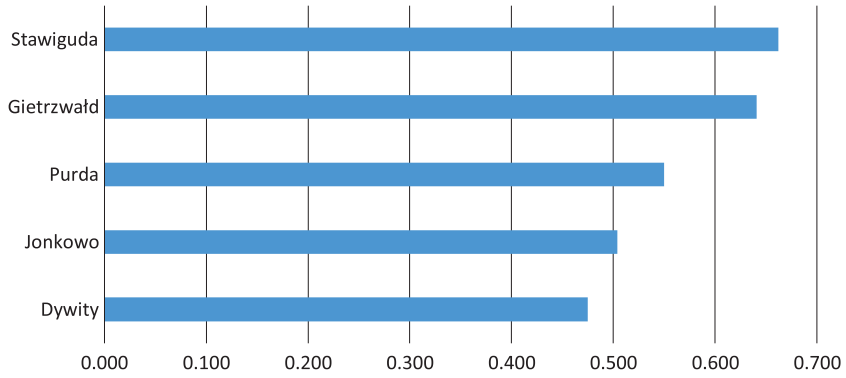

Fig. 8. Overall synthetic measure for tourist attractiveness of the communes under study
Source: prepared by the authors.

the commune of Dywity. It is a typically agricultural commune, with a low forest cover index and a small number of historical monuments. However, of all the communes under study, it shows the best indices related to its cooperation with the provincial city. It has the best indices in terms of the number of sports facilities and of bus stops and the number of bus services, making effective use of the public transport advantages in its link to the large urban centre.

Based on the overall synthetic measure of tourist attractiveness, one can identify communes of various degrees of attractiveness (Hakuć-Błażowska et al., 2018): of low attractiveness (<0.35), of medium attractiveness (0.35–0.5) and of high attractiveness (>0.5). According to these criteria, four of the communes under study can be classified as very attractive. However, one can note the advantage of the first two communes in the ranking: Stawiguda and Gietrzwałd, with valuable natural assets. The diagram of the attractiveness ranking can be expanded to a five-point numerical-conceptual scale, in which classification criteria for tourist attractiveness is developed with the use of arithmetic averages, enabling clear and comparable reference of class boundaries to the set of values (Brzezińska-Wójcik & Skowronek, 2018). The border values between different degrees of tourist attractiveness were isolated with the statistical value of 0.250 (half of the arithmetic mean for the set from 0 to 1). Thus, a commune can be termed as (Widz, 2019): unattractive (0), of low attractiveness (0.001–0.250), of average attractiveness (0.251–0.500), attractive (0.501–0.750) or very attractive (>0.750). According to this diagram, four communes can be classified as attractive and the commune of Dywity can be regarded as being of average tourist attractiveness.

CONCLUSIONS

The study of the tourist potential of the rural communes in the functional area of Olsztyn shows its considerable diversity. Different communes achieved the reference values of the indices in different sections. Each of the communes had features that made it stand out against the others. Different communes achieved the highest value of the measure in individual sections under study. Similar values of the measures of tourism attractiveness (equal level of tourism attractiveness) with high diversification of results in particular sections indicate the uneven distribution of resources in the rural communes of the functional area of Olsztyn, as well as their different use by the authorities and civil society. The best results in terms of the natural assets were achieved by the commune of Purda. This is a consequence of the largest number of lakes with an area exceeding 25 ha, a high forest cover index and the percentage of protected areas. However, its potential is lowered by the lowest score in the cultural values section. While it is not possible to increase the number of monuments in the commune,

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the local authorities should take measures to initiate and support social initiatives using the existing natural assets, organising educational events, shows and festivals connected with nature.

The commune of Stawiguda stands out in terms of its cultural assets (0.800 vs Gietrzwałd occupying the next position – 0.368), with numerous historical monuments in its area and many cultural events. It also ranks high in terms of natural wealth. However, it is the least developed in terms of tourist infrastructure among all studied communes. The activities of the commune authorities and entrepreneurs should focus on increasing the number of accommodation facilities and improving transport accessibility, especially by organising new tourist routes. The commune of Gietrzwałd proved to have the best-developed tourism infrastructure. It is a consequence of the largest number of accommodation facilities and a high density of tourist trails. Large forest cover and many valuable nature objects provide many opportunities for the development of tourism in this area. However, with a small number of monuments, the commune authorities or social organisations should undertake to organise events or other activities promoting cultural values in connection with the valuable nature of the commune.

The commune of Jonkowo proved to have the best external transport accessibility. With an average road and bus stop density, it has four train stops in a relatively small area. Jonkowo is a commune with a typically agricultural character, as evidenced by the highest score for the indicator related to meadows. The lowest indicators for protected areas and the number of nature monuments are also reflected in the small number of tourist trails running through the commune. However, it is in such areas that rural tourism should develop, with a particular focus on agrotourism. The commune authorities should create an appropriate climate, and entrepreneurs and associations should join together in clusters and put special emphasis on the organisation of cultural events.

Only the commune of Dywity did not achieve the best results in any of the sections under study. Its final result was also the lowest, mainly because of the low lake- and forest-related indices and a small number of historical monuments. The commune also has a typically agricultural character, which can be used mainly for the development of agrotourism. Individual indicators show the activities of the local government in the direction of exploiting small natural or cultural assets. The number of events organised in the commune or the increasing number of sports facilities, as well as transport links with the voivodship city may serve as an example. Further activities in these directions, increased internal accessibility and extended cooperation, for example, in the form of clusters, may bring positive results. The commune of Stawiguda, rich in natural and cultural assets and with good transport accessibility, proved to be the area with the highest tourist attractiveness. The very good conditions of external transport accessibility should be better exploited, both to connect the commune with the voivodship city and to improve internal transport.

The functional urban area of Olsztyn creates a monocentric urban agglomeration with a broad zone with a considerable range of everyday impact on the way between the place of work/school and home. It is also characterised by a large scale of internal functional integration with the opportunities for creating a developed transport network, whose examples are transport links between Dywity and Olsztyn. Tourism (and recreation associated with it) is an economic sector with high development potential and a continuous growth tendency. Therefore, the authorities of communes that strive to benefit from the tourist sector should focus on creating a proper development policy or strategy and aim at reaching sustainable tourism by improvement of infrastructure, not only tourist-related, protecting historical monuments and architecture, but also promoting environmental protection. Local authorities interested in tourism development should strive to support its growth by preparing plans for periods exceeding five to ten years or supporting the actions of public organisations and the private sector, as well as concluding inter-communal agreements aimed at using the financial support from Integrated Territorial

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Note: the results of this study were presented in another form, such as a poster at a conference: XXXVI Seminarium Geografii Wsi. *Współczesne kierunki badań w gospodarowaniu przestrzenią wiejską*. Olsztyn, 21-22.06.2021.

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PRESENT SECURITY OF THE NEIGHBOURHOOD URBAN PARKS CONSIDERING SARS-COV-2 POTENTIAL SPREADING – A CASE STUDY IN URSYNÓW DISTRICT IN WARSAW

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ABSTRACT

Motives: It is expected that COVID-19 pandemic will impact future design, use and perception of urban green spaces such as public parks. How to facilitate residents' safe use of the urban green spaces and reduce health risks has become important question to consider by landscape architects and municipal authorities responsible for the public green areas resources. This research focuses on examination of urban parks of a typical residential district of a large city in terms of their security in time of COVID-19 pandemic.
Aim: In urban parks of Ursynów district in Warsaw were assessed: quality and present security and possibilities of re-adjustments to increase their security.
Results: Ursynów district has good quality, accessible parks. Larger parks offer picnic areas and shelters, have more than one, entrance and paths with widening for benches. All playgrounds are enclosed with gates to install dispenser for hand sanitization. Gates and knobs are made of metal allowing frequent disinfection. Benches and tables are usually properly distanced and those in shelters may be marked 'for visitors from one social bubble only' but in the future an emphasis should be put on more scattered pattern of park furniture. All parks are equipped with trash cans, but usually open or semi-closed, which should be avoided.

Keywords: urban green spaces, public spaces, design, outdoor safety, recreational facilities

INTRODUCTION

Theoretical background

Urban parks are essential spaces for collective interaction (Peters et al., 2010; Dadvand et al., 2016; De Vries et al., 2013; Litt et al., 2015), physical activity (Richardson et al., 2013; Hunter et al., 2015), and relaxation (Lafortezza et al., 2009) in the urban environment. They improve public health and well-being (Bedimo-Rung et al., 2005; Payne et al., 2005; McCormack et al., 2010; Wolch et al., 2014; van den Bosch & Sang, 2017; Vujcic et al., 2018).

The COVID-19 pandemic has highlighted the relevance of access to urban green spaces that are interlaced within the built-up areas. The research of Venter et al. (2020) carried out in Oslo, has shown that during the lockdown period, recreational use augmented within residential areas and city parks roughly as much as in the forested zone. Cheng

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et al. (2021) also found that subdistrict-scale urban parks presence correlated with residents' expressed happiness. According to Johnson's et al. study (2021) park use corresponded to decreased residual COVID-19 case rates, chiefly with green space low and contiguous (not patchy). The results demonstrate that a minimization in total mobility may be a good strategy for reducing case rates.

The research by Ugolini et al. (2020) on impact of the COVID-19 pandemic on the usage and perceptions of urban green space has shown an augmented number of people walking to small urban gardens close-by (e.g. in Italy) or tree-lined streets (e.g. in Spain, Israel), as well as driving their car to green areas outside the city (e.g. in Lithuania). This research has emphasised the significance of inclusion of diverse types and sizes of greenery in cities and neighbourhoods, so that each resident has access to urban green spaces (UGS). The authors argue that to create flexible cities, urban design and planning should regard diversification of green spaces. Important are both: large parks offering spacious open-air green settings, valuable for visitation (even excluding large gatherings) in the pandemic time and smaller pocket parks and gardens which as much as possible guarantee access to UGS within walking distance from home for all residents (Ugolini et al., 2020).

Also the results of research of Xie et al. (2020) carried out in China during the pandemic demonstrate that more than half of the residents opted for visiting parks next to their homes, and the time spent travelling to parks usually did not exceed 10 minutes; thus, visiting a park in the neighbourhood was generally the first choice. The authors suggest that a dispersed network of smaller green spaces would facilitate interaction with nature for the residents, bringing about physical and mental health benefits. So, within the city each community has equal access to urban green spaces and reduced commuting time to urban parks and other UGS (Xie et al., 2020).

Also Honey-Roses et al. (2020) considering the impact of COVID-19 on public space anticipate a growing demand for smaller green spaces or neighbourhood parks which provide refuge from the loud and busy city. The authors have observed in places with stay at home orders, the renaissance of the small neighbourhood parks (van der Berg, 2020). They also argue that cities with an existing dispersed network of small green spaces will be better adapted to grant opportunities for the delight in nature and decentralized network of smaller green spaces will easily provide residents with their 'daily dose' of nature. Also Liu and Wang (2021) point out that the potential of pocket parks in delivering accessible urban green space to whole urban population should be considered a crucial 'lifeline' to improve urban residents' health during the pandemic.

Mehta (2020) points that during COVID-19 pandemic, people spend most of their time in their neighbourhood. He notes that many residential streets, sidewalks, parking lots, and other spaces have been repurposed and neighbourhood space have been transformed for active living, play, and sociability. This demonstrates the need of space for everyday recreation in the neighbourhoods.

According to Honey-Roses et al. (2020) COVID-19 pandemic also results in users' modifying preferences and expectations about green spaces which gives rise to original designs, uses and practices in green space planning. For instance, green space designers may necessitate to plan more spaces for individualized and introspective use over team sports. Paths and running trails may need widening. Contemporary expectations concerning social distancing may demand re-assessing where it is possible to exercise within green spaces. Also new or extended exercise infrastructure may be needed given that actual green spaces may not be capable to take in the influx of residents at the updated levels of acceptable density (Honey-Roses et al., 2020).

Recommendations on security considering coronavirus potential spreading

The first SARS-CoV-2 infection was diagnosed in Wuhan, China in December, 2019. The World Health Organization announced the outbreak of the worldwide pandemic in March, 2020. It resulted in the

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implementation of various preventive measures to cut down the risk of infection, which has changed numerous aspects of everyday life, including leisure time.

The technical report on social distancing of the European Centre for Disease Prevention and Control (ECDC) of March, 2020 did not address public green spaces, it only advised outdoor sporting events cancellation and encouraging people to engage in physical activity alone outside (Considerations relating to social distancing measures in response to COVID-19, 2020).

In September, 2020 further ECDC guidelines on non-pharmaceutical interventions against COVID-19 addressed coronavirus transmission and listed the following pieces of advice.

The physical distance of 1–2 m as key preventive measure is to be maintained with use of floor markings spaced at recommended distance, seat markings and rearrangement of furniture in public spaces.

Respiratory hygiene such as using paper tissue, which should be later properly disposed of, using no-touch bins is suggested.

Hand hygiene e.g. washing hands with water and soap or alcohol-based sanitisers, with widespread availability of hand-washing facilities is to be implemented.

Use of gloves was considered ineffective but it was mentioned that some people use them to avoid accidental touching of their mouth, nose and eyes.

Environmental cleaning for outdoor spaces may be limited only to standard detergents use on frequently-touched surfaces (hand rails, handles, door knobs); spraying (fumigation) disinfectants outdoors was not recommended due to the lack of effectiveness and possible damage to the environment.

The 'social bubble' concept appeared, i.e. constantly meeting with the same people – family, co-workers or friends can mitigate the negative effect of social isolation by allowing increased contacts yet minimising the risk of coronavirus transmission (Guidelines for non-pharmaceutical interventions to reduce the impact of COVID-19 in the EU/EEA and the UK, 2020).

In May, 2020 (updated November, 2020) United Kingdom Government published its guidance for owners and operators on public spaces, including green spaces (COVID-19 Secure: Safer Public Places – Urban Centres and Green Spaces, 2020).

It advised maintaining 2 m social distance (at least 1 m with other means of risk mitigation e.g. face covering) and exercising and visiting outdoor public places with people one lives with or from one's 'social bubble'.

It also suggested implementation of cleaning protocols for touch points (e.g. hand rails, gates) and keeping toilet open but carefully managed to promote good hygiene, yet to diminish the risk of COVID-19 transmission.

In the management of green spaces (park, recreational grounds, openly accessible playing fields, linked with housing developments public open spaces and public burial grounds) it addressed the following issues and interventions: footway widening to adopt distancing between pedestrians, markings to maintain social distancing (benches, floor, lawns), movement guidance around park promoting one-way flow of pedestrians, providing separate entry and exit routes, enlarging entrances to minimise queues.

It also encouraged implementing facilities for personal vehicle access, preferably bike, to reduce use of public transport.

It emphasised that visitors should be able to wash or sanitize hands.

Outdoor playgrounds and gyms could remain open but with safe distance between users, placing equipment back to back or side to side where possible and surface cleaning (COVID-19: Guidance for managing playgrounds and outdoor gyms, 2020).

But if an area of playground/gym is enclosed a limit on the maximum number of users at one time should be communicated and where practicable a booking system implemented (COVID-19: Guidance for managing playgrounds and outdoor gyms, 2020).

Cafés and bars could only provide food and drink for takeaway.

The American Centers of Disease Control and Prevention (CDC) has published in May, 2020

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guidance concerning among others also cleaning and disinfecting public spaces (Reopening Guidance for Cleaning and Disinfecting Public Spaces, Workplaces, Businesses, Schools, and Homes, 2020). It stated that outdoor areas do not require disinfection e.g. spraying disinfectants on sidewalks and in parks. Use of disinfectants can be done only on objects frequently touched by multiple people or outdoor hard surfaces.

In July, 2020 it addressed the problem of parks and recreational facilities (Visiting Parks and Recreational Facilities. Protect Yourself and Others from COVID-19, 2020). It advised: to stay at parks and recreational areas nearby one's home, to stay physically active and relieve stress, yet to maintain 6 feet (1,83 m) distance from people one doesn't live with (e.g. the use of markings on lawn) and to avoid crowded parks. It also encouraged to wash one's hands often.

In September, 2020 recommendation for management of outdoor learning gardens and community gardens maintained previously mentioned 6 feet distance and suggested implementing of one-way traffic, if possible (Considerations for Outdoor Learning Gardens and Community Gardens, 2020).

In October, 2020 park, trails and open spaces have been rated as lowest risk of coronavirus spreading when they permit social distancing of at least 6 feet between individuals or household groups and often touched surfaces and shared equipment are being cleaned or disinfected between uses or on regular schedule (Guidance for Administrators in Parks and Recreational Facilities, 2020). These guidelines also strongly advised wearing masks, particularly when social distancing measures are problematic to maintain.

The recommended distance of 2 m, however, may not be sufficient for people in movement. Some researches show that more rapid respiration while walking, running or cycling may create aerosol travelling for 4 or even 10 m, thus increasing risk of virus spreading, and suggest widening of the safe zone (Blocken et al., 2020).

It is known that aerosol containing virus may be infectious but it depends on virus concentration and environmental conditions. Highly concentrated virus aerosol in the laboratory remains infectious for up to 3 hours (van Doremalen et al., 2020) but in outdoor environment, in sunlight and with minor virus concentration, drying saliva containing virus loses 90% of its infectious potential after approximately 15 minutes (Ratnesar-Shumate et al., 2020).

In Poland, after the initial complete lockdown of public spaces in March/April, 2020, green spaces have been gradually reopened with public health organisations (mainly ECDC) recommendations implemented.

Ongoing COVID-19 pandemic (and unfortunately all pandemics yet to come) rise the question whether landscape architects and planers are aware of their responsibility to provide de novo designed comfortable and safe spaces or to adjust so those already present. Probably the process of education (which is also my personal concern and duty) should also include those problems solving.

Aim of research

Previous research on consequences of the COVID-19 pandemic for the use of urban green spaces has highlighted the importance of access to green spaces within residential areas (Venter et al., 2020; Xie et al., 2020; Ugolini et al., 2020). It has been shown that visiting urban green spaces can improve health condition as well as meet the social interaction needs (Xie et al., 2020). Moreover, due to limits on movement and gatherings as well as closing of indoor recreational spaces, the pandemic has augmented the contribution of outdoor public spaces to both mental and physical health (Freeman & Eykelbosh, 2020). It has been also noted that the green spaces, located within the nearest neighbourhood have been frequently chosen by many urban residents for everyday recreation (Venter et al., 2020; Xie et al., 2020; Ugolini et al., 2020; Mehta, 2020; Honey-Roses et al., 2020). The fact that in many cities, due to safety reasons, the residents were discouraged from using public transport reinforced the trend to visit green spaces within walking distance from home. To decrease the

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transmission of coronavirus and secure public health, restrictions on the use of public space, including green spaces, and social distancing have been introduced (Honey-Roses et al., 2020). Facilitating the safe use of green spaces and providing place for outdoor activities and socializing during pandemics have become an important challenge. As it can be seen now, cities may experience numerous peaks of the virus outbreak and it leads to the protracted restrictions on the social distancing and the use of public space (Kissler et al., 2020). As pointed by Freeman and Eykelbosh (2020) closed parks, amenities and green spaces also impede healthy outdoor activity and stress relief, subsequently driving individuals to use less convenient and more crowded spaces (e.g. sidewalks and pavements). Thus, the administration of outdoor recreational spaces takes the considerate study to balance the needs of the inhabitants against the potential risk of community spread (Freeman & Eykelbosh, 2020).

It is expected that COVID-19 pandemic will impact future design, use and perception of public space (Honey-Roses et al., 2020), including urban green spaces like public parks. How to facilitate residents' safe use of the urban green spaces and reduce health risks has become important question to consider by landscape architects and municipal authorities responsible for the public green areas resources. This research focuses on examination of urban parks of a typical residential district of a large city (Ursynów district in Warsaw) in terms of their security in time of COVID-19 pandemic.

The aims of the research are:

1. to characterise and assess quality of urban parks in the Ursynów district;

2. to assess their present security, considering the coronavirus potential spreading;

3. to assess possibilities of re-adjustments in order to increase their security according to the European and the American guidelines.

STUDY AREA

The study area is located within the city of Warsaw which is the capital and the largest city of Poland. Ursynów is the southernmost district of Warsaw (Fig. 1). The surface area of Ursynów is 4379 ha, including built-up land of 2255 ha. The district covers 8.5% of the capital city area, which makes it the third largest district in Warsaw. The district has a population of over 150,000 (the population density is 3455 inhabitants/km^2), being one of the fastest growing neighbourhoods in Warsaw. In 2015 the natural growth rate was 5.26 per 1000 inhabitants. Almost 25% of its residents are below 18 years of age (*Statistical Yearbook of Warsaw*, 2019).

Fig. 1. Map of Warsaw's administrative territory with the Ursynów district location
Source: own preparation.

The eastern section of Ursynów is heavily built-up with multi-storey blocks of flats, constructed mainly in the seventies of the 20th century using prefabricated cement blocks, popular in those years for ease of construction. Western and southern sections of Ursynów, where single-family housing dominates, is characterised by lower population density and broad open spaces and green areas. Ursynów was once called 'the bedroom district' because of its purely residential nature. However, now it is beginning to change its

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character, mainly due to the emergence of numerous shopping, recreational, cultural and sports centres, restaurants and educational institutions or public and private universities.

The largest green space in Ursynów is Kabaty Woods Nature Reserve covering 924.72 ha, located in the Ursynów's southern extremity. It is a place of leisure and recreation for the inhabitants of Ursynów and the whole city. In the reserve there are designated tourist trails, walking trails and nature trails. For active recreation there are fitness trails and bike paths, adapted also for winter sports. Those who prefer passive recreation will find many tourist shelters, benches or forest playgrounds for children. On the outskirts of the reserve there is also a large recreational meadow where it is possible to light a fire, play a ball or sunbathe.

Apart from the nature reserve, Ursynów district provides eight publicly owned and free accessible parks for the residents (Fig. 2). These parks vary in size and type of recreational facilities (Table 1). The largest park is the Powsin Park of Culture, located at the edge of Warsaw, established in the 1940s as the suburban complex of sports and recreation. In the early 1950s the complex was incorporated into the city limits. In recent years, the park has been revitalised, and recreational facilities have also been developed and modernised. The majority of Ursynów parks – the Pope John Paul II Park, the Roman Kozłowski Park, the 'Lasek Brzozowy' Park, the 'Moczydełko' Park, the 'Przy Bażantarni' Park and the 'Silent Unseen' – special-operations paratroopers of the Polish Army Park – have been created in the last two decades to provide for the needs of physical

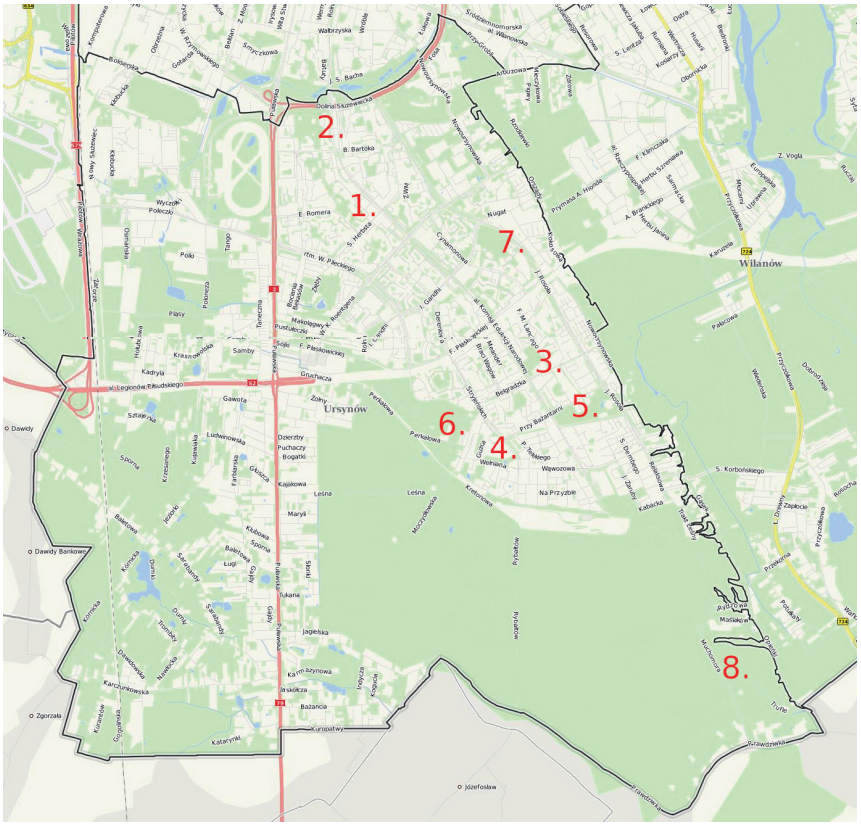

Fig. 2. Map of Ursynów's administrative territory with the eight parks location. Parks location is marked with the numbers as in the Table 1

Source: Map from the City of Warsaw Map Services available on https://mapa.um.warszawa.pl/ customized by the author.

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activity and recreation of the Ursynów inhabitants. The newest park of Ursynów – the Polish Inventors Park, officially established in 2018 within an open green space owned by the district, is still undeveloped.

Table 1. Size (ha) of the eight urban neighbourhood parks included in the study.

no.	Name	Size (ha)	% of the district
1.	Pope John Paul II Park	3,62	0.08
2.	Roman Kozłowski Park	8,68	0.20
3.	'Lasek Brzozowy' Park	3,64	0.08
4.	'Moczydełko' Park	0,83	0.02
5.	'Przy Bażantarni' Park	9,79	0.22
6.	'Silent Unseen' – special-operations paratroopers of the Polish Army Park	17,82	0.41
7.	Polish Inventors Park	8,10	0.19
8.	Powsin Park of Culture	49,53	0.13
			2.33

Source: own preparation.

MATERIALS AND METHODS

Data collection

Characteristics and quality of urban parks assessment

During the late summer and autumn beginning of 2020, each of the eight Ursynów's neighbourhood parks was visited and documented.

To describe the physical content of the Ursynów's neighbourhood parks, the Environmental Assessment of Public Recreation Spaces (EAPRS) tool was used (Saelens et al., 2009), previously applied in the research of Peschardt et al. (2016) concerning small public urban green spaces. In the assessment all elements of the EAPRS tool were considered. Some other elements originally not included in the EAPRS tool (e.g. outdoor gym, street workout area, climbing wall, rope park, tables for ping-pong, chess or board games, boulodrome, fenced dog park, mini golf, graduation tower, outdoor free library), and which were observed in the analysed parks, were also added to the assessment. All considered elements were as follows: path (distinct and designated walking area/route), paved trail (asphalt, concrete, brick), unpaved trail (gravel, grass), number of entrances, parking lot, roadway through, wooded area, meadow, wildlife areas, drinking fountain, picnic area, BBQ/fire place, shelter or pavilion, entertainment venue/stage, maps, soccer field, tennis court, basketball court, skate area/pump-track, pool, other (outdoor gym, street workout area, climbing wall, rope park, tables for ping-pong, chess or board games, boulodrome, fenced dog park, mini golf, graduation tower, outdoor free library), restroom, open space (larger area at least 20x20 m, for active use), flowerbeds and special shrubs, water area, art/sculpture, bike rack, event postings, telephone, bench, lights along at least one trail, trash cans, sidewalks adjacent, rules/regulations sign, café, historical feature, table, other seating, view outside park and playground. It was determined whether or not an element is present in the park.

To assess the quality of the Ursynów's neighbourhood parks the Perceived Sensory Dimensions (PSDs) tool was applied (Grahn & Stigsdotter, 2010). The tool includes eight perceived dimensions: 'nature', 'culture', 'prospect', 'social', 'space', 'rich in species', refuge' and 'serene'. In each of the eight neighbourhood park, eight perceived sensory dimensions (PSDs) were evaluated and rated by the landscape architect, similarly to the research of Peschardt and Stigsdotter (2013). The rating of each park corresponds to the degree of the presence of the specific PSDs based on the factors that generate the PSDs as outlined in Table 2 (Peschardt & Stigsdotter, 2013). Each factor was rated according to a scale from 0 to 3. It was possible to award 7 different grades (0, 0.5, 1, 1.5, etc.) with 0 indicating that the factor was not present at all and 3 indicating that the factor was present to a very high degree. Then the grades awarded to all factors were summed up and divided by a number of factors that generate each PSD.

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Table 2. Factors which generate the eight Perceived Sensory Dimensions (Grahn & Stigsdotter, 2010)

PSD	Factors
Nature	Nature quality
	Wild and untouched
	Free growing lawns
	Possible to light a fire
	Not crowded
	Feels safe
	Hilly
Culture	Fountains
	Statues
	Foreign plants
	City park characteristic
	Pond, canal
	Flowers
	Wooded pasture quality
Prospect	Plane, well-cut grass
	Prospect
	Cut lawns
	Football fields on grass
	Football fields
	Football fields are lit up
	Small ball grounds
	Showers, changing rooms
Social	Entertainment
	Exhibitions
	Restaurant
	Market stalls
	Paths made of gravel
	Special park animals
	General good lighting
	Roads well lit up
	Access to restrooms
	Places sheltered from the wind
	Sunny places
	Shady places
	Several seats and benches
	Tables and benches
	Plenty of people
	Feels safe
	Paths with hard surfaces
Space	Spacious
	Areas not crossed by paths
	Lots of trees
	Places sheltered from the wind
	Sunny places
	Shady places
	Places where people can gather
Rich in species	One can detect several species of animals
	Natural plant and animal populations
	Many native plants to study
Refuge	Many bushes
	Animals that people can feed and pet
	Sandpits
	Tables and benches
	Watching people being active
	Play equipment
	Feels safe
Serene	Silent and calm
	No bikes
	Not crowded
	No mopeds
	Clean and well maintained
	No traffic noise
	Feels safe

Source: own preparation.

Present security of the urban parks considering the coronavirus potential spreading assessment

A doctor of medicine – specialist in internal medicine, who has completed epidemiologic training in COVID-19 – patients dedicated large, multiprofile hospital in Warsaw in March/April 2020, was asked to identify safety measures concerning coronavirus spreading in public urban parks.

On basis of the ECDC, the UK government and the CDC recommendations and guidelines the list of following crucial safety issues was prepared and its elements were then identified in each park (Table 3).

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Table 3. Crucial anti-COVID-19 safety issues on the basis of the ECDC, the UK government and the CDC recommendations and guidelines

Social distancing	Entrances	Critical objects/facilities	Other
Social distancing i. E. Maintaining minimal interpersonal distance of 2 m; on this basis maximal park capacity was calculated, giving for each visitor 4 m2 or 16 m2 (as for people in movement e.G. Running)	marked entrances, possibly more than one	presence of amenities that require cleaning/disinfecting protocols due to their being frequently touched: handles, handrails, door knobs	presence of trash cans – open, semi-closed or closed
Whether all, at least 75% or only solitary paths are wider than 2 m	presence of a gate at an entrance in order to supervise number of visitors	presence of toilet facilities	presence of bike path leading to a park and other bike-related facilities, in order to promote reduction in public transport use
Presence of path forming ring-road	whether entrances are wider than 2 m, allowing visitors to pass within safe distance when there is no separated entrance/exit	presence of cafés	
Presence of benches, tables and other types of seating and whether they all, at least 75% or only solitarily are distanced 2 m or more		presence of drinking fountains	
Presence of lawns where marking for social distancing can be placed		presence of playgrounds	
		presence of outdoor gyms	
		bench and table characteristic, concerning cleaning protocols	

Source: own preparation.

Possibilities of re-adjustments in order to increase security according to the European and the American guidelines

On basis of the ECDC, the UK government and the CDC recommendations and guidelines the list of following possibilities of re-adjustments in the parks were identified:

1. whether it is possible to separate entry/exit points;
2. whether it is possible to install dispensers for hand sanitization;
3. whether playgrounds and outdoor gyms can be separated from rest of a park and dispensers for hand sanitization can be placed;
4. whether footway can be widened where appropriate;
5. whether one-way movement can be created;
6. whether distancing of benches and tables can be improved.

Statistical analysis

All calculations were performed using Statistica 13.3 software. The continuous variables (area, PSD values) were reported as medians with a range, because they did not follow a normal distribution. To compare medians of the quantitative continuous variables (area, PSD values) in groups where the qualitative variables are present/absent (EAPRS values and presence/absence of the features related to the risk of coronavirus spreading) the U Mann-Whitney test

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was used. The qualitative variables co-presence was assessed using Chi square test with Yates' correction and with Fisher exact test. The correlation between continuous variables was assessed with R Spearman correlation test.

To describe similarities between objects (parks) a cluster analysis was used.

For quantitative variables (PSD values) the Ward method was used, that involves an algorithm (dendrogram) which starts with n clusters ('leaves') and continues (forms 'branches') until observations are included into one cluster ('trunk'). The distance between objects in one cluster depends on how similar the objects in the cluster are – the smaller the distance the stronger the similarity.

Then the heat map was drawn to identify the variables that seem to be characteristic for each cluster. The columns and rows of the data matrix were subsequently re-ordered according to the clustering result, placing similar observations close to each other. Finally the colour scheme was applied for the visualization.

For qualitative variables (EAPRS values and presence/absence of the features related to the risk of coronavirus spreading) k-means algorithm was used, that attempts to subdivide the dataset into distinct, non-overlapping clusters as well as to make the intra-cluster data points as similar as possible while keeping the clusters as different as possible.

The significance of all statistics was given at the 0.05 level.

RESULTS

Parks characteristics

The median of park area is 8.39 (0.83–49.53) ha. The median of PSDs rating varies from 0.55 for 'culture' to 2.15 for 'serene' (table 5 and 6). The park characteristics according to EAPRS are presented in table 3.

The park area correlates strongly, positively with 'nature' ($r = 0.83$, $p < 0.05$) and 'culture' ratings ($r = 0.95$, $p < 0.05$), and the parks with 'picnic area' or 'shelter'

Table 4. Presence of elements included in the Environmental Assessment of the Public Recreation Spaces (EAPRS) in the eight urban neighbourhood parks included in the study

Elements included in the (EAPRS)	no.	%
Path (distinct and designated walking area/ route)	6	75.0
Wooded area	4	50.0
Meadow	4	50.0
Drinking fountain	1	12.5
Picnic area	3	37.5
BBQ/fire place	1	12.5
Shelter or pavilion	3	37.5
Entertainment venue/stage	1	12.5
Wildlife area	7	87.5
Number of entrances	8	100.0
Parking lot	3	37.5
Roadway through	0	0
Maps	1	12.5
Soccer field	3	37.5
Tennis court	1	12.5
Basketball court	4	50.0
Skate area/pump-track	2	25.0
Pool	1	12.5
Other (outdoor gym, street workout area, climbing wall, rope park, tables for ping-pong, chess or board games, boulodrome, fenced dog park, mini golf, graduation tower, outdoor free library)	7	87.5
Restroom	2	25
Open space (larger area at least 20x20 m for active use)	5	62.5
Water area	1	12.5
Art/sculpture	3	37.5
Bike rack	6	75.0
Event postings	2	25.0
Telephone	0	0
Bench	7	87.5
Lights along at least one trail	6	75.0
Trash cans	8	100.0
Sidewalks	6	75.0
Rules/regulations sign	7	87.5
Paved trail (asphalt, concrete, brick)	7	87.5
Unpaved trail (gravel, grass)	6	75.0

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cont. Table 4

Café	2	25.0
Historical feature	2	25.0
Table	4	50.0
Other seating	3	37.5
Flowerbeds and special shrubs	3	37.5
View outside park	3	37.5
Playground	6	75.0

Source: own preparation.

have larger area. Also 'unpaved trail' tends to be more frequent in larger parks (Table 7). In all 6 parks with 'bike rack' there are also 'path' and 'playground' ($p < 0.05$) and in all 6 parks with 'sidewalks' there are also 'lights along trail' ($p < 0.05$). In all 3 parks with 'picnic area" there is also 'shelter' ($p < 0.05$) and in all 2 parks with 'cafe' there is also 'restroom' ($p < 0.05$). In all 2 parks with 'historical feature' there is also 'skate area' ($p<0.05$).

The following correlations are observed between PSDs:
- strong negative between 'nature' and 'culture';
- positive between 'prospect' and 'social' and 'space';
- positive between 'social' and ' rich in species' and 'refuge';
- positive between 'refuge' and 'rich in species' (Table 7).

In the first step of the cluster analysis the following parks are included, according to their PSDs similarity (Fig. 3):
- in cluster one: Roman Kozłowski Park and 'Lasek Brzozowy' Park;
- in cluster two: 'Silent Unseen' – special-operations paratroopers of the Polish Army Park and Polish Inventors Park;

Table 5. Ratings of the Perceived Sensory Dimension (PSD) in each urban neighbourhood park included in the study, ranging from 0 to 3

Name	Nature	Culture	Prospect	Social	Space	Rich in species	Refuge	Serene
Pope John Paul II Park	0.7	1.1	1.5	1.7	1.5	1.3	1.1	2.0
Roman Kozłowski Park	1.6	0.5	1.1	1.5	2.1	1.8	1.5	1.9
'Lasek Brzozowy' Park	1.4	0.7	0.4	0.9	1.3	1.2	1.5	2.1
'Moczydełko' Park	1.2	0.6	0.1	0.9	1.1	1.7	1.1	2.6
'Przy Bażantarni' Park	1.4	1.1	1.9	2.0	2.8	2.5	2.2	2.3
'Silent Unseen' – special-operations paratroopers of the Polish Army Park	2.5	0.1	0.8	1.0	2.2	1.2	1.3	2.1
Polish Inventors Park	1.9	0.1	0.9	0.6	1.6	1.0	0.8	2.2
Powsin Park of Culture	2.2	0.4	1.8	2.0	2.9	2.5	1.9	2.5

Source: own preparation.

Table 6. Median of the Ratings of the Perceived Sensory Dimension (PSD)

	Median	Range
Nature	1.5	0.7–2.5
Culture	0.55	0.1–1.1
Prospect	1.0	0.1–1.9
Social	1.25	0.6–2.0
Space	1.85	1.1–2.9
Rich in species	1.5	1.0–2.5
Refuge	1.4	0.8–2.2
Serene	2.15	1.9–2.6

Source: own preparation.

Table 7. Significant correlations between park area and PSD and EAPRS ratings

	Picnic area present	p	Picnic area absent
park area [ha]	17.82 (9.79–49.53)	0.037	3.64 (0.83–8.69)
	shelter present	p	shelter absent
park area [ha]	17.82 (9.79–49.53)	0.037	3.64 (0.83–8.69)
	unpaved trail present	p	unpaved trail absent
park area [ha]	9.23 (3.64–49.53)	0,07	2.22 (0.83–3.62)

Source: own preparation.

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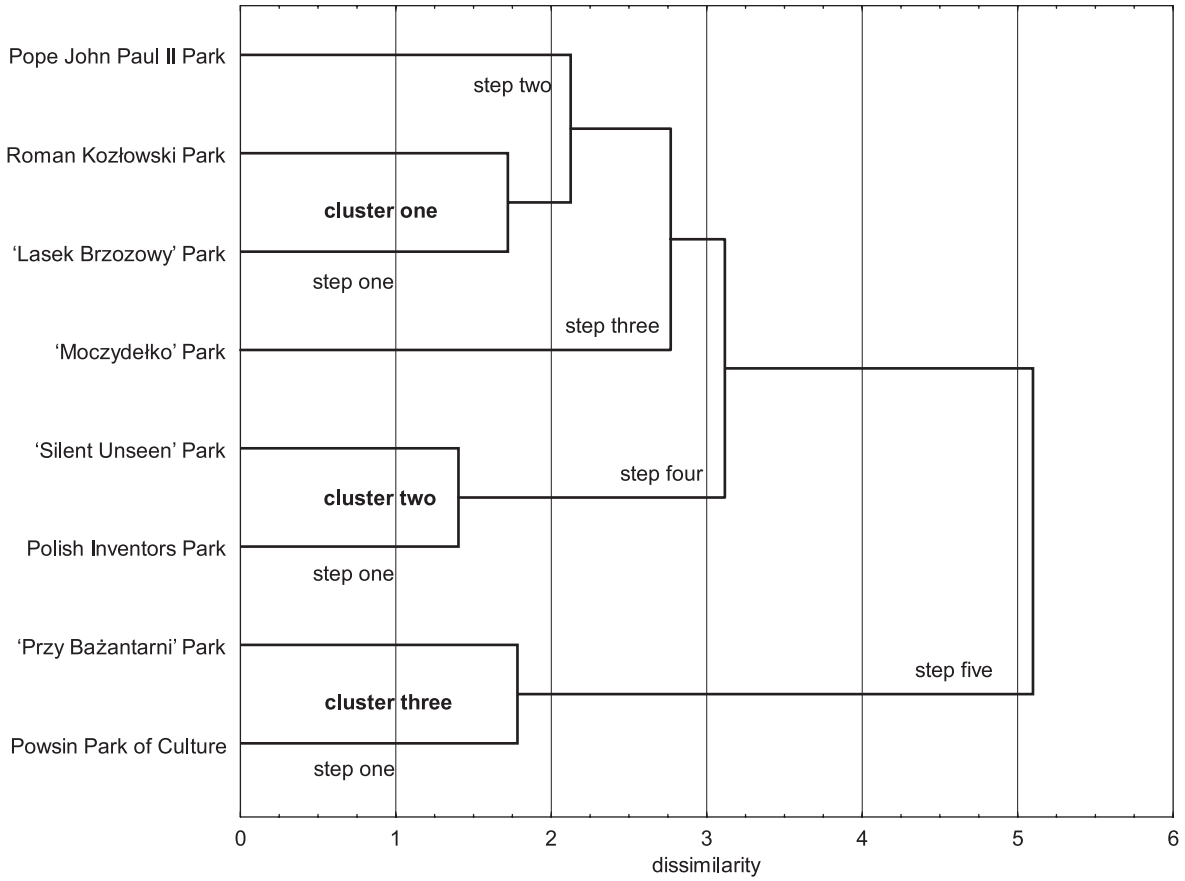

Fig. 3. Cluster analysis of Ursynów parks according to their PSDs (dendrogram)
Source: own preparation.

– in cluster three: 'Przy Bażantarni' Park and Powsin Park of Culture.

At step two, Pope John Paul II Park merges into cluster one while at step three 'Moczydełko' Park enters the same cluster one. The parks from cluster one and two merge into the same cluster at step four, while the parks from the last cluster – 'Przy Bażantarni' Park and Powsin Park of Culture – are strongly differentiated from the other, merging at step five.

As far as PSDs rating is concerned 'Przy Bażantarni' Park and Powsin Park of Culture are very similar, with the only difference of 'culture' and 'nature' rating, the first having high score in 'culture' while the second in 'nature' (Fig. 4). The parks from cluster two ('Silent Unseen' Park and Polish Inventors Park) are similar with the exception of 'space' ratings, higher for the 'Silent Unseen' Park. The parks from cluster one have similar 'nature', 'culture' and 'serene' ratings.

When analysing EAPRS, 2 clusters are defined. In cluster one 6 parks (Roman Kozłowski Park, 'Lasek Brzozowy' Park, 'Przy Bażantarni' Park, Powsin Park of Culture, Pope John Paul II Park and 'Moczydełko' Park) are included, while remaining 2 parks ('Silent Unseen' Park and Polish Inventors Park) form cluster two. The parks in cluster one have always 'bench', 'rules' and 'paved trail' and usually 'lights along trail' and 'sidewalks'. Only in the parks of cluster one 'bike rack' and 'playground' are present. The parks in cluster two have always 'meadow' and 'open space' but they lack 'path', 'wooded area' and 'table'.

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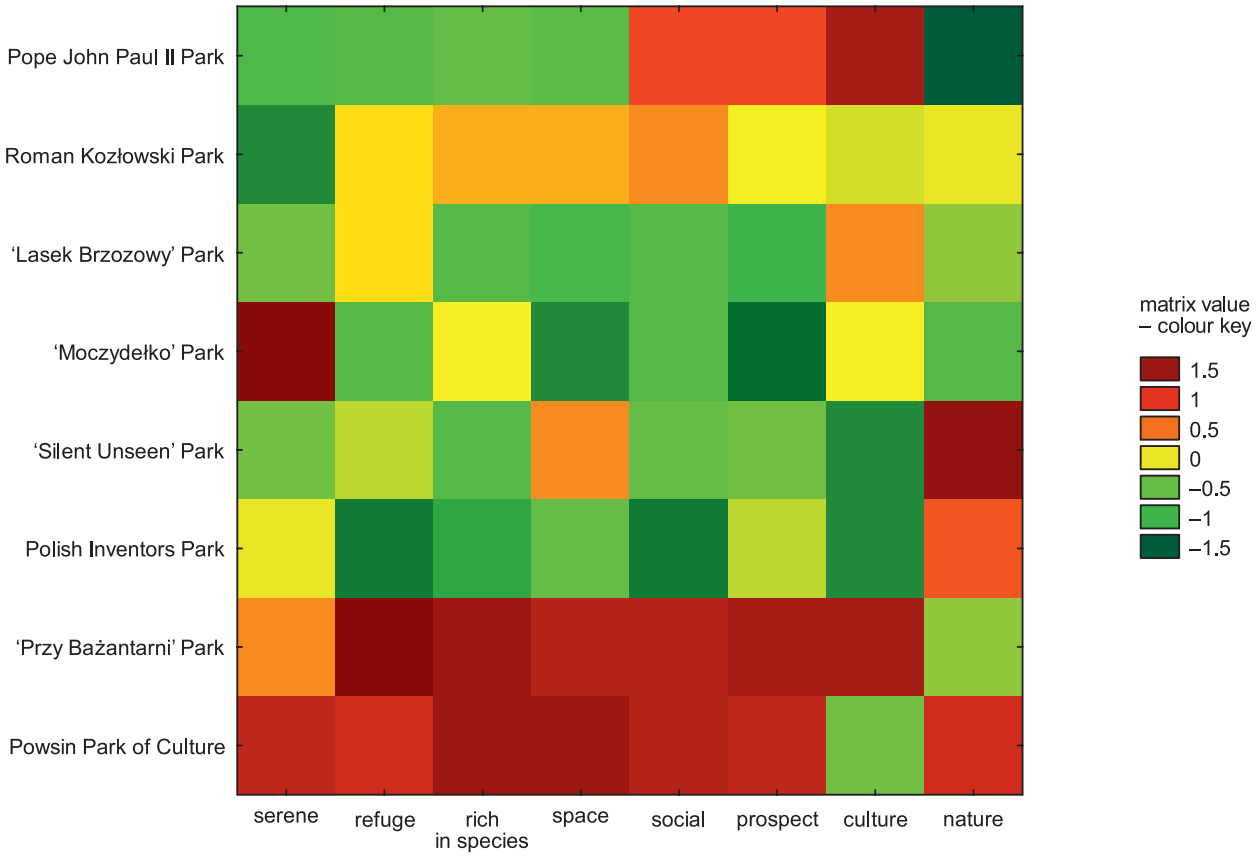

Fig. 4. Cluster analysis of Ursynów parks according to their PSDs ('heat map')
Source: own preparation.

Security considering coronavirus potential spreading

The number of person per 4 m^2 and 16 m^2 for each park are presented in table 8.

All parks have more then one entrance and 6 of them (75%) have entrances wider than 2 m.

All paths wider 2 m are present in 25% of the parks, while wide paths constituting the majority of track are observed in 37.5%. In 2 parks (25%) there is no wide path. In 6 parks (75%) there are paths creating full ring road while in the remaining 2 parks there are surrounding paths but they do not form full circle.

The presence of aforementioned amenities critical for coronavirus spreading is presented in table 9.

Only in Polish Inventors Park there is 1 separate bench, in the remaining parks there are numerous benches. In 1 park ('Silent Unseen' Park) all benches are properly distanced, while in the remaining 6 parks – their majority. In 7 parks some of the benches are located in 1–1.5 m path widening. Benches are either wooden with concrete legs or entirely made of metal. Their average width is 180 cm. In 2 parks ('Przy Bażantarni' Park and Powsin Park of Culture)

Table 8. Correlations between PSDs ($p<0.05$)

Correlation		r
nature	culture	-0.85
prospect	social	0.84
prospect	space	0,76
social	rich in species	0.83
social	refuge	0.73
rich in species	refuge	0.75

Source: own preparation.

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Table 9. Number of person allowed simultaneously in park according to coronavirus precaution rules

	per 4 m^2	per 16 m
Pope John Paul II Park	9050	2263
Roman Kozłowski Park	21700	5425
'Lasek Brzozowy' Park	9100	2275
'Moczydełko' Park	2075	519
'Przy Bażantarni' Park	24475	6119
'Silent Unseen' – special-operations paratroopers of the Polish Army Park	44550	11138
Polish Inventors Park	20250	5063
Powsin Park of Culture	123825	30956
median for all parks	20975 (2075–123825)	5244 (519–30956)

Source: own preparation.

there are permanent wooden deckchairs disposed in pairs, sometimes with a table in between. In 1 park ('Moczydełko' Park) there are 3 wide concrete steps leading to the waterfront, where people use to sit.

In 3 parks there are less than 5 tables, while in another 3 parks they are more numerous. In 2 parks all tables are properly distanced, while in 2 other – their majority. Tables are made of stone and metal, sometimes with some wooden elements and accompanied by 2 or 4 stools. Some of them are equipped with chessboard pattern (Fig. 5). In 3 parks there are longer (3–3.5 m) wooden benches and tables in wooden shelters or outdoors. They are too packed, both in shelters and sometimes outdoors (Fig. 6). In 1 park (Powsin Park of Culture) there is an outdoor amphitheatre equipped with plastic chairs.

In 7 (87.5%) parks there is lawn where markings on the ground can be placed to indicate safe distance. In 1 park ('Moczydełko' Park) by the pond there is the wooden deck 15x8 m with wooden balustrade where also markings can be placed.

In 1 park (Roman Kozłowski Park) there is the viewpoint at the top of the hill 4x3 m with one bench.

To 6 (75%) parks there is access via bike path. In 6 parks (75%) there are also metal bike racks. In 1 park (Powsin Park of Culture) there are even 2 bike-parks. Also in the same park there is the bike rental terminal. Bike racks are only present in the parks with the entrances wider than 2 m ($p < 0.05$) (Fig. 7).

Fig. 5. Examples of pieces of furniture present in the analysed parks
Source: own preparation.

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Fig 6. Longer wooden benches and tables in wooden shelters or outdoors
Source: own preparation.

Fig. 7. Examples of the metal bike racks present in the analysed parks
Source: own preparation.

All parks are equipped with trash cans – open in all parks, semi-closed in 5 parks and closed in 3 parks. The closed trash cans are present only in parks with more than 5 tables ($p<0.05$). In 1 park (Powsin Park of Culture) there are also separate, open ash-trays (Fig. 8).

Apart from mentioned in table 9, other facilities needing special hygienic regime are also present. In 2 parks ('Przy Bażantarni' Park and Powsin Park of Culture) there are rope parks fenced with gates and in 1 park (Roman Kozłowski Park) there is climbing wall. In 1 park (Powsin Park of Culture) there is detached football table equipment. In 2 parks ('Przy Bażantarni' Park and Pope John Paul II Park) there are outdoor free libraries. In single parks there are also: pool with its changing rooms (Powsin Park of Culture), saline graduation tower (Pope John Paul II Park), oligocene water spring (Powsin Park of Culture), small houses for chess and bridge players and camping bungalows, shelter to change a baby (Powsin Park of Culture), fenced dog park ('Silent Unseen' Park), educational path (Roman Kozłowski Park) and tactile park plan ('Przy Bażantarni' Park).

In cluster analysis concerning coronavirus precautions in the parks also 2 clusters are defined. In cluster one 6 parks (Roman Kozłowski Park, 'Lasek Brzozowy' Park, 'Przy Bażantarni' Park, Powsin Park of Culture, Pope John Paul II Park and 'Moczydełko' Park) are included, while remaining 2 parks ('Silent Unseen' Park and Polish Inventors Park) form cluster two, as previously. The parks in cluster one have always more than 5 benches with benches in path widening and usually sport field and bike path. Only in the parks of cluster one entrance > 2 m, playground and bike rack are present. The parks in cluster two have always outdoor gym, semi-closed trash cans, only narrow paths and all well distanced benches.

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Fig. 8. Examples of the trash cans present in the analysed parks
Source: own preparation.

Possibilities of re-adjustments in order to increase security according to the European and the American guidelines

As far as all parks have more then one entrance it is possible to separate entry from exit point.

Only in 2 parks it is possible to install dispenser for hand sanitization at the entrance. It is possible, however, to install it at the gates to all playgrounds (Fig. 9) and to 3 out of 5 sport fields (Fig. 10). In 1 park (Powsin Park of Culture) it is already installed. All 5 outdoor gyms lack gate (Fig. 11).

In 3 parks ('Silent Unseen' Park, Polish Inventors Park and 'Lasek Brzozowy' Park) it is possible to easily widen footways.

Although the parks have paths creating full or semi-ring road it is impossible to create one way movement, due to their too complex path system.

All tables as well as pairs of deck chairs and benches and tables in shelters are permanently attached to the ground and can not be easily repositioned to create proper distancing. In 6 parks there are the benches not permanently attached to the ground so they may be repositioned e.g. in quincunical arrangement, to create proper distancing.

Table 10. The presence of amenities critical for coronavirus spreading

	no. of parks	%
handle/door knob/handrail	6	75.0
restroom	2	25.0
playground	6*	75.0
outdoor gym	5	62.5
sport field	5**	62.5
drinking fountain	1	12.5

* 3 parks ('Lasek Brzozowy' Park, 'Przy Bażantarni' Park and Powsin Park of Culture) have more than one playground
** 1 park (Powsin Park of Culture) has more then one sport field
Source: own preparation.

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Fig. 9. Examples of the playgrounds present in the analysed parks
Source: own preparation.

Fig. 10. Examples of the sports fields present in the analysed parks
Source: own preparation.

Fig. 11. Examples of the outdoor gyms and street workout areas present in the analysed parks
Source: own preparation.

CONCLUSIONS

1. The Ursynów district has sufficient number of good quality parks, which enables its inhabitants to enjoy nature in the vicinity of their homes.

2. The Ursynów's parks are safe place in time of coronavirus pandemic, providing their users with the most of worldwide recommended solutions. Their layout alone has proved to allow social distancing.

3. At no/low cost the missing problems regarding coronavirus spreading in parks can be adjusted.

DISCUSSION

Ursynów district has sufficient number of parks, well rated in EAPRS and PSD, especially in 'serene', 'space' and 'nature' category. This is important for the fact that people generally favor the dimension 'serene',

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followed by 'space', 'nature', 'rich in species', 'refuge', 'culture', 'prospect' and 'social' (Grahn & Stigsdotter, 2010). Larger parks offer to the district residents also possibility of longer leisure in picnic areas and shelters. Parks with café pavilion also offer restrooms. However, public restrooms will require additional sanitation (Freeman & Eykelbosh, 2020; COVID-19 Secure: Safer Public Places – Urban Centres and Green Spaces, 2020).

Two parks (Park of the 'Silent Unseen'– special-operations paratroopers of the Polish Army and Polish Inventors Park) still under construction, distinguish from the rest of the Ursynów's parks, yet still add a lot to the district greenery, especially in 'nature', 'space' and 'serene' dimensions.

Two parks ('Przy Bażantarni' Park and Powsin Park of Culture) are very homogeneous in respect of high PSD rating, with the difference of area and 'culture'/'nature' balance.

The parks in Ursynów district are evenly distributed. They constitute decentralized network of green spaces of different sizes which can provide easily accessible opportunities for leisure and recreation (Honey-Roses et al., 2020). The majority of them has an access via bike path and provide visitors with places to leave their bikes which was suggested in COVID-19 Secure: Safer Public Places – Urban Centres and Green Spaces (2020). The residents can also reach the parks using the pedestrian walk network, well developed in Ursynów. This allows the district residents to chose green area close to their home and thus avoid public transport as suggested in the Visiting Parks and Recreational Facilities. Protect Yourself and Others from COVID-19 (2020). This is advantageous because during pandemic discouraged is travelling to far-off parks that provokes incidental contacts with services and people along the route, thus facilitating virus transfer into smaller or remote communities (Freeman & Eykelbosh, 2020). It is also in line with the Adaptation strategy of Milan (2020) which proposes to rediscover the neighbourhood dimension. This proposal assumes developing the availability of public services, including recreational amenities, in the community, with the objective to make everything accessible within 15-minutes walk, reducing travel between neighbourhoods (Milan, 2020). The strategy also recommends to municipal authorities introducing decisions promoting use of bicycles and scooters (Milan, 2020).

In Ursynów there is also north-south subway train line, which passes near 5 parks and is within walking distance 1–3 km from 3 others. The subway train line seems a safer alternative than a bus because it can accommodate more passengers and runs more often.

It has been thus confirmed that Ursynów inhabitants have been given the opportunity to rest 'close to nature', yet within the short distance from their dwelling and that the green spaces available offer them high aesthetic and functional potential. This fulfils good practices in urban planning (Hunter et al., 2015; Honey-Roses et al., 2020).

As far as the 2 parks under construction are concerned, they still can be upgraded in terms of their services and these observations can be helpful during social consultations which take place in the district on the regular base.

The Ursynów parks are safe place in time of pandemic, regarding the European and American guidelines. They have more than one entrance, usually fairly wide, allowing easy accommodation and no queues or even to create separate entry/exit as suggested in COVID-19 Secure: Safer Public Places – Urban Centres and Green Spaces (2020). As park entrances and exits constitute gathering points, supervision to those zones should be provided to improve physical distancing (Freeman & Eykelbosh, 2020).

The majority of parks has sufficiently wide paths. There are also path widening for benches which allows no obstacles for pedestrian movement flow. In 3 parks – 2 still under construction (Park of the 'Silent Unseen'– special-operations paratroopers of the Polish Army and Polish Inventors Park) and in the 'wild' part of 'Lasek Brzozowy' Park – it is possible to widen footways, as far as they are unpaved and cross the unorganised meadows. Although the parks have paths creating full or semi-ring road it is impossible to create one way movement to minimize interaction between park users, like for example has

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been implemented in the City of Richmond (Freeman & Eykelbosh, 2020), due to their too complex path system.

All playgrounds are enclosed and have at least one gate, where it is possible to install dispenser for hand sanitization as suggested in COVID-19 Secure: Safer Public Places – Urban Centres and Green Spaces (2020). Provision of opportunities for hand hygiene is recommended also by Freeman and Eykelbosh (2020).

All handrails, gates and knobs are made of metal which allows them to be frequently disinfected. Sanitizing surfaces, especially these non-porous, seems to be an important issue, since the viable virus may persist on them even for dozens of hours (Freeman & Eykelbosh, 2020).

In the majority of parks benches and tables are properly distanced. In the remaining cases it is possible to add seat marking where sitting is prohibited to maintain social distancing as recommended by the Guidelines for non-pharmaceutical interventions to reduce the impact of COVID-19 in the EU/EEA and the UK (2020). Some of the benches are not permanently attached to the ground so they may be repositioned e.g. in quincunical arrangement to create proper distancing according to the Guidelines for non-pharmaceutical interventions to reduce the impact of COVID-19 in the EU/EEA and the UK (2020).

Tables which are permanently attached to the ground and not properly distanced, as well as pairs of deck chairs and benches and tables in shelters may be marked 'for visitors from one social bubble only' as suggested in the Guidelines for non-pharmaceutical interventions to reduce the impact of COVID-19 in the EU/EEA and the UK (2020) and COVID-19 Secure: Safer Public Places – Urban Centres and Green Spaces (2020).

Also it is possible to place distancing markings on all lawns as recommended in COVID-19 Secure: Safer Public Places – Urban Centres and Green Spaces (2020) and in the Visiting Parks and Recreational Facilities. Protect Yourself and Others from COVID-19 (2020).

All café pavilions are prepared to serve for takeaway according to the COVID-19 Secure: Safer Public Places – Urban Centres and Green Spaces (2020).

All parks are equipped with trash cans, but they are usually open or semi-closed ones. There are no closed, no-touch bins, recommended by the guidelines, which allow to safely dispose of e.g. used paper handkerchief, mask or plastic gloves. This concern associated with the safe use of public spaces during the COVID-19 outbreak has been also addressed by Freeman and Eykelbosh (2020) who recommend to ensure trash containers for disposing of personal protective equipment (e.g. masks and gloves), which may otherwise turn into a public health hazard. It is also worth mentioning that irresponsible disposal of personal protective equipment might pose a risk to park animals who can accidentally eat them or become tangled in them.

Most of the parks posses such amenities like an outdoor gym and street workout area which are not fenced off from the park area. Thus, there is no place to install dispenser for hand sanitization. To prevent outdoor gym areas from being temporarily excluded from use, exercise equipment should be regularly disinfected. Keeping the possibility to use the outdoor gyms in urban parks is particularly important because during pandemic green spaces served as a substitute for forbidden indoor fitness and sport activities and a shelter from stress (Venter et al., 2020). Also the Adaptation strategy of Milan (2020) recommends allowing the use of the urban green areas for outdoor sports.

In several Ursynów's parks there are different types of sports fields. Some of them are enclosed, thus, there is possibility to install dispenser for hand sanitization. To avoid the risk of the virus transmission it would be recommended to mark these spaces 'for users from one social bubble only' according to the concept proposed in the Guidelines for non-pharmaceutical interventions to reduce the impact of COVID-19 in the EU/EEA and the UK (2020) and COVID-19 Secure: Safer Public Places – Urban Centres and Green Spaces (2020). It would be also advisable to introduce a use schedule that would allow e. g. for one-hour breaks between different groups of users, to allow sunlight

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to inactivate coronavirus as recommended (Ratnesar-Shumate et al., 2020).

In the analysed neighbourhood parks there are also facilities like climbing wall or rope park, which need special hygienic regime; pool or camping bungalows, which may require temporal closure in order to maintain personal limits in enclosed areas; view point or outdoor amphitheatre where distancing marking should be placed or tactile park plan which should be included in cleaning protocols.

It has been confirmed that the Ursynów's parks are safe place for leisure as far as crucial safety issues in coronavirus spreading are considered. Because their form is well balanced between 'natural zones' and 'park facilities', it makes their function more flexible in time of pandemic, when e. g. cafés and bars serve only takeaways and park provides lawn for picnic.

However, it is important to introduce in landscape architecture education the problem of smooth pedestrian flow in parks, and the need to create both: wide open spaces and garden interiors for visitors from one social bubble. It is also worth to discuss with students the choice of materials used in landscape architecture taking into consideration antiviral and antibacterial properties and facility for cleaning.

Urban parks are important spaces for physical and mental health and allow residents to meet their social interaction needs. The COVID-19 pandemic is likely generate considerable changes to future use of public space, including urban parks (Honey-Roses et al., 2020). The recent observations of urban green spaces have shown that during the COVID-19 pandemic period, recreational use of urban green spaces, especially neighbourhood parks was intensified. The demand for social distancing and other coronavirus precautions would require adaptation of the urban green spaces to the new conditions. The presented conclusions might help to asses the quality of urban green spaces and improve the security of their use.

Study limitations

This study was situated in Poland – mid-European country with moderate continental/maritime climate, so the observations do not apply to all types of parks and green spaces due to the e.g. seasonal changes in citizens activities, specific plant choice and small architecture materials.

However, it would be worth comparing these observations with corresponding ones from other mid-European countries and from countries within the same climate zone.

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ELECTROMOBILITY INFRASTRUCTURE AND VEHICLES IN THE CONTEXT OF POLISH LEGISLATION

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ABSTRACT

Motives: The increased interest in alternative fuels requires the creation of special legislation, especially in the context of rules for the development and performance of proper infrastructure necessary for electric vehicles. Any change in these regulations usually results in an increased interest in electric or hybrid cars. This, in turn, entails the need to develop appropriate infrastructure for alternative fuels.
Aim: The aim of this paper is to present the legal regulations in force in Poland related to the support of electromobility, which is particularly important in the context of the European Union policy aiming to reduce environmental pollution through, among others, the use of alternative fuels.
Results: The article presents the basic concepts of electromobility included in national and European legislation along with their adoption with regard to the increasing interest in electromobility in Poland. This entails the need to introduce changes, both in legal regulations and road infrastructure.

Keywords: electromobility, charging point, alternative fuels, Alternative Fuel Infrastructure Register, electric vehicle

INTRODUCTION

Regarding the idea of climate protection by e.g. reduction of CO_2 emissions to the atmosphere, the automotive industry and car users are gradually moving away from the use of petrol or oil. They are increasingly turning to vehicles powered by alternative fuels, with a particular interest in electric vehicles. And these, according to the European Environment Agency, are to be a key element of the European mobility system, contributing to reducing the impact on climate change and air quality (Burchart-Korol, 2020).

The issues related to alternative fuels and their introduction into everyday use are being addressed by numerous entities from all over the world. A few such initiatives, focused on the use of electrically powered vehicles, can be mentioned here:

1. The United Nations is promoting alternative fuels through The Partnership for Clean Fuels and Vehicles (PCFV). The UN also runs the Electric Mobility Programme, where it pursues objectives such as developing policies, sharing best practices, piloting technology options, tracking electric vehicle consumption, calculating emissions and economic benefits, and supporting the formulation of electric mobility plans at national and regional levels.

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2. Global Fuel Economy Initiative (GFEI) – GFEI's goal is to provide improved fuel economy as well as the use of efficiency technologies in both light and heavy-duty vehicles, including hybrid and fully electric vehicles.

3. International Transport Forum (ITF), which main tasks are:

a. to promote the understanding of governments about the role of transport as a key element of economic growth and its impact on the social and environmental dimensions of sustainable development;
b. raising the public profile of transport policy and a better understanding of the importance of transport for the economy, the environment, and society.

4. Driving Change Together – Katowice Partnership for Electromobility (COP24) – the declaration is a broadly worded guideline for accelerating the transition to low-carbon vehicles, enabling market and technological development. The partnership aims to "bring together countries, regions, cities, as well as institutions, NGOs and companies working for the development of electromobility", and the way to achieve it is "international cooperation and exchange of experience in this area", with particular emphasis on support for research and development (COP24, 2018).

5. International Energy Agency (IEA) is dedicated to transport research and analysis, focusing on how countries can improve the sustainability of their transport systems.

6. European Environment Agency (EEA), since 2000, publishing the TERM report (Transport and Environment Reporting Mechanism), which monitors the progress and effectiveness of the integration of transport into environmental strategies (European Environment Agency, 2016). Such reports include indicators used to track the environmental performance of the transport sector and measure progress towards key transport policy objectives.

7. Partnership on Sustainable Low Carbon Transport (SLoCaT) – a partnership engaging international entities connected with global transport to collaborate on sustainable, low carbon transport by working on public and non-motorised transport and fuel and vehicle efficiency (SLoCaT, 2015), enabling the following Sustainable Development Goals to be reached (Leśniewski et al., 2021): 3.9 (air quality), 7.3 (energy efficiency), 9.1 (sustainable infrastructure), 11.2 (urban transport), 12.c (fuel subsidies), and 13.2 (climate change mitigation).

Interestingly, the promotion of the use of electric and hybrid vehicles can be carried out by creating parking stands for these types of vehicles. The following is an indication of the Polish legal standards which results in facilitations for owners of electric cars. Article 12b of the Act on public roads (1985) contains two interesting standards. The first one concerns the obligation of the authority in charge of traffic management on roads to designate a parking space at publicly accessible charging stations on public roads, in residential zones, and in traffic zones. Such parking spaces must be marked in a way that allows them to be unambiguously distinguished from parking spaces intended for other motor vehicles. The second legal regulation contained in Art. 12b of this act states that parking spaces for electric or hybrid vehicles may be designated outside of the spaces at public charging stations. The legislator indicates that such parking spaces are created to promote vehicles powered by alternative fuels. Additionally, Article 148a of the Road Traffic Law (1997) indicates that until 1 January 2026 electric vehicles are allowed to use bus lanes designated by the road administrator.

Certain facilitations concerning the spread of electric cars may apply not only to the owners of such vehicles but also to entities interested in building charging stations. Article 29 section 1 point 25 of the Construction Law (1994) stipulates that the construction of charging stations, except for charging infrastructure for public road transport within the meaning of Article 2 point 3 of the Act on electromobility and alternative fuels (2018), does not require a building permit decision, but only a notification. Article 29 section 2 point 26 of the Construction Law states that the construction

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of charging points does not require a decision on planning permission or notification.

The aim of the article is to present legal provisions related to the promotion of electromobility. It is extremely important, since – according to the assumptions of the European Union – it is necessary to reduce air pollution and the use of fuels coming from oil.

METHODOLOGY

In the case of electromobility, a certain trend can be observed: the change in legislation entails an increased interest in electric and hybrid cars, and the interest in such cars entails the need to create the necessary infrastructure to support them (cf.: Flasza & Matuszczyk, 2018; Jacolik, 2019; Kołtonowski et al., 2021; Kowalski & Depta, 2019; Krawiec & Krawiec, 2017; Mazurek, 2021; Molecki, 2017; Pilecki & Binka, 2018; Zaniewska-Zielińska, 2018).

Firstly, the article presents the basic concepts of electromobility with an indication of the differences between the definitions contained in the Directive on the deployment of alternative fuels infrastructure (2014) (European Directive) and the Act on electromobility and alternative fuels (Polish act). The Member States, when implementing the provisions of directives of the European Parliament and the Council, adapt these standards to the existing legislation in the country. Therefore, there may be differences between definitions in the understanding of certain concepts.

Afterwards, the Polish law on electromobility was analysed and it was indicated which authorities are responsible for drawing up which documents in this respect. The law imposes on various entities the obligation to prepare plans or reports aimed at ensuring the availability of stations and charging points. Apart from the obligation to provide infrastructure, the Act also describes the requirements concerning the number of electric cars in the fleet of vehicles used by the chief and central bodies of state administration and local self-government units.

BASIC DEFINITIONS

In order to properly understand the essence of the problems addressed in this article, it is first necessary to familiarise oneself with the basic terms related to electromobility and their legal definitions (Table 1).

As can be seen from Table 1, the Act on electromobility and alternative fuels adopts almost identical definitions to those in the EU Directive.

"The definition of alternative fuels [from the Act on electromobility and alternative fuels] does not contain a closed catalogue of alternative fuels. Therefore, it is possible that apart from electricity, hydrogen, liquid biofuels, synthetic and paraffinic fuels, compressed natural gas (CNG), including that derived from biomethane, liquefied natural gas (LNG), including that derived from biomethane, or liquefied petroleum gas (LPG) listed in the provision – other substances may also be alternative fuels. The condition of qualifying them as alternative fuels will be that they do not originate from crude oil, including its processing, and that they are used for powering engines of motor vehicles or vessels" (Kokocińska & Pokrzywniak, 2020). The EU definition is very broad and in principle open to all types of vehicles equipped with an electric motor, both in terms of their construction (two-, three-, or four-wheel), the power of the installed electric drive (with no lower limit of power), and the possible combination of the electric drive with other types of drive. In this context, the definition of an "electric vehicle" in the provisions of the Act on electromobility and alternative fuels is much narrower, as certain types of vehicles are not covered at all (e.g. hybrid vehicles, electric bicycles and electric mopeds), although they fall within the EU definition (Kokocińska & Pokrzywniak, 2020).

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Table 1. Basic definitions

Definition	Directive on the development of an alternative fuels infrastructure	Act on electromobility and alternative fuels
Alternative fuels	fuels or energy sources that serve, at least partially, as a substitute for crude oil-based energy sources in transport and that have the potential to contribute to the decarbonisation of transport and the greening of the transport sector, including, inter alia: – electricity, – hydrogen, – biofuels meaning liquid or gaseous fuel for transport produced from biomass (Art. 2 letter i) the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (2009), – synthetic and paraffinic fuels, – natural gas, including biomethane, in gaseous form (compressed natural gas – CNG) and in liquid form (liquefied natural gas – LNG), – liquefied petroleum gas (LPG)	fuels or electricity used for the propulsion of motor vehicles or vessels as a substitute for fuels derived from crude oil or obtained from oil processing, in particular electricity, hydrogen, liquid biofuels, synthetic and paraffinic fuels, compressed natural gas (CNG), including from biomethane, liquefied natural gas (LNG), including from biomethane, or liquefied petroleum gas (LPG)
Electric vehicle (EV)	a motor vehicle fitted with a power unit containing at least one non-peripheral electric device as an energy converter with an externally chargeable electrical energy storage system	motor vehicle within the meaning of Art. 2 point 33 of the Act of 20 June 1997 – Law on Road Traffic, using for propulsion exclusively electrical energy accumulated by connecting to an external power source
Charging point	a device that enables a single electric vehicle to be charged or the battery of a single electric vehicle to be replaced	a facility for the recharging of individual electric vehicles, hybrid vehicles and zero-emission buses, and a location where the battery used for their propulsion is replaced or recharged
Normal power charging point	a charging point less than or equal to 22 kW capable of supplying electricity to an electric vehicle, with the exception of devices less than or equal to 3.7 kW which are installed in private households or whose primary purpose is not charging electric vehicles and which are not accessible to the public	a charging point with a capacity less than or equal to 22 kW, excluding devices with a capacity less than or equal to 3.7 kW installed at locations other than public charging stations, in particular in residential buildings
High power charging point	a charging point with a capacity greater than 22 kW capable of supplying electric energy to an electric vehicle	a charging point with a capacity greater than 22 kW
Publicly accessible charging or refuelling point (publicly accessible charging station)	a recharging or refuelling point supplying an alternative fuel, which allows users throughout the Union non-discriminatory access (meaning different conditions of authentication, use and payment)	a charging station open on equal terms to any electric or hybrid vehicle owner
Charging station	–	a) a constructional facility comprising a normal-capacity charger or high-capacity charger connected to a construction site, or b) a free-standing building installation with one or more normal-capacity charge points or high-capacity charge points – equipped with software allowing the provision of charging services, together with a parking space and, where the charging station is connected to a distribution network within the meaning of the Law of 10 April 1997 – Energy Law (1997), the installation leading from the charging point to the electricity connection

Source: own elaboration based on the Directive on the development of alternative fuel infrastructure and on the Act on electromobility and alternative fuels.

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ANALYSIS OF LEGISLATION

Directive 2014/94/EU of the European Parliament and the Council

As Poland is a member state of the European Union, it had to implement into its legislation the provisions of Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the development of alternative fuel infrastructure. This directive was created for several reasons, of which, with regard to the issue at hand, the most relevant seem to be: environmental protection, in particular against air pollutants such as nitrogen dioxide (NO_2), benzoalfapirene ($C_{20}H_{12}$) or sulphur oxides (SO_x), and the EU's dependence on oil imports. Apart from worsening the EU's trade balance with the rest of the world, dependence on imports of raw materials is also a threat to the EU's energy security. The preamble to the directive indicates that it is necessary to provide vehicle users with data on the geographical location of publicly accessible charging and refuelling points for alternative fuels. If companies or internet portals provide such information, it must be made available in an open and non-discriminatory manner to all users. Information on the availability of charging and refuelling points should, where appropriate, be included in traffic and travel information services as part of an intelligent transport system. These matters are regulated by the Act on electromobility and alternative fuels (hereinafter referred to as the Act), which is the implementation of the provisions of the Directive into Polish law.

Act on electromobility and alternative fuels

The explanatory memorandum to the draft of the Act on electromobility and alternative fuels indicates that: "alternative fuels require special infrastructure used for refuelling/charging motor vehicles powered by these fuels. Without the development of appropriate infrastructure, consumers will not be interested in switching from motor vehicles running on conventional fuels (e.g. petrol, diesel) to vehicles using alternative fuels for propulsion. In turn, entrepreneurs are not interested in doing business with alternative fuels because there are no customers for these fuels. As a result, neither the vehicle market nor the infrastructure has developed in a way that allows for greater fuel diversification in the market and increased climate neutrality of transport" (Explanatory Memorandum to the Act on electromobility and alternative fuels, 2018).

The Act on electromobility and alternative fuels specifies:

1. rules for the development and operation of infrastructure for the use of alternative fuels in transport, hereinafter referred to as "alternative fuels infrastructure", including the technical requirements to be met by this infrastructure;
2. obligations of public entities regarding the development of alternative fuels infrastructure;
3. information obligations concerning alternative fuels;
4. conditions for the operation of clean transport zones;
5. national policy framework for the development of alternative fuels infrastructure and the manner of its implementation.

The Act provides the basis for ensuring access to charging stations for users of electric and hybrid vehicles. It introduces the concept of "operator of a public charging station" – this is the entity responsible for the construction, management, operational safety, operation maintenance and repairs of a public charging station. his operator, among a number of other obligations, must:

1. enable the connection and charging of the electric vehicle and the hybrid vehicle;
2. provide data to the Alternative Fuels Infrastructure Register on the availability of a charging point and the price for the charging service.

He must also equip the charging point installed at the public charging station with a metering system allowing the measurement of electricity consumption and the transmission of metering data from this system to the charging station management system in near real-time. The charging station operator must

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also agree with the traffic management body on the number of parking bays that can be designated at public charging stations. He may also act as a charging service provider or sign a contract with another entity that will provide the service using the charging station belonging to the charging station operator.

The provisions of the Act, in addition to specifying the tasks of operators of a publicly accessible charging station, charging service providers, technical requirements of charging stations, also impose an obligation to design, build new public buildings and multi-family buildings in such a way as to ensure the connection power allowing to equip the stations with charging points with a power of not less than 3.7 kW (Article 12 section 1 of the Act). This provision applies to construction projects for which an application has been made for a decision on a construction permit or a separate decision on approval of a construction project after 1 January 2019 (Article 75 of the Act).

In Article 11 of the Act on electromobility and alternative fuels, the legislator indicated that activities related to charging infrastructure for public road transport are public purposes within the meaning of the Act on real estate management (1997). The investments for which the public purpose provisions can be applied to charging stations are:

1. construction and maintenance of road public transport charging infrastructure;
2. projects necessary to connect charging points forming part of this infrastructure to the network, consisting in particular in the modernisation, expansion or construction of the network.

Article 67 of the Act contains a provision from which it follows that the construction of public charging stations indicated in the plan (discussed below) and implementation of projects necessary to connect them to the network constitute a public purpose within the meaning of the provisions of the Act on real estate management. The fact that these activities are treated for public purposes allows, inter alia, the institution of expropriation to be applied, thanks to which it is possible to more quickly acquire land for the implementation of this project. With the emergence and development of electromobility, the Act imposes the obligation to create 3 different documents:

1. a plan for the location of publicly accessible charging stations and natural gas stations along the roads of the TEN-T core network under its management;
2. a national policy framework for the development of alternative fuels infrastructure;
3. a report on charging points within the municipality, installed in public charging stations/plan for the construction of public charging stations.

Ad 1) Plan for the location of publicly accessible charging stations and natural gas stations along the roads of the TEN-T core network under its management

The Act requires the General Director of National Roads and Motorways to develop a plan for the location of public charging stations and natural gas stations along the roads of the TEN-T core network under his management, for not less than 5 years (Art. 32 sec. 1). The main objective of TEN-T (Trans-European Transport Network) is to ensure the territorial cohesion of the EU and to facilitate the free movement of persons and goods (Regulation on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU, 2013). An efficient transport system within the Union is supposed to contribute to improving the functioning of the single internal market, stimulate regional economic growth, and increase the competitiveness of the individual Member States and the EU as a whole on a global scale. The Regulation of the European Parliament and the Council, in Article 38, identifies the most important roads (existing or planned) for the achievement of the TEN-T policy objectives and reflects the changing demand for transport and the need for multimodal transport. This network contributes in particular to serving increased mobility and ensuring a high level of safety and to developing a low carbon transport system. Member States have to construct and adapt

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the infrastructure to the guidelines of the regulation until 31 December 2030.

Furthermore, Annex 1 of Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) (2007) indicates that the spatial data elements disclosed in the Infrastructure for Spatial Information in a country are the following: transport networks – road, rail, air and water transport networks and related infrastructure. These include connections between different networks, e.g. the Trans-European Transport Network (TEN-T) as defined in Decision No 1692/96/EC of the European Parliament and of the Council of 23 June 1996 on Community guidelines for the development of the trans-European transport network and future revisions of that Decision.

The Regulation of the European Parliament and the Council sets out guidelines for TEN-T roads, among which the need for access to charging points for alternative fuel vehicles is indicated. When carrying out construction works on roads belonging to the TEN-T network, the possibility of providing a sufficient number of electro-mobility points should be designed and prepared.

According to the Act, the location plan for public charging stations and natural gas stations includes: the determination of the number and locations of public charging stations and natural gas stations, taking into account compressed natural gas (CNG) and liquefied natural gas (LNG), refuelling points, necessary to cover the demand for alternative fuels in vehicles travelling on the roads of the TEN-T core network. Such a plan, concerning 201 points, was prepared, agreed and posted on the website of the General Directorate for National Roads and Motorways (GDDKiA, 2018). It shows at which first-category motorway service points (MOP) a public charging station could be located, differentiating between the position of the distribution system operator and the position of the operator of the motorway service point. The consultation aimed to determine whether there is a possibility to locate distribution charging stations at MOPs (according to the distribution system operator and the operator of MOP), which yielded the following results (Fig. 1).

The data presented show that in most cases there is a possibility to build public charging stations at MOP points. Below (Fig. 2) shows which MOPs were consulted and which locations are covered by the plan.

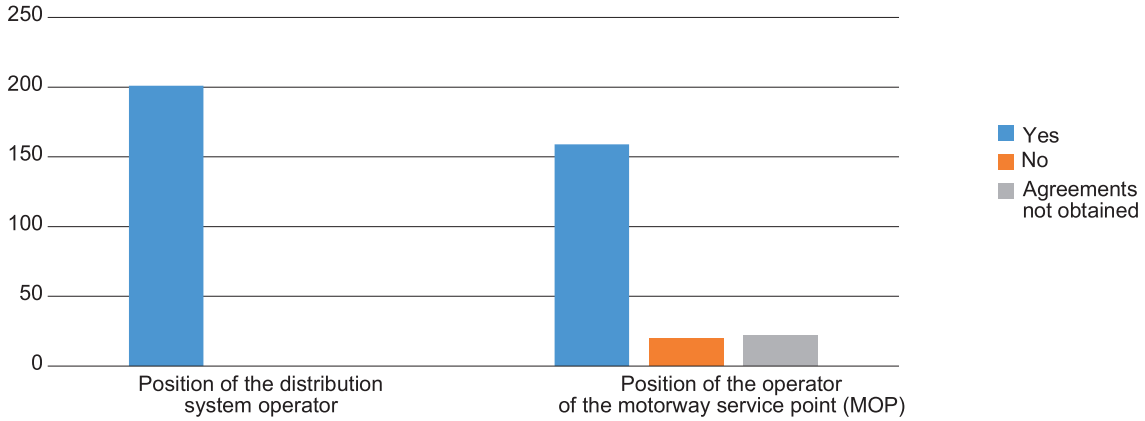

Fig. 1. Results of the consultation on the location plan for public charging stations and natural gas stations – number of MOPs where it is possible to locate distribution charging stations (according to the distribution system operator and the operator of MOP)

Source: own elaboration based on GDDKiA (2018).

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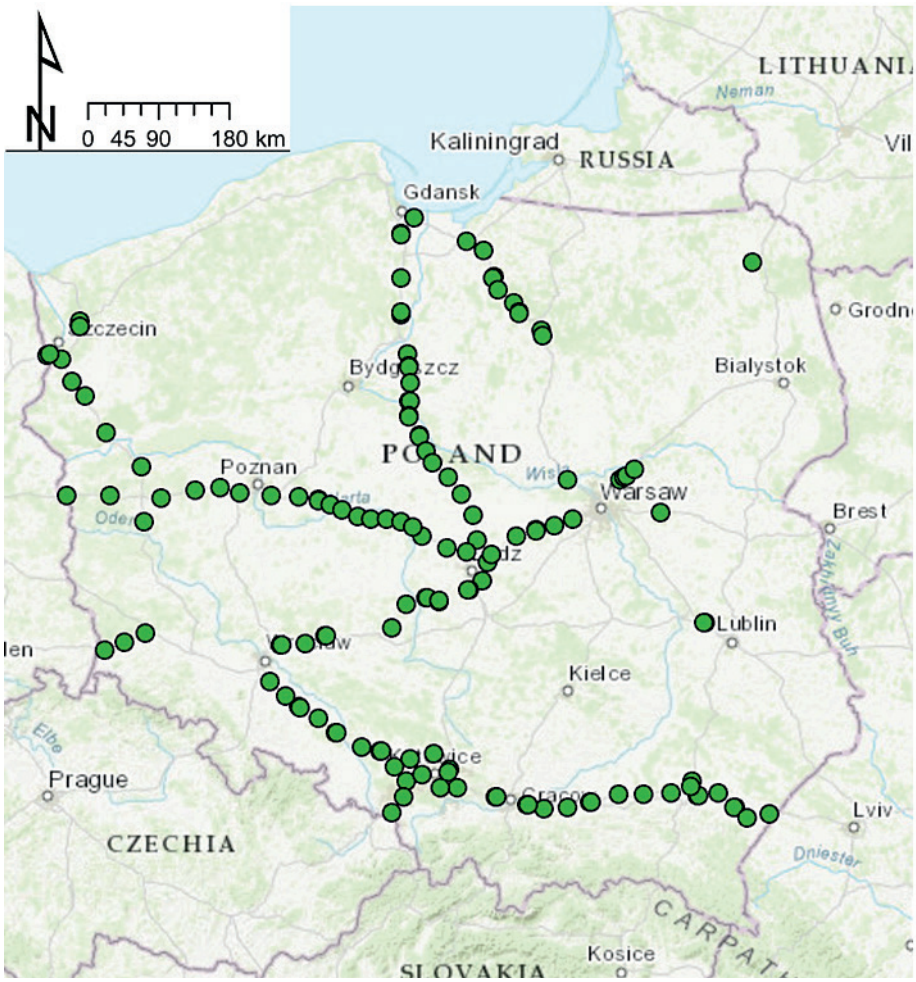

Fig. 2. Location of consulted MOPs
Source: own elaboration based on GDDKiA (2018).

Ad 2) National policy framework for the development of alternative fuels infrastructure

The national policy framework for the development of alternative fuel infrastructure is developed by the minister competent for climate affairs (Art. 43 sec. 1). Their current version was adopted on 29 March 2017. In the National Framework, with regard to the content of the article, there are (Art. 43 sec. 2): an assessment of the existing state and future development of the market for alternative fuels in the transport sector, a national target for the number of charging points installed in publicly accessible charging stations in municipalities, and the measures necessary to ensure that the national targets for the number of charging points are achieved.

Ad 3) Report on charging points within the municipality, installed in public charging stations/ plan for the construction of public charging stations

A report on the charging points on the commune's territory, installed in publicly accessible charging stations, was to be drawn up by 15 January 2020 by the commune head, mayor or city president. This report, according to Article 61 section 2, contains information on:

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1. the number and location of publicly available charging stations, taking into account the capacity of the charging points installed in these stations;
2. the number and location of public charging stations planned to be built by 31 December 2020, taking into account the capacity of the charging points planned to be installed in these stations;
3. the number of charging points missing to achieve the minimum number of charging points, as indicated in Art. 60 sec. 1, on 31 December 2020, taking into account the charging points referred to in point 2.

Article 60 of the Act defines the minimum number of publicly accessible charging stations in a municipality. In case the report shows that the number of available charging stations is insufficient, the commune head, mayor or city president prepares a plan for the construction of public charging stations. This plan shall specify:

1. the number and location of planned publicly accessible charging stations with the number of charging points planned to be installed in them, taking into account the power of each of these points;
2. the proposed schedule for the construction of the public charging stations.

According to Art. 60 sec. 1 point 3, the minimum number of charging points in municipalities with a population higher than 150.000, where at least 95.000 motor vehicles are registered and there are at least 400 motor vehicles per 1.000 inhabitants, is 100. The city of Olsztyn can be given as an example of such a municipality, expanding significantly with many multi-family buildings being built and located near the Warsaw-Gdańsk route (S7). Due to the fact that in Olsztyn there was not the required number of charging points, on June 26, 2020 resolution No. XXII/395/20 on approval of the "Plan for construction of public charging stations in the area of the Municipality of Olsztyn" was adopted (Rada Miasta Olsztyna [Olsztyn City Council], 2020). The plan accepted by this resolution assumes building the missing charging points; 94 points are planned to be built, each with a power of 22 kW. Additionally, locations for 6 reserve charging points have been identified, also of 22 kW capacity.

RESULTS

The Act on electromobility and alternative fuels requires the President of the Office of Technical Inspection to maintain the Alternative Fuels Infrastructure Register (Art. 42 sec. 2). The Register contains the following information on (Art. 42 sec. 3):

1. coordinates of natural gas stations, up to the national spatial reference system in the Cartesian coordinate system;
2. coordinates of public charging stations, up to the national spatial reference system in the Cartesian coordinate system;
3. current prices of alternative fuels at the above-mentioned locations;
4. availability of charging points installed at public charging stations.

This information is presented on an interactive map (UDT, 2019) with the symbol of an inverted teardrop: blue teardrops indicate charging stations and orange teardrops indicate CNG and LNG refuelling stations (Fig. 3).

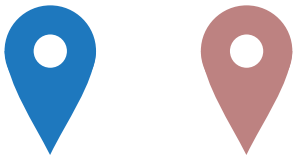

Fig. 3. Marking of charging station (left) and CNG and LNG refuelling station (right) in the Alternative Fuels Infrastructure Register map

Source: own elaboration based on UDT (2019).

When you move the mouse cursor over a selected symbol you get information about the location of the station, its opening hours and prices. The website also displays a counter with the number of currently free and occupied charging points (near real-time data). The Act in Article 42 imposes on the operator of a public charging network the obligation to send information on charging points, among others, on the availability of a charging point installed at a public charging station immediately after a change in the availability status of this point, within the time resulting from the operation of the network service,

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as well as current prices of charging services – within one hour from the change in this price. The Regulation of the Minister of Energy of 10 December 2018 on the templates of notifications made to the Alternative Fuel Infrastructure Register by the operator of a public charging station and the operator of a natural gas station (2018) contains detailed guidelines on the form and content of the notification.

CONDITION OF POLISH ELECTROMOBILITY

In 2019 the European Parliament and the Council have adopted the Regulation setting CO_2 emission performance standards for new passenger cars and new light commercial vehicles (2019). The target for 2025 is to reduce CO_2 emissions per kilometre by 15%, and by 2030 – by 37.5% (for cars), and 31% for vans. Therefore, there is a need for the Member States to monitor the annual progress of car manufacturers in this regard, primarily using the information on new registrations and laboratory test results, under the WLTP procedure (Worldwide Harmonised Light-duty Vehicles Test Procedure) (PZPM & EAMA, 2020). In order to ensure a complete transition to zero- and low-emission vehicles in the EU, it is necessary to invest more in the charging and refuelling infrastructure for alternative-propulsion vehicles – hence, the development of this type of infrastructure has also become a subject of interest. The results of this monitoring of the number and type of electric vehicle charging stations are published in the form of reports by, among others, the European Automobile Manufacturers Association (Fr. Association des Constructeurs Européens d'Automobiles – ACEA) (Fig. 4, Fig. 5).

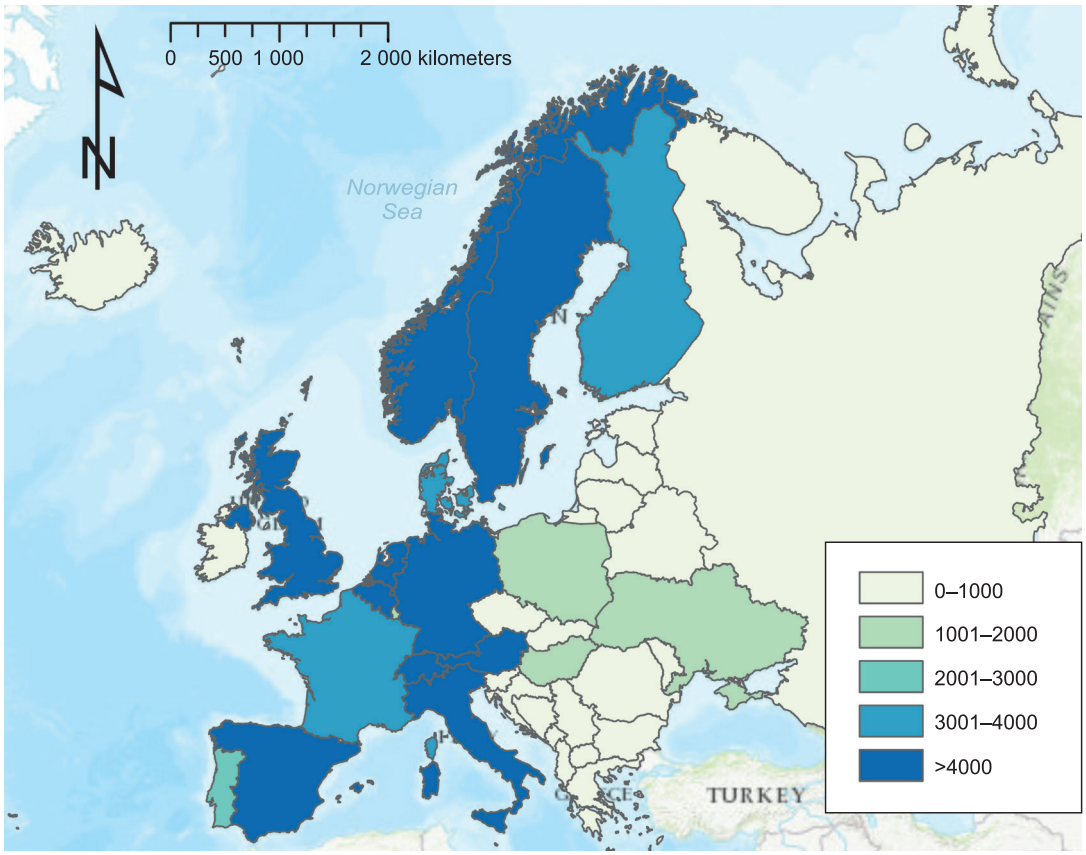

Fig. 4. Number of charging stations in Europe
Source: own elaboration based on ACEA (2021), Chargemap (2009), Electromaps (2009).

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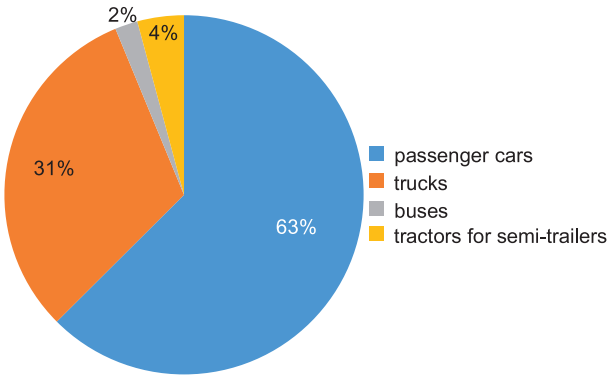

Fig. 5. Share of each type of vehicle in the number of all vehicles using fuels other than gasoline, diesel, or LPG in Poland
Source: own elaboration based on GUS (2021).

According to Statistics Poland (2021), there were nearly one million vehicles registered in Poland in 2019 that use fuels other than gasoline, diesel, or LPG (as of 23.09.2019). The vast majority of these types of vehicles are passenger cars (Fig. 5). A systematic increase in their number has been observed for several years (Fig. 6). The biggest one has occurred in the Silesian Voivodeship (1059% in 5 years), Podlaskie Voivodeship (737%) and Lublin Voivodeship (705%), while in the Masovian Voivodeship (with the capital city of Poland) the number of alternative-powered passenger cars has increased by 284%. In the Warmian-Masurian Voivodeship (with the capital in Olsztyn, given as an example above) there are ca. 95% more of these than 5 years ago (GUS, 2021). It is important to bear in mind, as noted by ACEA (2018), that although there is an increase in the number of alternative-powered cars sold, this is related to an increase in the number of total vehicles sold, and their share of total cars sold remains more or less stable.

However, the data provided by Statistics Poland do not describe exactly what fuel types should be understood as "other". The Local Data Bank also lacks information on vehicles powered by strictly alternative fuels, with a breakdown by type.

Information on registered electric vehicles is published by the Polish Alternative Fuels Association (PSPA) and the Polish Automotive Industry Association (PZPM) in the form of an Electromobility Counter. According to the latest press release (PSPA & PZPM, 2021), at the end of June 2021, the number of electric passenger cars in the country was 26,985, of which 49% were all-electric BEVs (Battery Electric Vehicles), and the remainder were plug-in hybrids PHEV (Plug-in Hybrid Electric Vehicles) – Fig. 7. The total number of electrically-powered vehicles registered in Poland is approximately 39 thousand (PSPA & PZPM, 2021).

Increasing the sales of electric vehicles in Poland was possible thanks to the introduction of tax exemptions for their purchase (for fully electric

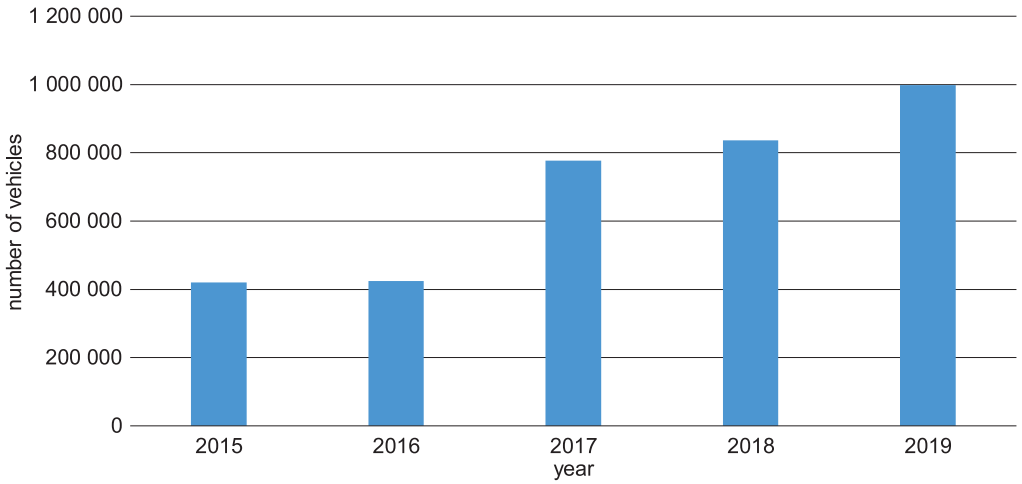

Fig. 6. Number of vehicles using fuels other than gasoline, diesel, or LPG in Poland
Source: own elaboration based on GUS (2021).

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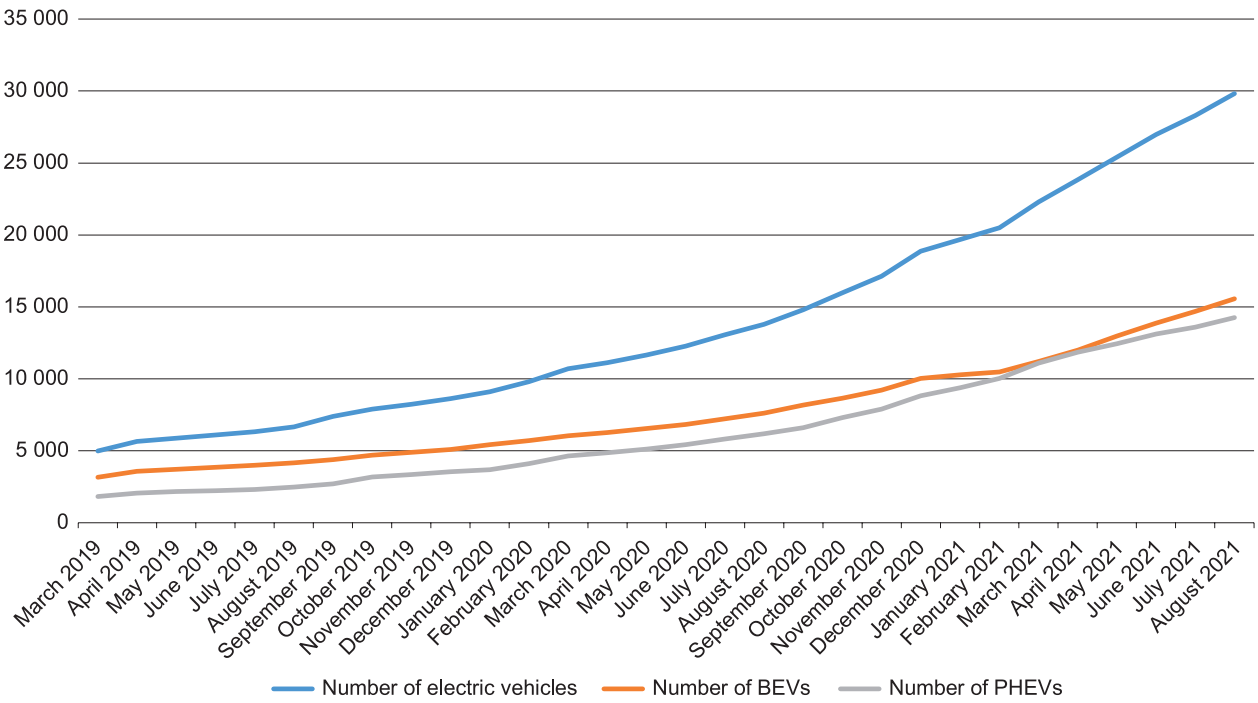

Fig. 7. Number of electric passenger cars in Poland
Source: own elaboration based on PSPA & PZPM (2021).

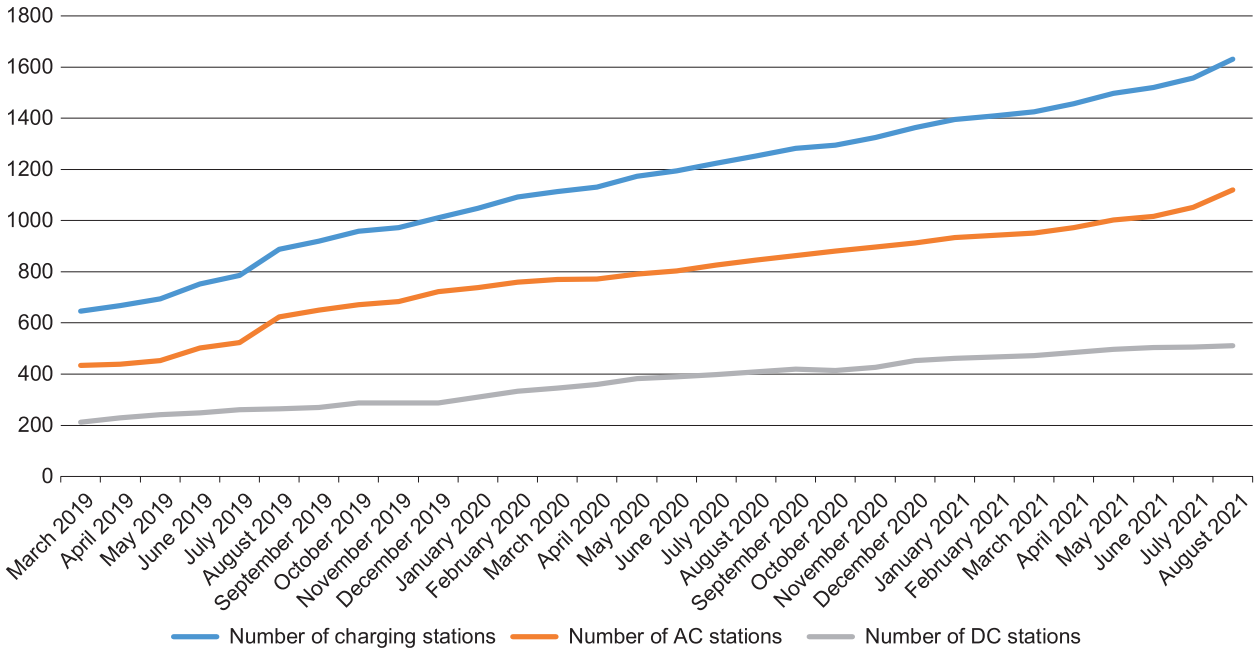

Fig. 8. Number and types of charging stations in Poland
Source: own elaboration based on PSPA & PZPM (2021).

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or hybrid vehicles with a cylinder capacity of less than 2,000 cm^3) and a programme of special incentives for individuals buying a car by the end of 2027 (up to 37,500 PLN for fully electric vehicles with a price ≤ 125,000 PLN and up to 90,000 PLN for electric vehicles using hydrogen fuel cells or CNG with a price ≤ 300,000 PLN) (ACEA, 2020d, 2020b). Unfortunately, this does not compare very favourably with European countries such as Germany, Greece, Austria, Hungary, Spain, Portugal, the Netherlands or Finland, where the purchase is encouraged through allowances also linked to car ownership or the introduction of cars to the company fleet (ACEA, 2020c, 2020a, 2021a).

According to the PSPA & PZPM report (2021), in addition to the increase in the number of electric vehicles, there has also been a development of the necessary infrastructure related primarily to their charging: "At the end of June, there were 1,521 publicly available electric vehicle charging stations in Poland (2,964 points). 33% of them were fast direct current (DC) charging stations and 67% were slow alternating current (AC) chargers with power less than or equal to 22 kW. On June, 23 new public access charging stations (33 points) were launched" (Fig. 8). Most stations are located in Warsaw, Katowice and Kraków.

CONCLUSIONS

On the basis of the statistics mentioned above, we may observe that an increasing number of electric cars are registered in Poland, which implies the necessity to ensure appropriate infrastructure for charging them. There are also more and more organisations and initiatives in the world that focus, directly or indirectly, on issues related to this area. This interest in electromobility entails the need to introduce changes, both in legal regulations and road infrastructure.

As can be seen from the analysis of the legislation, Polish legislators have, for the most part, adopted the solutions contained in the Directive on the development of alternative fuel infrastructure. Thanks to this, the Polish solutions will be similar to the solutions of other Member States, and the use of electric and hybrid cars will be on similar principles across the European Union.

Moreover, the presented research shows that the obligations contained in the legal acts analysed in the article are fulfilled in Poland by the Register of Alternative Fuel Infrastructure maintained by the Office of Technical Inspection. However, there is still no coherent, intelligent transport system providing up-to-date and comprehensive spatial and descriptive data on electromobility. Without appropriate technical and information infrastructure, as well as coherent legal regulations, a gradual transition to alternative fuels and clean energy sources to achieve climate neutrality of transport will be significantly hindered in Poland.

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CHANGES IN THE SPATIAL STRUCTURE OF LAND USE AS A RESULT OF SUBURBANISATION PROCESSES IN RURAL AREAS SURROUNDING THE TRI-CITY AGGLOMERATION

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ABSTRACT

Motives: For many years now, suburbanisation processes have been perceived as one of the most significant factors affecting changes in landscape structures. Numerous attempts are made to find appropriate methods and materials for a comparative analysis of land use changes in different periods of time and other indicators measuring the scale of this phenomenon. These studies result from the need to balance the suburbanisation process around the main service area of the Tri-City, the rapid pace of which causes development to enter areas that are not suitable for development due to environmental reasons. This implies the need for constant monitoring of this process.
Aim: The study is an analysis of changes in land use patterns that took place in some rural areas surrounding the Tri-City agglomeration in the period of 2012–2018, and an attempt to assess how suburbanisation processes may be perceived in the light of the 1985 concept of the Gdańsk agglomeration development. The analysis covers selected rural areas located in the closest vicinity to the central housing zones of the Tri-City agglomeration and areas of rural characteristics located within the administrative borders of the cities.
Results: Applying a synthetic indicator allowing to analyse convergence of structures made it possible to determine areas where the far-reaching changes are observed. The analysis covers some negative consequences of suburbanisation in relation to the natural environment, e.g. the unbalanced proportion between bioactive and built-up areas. In order to grasp current trends, the analysis refers to the data on the agglomeration development in the 1980's. The methods of the research can be used in the analysis of other areas – regardless of administrative borders, for research where statistical data generalized at the commune level are insufficient.

Keywords: suburbanisation, land use changes, indicator of structure convergence, Tri-City, Poland

INTRODUCTION

Suburbanisation processes lead to changes in rural landscape functions and physiognomy through implementation of housing development having sub-urban and urban features. Such processes have negative impact on the natural environment, e.g. the unbalanced proportion between bioactive and built-up areas. New housing zones often emerge in areas of high ecological value. There are four

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basic aspects of urbanization mentioned in the literature: economic (employment, land use), spatial (morphological and physiological changes), social (adapting to the so-called urban way of life) and demographic ones (increasing spatial density and changes in demographic structures) (Jakóbczyk-Gryszkiewicz, 1998; Ziółkowski, 1965). As for the reasons of suburbanisation, there are numerous factors behind it, including:

- searching for more attractive residential areas (the wealthy escape from city centres);
- technological progress (domination of individual modes of transportation on the one hand and possibility to online work from home on the other);
- land rent – lower property prices in the suburbs;
- decentralisation of work places within the metropolitan area (often supported by the administration): trade, industry and service centres are moved to the suburbs and located near transport hubs;
- lack of local development plans or implementing changes to the already existing ones that are beneficial for developers who offer some profit to municipalities (allowing for short-term profits to take precedence over long-term sustainable development);
- lack of coherent spatial policy in cities and metropolitan areas (usually absence of good will to cooperate);
- investors aiming at implementing their development projects in more easily accessible areas, no matter their ecological value (Korwel-Lejkowska, 2020).

Therefore, it may be stated that suburbanisation processes are triggered mainly by socio-economic factors and lack of proper spatial planning. Being aware of how significant are the factors behind suburbanisation processes, their results and methods of analysis, the study presented herein focuses mainly on changes in land use in terms of time and location. These studies result from the need to balance the development of the Tri-City's suburban zone, which, due to its coastal location, cannot expand to the east. The fast pace of suburbanization around the main service area of the Tri-City causes buildings to enter areas that are not suitable for development due to environmental reasons, including valuable natural areas. This implies the need for constant monitoring of this process. This study is an attempt to analyse changes that affected some selected land cover types and to assess how suburbanisation processes may be perceived in the light of the 1985 concept of the Gdańsk agglomeration development. The study covers data for the period of 2012–2018 and its results were compared to the vision of the Gdańsk agglomeration spatial layout prepared in the middle of the 1980's (Przewoźniak, 1985). Moreover, the study is continuation of analyses previously done by the author for the period of 1985–2012 what allowed to determine similarities and differences in ongoing landscape changes. Justifying the need for research, one can refer to the statement that "suburbanization in Poland is an important phase of urbanization. This progressive phenomenon is worth a cyclical study" (Rejter, 2018), but above all, these studies can be used for the sustainable development of the Tri-City suburban area. The use of only statistical data relating to entire administrative units is insufficient – in research in the field of broadly understood spatial management, as well as landscape ecology, there is a need to search for methods combining the use of statistical and geospatial data. The analyzes below follow this trend by proposing to use the structure convergence index. It enables the study of changes in space regardless of administrative boundaries. The presented methods and materials, with their limitations and benefits identified on the basis of the research results, can be used in the analysis of other areas. They constitute a specific method proposition for research for which statistical data generalized at the commune level are insufficient.

LITERATURE REVIEW

The issue of suburbanisation has been a subject of global scientific interest, including the methods of research – especially in relation to the urban sprawl phenomenon (Adamiak et al., 2021; Bosch et al., 2019; Fuladlu et al., 2021; Galster et al., 2001; Lityński, 2021; Mantey & Sudra, 2019; Matuszewska & Będkowski,

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2019) as well as its spatial, economic, demographic, sociological, environmental or political (domestic, regional and local policies) aspects. Some of the published works are reviews – of continental or global range (Antrop, 2004; Dong et al., 2019; Guérois & Pumain, 2008; Güneralp et al., 2020), other focus on a certain issue or region. Both reasons and consequences of suburbanisation vary from one region to another. Among the European studies there are several cases which are worth mentioning: Croatia (Jogun et al., 2017), Spain (Abellán & Ondoño, 2019), Moldova (Sirbu & Cujba, 2020), Germany (Burdack & Hesse, 2007), Romania (Mihai et al., 2015), Slovakia (Repaska et al., 2017) and Hungary (Bagyura, 2020).

Suburbanisation processes are also studied by Polish researchers and there are numerous interesting works including different aspects of the phenomenon, e.g. demographic and economic changes triggered by spatial transformation (Jakóbczyk-Gryszkiewicz, 1998; Rejter, 2018), changes in land cover (Ciesielski & Będkowski, 2014; Polna, 2019; Pukowiec-Kurda & Vavrouchová, 2020) or spatial planning (Ciesielski & Będkowski, 2014; Bieńkowska & Korpetta, 2019; Sobotka, 2015). As concluded Pukowiec-Kurda & Vavrouchová (2020), unplanned and careless introduction of new land cover forms can lead to both the environmental and social degradation of these areas. To prevent this, landscape transformation processes in areas with high dynamics should be constantly monitored. There are also methodological publications in the Polish literature (Staszewska, 2012). One of the problems noticed in the literature is the issue of the availability of statistical data in local research. As rightly stated by Ciesielski and Będkowski (2014), it is not possible to collect information with a greater degree of detail than the commune, which would allow for a more accurate correlation of statistical data with changes in space. Many of the studies relate to administrative units: Rejter (2018), Pukowiec-Kurda and Vavrouchová (2020), Świątkiewicz and team (2021). Usually, it is associated not only with the easier acquisition of statistical data, but also with the spatial policy pursued. However, the different sizes of administrative units in combination with heterogeneous environmental conditions reduce the possibility of a reliable comparison of changes in different areas. The use of small primary fields with the same area allows for a better comparison in this aspect. The method proposed in this article makes it possible to analyze geospatial data in greater detail than a commune.

The most recent works on land cover changes and suburbanisation processes around Tri-City are studies by Czochański (2018), Kistowski (2018), Lorens (2015), Masik (2018), Świątkiewicz and team (2021) as well as the publications by the author of this study (Korwel-Lejkowska, 2016; Korwel-Lejkowska & Nadratowska, 2018; Korwel-Lejkowska, 2020). The work by Lorens (2015), presenting various possible variants of transforming the functional and spatial structure of the Tri-City metropolitan area, draws particular attention. It is a very good study of possible scenarios of urban development pattern as well as with the possible consequences of the these pre-defined scenarios. However, for obvious reasons, this approach is generalized. It is the work on a regional scale, showing schematically the anticipated changes. Moreover, some of the changes that have taken place in the last few years go beyond the forecasted variants. The lack of a detailed approach may be supplemented with studies similar to the ones presented in this article. Nowadays, spatial changes are taking place quickly, yet accessibility to digital data and GIS systems allowing to analyse them is high. However, it should be kept in mind that in central and eastern European countries (Central-East Europe, CEE), including Poland, the pace of landscape transformation has grown significantly since the political transformation that took place at the end of the 20th century. What is more, for many of them becoming a EU member state was an additional driving force of rapid economic development. The study presented herein refers to a concept of the Tri-City agglomeration development (which was called Gdańsk agglomeration at the time) by Przewoźniak (1985) whose recommendations concerning land use are clearly in line with the current sustainable development goals.

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MATERIALS AND METHODS

Research Area

The research area covers the Tri-City agglomeration: Gdańsk, Sopot and Gdynia. The research area is located in northern Poland, in Pomeranian Voivodeship and within the Tri-City Metropolitan Area (Fig. 1). The Tri-City agglomeration (Gdańsk, Gdynia, Sopot) is a vital transportation hub as well as a flourishing cultural and economic centre of this part of the country. According to the physico-geographical regionalisation by Solon et al. (2018), most of the research area is located in the Kashubian Lakeland, with its highest point at 237 m a.s.l. The south-eastern part of the research area stretches over the Vistula delta region (called Żuławy Wiślane) and Sobieszewska Island; the north-eastern part lies within the Kashubian Coast and there is also a small area being part of the Reda-Łeba ice-marginal valley. The edge of the plateau is quite steep and it transforms into a coastal plain. High environmental diversity of the research area seems to predestine it to perform various functions. Having the most fertile soil, the Vistula delta region has the best conditions for agriculture. In the lakelands there are more forests, lakes and river valleys. The soil there is not that fertile and there are less advantageous weather conditions. Therefore, forestry and tourism are the key sectors for this area.

As the Tri-City agglomeration is located along the Gulf of Gdańsk, its development directions are limited, what causes numerous problems, e.g. ones concerning development of the transportation system and increasing investment expansion to other areas. The analysed rural areas are located in close vicinity to the strict agglomeration centre: the eastern border of the research area runs along a densely built-up central service belt, the remaining borders are formed by natural barriers.

Data sources and research methods

In order to analyse the changes in land use, data related to location and area covered by forests, grasslands, waters and buildings in 2012 and 2018 was downloaded from the Topographic Objects Database (BDOT10k). This vector database is appropriate to the topographical maps in the scale 1:10000 what allowed the author to analyse the actual area covered by buildings themselves.

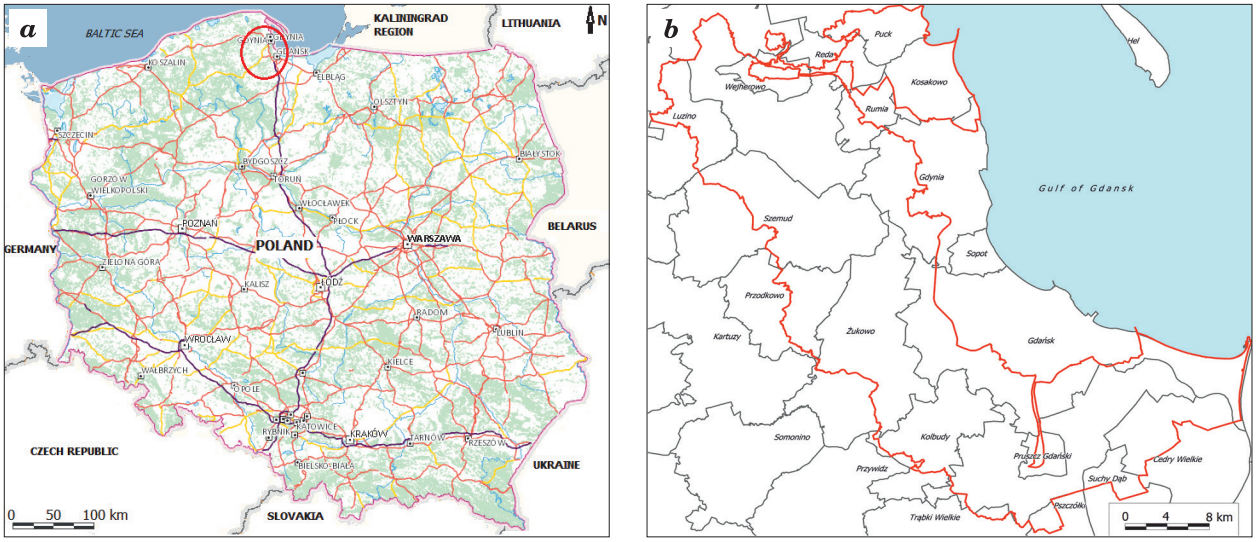

Fig. 1. Location of the research area in Poland and Central Europe (a) and at the background of municipalities of Pomeranian Voivodeship (b)

Source: own preparation based on https://mapy.geoportal.gov.pl/.

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The study takes into account location of the following types of land cover (percentage of the primary field):
- ones that existed at the beginning of the analysed period of time;
- ones that increased their area in the analysed period of time;
- ones that decreased their area in the analysed period of time;
- ones that did not undergo changes in the analysed period of time.

Vector layers for objects that emerged or were eradicated/demolished in the analysed period of time were obtained by superimposing the input vector layers. For the purpose of the analysis the author divided the research area into square primary fields, each covering the area of 0,25 km^2. For each primary field and for the whole research area, changes in the areas covered by forests, grasslands, waters and buildings in 2012 and 2018 were calculated.

Then, in order to indicate areas where the changes in land use were the most advanced in the analysed period, the following indicator of structure convergence was applied (c) (Wiatrak, 1982):

$$c = \cos \propto = \frac{\sum_{j=1}^{m} \overline{W}_{j(t0)} * \overline{W}_{j(t1)}}{\left[\sum_{j=1}^{m} \overline{W^2}_{j(t0)}\right]^{\frac{1}{2}} * \left[\sum_{j=1}^{m} \overline{W^2}_{j(t1)}\right]^{\frac{1}{2}}} \quad (1)$$

where:

$\overline{W}_j$ – branching indicator (the area covered by a certain land cover type within the primary field, divided by the total area of the primary field and multiplied by 100)

The indicator ranges from 0 (turnabout) to 1 (no change). The results were then clustered into six classes on the basis of the main break points on the distribution curve what allowed the author to indicate the areas that underwent the most advanced changes in land use in the analysed period. In the next step, the results were compared with the analyses done for the period of 1985–2012 (Korwel-Lejkowska, 2020) and current directions of spatial changes for the research area were set.

Finally, the analysis results were compared to the 1985 concept of the Gdańsk agglomeration development by Przewoźniak (1985) which includes not only the author's vision of future development directions, but also an analysis of physico-geographical development barriers as well as an in-depth analysis of environmental conditions within the delimited geocomplexes (including part of Łężyce village which was excluded from the Tri-City Landscape Park in 2006 – Regulation No. 57/06). What is more, Przewoźniak determined areas of acceptable urban development. Those areas were compared with the results for the periods of 1985–2012 and 2013–2018. At this stage of the analysis, the author determined 100-metre buffer zones around the new built-up areas. Single buildings having a buffer zone smaller than 5ha were excluded from the analysis as well as cases when there were less than three buildings within the buffer zone.

The GIS analysis was carried out using MapInfo Professional and statistical calculations were done with the use of Microsoft Excel.

RESULTS

Changes of the selected land cover types in the period of 2012–2018

Most of the forest areas did not undergo any changes within the analysed six-year period. Minor increases in the forest cover were observed between Gdynia – Dąbrowa and Chwaszczyno, near Smęgorzyno and in the area north of Kolbudy (restoration started more than 10 years ago). Decreases in the forest cover were recorded in Kępa Oksywska (as a result of construction works when building an airport in Gdynia – Babie Doły), in the *Borowiec Ip* sand and gravel mining area (currently a water reservoir), near Gdańsk-Matarnia (as a result of construction works when building a railway line to Rębiechowo) and Kokoszki (development of the industrial area near the airport), in Łapino and Kolbudy (residential areas development).

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Both, the grasslands and built-up areas have undergone sweeping changes in the last 30 years. In the period of 2012–2018 the percentage of grasslands increased in belts stretching from Gdańsk – Osowa to Przodkowo and from Matarnia to Przywidz what was mainly the result of agricultural abandonment. Some of the above-mentioned areas have been designated for residential development. An increased percentage of grasslands near the Wisła Śmiała (Bold Vistula) mouth and the Vistula Canal is a result of natural processes. However, closer attention was paid to a continuous area located between Wiślina, Wocławy and Grabiny Zameczek that is classified as grasslands in the BDOT10k. The analysis of the 2011–2018 Google Earth ortophotomaps revealed that this area has never been covered by grass. This case may contribute to the debate on the BDOT10k data credibility.

Some decreases in the grassland area resulting from changes in agricultural activities was observed in Moście Błota and in some places located in the Vistula delta region (e.g. near Cieplewo). Some significant decreases in the percentage of grasslands are also observed within a belt surrounding the densely built-up areas of the Tri-City (excluding the forests) and belts stretching south of the Tri-City towards Pruszcz Gdański and southwest of Żukowo. In these cases, the decreases are the result of functional changes, mainly connected with development of the transportation network. However, some of the above-mentioned areas, especially in the central part of the research area, have been undergoing self-afforestation by natural succession. There is also an interesting case of Sobieszewska Island which is another example of incorrect land cover classification in the 2012 BDOT10k data (Korwel-Lejkowska, 2020).

There were almost no changes observed in the percentage of water surface in the analysed region and the minor ones that actually were observed resulted from natural coastal processes and channel processes, mainly concerning the Radunia and Reda rivers. However, some water reservoirs emerged in the centre of the research area, between Tuchom and Borowiec, as a result of mining activities performed by the Polgravel company within the ares of the *Borowiec* sand and gravel deposits.

The changes concerning new buildings constructed in the area in the analysed period may be concerned a perfect example of how suburbanisation processes work. During the six-year period more than 15 thousand buildings, having an average area of 163 m^2, were constructed or enlarged in the research area. At the same time, 5187 objects, having an average area of 93.5 m^2, were demolished – nearly half of them were farm buildings. They used to be located evenly around the Tri-City central service belt with some more densely built-up areas in the southern part of Kosakowo (within the boundaries of the Naval Aeronautical Base), the western (industrial) part of Wejherowo and the south-eastern part of Gdańsk (old farm buildings in Olszynka and Orunia; neglected summer houses in Sobieszewska Island). Table 1 presents areas with the highest percentage of newly built/enlarged residential or industrial objects.

Table 1. Areas with the highest increases in housing/industrial development in the period of 2012-2018

Municipality*	Towns/villages with the highest percentage of newly built/enlarged residential or industrial objects	Main functions of the newly built objects
1	2	3
Cedry Wielkie (r)	Wocławy Miłocin II (south of Koszwały)	production facilities and warehouses
Pruszcz Gdański (u)	along the transport route to Rotmanka	multi-family buildings and large area commercial objects
	north and northeast of the Wschód residential area	common residential zone including single-family detached and terraced houses which has blurred the border between urban and rural areas
	in the south-western part	development of the warehouse-production zone

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cont. Table 1

1	2	3
Pruszcz Gdański (r)	Straszyn-Prędzieszyn Zone	warehouses, commercial objects, single- and multi-family buildings located on slopes of 9° angle (some of them located far from the already existing housing estates)
	Rotmanka	development of multi-family housing estates and terraced houses large area warehouses
	Cieplewo – the southern part	production facilities and warehouses
	in the villages along DK 75, continuing in Pszczółki (Różyny, Kleszczewko)	residential objects (located further and further from the main transport route)
	Mokry Dwór, Wiślina, Wiślinka, Radunica, Rokitnica and Roszkowo	single-family buildings (including the areas located at -0.5 - 2 m above the sea level with shallow ground waters)
Gdańsk (u)	„Wschód" sewage treatment unit	farm buildings
	between DK 89 and DW 501	warehouses
	airport	airport buildings
	near the boudary with Kowale and in Bysewo, Matarnia and Kokoszki	commercial objects and smaller warehouses
	Gdańsk Osowa (district)	large area commercial objects near the hub with the Bypass and multi-family buildings in the southern part of the district
	Klukowo, Smęgorzyno, Kiełpino Górne, Borkowo	scattered single-family buildings
	Kiełpinek, development of Kolorowe Housing Estate, the area between the Cztery Pory Roku Housing Estate and Gdańsk-Maćkowy,	multi-family buildings
	in the belt stretching from Gdańsk-Migowo in the north to the border with Kowale in the south; Ujeścisko and Piastów Housing Estate	the highest percentage of new residential buildings
	along the belt paralel to St. Wojciech Street in Gdańsk-Nowy Port and Gdańsk-Lipce	slightly higher percentage of new buildings (mainly farm and single-family ones)
Kolbudy (r)	Kolbudy, Łapino, Ostróżki, Lisewiec, Otomin, Jankowo Gdańskie, Lublewo, Pręgowo	increasing housing density and scattered single-family buildings (also on the slopes of neighbouring hills, far from transport routes)
	Kowale – west of DK S6	large warehouses, scattered single-family buildings located further from DK S6
	Kowale – east of DK S6, towards Borkowo	commercial objects, multi- and single-family buildings (the existing residential belt hampers wildlife movements, especially near wetlands)
Żukowo (u-r)	Chwaszczyno	single-family buildings further from DW 218 and DK 20; warehouses, farm buildings and production facilities north-west and west of the centre of Chwaszczyno
	between Tuchom and Miszewko	production facilities and warehouses along DK 20
	Tuchom	single-family buildings – increasing the density of the existing housing areas and building some new objects; new Golf Park Housing Estate near Tuchom Lake
	Banino	single-family detached and terraced houses – scattered and located on the former arable lands

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cont. Table 1

1	2	3
	Rębiechowo	single-family buildings, some production facilities near the boundary with the city of Gdańsk
	Pępowo, Małkowo, Czaple, Leźno, Borkowo, Lniska, Niestępowo, Mała Przyjaźń	scattered single-family buildings in the already existing residential area
	Żukowo	single-family buildings with some commercial facilities and an education centre
Przodkowo (r)	Tokary	sports hall;
	Przodkowo	scattered single-family buildings, commercial facilities
Szemud (r)	Bojano	upgrading the existing school sports centre, scattered single-family buildings located on wetlands
Gdynia (u)	Chwarzno	increasing density of the already existing single-family housing areas, farm buildings
	Wiczlino	multi-family buildings
	Wielki Kack and Dąbrowa	production halls, warehouses and a commercial centre
	Enclaves in the forest along Kmd Sakowicza Street	military administration facilities
	Pustki Cisowskie	multi-family buildings and a commercial object
Kosakowo (r)	Dębogórze-Wybudowanie	single-family buildings
	within the boundaries of the military base, south of Suchy Dwór and in Ostrowski Canyon	residential buildings and farm buildings according to the BDOT classification
	Suchy Dwór	single-family buildings
	Pogórze	large area shopping centre, single- and multi-family buildings
	between Pogórze and Kosakowo	school
	Kosakowo	single-family buildings
	Pierwoszyno, Mosty and Mechelinki	increased percentage of single-family buildings
Reda (u)	Reda	large area shopping centre, twelve multi-family buildings located on a steep slope (deforestation)
	Ciechocino	residential areas: mainly single-family buildings; some new farm buildings
	Betlejem	single- and multi-family buildings
Wejherowo (r)	Gościcino	production facilities, farm buildings, service and commercial facilities, warehouses
	Bolszewo	single-family buildings in the existing residential area; multi-family housing estate, commercial and service facilities, a care institution

* u – urban areas, r – rural areas, u-r – urban-rural areas (according to the Eurostat – Local Administrative Units)
Source: own preparation based on the BDOT10k data.

The analysis of structure convergence indicator *c* allowed to indicate eight areas where changes in land use are the most extreme in the whole period of 1985–2018. Five of them are also areas of the most intense changes in the period of 1985–2012 (Korwel-Lejkowska, 2020) and other three were experiencing the most intense transformations after 2012 (Fig. 2). The final analysis did not cover the areas located in the south-eastern part of the research area as they had been incorrectly categorised in the BDOT10k (the assignment of cultivated areas to grasslands).

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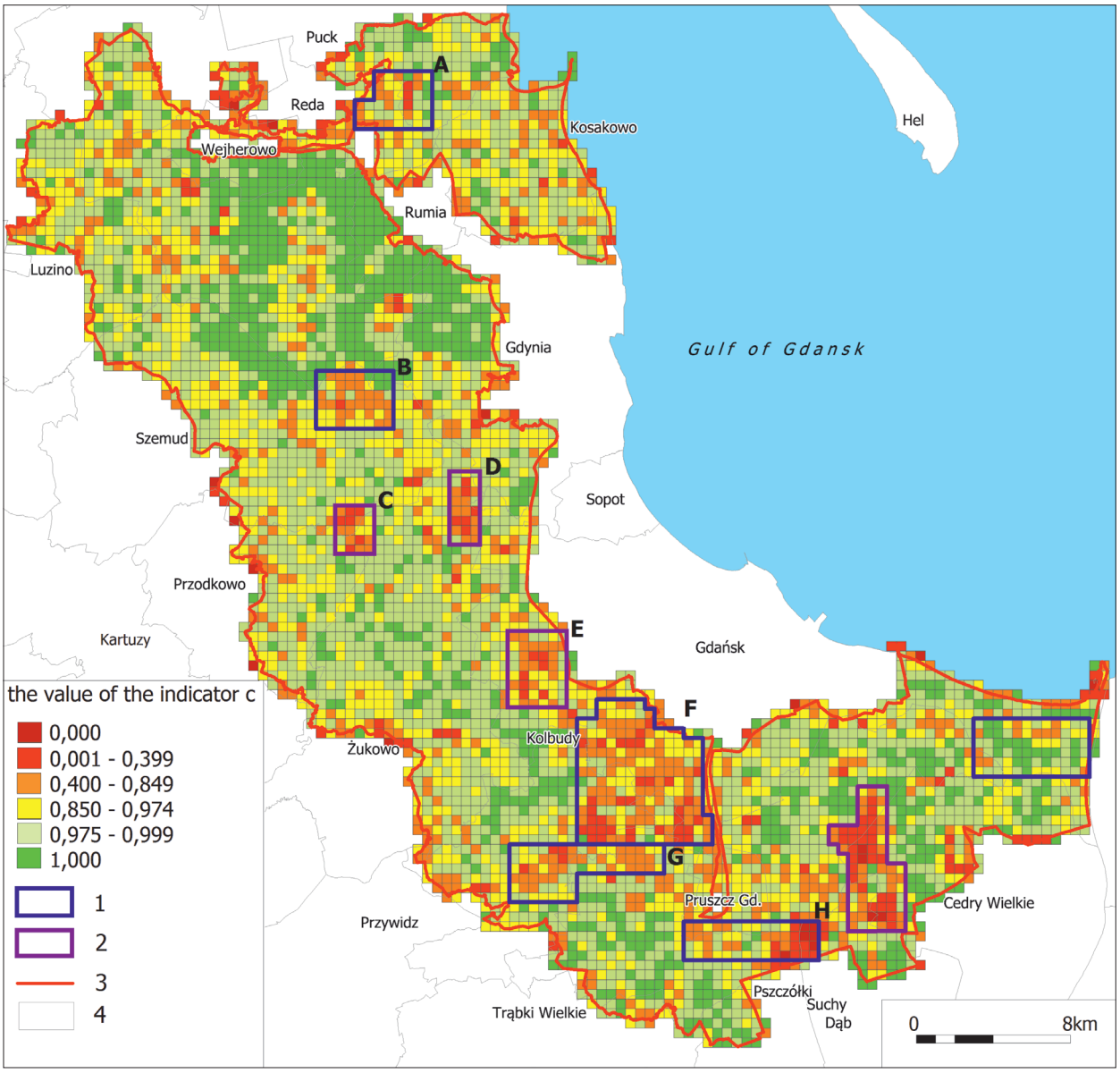

1 – areas of the greatest changes in 1985–2012; 2 – areas of the greatest changes in 2012–2018; 3 – border of the study area; 4 – borders of municipalities;

Fig. 2. Spatial distribution of the „c" indicator and location of the areas where the most intense changes took place in the analysed periods

Source: own preparation based on the BDOT10k data.

The areas where the most advanced changes in land use are observed are as follows:

A. Rekowo (municipalities: Reda and Puck / area of 10.5 km^2) – changes in farming areas, including grasslands, resulting from agricultural activities;

B. Koleczkowo (municipalities: Szemud, Wejherowo and the city of Gdynia / area of 12 km^2) – high dynamics of changes in grassland areas after 2001, a significant increase in residential areas along the main roads and some new holiday housing areas near forests and lakes in Marchowo;

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C. Warzenko (municipalities: Szemud, Przodkowo and Żukowo / area of 5.12 km^2) – area where the most intense changes started after 2012 as a result of agricultural abandonment, set-aside (probably in order to sell the grounds to developers); new housing objects;
D. Kowale – Chwaszczyno (Żukowo municipality, the cities of Gdańsk and Gdynia / area of 6,05 km^2) – area where the most intense changes started after 2012 as a result of large increases in housing and green areas (formerly used for farming);
E. Rębiechowo – Kokoszki (the city of Gdańsk / area of 12.3 km^2) – area where the most intense changes started after 2012 as a result of development of the airport (transport network and service buildings) – new objects are of large area (warehouses and offices) and were constructed, among others, in areas that had undergone deforestation;
F. Gdańsk – Południe (the city of Gdańsk, municipalities: Pruszcz Gdański and Kolbudy / area of 44 km^2) – the observed changes in land use refer to new residential areas in the southern part of Gdańsk: there are some multi-family housing estates in areas where this type of housing already existed and some new housing estates located far away from the main transport routes (up to 300 m) and other residential areas (up to 500 m), sometimes established in the middle of a set-aside field; large area commercial facilities and warehouses along DK S6; 10 enlarged or newly built water retention reservoirs; changes in the percentage of grasslands;
G. Radunia Valley (Kolbudy municipality / area of 17.25 km^2) – most changes were triggered by: construction of new water reservoirs (water retention reservoir in Bielkowo and some smaller reservoirs and ponds), changes in the grassland areas, forest succession, new housing estates – especially in the eastern part of the area (single-family buildings, gated multi-family housing estates);
H. Cieplewo (municipalities: Pruszcz Gdański and Suchy Dąb / area of 14 km^2) – a large industrial-warehouse zone near the border with Pruszcz Gdański and in close vicinity to the main transport routes has been developed for more than 10 years – as a result the percentage of farming and grassland areas has decreased significantly; some small water retention reservoirs were built; new housing estates in Cieplewo; in the eastern part of the area changes in the percentage of farming and grassland areas are the result of agricultural activities.

The currently observed changes are the result of some former processes. When comparing the period of 2012–2018 to the studies done for the earlier periods (Korwel-Lejkowska, 2020), some trends become clearly visible. From 1985 to 2018 the percentage of biologically active areas (understood as a total area of forests, grasslands and waters) increased by more than 10.5 (Table 2). Changes in the ratio of biologically

Table 2. Changes in the land cover structure in the period of 1985–2018

Land cover types	1985		2000		2012		2018	
	ha	%	ha	%	ha	%	ha	%
forests	24533.8	23.58	25373.4	24.39	27423.0	26.36	27393.0	26.33
grasslands	16441.3	15.80	17426.1	16.75	24079.3	23.14	24360.4	23.41
waters	1955.2	1.88	1984.31	1.91	2114.77	2.03	2133.98	2.05
total	42930.3	41.26	44783.8	43.04	53617.07	51.53	53887.38	51.79
built-up land	794.7	0.76	1082.0	1.04	1346.34	1.29	1550.87	1.49
total	43725.1	42.03	45865.8	44.08	54963.41	52.83	55438.25	53.28
other types of land cover	60321.2	57.98	58180.4	55.92	49082.8	47.17	48607.97	46.72

Source: own preparation based on the BDOT10k data.

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active areas to built-up areas are considered an indicator of suburbanisation advancement. In the research area the ratio was 54.02 in 1985 and 34.75 in 2018. Thus, the percentage of built-up areas increased significantly during the analysed period. Yet, the intensity of the process was not always the same in terms of time and location. The pace of urban expansion before 2000 was eight times faster than after 2001. It is also worth mentioning that between 1985 and 2000 its value decreased by 12.63 while during the second analysed period – only by 1.57. This is a result of setting-aside arable lands and afforestation (opportunity to apply for the EU funding) in the period of 2001–2012. However, there are also vast areas where the biologically active area is decreasing leading to negative changes in the natural environment and landscape physiognomy. The analysis revealed that the actual percentage of built-up areas is not high for the whole research area (Table 2). Yet, it has to be remembered that it is a result of the methodology applied as the scale of maps used allowed to sum up the areas actually cover by buildings that are not biologically active. The analysis of changes in the land cover structure indicated clearly that the built-up areas increased by 69% during the analysed period while the grasslands by slightly more than 46%, the forests and waters by approximately 10%. This proves that suburbanisation processes were taking place in the research area in the analysed period.

Suburbanisation in the area surrounding the Tri-City agglomeration: concept from 1985 compared to the actual course of the process

In order to estimate changes that took place in the area surrounding the Tri-City agglomeration from 1985 to 2018, the author referred to the study by Przewoźniak (1985) where a scheme of the Gdańsk agglomeration spatial layout can be found. Przewoźniak indicated development thresholds, suggested sustainable development directions and, what is worth paying special attention, determined areas of high ecological value which should not be intensely developed for housing, commerce, industry, etc. The analysis for the periods of 1985–2012 and 2012–2018 showed that almost all development thresholds were overrun, especially in the northern and south-western part of the research area (Fig. 3). Only the forest on the edge of the Gdańsk Upland has remained relatively untouched as it is now part of the Tri-City Landscape Park. However, there are more and more roads running through the park and leading to some new housing estates. The development belts westward that were suggested by Przewoźniak have been replaced by massive urban sprawl towards farming areas in the northern and southern parts of the research area and towards multi-functional open spaces (sometimes even protected areas).

Change in the land cover structure (%) during the analysed period					Change in the land cover structure (%) in relations to the first year of the analysed period				
1985–2000	2001–2012	1985–2012	1985–2018	2012–2018	1985–2000	2001–2012	1985–2012	1985–2018	2012–2018
0.81	1.97	2.78	2.75	-0.03	3.42	8.08	11.78	11.65	-0.11
0.95	6.39	7.34	7.61	0.27	5.99	38.18	46.46	48.17	1.17
0.03	0.13	0.15	0.17	0.02	1.49	6.58	8.16	9.14	0.91
1.78	8.49	10.27	10.53	0.26	4.32	19.72	24.89	25.52	0.50
0.28	0.25	0.53	0.73	0.20	36.15	24.43	69.41	95.14	15.19
2.06	8.74	10.80	11.26	0.46	4.90	19.84	25.70	26.79	0.86
-2.06	-8.74	-10.80	-11.26	-0.46	-3.55	-15.64	-18.63	-19.42	-0.97

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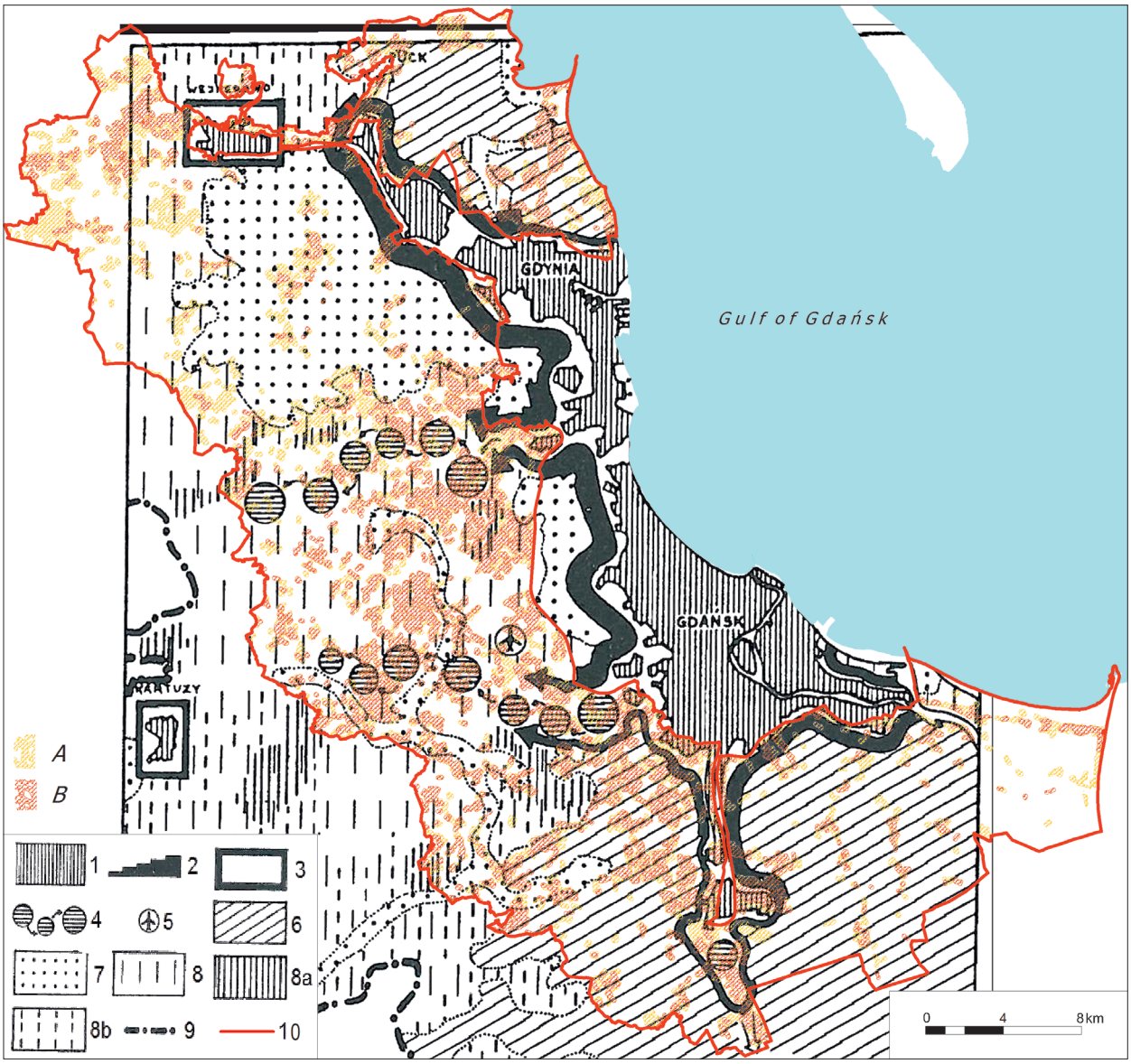

A – buffer zones of the housing estates built in the period of 1985–2012; B – buffer zones of the housing estates built in the period of 2012–2018; 1 – built-up urban areas; 2 – development thresholds with a growing number of development barriers; 3 – areas with no spatial development perspectives; 4 – suggested urban belts; 5 – airport; 6 – areas of intensive farming; 7 – preserved areas; 8 – multi-functional open spaces: 8a – leisure areas, 8b – forest stands; 9 – border of „the agglomeration natural area"; 10 – border of the study;

Fig. 3. Comparison of the distribution of buildings erected in the period of 1985-2018 and the 1985 scheme of the Gdańsk agglomeration spatial layout by Przewoźniak

Source: own preparation based on Przewoźniak (1985).

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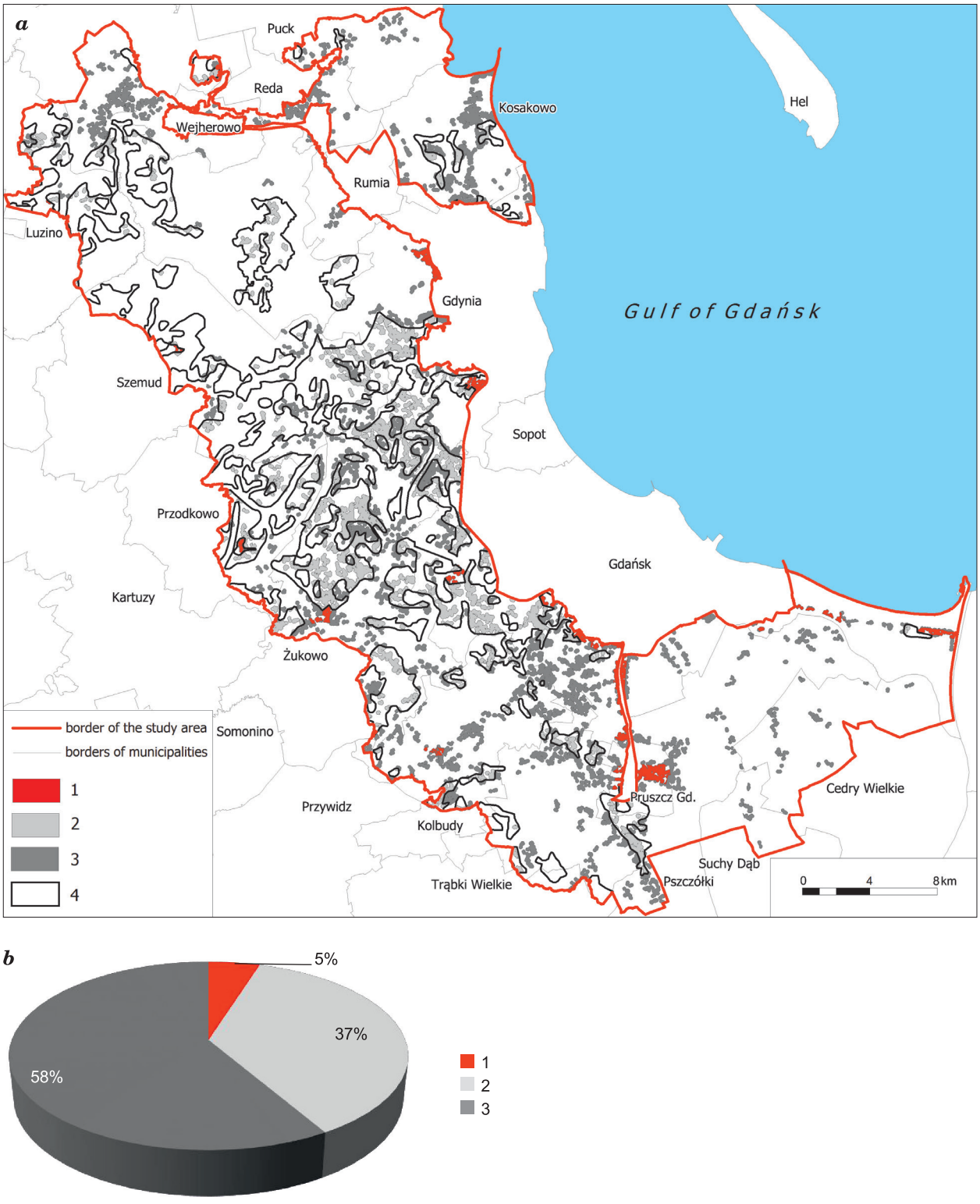

1 – existing built-up areas where some new development projects were implemented, increasing the density of buildings; 2 – buffers created by buildings constructed within the areas of acceptable urban development; 3 – buffers created by buildings constructed outside the areas of acceptable urban development; 4 – areas of acceptable urban development

Fig. 4. Location (a) and structure (b) of buildings constructed in the period of 2012–2018 (in a form of buffers) in relations to the areas of the acceptable urban development by Przewoźniak

Source: own preparation based on Przewoźniak (1985).

Negative changes observed in the areas surrounding the Tri-City agglomeration are even more visible when compared to the suggested directions of landscape management. Przewoźniak determined these directions on the basis of:
- geocomplexes conditioning functional balance of landscape (they are areas having great impact on humidity and water conditions as well as areas vulnerable to erosion processes);
- geocomplexes of high productivity – having fertile soils;
- geocomplexes of acceptable urban development which were analysed in the last stage of this study.

The analysis of spatial distribution of the built-up areas in the period of 2012–2018 in relation to the areas of acceptable urban development suggested by Przewoźniak (Fig. 4) revealed that 6183.1 ha of new built-up areas were established within such areas and 9853.6 ha outside of them, in the areas predestined to perform other functions. The remaining new residential areas were established within the borders of the already existing settlement units (824.2 ha).

DISCUSSION

Suburbanisation is a significant issue which has been studied using different research methods. The methodology applied to the study presented herein allowed the author to indicate exact places where spatial changes took place in the analysed period, no matter the administrative borders. The BDOT10k is very useful for local and regional studies, e.g. for a single municipality, like in the study by Matuszewska and Będkowski (2019). However, when analysing the BDOT10k data, one should have some knowledge of the analysed area as this data base is not free from categorisation mistakes, especially concerning grasslands and different stages of forest development. A limitation for retrospective analyzes may be the availability of land cover data, mainly related to the year of publication of topographic maps or aerial photographs. Currently, for many years the availability of digital data has been improving year by year, which eliminates the previous problem. Therefore, it is advisable to compare the BDOT10k data with another source, e.g. satellite and aerial photos which can be downloaded from *Corine Land Cover* (CLC), what has also been confirmed in the studies by Ciesielski and Będkowski (2014), Matuszewska and Będkowski (2019), Pukowiec-Kurda and Vavrouchová (2020). For the area of Poland, BDOT10k or CLC data are a good source. For areas of other countries – CLC coverage or data from individual countries' resources are recommended. When conducting research for areas located in various countries, it is important to use a unified database or data closest in terms of the scale and detail of mapping.

The process of urban sprawl usually affects the structure of land cover types in a particular area. Thus, a comprehensive approach should be applied in order to evaluate spatial changes it brings. For the purpose of this study, the author analyse – apart from the buildings – changes in the area of forests, grasslands and waters. Having sufficient knowledge on the research area, the author was able to generalise some land cover types, e.g. orchards and plantations that cover a relatively minor percentage of the research area and did not undergo any significant changes during the research period. When analysing larger areas with the use of the CLC data, the number of land cover types is much bigger (using CLC allows the analysis land changes on a regional scale), yet this data base is not free from classification errors. That is why using some older studies, based on numerous cartographic sources and fieldwork research, is strongly advisable. The study by Przewoźniak (1985) is a good example of such works and may be used as a proper reference for spatial analyses. The process of urban sprawl in the areas surrounding the Tri-City agglomeration is so advanced that new buildings are constructed in areas with physio-technical, biological, topographic and climatic constrains (the Vistula delta region, the Reda-Łeba ice-marginal valley), in areas that should perform agricultural function (fertile soils) or should be left as bioactive in order to maintain functional balance of the environment. The investment-related pressure in the uplands has caused a significant

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increase in the impermeable surface area. As a result, flooding and water accumulation are recurring problems in Gdańsk. Lack of the urban belts along the main transportation routes (as suggested by Przewoźniak) results in constant problems, which are as follows: insufficient accessibility by the means of public transportation (costly and time-consuming daily private commuting); air pollution caused by an insufficient system of individual heating; a decreasing percentage of green areas (including public leisure areas) and negative changes in landscape (lack of local development plans). At the same time, the newly built infrastructure is often damaged by flooding or land sliding because it has been constructed in areas where physiographic and technical constraints had been identified yet not taken under consideration. To sum up, in line with the assumed goal, the changes in selected land cover forms in 2012–2018 were analyzed and the places of the greatest changes (taken collectively) in the landscape were pointed out. Areas which have been undergoing intensive changes for many years, as well as new places to pay attention to in order to monitor changes have been identified. At the same time, the location was identified and the scale of new buildings erected in areas not recommended for investment due to environmental conditions (according to Przewoźniak [1985]) was estimated. The tested index of structure convergence can be recommended as a tool for other research.

As the analyzes have shown, the use of the structure convergence index (c) and the geometric grid of basic fields allows for conducting the research at a very detailed level. For comparison, in works based on schematics (e.g. connections in the landscape, directions of development, etc.), as in the work of Lorens (2015), it is not possible to obtain information about specific places of changes or conflicts. In article about urban development scenarios of the Tri-City Metropolitan Area (Lorens, 2015) the economic, political, social and communication implications are mentioned, but there is no deeper environmental aspect, including land cover changes, which is contained in the analyzes presented above. Similarly, the problem of generalizing or averaging data concerns works relating to entire communes. An example can be the work of Pukowiec-Kurda and Vavrouchová (2020). Their analyzes were conducted using CLC data in 10 municipalities in the Śląskie Voivodeship (mainly the Silesian Upland). This work is very valuable, showing changes by using the index of relative change of selected land use types. The one thing is that values of the index of landscape change are shown for whole municipalities. The thus calculated variable may result from phenomena involving only a part of a municipality, and even be a continuation of the processes occurring in the neighboring municipality.

Comparing the obtained results with the works concerning other areas subject to changes in the development, we can observe that the direction of changes is not always so unfavorable. The results of the research conducted by Ciesielski and Będkowski (2014) in the Łódź Voivodeship show the desire to maintain the specific features of the area and the structural systems of villages, including the designation of land for development along the main communication routes. Also Rejter (2018) draws attention to the fact that "The differences that occur in the process of change are regional and depend on the specificity of a given region". The largest agglomerations in Poland are most often located on rivers and spread relatively evenly in all directions, obviously taking into account factors supporting this process, such as the course of main communication lines or the policy of suburban communes. Due to its seaside location, the Tri-City is characterized by slightly different possibilities of territorial expansion.

The presented approach can be used for any area: both in terms of geographic location and size of the area, with the appropriate size and shape of the mesh (squares, hexagons). The possibility of calculating the value of the indicator for different time intervals allows you to monitor changes. The method can also be used to compare the intensity of changes over a given period of time for two different study polygons, assuming that the same types of land cover and the same size and shape of the base field will be taken for the analysis. This approach is not only of cognitive value, but it also has a practical application: identifying

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conflict places in space. It is therefore a contribution to both research methods (through the use of the structure convergence index) and a contribution to the practice of spatial planning.

CONCLUSIONS

The deteriorating imbalance between biologically active and built-up areas (reflected by the changes in the land use structure) may be perceived as an indicator of the ongoing suburbanisation processes (Chart 1). It is also a key issue in terms of maintaining continuity of the environmental structure.

At the same time, the structure of land cover types in the research area is undergoing constant changes. Although the percentage of forests, grasslands and waters increased in the analysed period, still urban development is advancing and the proportion of biologically active and passive areas is decreasing. The areas where the most intense changes are observed are located in the western and southern districts of Gdańsk, in the areas southwest of Sopot and Gdańsk, west of Wejherowo, in Kępa Oksywska and Żuławy Wiślane (the Vistula delta region) – especially Sobieszewska Island (tourist infrastructure along the dune ridges) and areas east of Pruszcz Gdański. The areas where negative changes have been observed more often in the last few years include Warzenko, Chwaszczyno and Rębiechowo. The above-mentioned areas of intensive investment-related pressure should be continuously monitored and a scheme of spatial planning processes should be implemented in order to hamper the ongoing suburbanisation processes and deal with destruction of the natural environment and landscape. Taking into account the above considerations, it is concluded that the aim of the research has been achieved.

Comparing the change in the proportions between biologically active and built-up areas at different time intervals can be helpful in assessing whether changes in the landscape are conducive to sustainable development. The methods and materials used in the analysis can be applied for the analysis of other areas and for the comparison of land use changes, regardless of the adopted reference unit (for areas of different size, with appropriately selected grid). The value enumeration of the indicator of structure convergence allows to monitor changes in time and space. As highlighted in the "Discussion" section, this approach is not only of cognitive value, but it also has a practical application. It is a contribution to the methodology of landscape science and also offers the possibility of practical use in spatial planning. It is possible to use this method, for example, to indicate areas that should be under protection or for which a change of use is recommended. The analyzes of the land use changes in the long run may allow modeling of future landscape transformations.

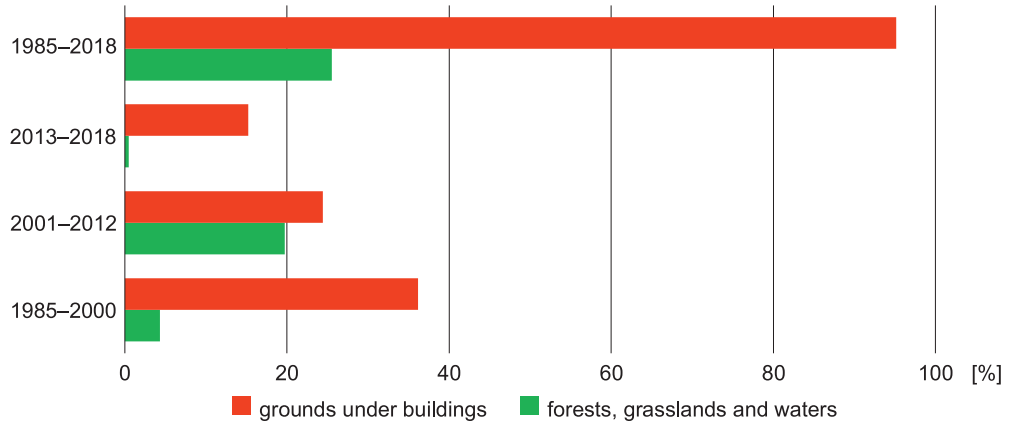

Chart 1. Changes in the structure of biologically active and passive areas in relation to the first year of a given period (%)
Source: own preparation based on Korwel-Lejkowska (2020).

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THE ECONOMIC DIMENSION OF REVITALISATION IN POLAND – LOCAL AUTHORITIES' PERSPECTIVE

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ABSTRACT

Motives: The paper focuses on economic aspects of revitalisation of distressed areas and discusses results of the first and so far the only one survey on the subject conducted among the local governments in Polish municipalities. The article continues our previous research on sustainable revitalisation and focuses attention on one dimension of revitalisation – the local economy. We propose an innovative framework for economic revitalisation, which has been positively verified on the basis of the analysis of research results. The article also explores the views of local authorities on entrepreneurial participation in revitalisation.
Aim: The main objective is to develop a research method for analysing economic revitalisation and to identify local authorities' perception of priority policy interventions for economic revitalisation in Polish municipalities. We also aim to verify the scale of entrepreneurs' involvement in planning and monitoring revitalisation.
Results: Respondents show higher appreciation for economic revitalisation approach based on renovation and modernisation of buildings and technical infrastructure. The integrated approach to economic revitalisation was indicated by the fewest respondents. The low level or total lack of mobilisation of the business community around revitalisation in economic dimension can be considered as significant threats to the achievement of its objectives.

Keywords: sustainable revitalisation, local economic development, economic revitalisation, participation, local authorities

INTRODUCTION

Besides destruction inflicted by the World War II, historical breakthroughs and downturns that overshadow the current situation and development perspectives of Polish municipalities constitute the legacy of the previous communist system (Stawasz & Sikora-Fernandez, 2016). After the collapse of the People's Republic of Poland (Poland's former socialist system – prior to today's democracy) social and economic effects of transformation left their traces on Polish cities and villages (UMiRM & GTZ, 2003). Since the early 1990s Polish cities began to experience problems stemming from social and economic consequences of the collapse of traditional industries (Gawronska et al., 2019; Przywojska, 2021). Urban

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structures shaped under such circumstances have become a barrier to the local development (UMiRM & GTZ, 2003). At the same time, the phenomenon of suburbanisation occurred in Poland, stimulated by the change of political and economic orientation within the liberal and capitalist trends. The political transformation included, inter alia, the release of property, which led to changes in the management of space and the emergence of a new offer of land for housing purposes in suburban areas. The consequence of these transformations was uncontrolled urban sprawl and further degradation of the central areas (Bieńkowska & Korpetta, 2015).

The revitalisation has become a fairly common local policy instrument in Poland deployed to support the development and transformation of deprived urban and rural areas (Jarczewski & Kułaczkowska, 2019). The data presented by the Institute of Urban and Regional Development (Instytut Rozwoju Miast i Regionów, IRMiR) show that revitalisation is carried out in almost 55% of municipalities (Jarczewski & Kułaczkowska, 2019).

Sustainable revitalisation should mean an integrated vision and undertakings designed to resolve complex territorial problems and resulting in a lasting improvement in the economic, physical, social and environmental condition of a run-down neighbourhood (Chahardowli et al., 2020). Its key components are local partnerships empowerment and involvement of the local community (Brunetta & Caldarice, 2014; Doyle, 2004; Huston & Darchen, 2014; Roberts, 2000; Woolrych & Sixsmith, 2013). In Poland, revitalisation remained without a legislative framework for many years. The real breakthrough came with the adoption of the Revitalisation Act in 2015, which defined the principles and procedures for preparing, conducting and evaluating revitalisation. The legal definition of revitalisation in Poland assumes that it is a process of bringing degraded areas out of crisis, conducted in a comprehensive manner through integrated actions for the benefit of the local community, public space and local economy, territorially concentrated, carried out by revitalisation stakeholders on the basis of a communal revitalisation program (Act of 9 October 2015 on revitalisation, 2015). In this frame, revitalisation should be perceived in municipalities as a stakeholder-engaged method of action aimed at bringing neglected territories out of crisis and restoring all the functions they had previously lost, including, of course, economic functions.

In the light of the above mentioned polish Revitalisation Act, the local economy is an important area of sustainable revitalisation. In the legal definition of revitalisation the economic dimension is clearly specified and negative economic symptoms, in particular low entrepreneurship, poor condition of local enterprises and unemployment, are indicated as main criteria for distinguishing degraded areas in municipalities.

The main objective of the conducted research is to develop a research method for analysing economic revitalisation and to identify local authorities' perception of priority policy interventions for economic revitalisation in Polish municipalities. We also aim to verify the scale of entrepreneurs' involvement in planning and monitoring revitalisation. The paper seeks to answer the following research questions: (1) Which objectives and corresponding lines of action lead to revitalisation in the economic sphere? (2) How local authorities perceive the importance of economic revitalisation activities? (3) How do local authorities perceive the participation of business entities in revitalisation planning? (4) Are representatives of business units involved in the programming and monitoring of revitalisation?

The paper is structured as follows: the next section presents a review of literature devoted to economic aspects of revitalisation and participation of entrepreneurs in planning and managing revitalisation programmes. On the basis of the literature review we propose a conceptual framework for economic revitalisation, which we validate with the results of a survey conducted among representatives of the authorities of Polish municipalities.

Section Materials and Methods discusses research assumptions adopted for the identification of economic revitalisation approaches in municipalities. Therefore, we analysed the opinions of representatives

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of local authorities on the activities undertaken as part of economic revitalisation and the participation of business entities in this process. Quantitative research was carried out using the survey technique among 1,236 municipalities, 598 of which carried out revitalisation activities. Taking into account the legal conditions of revitalisation in Poland, the study covered urban and rural communes. We wanted to identify similarities and differences in the perception of economic revitalisation approaches among authorities of different types of territorial units. The main research results are presented in section Results and discussed in section Discussion. The article closes with conclusions.

LITERATURE REVIEW

The literature review provides interesting conclusions regarding the economic dimension of revitalisation, especially the perception of the relevance of its objectives and actions. In general, economic regeneration is a method of rebuilding a place to make it more economically successful (Mapes et al., 2017; Prusik & Źróbek, 2014). The process aims to stimulate the local economy and to ensure the sustainability of the urban system. Wagner, Joder, and Mumphrey Jr. (2016) observed that one of the weaknesses of urban regeneration policy, and programmes related with it, is that it does not develop human capital. Human capital is understood as a resource of knowledge, skills, health and vital energy contained in each person and in society as a whole, determining the ability to work, to adapt to changes in the environment and the ability to create new solutions. Many strategies that have been developed with revitalisation in mind, focus on the physical reconstruction of declining infrastructure. They also use grants and tax allowance schemes to attract business and investment capital (Couch et al., 2011; Noon et al., 2000). The most high profile aspects of this regeneration was the ambitious re-making of urban space typically in the form of one-off flagship projects such as conference centres, upmarket leisure and retail complexes, sports stadia, casinos, aquaria, cultural facilities, often combined with high-quality offices in multi-use complexes (Barber & Pareja Eastaway, 2010). Some authors point to the potential of urban transport infrastructure projects that indirectly work as a catalyst for the development and redevelopment of urban areas as well as the economic regeneration of declining areas (Gospodini, 2005; Lawless & Gore, 1999).

In contrast to an approach based on physical reconstruction and financial incentives, the idea of investing in human capital is less popular (Barber & Pareja Eastaway, 2010; Wagner et al., 2016). Meanwhile, spatial inequalities, limited education, a changing economic landscape, and poverty are key problems that accumulate in city centres (Syrett & North, 2010). These problems can be overcome precisely by investing in human and social capital of local residents. Also Jargowsky (1997) argues that investment in education and training should be a key priority in revitalisation. McGregor and McConnachie (1995) emphasise the need for a multi-sectoral approach to bring about economic reintegration in excluded areas. They advocate that revitalisation programmes should include, inter alia: support to education, general human resource development, vocational training targeted at specific sectors within the local labour market, enterprise development and job creation, the so-called intermediate labour market creation, support given to enabling programmes (child care, transport subsidies, etc.). Literature suggests that urban regeneration policies should also take into account the improvement of mental (Kearns et al., 2020; Zapata-Moya & Navarro-Yáñez, 2021) and physical health of residents (Baeza et al., 2021; Kearns et al., 2021). Investment in human capital is a human-based strategy, while physical revitalisation projects and financial incentives are place-based. Although we might assume that one of these two approaches is more effective, we (like other researchers: Fainstein & Markusen, 1993) oppose this and claim that the choosing between people and places is a false dichotomy.

Research studies on economic aspects of revitalisation, in particular those focused on supporting the development of entrepreneurship and network

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connections in run-down neighbourhoods, also emphasise the embeddedness of companies from the revitalised area (Bensemann et al., 2021; Souliotis, 2013; Welter et al., 2008). With regard to revitalisation, social capital is the "glue" which helps to foster the local embeddedness of entrepreneurship; and trust, an important trait of social capital, is the "lubricant" without which networking would not be possible (Anderson & Jack, 2002). Successful economic regeneration is therefore not possible without supporting the development of social capital and network organisation of entrepreneurship (Welter et al., 2008). This approach should be applied to both start-ups and existing businesses as well as external investors. Designing pathways for economic revitalisation requires taking into account that the creation of new economic structures is rarely an entirely 'new beginning' and that it cannot be understood without priorly taking into account economic, social and spatial structures, local knowledge and competences and existing spatial relations (Gwosdz et al., 2020).

Many researchers stress the importance of economic objectives of revitalisation and the need to provide conditions for the development of economic activity. In addition to research focused on the linkages between gentrification and revitalisation (Axenov, 2014; Bernt, 2016; Brown, 2014; Drozda, 2017; Groyecka, 2014; Ha, 2004; Jadach-Sepioło, 2007; Lees et al., 2013; Pobric & Robinson, 2019), the issues of generating urban land rent (Markowski, 2014) and stimulating local entrepreneurship, especially the formation of entrepreneurial attitudes among disadvantaged (Battaglia & Tremblay, 2011; Bobadilla et al., 2019; Varady, Kleinhans, & van Ham, 2015) are also explored.

On the other hand, the evaluation report of the revitalisation system in Poland indicates that by 2018, more than 2 thousand revitalisation undertakings were planned in Polish municipalities and concerned the economic sphere, while only 16% of them were realised (IRMiR & Ecorys, 2020). This was explained by the fact that local economy is a more difficult and less urgent dimension of revitalisation than the other dimensions: social, technical or spatial. In addition, the authorities of Polish municipalities depreciate undertakings of an economic nature in the revitalisation process. In terms of activity in economic revitalisation urban municipalities are most prominent, especially cities with county rights, where activities stimulating the local economy are concentrated. In rural municipalities, on the other hand, economic revitalisation is completely neglected.

Researches also point to the progressively prominence of the inclusive and effective involvement of the community and citizen participation in economic revitalisation (Ferilli et al., 2016; Raco, 2000; Sepe, 2014). Relying on local potentials and resources also means direct involving economic stakeholders in the regeneration process. Interaction and recognition of the needs and expectations of different stakeholders, including economic actors, is a necessary condition for the preparation of effective municipal revitalisation programmes (Dembicka-Niemiec et al., 2016; Li et al., 2020). Intersectoral cooperation and participation is therefore supposed to increase the effectiveness of revitalisation, its rootedness in the local environment and the relevance of selected projects (Kołsut, 2017). The above-mentioned scientific findings are reflected in the Revitalisation Act. It clearly states that community participation includes preparation, implementation and evaluation of revitalisation in a way that ensures active participation of stakeholders, among others through participation in public consultations and revitalisation committees. Among the key stakeholders in revitalisation, the act mentions entities conducting or intending to conduct economic activity in the municipality. Participation and cooperation as key principles for the implementation of urban policy in Poland, were also indicated in the National Urban Policy 2023 (MIR, 2015).

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THE ECONOMIC OBJECTIVES AND ACTIVITIES IN REVITALISATION POLICY – CONCEPTUAL FRAMEWORK FOR ECONOMIC REVITALISATION

Within the context of this theoretical background, we offer a conceptual framework for economic revitalisation. We assume that the impact of revitalisation on local economy should include the following objectives: a) renovation of buildings and infrastructure as material base of economic activity, b) regeneration of human resources, c) regeneration of economic functions in the form of direct impact on business entities and d) regeneration of network connections within the economy of the distressed area. These objectives are the basis for our conceptual framework of economic regeneration. We attribute a specific actions to economic revitalisation objectives we have mentioned above (Fig. 1). Moreover, based on the provisions of the Polish Revitalisation Act, National Urban Policy 2023 and governmental guidelines, we assumed that for the proper course of economic revitalisation entrepreneurs should be involved (should participate) in its planning and monitoring.

In our approach, comprehensiveness of economic revitalisation means the need for simultaneous strengthening and regeneration of material and human resources, economic functions and development of economic network connections in the run-down neighbourhood according to the needs and possibilities of the territory in question. Material (infrastructural) conditions of conducting business activity, as well as human resources and entrepreneurial attitudes of the inhabitants, are the basic factors of entrepreneurship development and determine the investment attractiveness of the neighbourhood.

MATERIALS AND METHODS

Research assumptions

The article continues one author's research (Przywojska, 2021) and focuses attention on one dimension of revitalisation – the local economy. From the 26 potential revitalisation measures that were the subject of Przywojska's study, 13 measures that contribute to strengthening the local economy

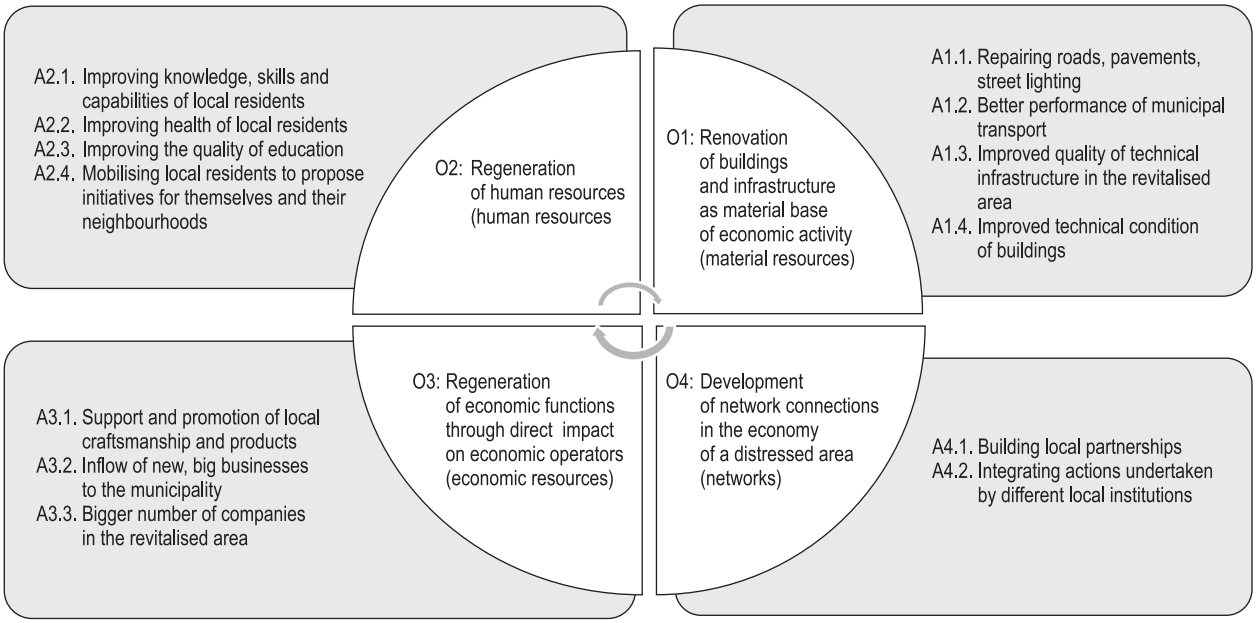

Fig. 1. Economic revitalisation objectives and activities relating to them – conceptual framework
Source: own preparation.

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were selected for in-depth research on the basis of the literature review. In order to validate the assumptions in the conceptual framework for economic revitalisation and to determine which approaches to economic revitalisation are preferred by Polish local authorities, we carried out questionnaire survey. The questionnaire was completed by representatives of the executive authorities of Polish municipalities (mayors) as organisers of revitalisation at the local level. Respondents assessed the relevance of all 13 economic revitalisation activities included in the conceptual framework for economic revitalisation on a 5-point Likert scale ranging from 1 'totally irrelevant' to 5 – 'very much relevant'.

Validating the research tool, we check whether it has been properly developed. For this purpose we use a second order confirmatory factor analysis.

We assume that the mayors' assessment of the importance of economic revitalisation activities will enable us to discover how local authorities perceive the approaches to economic change in degraded areas of Polish municipalities. We also tried to find out whether the type of municipality influences the perception of the local authorities.

In the study we also identified the assessment of the importance of economic partners for the course of economic revitalisation made by the respondents on a scale from 1 to 5, where 1 means that they are irrelevant while 5 that they are very much relevant to the planning and course of economic revitalisation.

We also wanted to learn whether entrepreneurs participate in revitalisation committees and how municipal authorities assess the importance of involving entrepreneurs in revitalisation.

Data collection

Data were obtained from a quantitative study carried out in Polish municipalities in 2018. The survey was a questionnaire-based research effort. Respondents could answer the questionnaire online or send its hard copy by traditional mail or e-mail. The survey was conducted on a representative sample of 1,236 Polish municipalities. All the subjects have provided appropriate informed consent. The sample structure included 15% of urban, 22.2% of urban-rural, and 61.3% of rural municipalities representing all voivodeships (regions). Out of the total number of municipalities covered by the analysis, 573 were engaged in revitalisation projects and they feature in analyses presented in this article (Table 1). Respondents were heads of villages, and mayors or persons delegated by them to take part in the survey. The data were analysed anonymously, therefore, the author had no access to personal identifying information.

Table 1. Municipalities engaged in revitalisation projects which took part in the research study by type (N=573)

Type of municipality	Number	Share
Urban municipality	113	19.7
Town with a county (poviat) status	39	6.8
Urban-rural municipality	184	32.1
Rural municipality	230	40.2
Unspecified	7	1.2
Total	573	100.0

Source: Przywojska (2021).

Data analysis

In order to determine the structure of revitalisation objectives and actions in conceptual framework, a second order confirmatory factor analysis was conducted. Two main indicators of composite reliability (CR) and average variance extracted (AVE) were calculated for the model.

In the next step of the analyses, respondents' assessments for each activities group assigned to the economic revitalisation objectives, confirmed by the factor analysis, were averaged. On this basis, perceptions of economic revitalisation approaches of local authorities were identified. To analyse specific approaches, the survey results provided by 457 out of 573 municipalities (which were engaged in revitalisation activities and had complete data for given objectives) were taken.

To assess the impact of the municipality type on how they perceive different economic revitalisation approaches the Chi-Square test was used. In order to determine the nature of the differences between

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municipalities, an additional test was carried out which took the correction of Bonferroni's significance level into account. The significance level for the analyses was assumed to be $\alpha = 0.05$.

RESULTS

The validation of conceptual framework for economic revitalisation – second order confirmatory factor analysis

First, we checked whether the adopted structure of economic objectives of revitalisation is sufficiently suited to the data. In addition to the objectives set, we assumed that all of them are components of a single structure which is the economic revitalisation. Assuming such a two-stage revitalisation structure, a second-order confirmatory factor analysis was carried out for the 4 distinguished objectives, taking into account FIML (full information maximum likelihood) estimation due to the gaps in data provided in the respondents' answers. The confirmatory analysis used in our research is in fact a method of assessing the accuracy of a measurement model. This assessment takes place when a theoretical model of measurement is compared with a real/empirical model. In order to see how well the data fit together, the validity of the developed measurement model needs to be checked.

Initially, the analysis showed an insufficient match between the conceptual framework (based

Table 2. Factor loadings for actions relating to individual revitalisation objectives

Factor	Component	b	SE	β	T	p	CR	AVE
revitalisation	O1 (material resources)	1.00		0.66			0.910	0.72
	O2 (human resources)	1.38	0.17	0.96	8.20	<0.001		
	O3 (economic resources)	1.51	0.18	0.96	8.35	<0.001		
	O4 (networks)	1.61	0.18	0.78	8.91	<0.001		
O1. Renovation of material resources	A1.4. Improved technical condition of buildings	1.00		0.67			0.665	0.34
	A1.3. Improved quality of technical infrastructure in the revitalised area	0.69	0.09	0.49	7.80	<0.001		
	A1.2. Better performance of municipal transport	1.16	0.14	0.60	8.48	<0.001		
	A1.1. Repairing roads, pavements, street lighting	1.09	0.13	0.54	8.21	<0.001		
O2. Regeneration of human resources	A2.4. Mobilising local residents to propose initiatives for themselves and their neighbourhood	1.00		0.59			0.733	0.41
	A2.3. Improving the quality of education in revitalised area	1.23	0.12	0.66	10.59	<0.001		
	A2.2. Improving health of local residents	1.13	0.11	0.64	10.38	<0.001		
	A2.1. Improving knowledge, skills, and capabilities of local residents	1.19	0.11	0.66	10.57	<0.001		
O3. Regeneration of economic resources	A3.3. Bigger number of companies in revitalised area	1.00		0,61			0.697	0.44
	A3.2. Inflow of new, large businesses to the municipality	1.13	0.10	0,60	11.60	<0.001		
	A3.1. Support and promotion for local craftsmanship and products	1.31	0.11	0,76	11.60	<0.001		
O4. Development of network connections	A4.2. Integrating actions undertaken by different local institutions	1.00		0.84			0.833	0.71
	A4.1. Building local partnerships	1.06	0.06	0.85	16.73	<0.001		

Note. b denotes unstandardized regression coefficient; SE denotes standard error; β denotes standardised regression coefficient; t denotes test t value; p denotes significance level; CR denotes composite reliability; AVE denotes average variance extracted
Source: own preparation.

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on a literature review) and data ($\chi2(61) = 422.77$; $p < 0.001$; Confirmatory Fit Index CFI = 0.825; Root mean square error of approximation RMSEA = 0.104 [90%CI: 0.095-0.113]). On the basis of modification indices, additional covariances between variables were taken into account. Having considered these relationships, the framework proved to be well suited to the data ($\chi2(54) = 203.10$; $p < 0.001$; CFI = 0.928; RMSEA = 0.071 [90%CI: 0.061-0.081]). Table 2 presents factor loadings for individual items included in a given factor.

All analysed items proved to be important components of the individual objectives. Thus, our theoretical framework for economic revitalisation has been confirmed as appropriate. The analysis also made it possible to determine the relevance of the individual measures to the economic revitalisation goals – as evidenced by the values of the factor loadings.

This confirms the good construction of the research tool and, as a result, proper assignment of economic revitalisation activities to the objectives. This has led to the identification of perceived

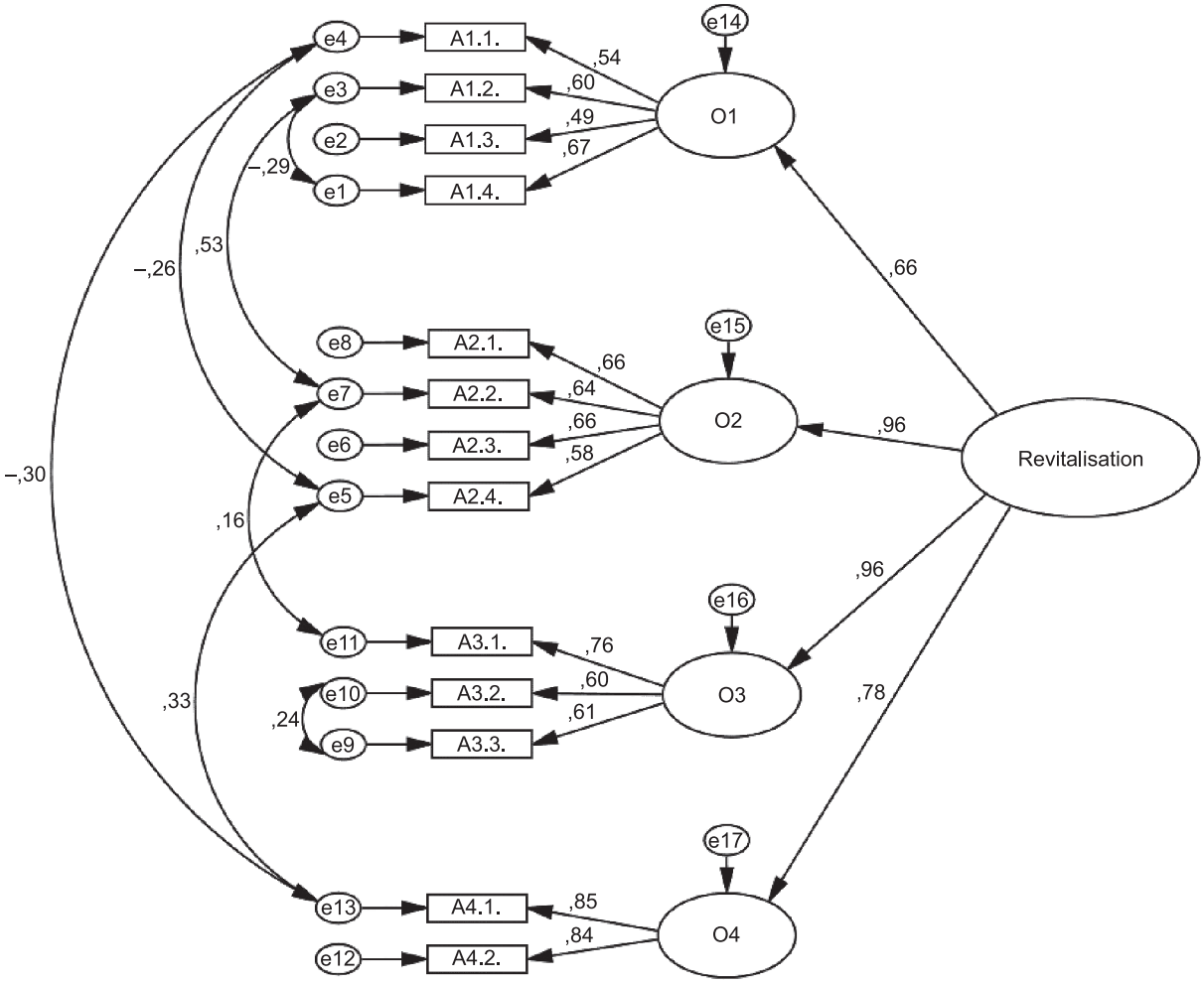

Fig. 2. Second order confirmatory factor analysis for economic revitalisation
Source: own preparation.

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approaches (sequences of objectives and actions) towards economic revitalisation (Fig. 2).

For the objective concerning the regeneration of material resources of economic activity (objective 1), the most important item turned out to be the improvement of the technical condition of buildings, while the least important one was the improvement of the technical infrastructure in the revitalised area.

For the objective concerning the regeneration of human resources (objective 2) the components taken into account were characterised by similar values of factor loadings – from 0.59 for mobilising residents to show initiative and to take care of themselves and their neighbourhood to 0.66 for improving the quality of education, knowledge, qualifications and skills of the residents.

For the objective concerning the regeneration of economic functions that exert direct impact on economic operators (objective 3), the component with the highest factor loading is the support and promotion of local craftsmanship and products, while lower factor loading is observed for the inflow of new large companies into the municipality. In our opinion, it is a positive observation which may suggest that local authorities are interested in revitalisation based on the endogenous resources of the area and show willingness to reduce gentrification of local economy through the inflow of completely new large companies into the revitalisation area.

For the objective concerning the development of network links in the economy of a run-down area (objective 4) a higher factor loading is reported for building local partnerships, although the integration of activities of various local institutions is slightly less valued.

For revitalisation as a second order structure consisting of 4 latent variables representing objectives, factor loadings for objectives range between 0.66 for objective 1, 0.96 for objectives 2 and 3 and 0.78 for objective 4. This means that the most important activities for the process of economic revitalisation are those connected with the improvement of human resources and with direct influence on the local economy through the strengthening and development of existing and new business entities. The objective related to the regeneration of material resources has the least influence on the analysed variable. An analysis of the evaluations made by the respondents, provided completely different research results. We will describe this in the next part of our paper. Two main coefficients of composite reliability (CR) and average variance extracted (AVE) were calculated for the framework. While CR values are satisfactory for all constructs (>0.6), the values of AVE for objectives 1, 2, and 3 are below the adopted threshold of 0.5. Nevertheless, if CR is higher than 0.6, lower AVE is acceptable (Adamowicz & Zwolińska-Ligaj, 2009; Kłodziński, 2012; Wojtyra, 2017) and the construct is considered internally coherent. This means that the conceptual framework for economic revitalisation that we developed (based on the literature review), proved to be correct. Figure 1 shows the examined economic revitalisation framework.

Perception of economic revitalisation activities by Polish municipal authorities – economic revitalisation approaches

The respondents whose municipalities were implementing revitalisation were asked to rate the importance of revitalisation initiatives (on a scale of 1 to 5, the higher the value of this variable, the higher the perceived importance of the initiative). Table 3 presents the overall and for each type of municipality average ratings from respondents.

The analysis of the results leads to the conclusion that in Poland the local authorities definitely mostly value the infrastructural projects in the framework of revitalisation. Improvement of technical infrastructure, minor repairs of pavements or lighting and improvement of the technical condition of buildings are the directions of intervention perceived by the authorities as the most important components of economic revitalisation. Relatively high ratings were also given to activities aimed at releasing the initiative and self-reliance among the citizens, as well as the development of the local economic base by increasing the number of enterprises in the

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Table 3. Mean importance ratings of economic revitalisation activities – total and by type of municipality

Activities of economic revitalisation	Total for all municipalities						Average by type of municipality				p
	n	M	STD	Q1	Me	Q3	U	TCS	U-R	R	
Improved quality of technical infrastructure in the revitalised area	512	4,20	0,814	4	4	5	4,31	3,96	4,20	4,18	0,213
Repairing roads, pavements, street lighting	533	4,00	1,096	3	4	5	3,72	3,37	3,97	4,21	<0,001*
Improved technical condition of buildings	506	3,96	0,844	4	4	5	4,00	3,97	3,98	3,92	0,871
Mobilising local residents to propose initiatives for themselves and their neighbourhood	496	3,90	0,916	3	4	5	3,99	4,34	3,89	3,80	0,002*
Bigger number of companies in revitalised area	485	3,81	0,948	3	4	4	3,86	4,00	3,85	3,74	0,355
Improving the quality of education in revitalised area	495	3,70	0,958	3	4	4	3,67	3,57	3,77	3,68	0,687
Improving knowledge, skills, and capabilities of local residents	492	3,64	0,936	3	4	4	3,61	3,97	3,65	3,58	0,158
Inflow of new, large businesses to the municipality	488	3,62	1,071	3	4	4	3,57	3,60	3,78	3,53	0,172
Integrating actions undertaken by different local institutions	487	3,57	0,890	3	4	4	3,63	4,07	3,58	3,45	<0,001*
Improving health of local residents	481	3,56	0,938	3	4	4	3,46	3,50	3,70	3,50	0,100
Building local partnerships	491	3,52	0,924	3	4	4	3,67	4,03	3,52	3,37	0,001*
Support and promotion for local craftsmanship and products	483	3,48	0,960	3	4	4	3,44	3,64	3,58	3,38	0,199
Better performance of municipal transport	481	3,30	1,030	3	3	4	3,33	3,43	3,37	3,21	0,410

Note. n denotes number of municipalities assessed; M denotes Mean; STD denotes standard deviation; Me denotes Median; Q1 denotes Quartile 1; Q3 denotes Quartile 3; U denotes urban municipality; TCS denotes town with county status; U-R denotes urban-rural municipality; R denotes rural municipality; p denotes probability of an F test of analysis of variance or Welch test (after omitting non-responses); * $p < 0.05$.
activities with the highest average score by type of municipality are marked in grey
Source: own preparation based on Przywojska (2021).

revitalised area. Activities aimed at strengthening human capital, attracting new large companies to the revitalised area, building local partnerships and integrating the activities of local institutions were rated lower. The importance of actions aimed at supporting local craftsmanship and improving the functioning of public transport was appreciated least by the local authorities.

Economic revitalisation approaches in municipalities were delineated with comparison of average ratings for a given set of actions attributed to individual revitalisation objectives. The following approaches were specified basing on the above conceptual framework (Fig. 2):

1. Approach based on material resource regeneration – the highest average rating for the set of activities for objective "Renovation of buildings and infrastructure as material base of economic activity";

2. Approach based on human resource regeneration – the highest average rating for the set of activities for objective "Regeneration of human resources";

3. Approach based on regeneration of economic functions – the highest average rating for the set of activities for objective "Regeneration of economic functions";

4. Approach based on network connection development in the economy of a distressed area – the highest average rating for the set of activities for objective "Development of network connection";

5. Integrated and balancing approach – high average rating for all objectives: "Renovation of buildings and infrastructure as material base

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of economic activity", "Regeneration of human resources", "Regeneration of economic functions", "Development of network connection";

6. Hybrid approach – the highest average ratings for activities relating to two objectives.

Table 4 presents percentage distribution of approaches made by respondents participating in the study. The analysis showed that in the examined sample the approach based on material resources regeneration was by far the most frequently chosen. This suggests that in revitalisation material investments are seen as a priority. High rating of this objective means that local authorities prefer road repairs, transport improvements, improvement of the technical condition of buildings and repair of technical infrastructure in a run-down area. The approaches based on the regeneration of economic functions (by supporting and promoting local craftsmanship and products, stimulating the arrival of new large companies into the municipality and striving to increase the number of businesses in the revitalised area) and the development of network connections (by building local partnerships and integrating the activities of various local institutions) were rated much lower and were chosen by a similar number of respondents. An even lower rating was given to the revitalisation approach based on human resource regeneration. This is a very important observation as this approach to economic revitalisation contains important actions for a successful transformation of a distressed area, such as improving the knowledge, qualifications and skills of the inhabitants, improving their health, the quality of education and, finally, shaping entrepreneurial attitudes by stimulating initiatives among the inhabitants so they could take care of themselves and their neighbourhood. Hybrid approach, which combine two objectives in the revitalisation strategy were declared by a total of 67 municipalities. The activities assigned to the regeneration of material and human resources were mostly assessed at a similarly high level. Another interesting conclusion from the analysis is that the authorities represent low interest in the integrated approach of economic revitalisation, which was chosen by only 5.3% of respondents.

Table 4. Frequency analysis for choices of economic revitalisation approach in municipalities (N=457)

Approach type	N	%
Based on renovation of material resources	148	32.4
Based on regeneration of human resources	58	12.7
Based on regeneration of economic functions	80	17.5
Based on development of network connections within the economy of a run-down area	80	17.5
Integrated and balanced	24	5.3
Hybrid approach:		
objectives 1 & 2	17	3.7
objectives 1 & 3	11	2.4
objectives 1 & 4	10	2.2
objectives 2 & 3	5	1.1
objectives 2 & 4	11	2.4
objectives 3 & 4	13	2.8
Total	457	100

Note. n denotes sample size; % denotes share of the sample.
Source: own preparation.

We confirmed the results of the previously quoted research carried out by other authors (Wagner et al., 2016) who indicated a fragmented perception of revitalisation with a clear advantage of the renovation perspective. This is an interesting result of our study which proves the low impact of the Act on revitalisation (promoting a comprehensive and integrated approach) on the perception of decision makers in Polish municipalities.

Type of municipality as a variable differentiating economic revitalisation approach

In the next step, an analysis was carried out using a Chi-Square test of independence to check whether the approach selection depends on the type of municipality represented by the respondents. The analyses included 5 main approach types – hybrid choices were omitted due to their small number. The results of the analysis are presented in Table 5.

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Table 5. Comparison of the frequency of preference for a revitalisation approach by types of municipalities

	urban municipality		town with county status		urban-rural municipality		rural municipality	
	n	%	n	%	N	%	n	%
Based on regeneration of material resources	28_{ab}	34.6	1_{c}	3.6	41_{b}	33.6	77_{a}	49.7
Based on regeneration of human resources	15_{a}	18.5	3_{a}	10.7	17_{a}	13.9	23_{a}	14.8
Based on regeneration of economic functions	9_{a}	11.1	10_{b}	35.7	33_{b}	27.0	26_{ab}	16.8
Based on regeneration of network connections within the economy of a run-down area	24_{ab}	29.6	13_{b}	46.4	21_{ac}	17.2	21_{c}	13.5
Integrated and balanced	5_{a}	6.2	1_{a}	3.6	10_{a}	8.2	8_{a}	5.2
$X^2(12) = 44{,}78$; $p < 0{,}001$; $V = 0{,}20$								

Note. χ2 denotes chi-square test value; p denotes significance level; V denotes Cramer's V – effect
Each letter in the subscript denotes a subcategory of the type of municipalities for which the columns differ by a factor of 0.05.
Source: own preparation.

The analysis showed significant differences in the frequency of approach selection depending on the type of municipality. The correlation turned out to be statistically significant for economic revitalisation approach based on regeneration of material resource, based on regeneration of economic functions and based on development of network connection. Differences between the types of municipalities in the frequency of choosing the approach based on regeneration of human resource and integrated approach turned out to be insignificant, which indicates a similar frequency of choosing the sustainable option and the approach based on the regeneration of human resources. In order to determine the nature of the differences between municipalities, an additional test was carried out which took into account the correction of Bonferroni's significance level.

The approach based on regeneration of material resources is the least frequently chosen by respondents from towns with a county status (only 3.6% of them), while most frequently by respondents from rural municipalities (49.7%). This confirms the impact of significant infrastructural deficits in rural areas on the choices made by the respondents.

Interestingly, the approach based on the regeneration of economic functions – is rarely chosen by representatives of urban municipalities, and mostly by representatives of towns with a county status and urban-rural municipalities. It is hard to explain why this dependence is usually in cities in which problems of local economy get cumulated in distressed neighbourhoods.

Difficulties with the interpretation of this result make us unable to consider this conclusion as a significant result of our analyses. Certainly, this issue requires further research oriented towards qualitative methods of finding out justifications for assessments made in quantitative surveys by local authorities. At this stage, we can only assume that the interest in economic development in rural municipalities may indicate a change in the orientation of their policies towards multifunctional rural development. The need for such an approach to rural development in Poland has been signalled by other researchers for years (Adamowicz & Zwolińska-Ligaj, 2009; Kłodziński, 2012; Wojtyra, 2017).

The approach based on the development of network connections in the economy of a distressed neighbourhood is most often chosen by respondents from towns with a county status and the least often by representatives of rural municipalities, whose choices do not differ significantly from those made by urban-rural municipalities. The obtained research result is interesting because other studies indicate, that Polish rural municipalities clearly lack social capital that would trigger the development of local entrepreneurship. Kłodziński (2012) openly states that taking care of good business climate leads to the development of business entities and it is an important factor in the development of entrepreneurship

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in a municipality and should manifest itself in frequent contacts between local government and entrepreneurs. In his opinion, the local government should encourage the creation of a joint, local or supra-local organisation of entrepreneurs, which would give rise to a new institutional arrangement in the municipality, capable to identify and resolve emerging problems.

Relevance of entrepreneurs involvement in planning and implementation of economic revitalisation

An in-depth analysis of the views of the authorities on the involvement of business entities in economic revitalisation produced interesting results. More than half of the respondents decided that existing businesses and entities intending to get engaged in business activity are important for the course of economic revitalisation. Their impact was described as important by 41% of respondents and very important for another 26.3%. A significant group, almost 25%, of the respondents saw the role of these entities as moderately important. The average overall rating of the importance of these entities for economic revitalisation was 3.84 on a 5-point scale.

The opinions of the respondents about the importance of business representatives in revitalisation is accompanied by the fact, that in almost half (47.3%) of municipalities which have established revitalisation committees, entrepreneurs from the revitalised area are not represented at all. In 30% of municipalities with revitalisation committees, business from the revitalised area is represented by not more than 3 entities. The situation is even worse with regard to entrepreneurs from outside of the revitalised area. In most municipalities (ca. 73%) they are absent from this body.

The absence of entrepreneurs from revitalisation committees, which are the opinion-forming and advisory forums for the local government, may result in poor understanding of the needs and potential of the business sector and the omission of entrepreneurs' opinions in the preparation, programming and implementation of revitalisation.

The small scale of participation of entrepreneurs in revitalisation results, among other things, from the difficulties in undertaking inter-sectoral cooperation (Table 6). In the opinion of the respondents, building cross-sector partnerships for revitalisation proved to be particularly difficult (mean score of 3.04 on a 5-point scale). More than 50% of the respondents also found it difficult to rely on entrepreneurs in social consultations on revitalisation, while the involvement of NGOs was slightly less problematic. The formation of the revitalisation committee itself proved to be the easiest task. This result is not surprising as the committees are dominated by the representatives of the local administration and its subordinate organisational units. In this case, cooperation is not only simpler but even evident.

Table 6. Respondents' opinions on the difficulty of undertaking inter-sectoral cooperation in revitalisation

	Not applicable	Very easy	Easy	Medium difficult	Difficult	Very difficult	Mean
Involvement of economic entities in social consultations for the purposes of revitalisation	2.2	3.8	13.3	26.6	29.5	24.6	3.51
Involvement of non-governmental organisations in social consultations for the purposes of revitalisation	2.7	8.2	18.7	31.8	24.0	14.7	3.19
Creation of revitalisation committees	18.4	15.1	17.9	23.9	16.6	8.1	2.81
Creation of partnerships with entities from different sectors for the purposes of revitalisation	12.7	5.1	13.0	23.1	26.4	19.6	3.04

Source: own preparation.

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DISCUSSION

Municipal authorities in Poland are responsible for: initiating, planning, organising, coordinating, supporting, controlling and evaluating revitalisation processes (Parysek, 2016). The literature review shows that in order to properly fulfil this role, local authorities should see revitalisation in an integrated, sustainable and holistic way (Natividade-Jesus et al., 2019; Przywojska, 2021) and be open to local partnerships and the participation of various stakeholders in revitalisation process (Doyle, 2004; Huston & Darchen, 2014; Woolrych & Sixsmith, 2013). However, research carried out by Polish scientists indicate that the primacy of renovation objectives over socio-economic revitalisation of distressed areas in municipalities is still visible in Polish reality (Dembicka-Niemiec et al., 2016).

In Poland there has been little research concerning the economic dimension of revitalisation but there are some interesting conclusions. Firstly, social and economic activities are treated as something additional, often written into the revitalisation programme out of necessity (mostly in order to obtain EU funds because it was necessary to meet the requirement of the integrated nature of the activities) with no intention to implement them (Jadach-Sepioło, 2017). Secondly, the effects of measures for the economic revival of an area have to take some time, as they are outcomes of the process, so it is difficult to measure their results at the moment in Poland (Lisowska & Ochmański, 2016). Meanwhile, local authorities are interested in renovation because renovation results are visible basically immediately after the completion of the investment, which significantly improves the attractiveness of the area. It is worth adding at this point that measures in the technical sphere, especially in the infrastructural sphere, although spectacular in their results, often require the relocation of economic entities from the revitalisation area or the restriction of pedestrian and transport traffic in the area, which in the short term poses a serious threat to business activities in the revitalised area (Popławska, 2015).

In Poland, the Act on revitalisation was adopted as a response to the existing fragmentary and renovation-oriented approach to the process observed in all types of municipalities. It has shifted the attention to the accomplishment of social and economic objectives in relation to which technical and spatial transformations just provide the setting. The principle of participation and partnership at all stages of the revitalisation process was also highlighted.

These assumptions have been taken into account in our conceptual framework for economic revitalisation. Its validation by factor analysis confirmed the correctness of the selection of economic revitalisation objectives and activities in the conceptual framework. In addition, it confirmed the demands from literature and practical observations that actions related to human resources improvement (Jargowsky, 1997; Kearns et al., 2021) and direct impact on the local economy through the strengthening and development of existing and new economic entities are the most important for the economic revitalisation process (Gwosdz et al., 2020; Welter et al., 2008). On the other hand, the objective related to the regeneration of material resources has the least influence on economic revitalisation.

The analysis of respondents' answers in our survey provides different conclusions. Mayors of Polish municipalities clearly rate the physical and infrastructural aspects of economic revitalisation higher. On the other hand, mayors underestimate the need to build the local partnerships (except cities with county rights) and to support local entrepreneurship and craftsmanship, which can be a limitation for fair and sustainable revitalisation. What is particularly surprising is that the integrated approach of economic revitalisation was indicated by the fewest respondents. This shows that so far the new national legal and organisational solutions have had little impact on the perception of revitalisation in Polish municipalities. Undoubtedly, however, comprehensive, integrated and territorially rooted revitalisation activities in the economic sphere would allow to achieve better effects of economic revival. This is a crucial approach, especially for entrepreneurs who express concerns

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that renovation activities could be a threat to the traditional model of trade functioning.

The results of our study on the economic dimension of revitalisation confirm the lack of application of integrated approach in Polish municipalities, that is the same as other authors' conclusions (IRMiR & Ecorys, 2020; NIK, 2016). The research results also indicate that the principle of stakeholder participation in the planning and implementation of revitalisation has not found recognition among the organisers of this process (section Relevance of entrepreneurs involvement in planning and implementation of economic revitalisation). This conclusion explains why Polish entrepreneurs do not see themselves as addressees of revitalisation measures (IRMiR & Ecorys, 2020). The absence of representatives of the business community in revitalisation committees can be seen as a significant threat to achieve economic objectives of revitalisation process. Revival of local entrepreneurship is a complex, multidimensional process that requires the involvement of cooperating organisations and inhabitants and takes into account the specific place identity, shaped by social and economic experience and certain social norms and lifestyles (Bensemann et al., 2021). Although our study provided interesting and important results it also has some limitations. The article presents only the local authorities' perception of economic revitalisation. The opinions of entrepreneurs from the revitalised area were omitted. Further studies applying our research method and taking into account the perspective of local entrepreneurs, including social entrepreneurs and business environment institutions, would be advisable.

CONCLUSIONS

The main objective of our paper was to develop a research method for analysing economic revitalisation and to identify local authorities' approaches to this process. The paper complements and tests theory on the revitalisation process and shows important empirical implications for understanding and investigating economic revitalisation. Both, our theoretical framework for economic revitalisation and the proposed research method have been successfully validated and can serve as a basis for further research in Poland and other countries. This adds a value to the study of urban regeneration and urban policy. The article is also important for practitioners and politicians managing the process of economic revitalisation as it points out the components of this process and the relationships between them. Additionally, the article provides knowledge about the perception of economic revitalisation by Polish local authorities. The results of the research serve as a rationale for the formulation of guidelines and recommendations for revitalisation policy at central government level, within the framework of the Revitalisation Act and the National Urban Policy.

Economic revitalisation requires comprehensive strategies aimed at regenerating material and human resources, economic functions and network connections in distressed areas. Apart from activities consisting of supplementing and renovating infrastructure facilities and real estate modernisation, the intervention of local authorities and other stakeholders should cover human and social capital in the revitalised area. Many inhabitants of these areas are entangled in the spiral of social problems, which is why they lack entrepreneurial attitudes and the ability to maintain economic independence. The research carried out indicates that local authorities focus too much on the regeneration of physical resources such as technical infrastructure, road infrastructure and buildings. In the light of the research results we recommend organising workshops aimed at self-government administration employees involved in the revitalisation process. The issues covered in the workshops should concern a) methods for diagnosing challenges and economic potentials of degraded areas, b) setting appropriate, integrated objectives and actions for improving the condition of the local economy and c) the creation and use of multi-sectoral local partnerships in revitalisation practice.

We also advocate the embeddedness of revitalisation in the local community. The grounded revitalisation approach should focus on supporting local

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entrepreneurs as internal facilitators of the economic recovery of a disadvantaged area. Economic transformation, especially in places where poverty and exclusion are concentrated, should be accompanied by networking and stimulating local entrepreneurship. An important element of such measures should include representatives of economic entities as equal partners in planning, implementing and monitoring the revitalisation process. This will provide better understanding and use of the inherent potentials in the revitalised area. Partnership and participation are currently the key principles of revitalisation in Poland, clearly defined in the new legislation. However, they have not guaranteed a broad participation of business representatives in determining the course of revitalisation change. This requires local authorities to run an information campaign addressed to business and to use incentives to get them involved in planning, implementing and monitoring economic revitalisation.

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BRIDGING THE GAP IN INJUSTICE URBANISM

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ABSTRACT

Cities are often divided by invisible borders, and this demarcation is man-made, with some areas featuring large infrastructure, well-maintained parks, gardens, and upscale residential areas. In contrast, other areas are characterized by severe deprivation, inadequate housing, inadequate services, poor recreation and cultural facilities, deterioration, and scarce infrastructure investment. These tangible differences come as symptoms of intangible and persistent divisions in society that distribute unequal opportunities and freedoms among the population. The research problem has shown the lack of clarity and diagnosis of urban problems that led to the emergence of the urban gap in cities). This paper focuses on breaking down the difficult edges created by the urban zoning of the city that would enhance interactions between communities and social classes through a practical study on a selected sample (Al-Hussein neighbourhood and Al-Intisar neighbourhood, Al-Muthanna, Iraq). The research concluded the importance of finding appropriate architectural and urban solutions and strategies to cross the urban inequality gap and achieve justice.

Keywords: urban gaps, urban problems, urban injustice, divisions, deprivation, boundaries

INTRODUCTION

Some cities are far from providing equal conditions and opportunities for their communities. The separation between uses and degrees of prosperity is so clear that the rich live in well-serviced neighbourhoods, gated communities and well-built formal settlements, while the poor are confined to inner-city or informal settlements and semi-urban slums (Mekawy & Yousry, 2012). The urban divide emerges as one of the main paradoxes in cities where equal access to urban services and opportunities is often constrained by all kinds of visible and invisible barriers (UN-Habitat, 2010). Large sections of society are often excluded based on pre-determined traits such as gender, age, race or traits over which they have little control, such as where they live (poor neighbourhoods versus rich neighbourhoods) or what they or what they own (income and social status). Therefore, this narrow perspective ignores marginalised groups' actual and potential contributions in building cities and thus can only delay progress towards sustainable and inclusive development (van Ham et al., 2016). Various forms of exclusion marginalize the vast amounts of human capital ready to be mobilized for a sustainable city. So, the city fails to absorb its poorer residents, regardless of the social and cultural riches they may contribute (UN-Habitat, 2011). The urban divide

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between "haves" and "have-nots" opens a gap – or a deep wound – that can result in instability or at least generate high social and economic costs not only to the urban poor but also to society as a whole (Marom, 2019). Therefore, the research seeks to reunify social and economic classes through genuine architectural and urban strategies through which the urban divide can be crossed.

URBAN DIVIDE

It is a metaphor for the spatial segmentation of the urban fabric, refers to the growing divisions and inequalities that exist within our cities and societies, and represents one of the major paradoxes of our time (Avni & Yiftachel, 2014). The urban divide leads to a potential conflict between marginalized slums, degraded areas, and prosperous and luxurious communities (Little et al., 2014). The urban divide leads to many associated problems such as dissonance in urban land use and physical characteristics of space, spatial disintegration, general lack of integration in the city, increasing segregation of functions, and segregation in the distribution of essential services (Solari, 2012). This separation is more like a random patchwork tapestry where the different pieces are grouped due to practical necessity, rather than a harmonious tapestry of a variety of shapes and patterns forming a meaningful whole (Altinok & Cengiz, 2008).

The urban divide can be characterized by various forms of inclusion/exclusion, integration/marginalization, wealth/poverty, equality/inequality, formality, and informality. Those on the wrong side of the divide are excluded from the benefits of urbanization and prosperity. They are deprived of urban advantage (van Gent et al., 2009). The physical and social distance between slums and affluent neighbourhoods constitutes a spatial poverty trap characterized by six distinct challenges: (a) strict job restrictions; (b) high rates of gender disparities; (c) deterioration of living conditions; (d) Social exclusion and marginalization; (e) lack of social interaction and (f) high crime rate (UN-Habitat, 2010). Therefore, the apparent spatial inequalities in many cities are the product of both social and economic disparities, larger processes of urban development and governance, and institutional exclusion of specific groups, where the urban divide results from social, economic, political and cultural exclusion (SDD, 2011). As a result of the multiplicity of problems that lead to the emergence of urban gaps, we will focus on a group of the most important and most frequent urban gaps in the city and the strategies and mechanisms of filling them that are adopted by the research, the most important of which are:

Access Gap

Access restrictions significantly contribute to people's deprivation and marginalization, resulting in disproportionate poverty, deprivation, and exclusion rates (Irani & Rahnamayiezekavat, 2021). Socially and economically disadvantaged neighbourhoods lag in access to infrastructure benefits, for example, restricting access to quality green and safe public spaces to low-income and minority communities. And if they are found within these neighbourhoods, they are of lower quality, less maintenance, and smaller compared to more affluent neighbourhoods. In contrast, wealthier communities have better advantages through the better presence of parks and other open spaces in their neighbourhoods (Landry & Chakraborty, 2009). The concept of access is not necessarily limited by proximity to the city's infrastructures, but through the actual use and benefits that they provide to people of different affiliations, without creating psychological or physical barriers to accessing them (Rofé et al., 2015).

Urban Planning Policy Gap

The lack of planning policies on urbanization and chaotic development problems such as the unmanageable flow of population into cities, thousands of illegal buildings, urban overcrowding, poor quality of life leading to social and structural inequalities, poor living and environmental conditions in some neighbourhoods, and poor access to basic services (Baftijari et al., 2007), thus leading to a lack of job and housing security, as well as a lack of policies

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that contribute to meeting their needs, and as a result slum dwellers are left bearing the suffering of the structural and social inequalities left by the urban planning policy gap in their lives, bodies and health (Rashid, 2009).

Communication Gap

Many reasons led to social stratification and the emergence of the communication gap between societies, the most important of which are related to the construction of the urban fabric and the effects of infrastructure in terms of its presence or absence, as infrastructure has always played its role in strengthening unspoken divisions, isolating societies, containing their expansion, and separating them physically from nearby schools, parks, or communities (Jaeger et al., 2007). Infrastructures can be a symbol of zoning about the disruption they create within the urban fabric and the consequent social and cultural disruption, which in turn contributes to urban zoning and all the negative effects that we currently see in society as a whole (Powers, 2016).

STRATEGIES FOR BRIDGING THE URBAN DIVIDE

Access Strategy

Accessibility can facilitate the full and effective participation of all, through:

1. easy access to transportation, public spaces and public services by providing integrated transportation facilities and services with reliable and affordable access to all. Inclusive transportation also requires continuity of accessibility across the travel chains. All elements of the journey from the starting point to the final destination include entrances that are easily accessible to all. In addition, social justice requires that low-income users not bear exorbitant transportation costs to ensure opportunities for full and effective participation in social, economic, cultural, and political life (Litman, 2017).
2. reducing psychological barriers hindering access, such as fear of crime, by reducing exposure to physical and social risks (Biazzo et al., 2019).
3. reducing physical obstacles to accessing the physical environment, transportation, employment, education, health, services and information by providing permeable public spaces, pedestrian-friendly landscaping, useful and well-designed furniture and amenities, such as benches, lighting, public toilets, and bicycle parking/paths (DESA, 2016).

Urban Planning Policies Strategy

Urban planning policies play an important role in combating poverty and apartheid while promoting more sustainable and inclusive urban development (Bolay, 2020) by protection from urban heterogeneity through the proximity of services and facilities and avoidance of zoning, neighbourhood fragmentation, and closed communities (Purwantiasning et al., 2015), managing the proliferation of informal settlements through the more comprehensive implementation of existing legislation and increasing alternative housing options for the poor as well as increasing the availability of serviced land at affordable prices for the poor. In addition to reforming the financial mechanism for the production of social or low-cost housing to provide loans and credits that the middle class and the urban poor can obtain, monitoring rental markets so that the urban poor can be assisted and protected, through a policy program of tiered regulation guided by the concept of subsidized minimum rent levels, the government should also encourage the construction of public/private rental housing units as part of social housing policies (UN-Habitat, 2011).

Communication Strategy – Reconnecting Communities and Repairing Broken Relationships

A communication strategy provides a social or spatial network that connects people and places together by reshaping or reconnecting the urban fabric, creating a more permeable city, where there

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are no hard boundaries between communities by understanding the social and economic dynamics of the community (*Public life*…, 2015), investigating the impact of infrastructure on surrounding communities, the search for a location where the urban divide and social stratification within society have strengthened, the search for areas that can be "activators" to tie the urban fabric back together which represents a solution to repair the broken urban fabric destroyed by decades of uncontrolled growth of infrastructure by designing a project that serves the surrounding community and brings its citizens together in an educational environment (Jian et al., 2020). and defining a program that helps bring together stratified and dispersed societies; thus providing physical and visual communication across barriers that would have been impenetrable within societies (Powers, 2016), added to this the use of equitable urban renewal provided that this improvement meet the needs of current and future generations while achieving justice and equity (Bianchi, 2019).

Finally, several main and sub-indicators were reached based on which the practical study of the research was measured and the questionnaire form was built as shown in Table 1.

METHODOLOGY THE CASE STUDY

Two opposite neighbourhoods separated by the Euphrates River were elected: Al-Intisar neighbourhood and Al-Hussein neighbourhood in the city of Samawah, the centre of Al-Muthanna Governorate in Iraq for the practical study. Their locations are shown in Figure 1. The total area of the elected sample is 137.4 hectares without the river, 63.2 hectares for the Al-Intisar neighbourhood, in which 9,688 people live, with a total of 973 families, and a population density of 153.2 people/hectare, with a growth rate of 5.9 and 74.2 hectares for Al-Hussein neighbourhood, in which 7788 people live, with a total of 690 families. With a population density of 105 people/hectare, and a growth rate of 3.8 (from 1997 to 2019 according to the data of the Department of Statistics in the Governorate of Muthanna), the study area is located between two important bridges that were newly established, namely, the North Samawah Bridge from the east, and Barbouti Bridge from the west, which are separated by a distance 1 km approx. The Al-Intisar neighbourhood is usually inhabited by the middle to poor class, while the Al-Hussein neighbourhood is inhabited by the sons

Table 1. List of indicators of the final theoretical framework

Indications	Sub-indicators	
access strategy	Public transportation is user-defined and available at more than one point in the neighbourhood	X-1
	Easy access to electricity networks	X-2
	Easy access to sewage networks	X-3
	Physical barriers to accessing the built environment	X-4
	Psychological obstacles that prevent access to certain places	X-5
Strategies to enhance urban planning policies	The spread of informal settlements	X-6
	Sufficient diversity of activities in the neighbourhood	X-7
	Monitoring the rental markets	X-8
	Financing for the purchase and lease of land	X-9
	Low-cost social housing	X-10
Communication strategy	equitable urban renewal in the area	X-11
	Infrastructure obstructions	X-12
	Spaces that help the region to strengthen the links between them	X-13
	Programs that target and help bring together scattered communities	X-14

Source: own elaboration.

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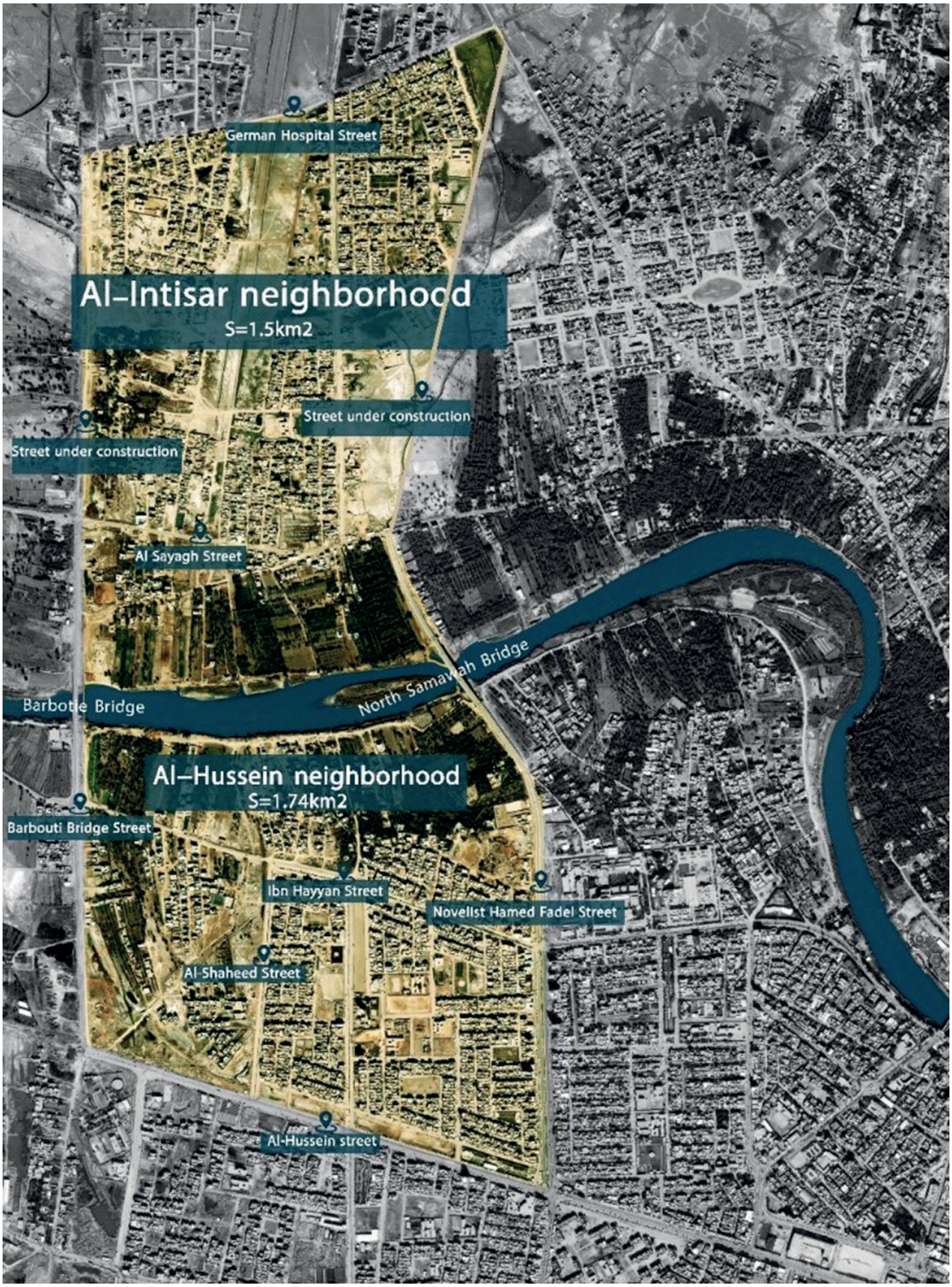

Fig. 1. Study area and boundaries
Source: own preparation based on Google Earth maps.

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of the wealthy class. Several reasons prompted us to choose the site, the most important of which is that this sector is an essential part of the city of Samawah. There is a different mix of social and cultural levels in both neighbourhoods, and there are clear differences in terms of urban level and infrastructure services for both neighbourhoods. Lack of development projects aimed at bridging the gap between the two neighbourhoods. There are clear differences in the availability of activities and services in both neighbourhoods, attracting the people of the upper and middle class closer to the upper class to live in the Al-Hussein neighbourhood; in contrast, people are not attracted to live in the Al-Intisar neighbourhood due to the feeling of insecurity, and the lack of attractive activities. The presence of two physical bridges that opened not too long ago was not enough to bridge the gap between the two neighbourhoods.

The research adopted several methods in measuring the local practical experience to verify the hypothesis and achieve the goal of the research, as shown in Figure 2:

First: The method of analytical field survey: collecting information about the study area through the analytical field survey, including a direct visit to the site and taking pictures of the study area, and collecting and reviewing the concerned departments in the governorate to obtain information, laws and existing instructions, the most important of which is the basic plan, which confirms that it is not permissible to use the lands unless the required use is by what was decided in the basic plan, where the use of the two neighbourhoods was for residential purposes at a rate of no less than 200 m for the housing unit in the two neighbourhoods. Dredging the river and its vicinity for agricultural and recreational purposes, determining the conditions for obtaining a building permit in them, identifying the penal laws used by municipal officials that are imposed on abuses, and identifying the controls of residential construction and commercial streets in them, and they were analyzed according to the indicators of the theoretical framework for diagnosing urban problems that led to to the emergence of gaps in the study area.

Second: The questionnaire method: the measurement of the indicators of the theoretical framework shown in Table 1. where the question is as follows: "Were they achieved?" with yes, no, or somewhat. The questionnaire was distributed to a random sample of the residents of the two neighbourhoods (20 individuals from each neighbourhood), i.e. a total of 40 as a total number of respondents, where the authors assumed that the sample size was sufficient for logical thinking and generalization of the results obtained, either using the method of statistical analysis in percentage and formulating graphs Through Microsoft Excel (The survey was conducted on [05.12.2020]).

The questionnaire included 55% of men and 45% of women. The respondents were mostly young people: 70% were between the ages of 20–35, 20% were between the ages of 35–50, and only 10% were 50 years and over. In the Al-Intisar neighbourhood, 20% of the respondents work in the private sector, while 35% of them work in the government sector, and 45% of them are without work. As for the Al-Hussein neighbourhood, 55% of the respondents work in

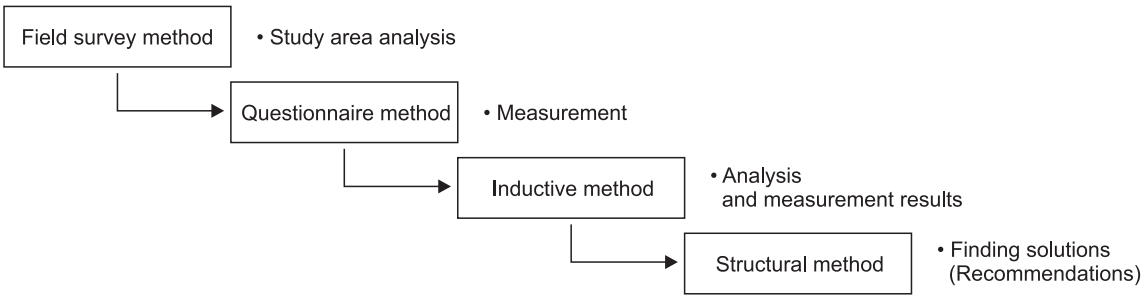

Fig. 2. The methods used in the practical study
Source: own preparation based on Author.

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the private sector, while 30% of them work in the government sector. And 15% of them are without work. Respondents in the Al-Intisar neighbourhood reported that 45% of the neighbourhood's residents did not complete their education or left it in the primary stages and that 35% of them completed secondary education and only 20% of them completed university education. As for the Al-Hussein district, 15% of the Only of the neighbourhood's residents did not complete their education or left it in the primary stages, 35% of them completed secondary education and 50% of them completed university education.

Third: The inductive method: access to the analysis and measurement results by comparing the results achieved in the two methods and adopting the statistics approach using the (Microsoft Excel Worksheet) program.

Fourth: The method of analysis and structural construction: access to solutions (strategies), conclusions, and recommendations by analyzing) the possibility of applying the proposed solutions based on (strategies for bridging urban gaps in the city) leading to the development of a development proposal in the study area.

RESULTS

To reach the results of measurement and analysis, the inductive method was adopted by comparing the results achieved with the two methods. The first is the field survey conducted by the researcher, and the second is the questionnaire method, through which a set of conclusions and readings were reached for the extent of the emergence of the urban gaps that the study focused on, to reach after that the methods and mechanisms of bridging them structurally.

The access gap

The extent of the access gap, which is illustrated in Figure 3, was measured using the information that was obtained from the field survey method and the resolution method, as follows:

As for public transportation in the two neighbourhoods, there is a public means of transportation, which is small buses, at nominal prices in both neighbourhoods, and the river transport is not activated, even though the two neighbourhoods extend on the river from one of its sides. As for the pedestrian axes in the Intisar neighbourhood, they suffered from poor services, some of them are unpaved and unsuitable for walking and filled with excesses and devoid of the simplest furniture for the streets, such as seating, landscaping and others, while we find them in the Al-Hussein neighbourhood wider and furnished with lighting, landscaping and some benches.

In the Al-Intisar neighbourhood, we concluded that there were poor services, as the neighbourhood suffered from a lack of sanitation services, water and electricity services were very bad, and its streets are unpaved. As for the Al-Hussein neighbourhood, it is good in terms of the aforementioned public services.

About the presence of psychological obstacles such as fear of crime, we find them in the Al-Intisar

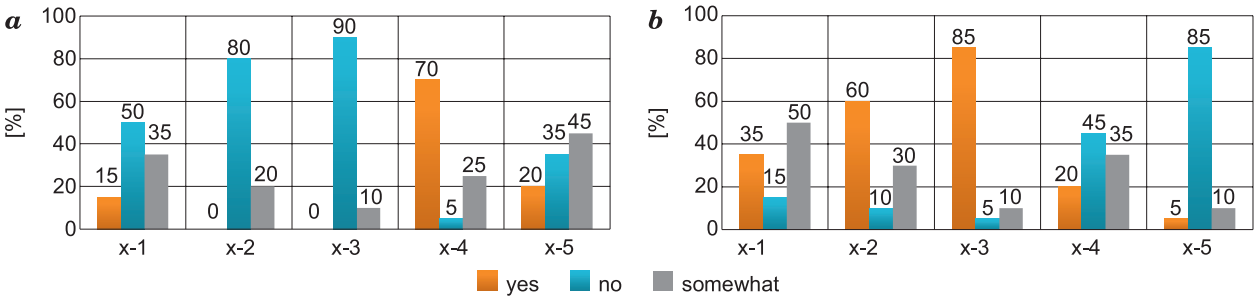

Fig. 3. The results of achieving the access strategy in Al-Intisar neighbourhood)A) and Al-Hussein neighbourhood (B) – % of respondents' answers (05.12.2021)

Source: own analysis based on the results of the survey questionnaire.

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Fig. 4. The difference in access services between the two neighbourhoods
Source: authors' photographs.

neighbourhood in a greater percentage than in the Al-Hussein neighbourhood. As for the physical obstacles are found in a greater percentage in the Al-Intisar neighbourhood, where the streets are not fully serviced (see Fig. 4).

Urban Planning Policy Gap

On the urban level, The results of the questionnaire shown in figure 5, that most of the buildings of the Al-Intisar neighbourhood are poorly executed, and not fully finished, which gives the appearance of a poor building that does not have an identity or a distinctive architectural character. On the other hand, the Al-Hussein neighbourhood has most of the houses in it with complete finishes, and with modern architectural designs. As for the slums, we find that they appear in the Al-Intisar neighbourhood along the agricultural lands extending on the Euphrates River to turn into irregular residential purposes. There is not enough diversity of activities in the Al-Intisar neighbourhood. On the other hand, we find their diversity in the Al-Hussein neighbourhood. As for the rental markets, we find that they are not subject to supervision, as their wages rise in the Al-Hussein neighbourhood. As for the financing in the form of loans to buy and rent land, we find that there are limited opportunities for the low-income residents of the Al-Intisar neighbourhood, with complex conditions. And the absence of any housing complexes within the Al-Intisar neighbourhood despite the availability of sufficient spaces. On the other hand, the Al-Hussein neighbourhood contains an expensive residential complex (see Fig. 6).

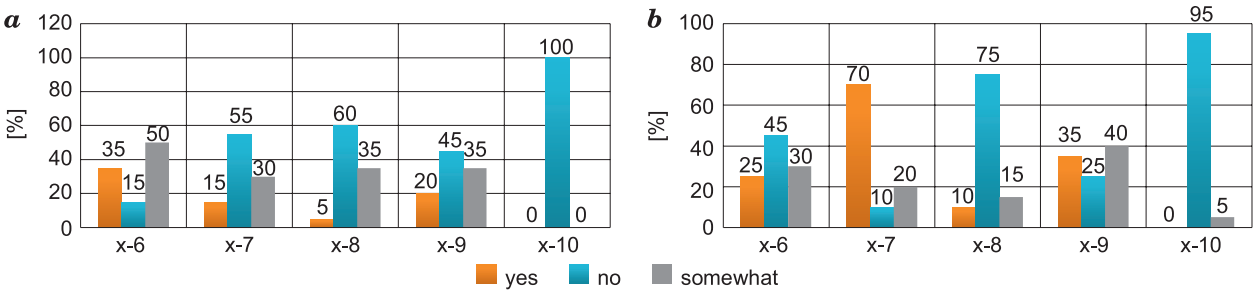

Fig. 5. The results of achieving the urban planning policy strategy in Al-Intisar neighbourhood (A) and Al-Hussein neighbourhood (B) – % of respondents' answers (05.12.2021)
Source: own analysis based on the results of the survey questionnaire.

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Fig. 6. Explanation of the urban planning policy gap between the two neighbourhoods.
Source: authors' photographs.

Urban connectivity gap

The results of the field survey and the questionnaire whose results are illustrated in the figure 7 showed the communication gap, Al-Intisar neighbourhood is devoid of any space for a family gathering, whether recreational, gardens or children's playgrounds, it contains a group of gathering spaces planned within the neighbourhood some of which are implemented while the other is under implementation, represented by parks and gardens for families to gather and playgrounds for children (see Fig. 8). We find

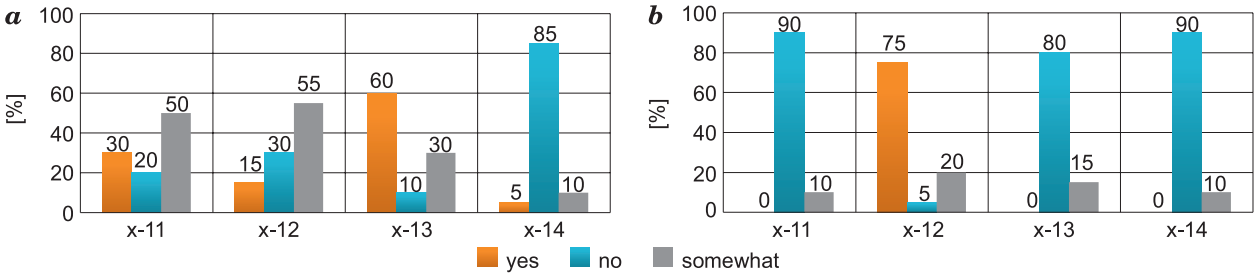

Fig. 7. The results of achieving the urban connectivity strategy in Al-Intisar neighbourhood (A) and Al-Hussein neighbourhood (B) – % of respondents' answers (05.12.2021)
Source: own analysis based on the results of the survey questionnaire.

Fig. 8. The difference is in the gathering places and the connection of both neighbourhoods
Source: authors' photographs.

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many obstacles caused by the lack of infrastructure in the Al-Intisar neighbourhood when compared to the similar quality in the Al-Hussein neighbourhood, which contributed to increasing the gap between the two neighbourhoods. There are also no significant programs targeting poor families and helping to bring together dispersed communities. Regarding urban renewal, in previous years, no urban renewal projects took place at the urban level, except for some single and fragmented projects the most important projects is affecting the level of both neighbourhoods is the construction of the Barbuti bridge and North Samawah bridge where they strengthened the connection between the two neighbourhoods after it was almost non-existent, but these two projects were not enough to bridge The multilevel gap between the two neighbourhoods.

DISCUSSION

In the light of the literature and after identifying the urban gaps in the field of practical study, the research discusses an analysis of the possibility of applying the proposed solutions within three important strategies to break the hard fears in cities, where the role of *the access strategy* is linked to the development of the urban spatial structure and linking the gaps in the city (Krzywnicka & Jankowska, 2021) through:

Connecting the two neighbourhoods with an effective integrated public transport between the two neighbourhoods, instead of being separate in the past, and extending it to include all the surrounding main streets, and the integration of the pedestrian movement network without obstacles to achieve access to places and activities by the residents of both neighbourhoods. Activating the river transport to enhance the interconnection of the two neighbourhoods, after it was neglected and became ineffective in the past, activate all axes leading to the river, activating the bridge to be not only for cars but also a dynamic axis dedicated to pedestrians that contains a variety of activities, addressing the lack of access to infrastructure services that Al-Intisar neighbourhood suffers from, as well as Al-Hussein neighbourhood, removing the psychological obstacles (fear of the crime, class discrimination among the residents of neighbourhoods) from which the neighbourhood suffers.

Further fragmentation imposed by ongoing societal transformations, providing opportunities for interaction and facilitating city management at various spatial and administrative levels (Onyango et al., 2021) can also be avoided through *the strategy of enhancing urban planning policies* to enhance opportunities through:

Avoid uncontrolled and unplanned "urban sprawl" in both neighbourhoods, and work to remove encroachments, especially those based on agricultural lands and near the river, protection from urban heterogeneity through the proximity of services and facilities and avoiding zoning, the fragmentation of neighbourhoods, and the closure of these neighbourhoods, monitoring the rental, buying and selling markets to make them suitable for both neighbourhoods, providing loans and credits that the middle and weak classes can obtain, building public/private rental housing units equipped with services as part of social housing policies.

In addition to using the *communication strategy* as the backbone of the diverse fabric of the city to provide a social or spatial network that connects people and places together in the two neighbourhoods, providing access and opportunities for all (Powers, 2016) through:

Creating more permeable neighborhoods, in which the infrastructure does not create solid borders between communities, but rather it becomes the means to bring and mix them together by making the bridges linking the two neighborhoods (North Samawa Bridge and Barbuti Bridge) not only as a means of transporting cars, but rather making it a dynamic hub that contains attractive activities for the residents of the neighborhood, enhancing interactions and experiences between the two neighborhood residents by activating activities along the river's edges, alienation and separation that you feel due to the different social classes, by

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proposing the establishment of a green bridge for pedestrians that contains a variety of activities that attract pedestrians from both neighborhoods to meet and exchange conversations, find areas that can be "activators" to tie the urban fabric and communities together, such as farmland along a river, and design a project that serves the surrounding community and brings its citizens together in an educational setting. It requires the existence of urban renewal projects that contribute to the development of the two neighbourhoods, and improve the quality of life and the well-being of residents, especially the Al-Intisar neighbourhood.

CONCLUSIONS

From the information we have collected, it is clear that social and economic classes are reunified through simple architectural and urban strategies. The hard edges created by infrastructure must be broken to create a more permeable city, which will enhance interactions between communities through an architectural intervention focusing on bringing people together in an open and educational environment where the gap created by social stratification can be bridged. By understanding the causes of stratification and its pressure on society, one can then strive to reform and unite a fractured society. Many neighbourhoods face this urban divide, so it requires much sustainable effort that includes multiple strategies to bridge the urban divide. Accordingly, we made our recommendation for the functional study area, which focused on unifying the two neighbourhoods and removing the physical and moral boundaries between them to reach urban justice by following three essential strategies, which are the access strategy, the strategy of enhancing urban planning policies, and the communication strategy. It is possible to mitigate the adverse effects of the urban injustice gap by stitching the urban fabric and reconnecting it together to reach more mixed communities with no barriers between them.

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MY HOME IS NO LONGER MY CASTLE. COLLABORATIVE HOUSING AS AN ELEMENT OF SHARING ECONOMY

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ABSTRACT

Collaborative housing is considered a long-term housing option based on the idea of sharing space in a community-boosting manner. Residents share areas like laundry, utility or leisure rooms. On this basis the authors argue that housing may be treated as a commodity that could be shared just like sharing economy goods are. Thus the aim of this study is to evaluate the potential of collaborative housing from the sharing economy perspective. To achieve the aim, concepts of Curtis and Lehner (2019) and Curtis (2021) were applied to check what collaborative housing lacks to become a fully-fledged sharing economy entity. Apart from the nature of housing, which is by no means a fast moving consumer good, the lack of a digital platform that is the basis of most sharing economy entities, is the most visible difference between collaborative housing and sharing economy entities. Moreover, a questionnaire survey was conducted among prospective housing market users in Poland to check their awareness and readiness for this housing option. The research findings confirmed that they are still very low among housing market participants and private property is still considered considerably better than shared property. However, a tighter connection between collaborative housing and the sharing economy may provide the impetus for the young generation to enter this form of housing. The study is a contribution to the debate on collective housing options in Europe and may be considered novel as it attempts to conceptualize and position collaborative housing within the sharing economy context.

Keywords: collaborative housing, sharing, housing, shared housing, cohousing, housing market

INTRODUCTION

Granting broad and global access to the Internet, popularizing smartphones, increasing the cost of "ownership" in relation to the cost of "access" to products or services, entering the market by the digital generation born at the turn of the millennium and strong pro-ecological trends focused on climate change cause significant socioeconomic changes. Consumers who consciously and carefully resign from possessing in favour of sharing means of transport, office space or equipment, are turning their eyes towards the advantages of sharing their houses and flats – premises that have so far been protected against the outside world. The famous 17th century English saying "My home is my castle" is no longer (so) relevant.

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The subject of the study is the concept of sharing economy, understood as a socio-economic system that facilitates the exchange of products and services between individuals and organizations, the aim of which is to increase efficiency and optimize unused resources in society (Munoz & Cohen, 2017). Sharing economy is based on putting the unused resources in use in a way that improves efficiency and sustainability. Sharing economy takes advantage of the potential of collaborative economy platforms by connecting people through them and enabling them to provide services or share resources (e.g. cars, real estate, media content, time, skills or capital) without transfer of property rights. As a consequence, prosumers are created, i.e. consumers and producers in one, gaining the potential to reach a wide group of customers (PwC, 2016).

To illustrate the sense of limiting excessive consumption in favour of sharing things, researchers most often use examples of rarely used equipment for minor repairs or gardening (Apte & Davis, 2019; Botsman & Rogers, 2010). By replacing ownership with common access to items, the use of sharing leads to a reduced production of equipment and, consequently, a reduction in the consumption of raw materials and greenhouse gas emissions. Households are responsible for about 70% of the global environmental footprint, therefore it is extremely important to implement changes at their level (Ivanova et al., 2016). In addition to tangible benefits in the environmental context, shared hopes are placed to shape new forms of cooperation and relations between individuals. It is emphasized that the concept of the sharing economy should be developed towards a greater sense of community, decentralization and solidarity (Gossen et al., 2019). The potential of under-utilized resources is mainly seen in five sectors: automotive, technology, product trading, accommodation and entertainment, media and communication. It should be noted that the large actors of the sharing economy remain best researched, particularly in the car sector (Shaheen & Cohen, 2008; Stryjakiewicz et al., 2021). Sharing has enormous economic potential, estimated in the report for the European Parliament at EUR 260 billion per year, which is approximately 1.5 times the European Union budget. The search for savings on the level of equipment, vehicles or accessories that we rarely use, had to translate into optimizing housing expenses too.

An apartment or house, the acquisition and subsequent maintenance of which is one of the most expensive goods in the shopping basket of households (Kisiała & Rącka, 2021), naturally enters the scope of interest of the sharing economy. Even though an apartment or house is traditionally perceived as a private, secure and intimate place (Kisiała & Suszyńska, 2017), more and more people realize that they are not making full use of this resource. Goudin (2016) emphasizes that the average oversupply of housing resources in Europe is estimated at around 3%. The research conducted by the European Commission in 2021 on short-term rental with the use of online platforms (renting a room in a private flat, apartment or house using online platforms) shows that in the EU-27 countries, this solution varies widely (European Commission, 2021). In France, every second person uses short-term rental via platforms, in Austria and Germany every sixth. On average, in the EU-27 countries, 25% of respondents have taken advantage of short-term rental (the sum of the answers "sometimes" and "at least once a month"). People aged 25–39, studying or boasting higher education prevailed. Poland was ranked fourth in the EU-27 countries (after France, Slovenia and Hungary) in terms of popularity of short-term platform-based rental (32%). The respondents emphasised that the main reasons for using this type of service are price, desired facilities and attractive location. With regard to the creation of rental offers using platforms, in the EU-27 countries, less than 5% of respondents used this rental option (the option was most popular in Spain, Croatia, Greece, Malta, Sweden and Denmark). Landlords pointed to poor profitability, bad tenants and local regulations limiting rent. The main advantages of short-term rental with the use of platforms in the EU-27 were identified, i.e. additional source of income for the hosts, increased financial ability to travel, more money spent by guests

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in the vicinity of rented spaces, presence of guests in less touristic areas. The main disadvantages include: increase in noise, congestion and garbage produced, negative impact on prices and availability of housing for permanent residents, concentration of tourists in specific locations, lowering the sense of security and protection.

From the second decade of the 21st century, research based on the concept of sharing economy began to recognize the potential of housing not only in the field of short-term rental (often detrimental to the sustainable development of housing), but also in the field of long-term sharing. The aim of this study is to assess the potential of housing cooperatives in Poland as a form of long-term community living from the perspective of the sharing economy. A thesis has been put forward that collaborative housing boasts the potential to become an element of sharing economy.

In the literature and wider public discussion, the term collaborative housing was coiled in 2020 as an umbrella term encompassing housing forms with varying degrees of integration of the residents (Czischke et al., 2020; Lang et al., 2020). These forms include various widely known variants of shared housing, but also other forms such as: ecovillages, community housing initiatives and construction groups, mutual support groups, non-profit housing, housing cooperatives, and community trust funds (Czischke et al., 2021). The authors distinguish three main features of housing collaboratives, such as: common space, wide participation and creation of the community (Lis et al., 2022). It is housing with more common space or shared facilities than in conventional housing (Vestbro, 2000). In addition, it includes private space alongside common space (Fromm, 2012; Lietaert, 2010; Marcus, 2000). Moreover, it is crucial to participate as broadly as possible in organizational, decision-making and financial processes (Bamford & Lennon, 2008; McCamant & Durrett, 2011), as well as in non-hierarchical, consensual forms of group decision-making (Cheung et al., 2014; Sørvoll & Bengtsson, 2020). Collaborative housing is most often based on housing ownership and shared ownership of common space, but there are different legal forms, types of ownership and organizational structures around the world (Czischke et al., 2020). According to Vestbro (2000), the existence of extensive common space or shared facilities is the main difference between collaborative housing and traditional forms of housing.

In collaborative housing, a key element is also the social bond, integration between residents. It is often a natural phenomenon when the project brings together like-minded people, having the same housing needs or common goals related to environmental sustainability. Collaborative housing is based on a strategy of consensus and a lack of hierarchy – the residents jointly control the investment process and jointly make an effort to arrive at decisions (Tummers, 2015; Cheung et al., 2014).

It is often relatively easier than in traditional housing associations due to the fact that the initiators of such projects have similar views and values, or they share a common vision and readiness to live in housing with specific rules of operation (Sargisson, 2012).

MATERIALS AND METHODS

In terms of methods used, the authors applied the concept of Curtis and Lehner (2019) and Curtis (2021), which enables the identification of the entities of the sharing economy and the attributes associated with their day-to-day operation. To identify the potential of collaborative housing in Poland, an online questionnaire was conducted among university students from the entire country.

Based on the analysis of sharing economy definition, which means broadly understood social and economic activities (Dreyer et al., 2017), consumption and organization models (Habibi et al., 2017) that assume various forms of sharing, the authors adopted a set of features that may help to exclude entities from such a classification. The selection of features was first proposed by Curtis and Lehner (2019) to identify entities that are not sharing economy representatives. Thus, sharing economy excludes the following entities:

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1. businesses operating on the basis of the B2C (business to consumer) formula;
2. second-hand market entities providing redistribution services in which ownership is transferred to the buyer;
3. entities offering intangible products.

Curtis (2021) distinguishes a set of attributes that should characterize an enterprise in this sector. First, it should supply users with an exchange platform. Such entities should use technology to operate bi- or multilateral platforms in order to forward goods with greater usable potential, to facilitate exchanges of those goods and to allow transactions between resource-owners and users. Typically, the owner of the platform is not the owner of the traded goods. The value is not created directly by the platform itself, yet it is reinforced through an intermediary system, including a user feedback system.

Second, in the literature there is an assumption that one of the main goals of the sharing economy is to activate the untapped potential of already produced goods. Experts emphasize that in the market economy, sharing economy companies compete in terms of accessibility and convenience of use. These actors are under pressure to buy more and more new products and offer them to users in order to increase availability, which in turn leads to an oversupply of items with untapped usable potential.

Third, the collaborative economy sector pursuing environmental sustainability should be guided by non-financial motives. Curtis and Mont (2020) point out that they do not rule out income as an organisation's goal, but it should not be the primary business premise. As follows from the previous rule, resource owners should not purchase new goods to multiply the income derived from the sharing of goods. This principle allows to prevent a situation when the unused potential is created and magnified by the owner of the resources. Short-term apartment owners should not buy more city centre properties for the sole purpose of listing them on Airbnb or purchase multiple new drills for sharing through Peerby.

Fourth, sharing economy entities should promote temporary access to goods rather than ownership of them. Business models of enterprises in this segment should maximize the number of users of the shared good (Curtis & Mont, 2020).

Based on the features listed above, the authors constructed and conducted a questionnaire survey among 407 students of Polish universities (Table 1). The potential of collaborative housing as new forms of housing was examined. The beliefs and preferences influencing the choice of the future housing route were analyzed. The authors chose students as the target group due to the fact that they will soon be active participants in the housing market, and thus will face various investment options and housing forms on this market. The CAWI survey was distributed among students of eight universities, the sample selection was purposeful – only the last grade students of economics and finance were selected. Such a decision was dictated by the selection of students with basic knowledge (minimum at the bachelor's level) in the field of finance and investment. The authors wanted to avoid the situation that the respondents are not aware of the investment environment in Poland or investment possibilities in the housing market. Due to the uneven distribution of respondents between universities, the sample is not representative.

Table 1. Structure of respondents by universities

Name of the university	N (%)
Poznań University of Economics and Business	156 (38.7)
University of Białystok	72 (17.9)
Calisia University	31 (7.7)
Jagiellonian University in Cracow	30 (7.3)
University of Lodz	22 (5.5)
Maria Curie Skłodowska University in Lublin	20 (5.0)
University of Gdansk	17 (4.2)
University of Szczecin	16 (4.0)
University of Warmia and Mazury in Olsztyn	14 (3.5)
Cracow University of Economics	9 (2.2)
University of Warsaw	6 (1.5)
University of Rzeszow	4 (1.0)
Wroclaw University of Economics	1 (0.2)
Other	8 (1.9)

Source: own study.

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Multiple-choice questions were mainly used in the study. Demographic data such as place of residence, housing form and region were asked (Table 2).

Table 2. Structure of respondents by place of residence

Place of residence	N (%)
Rural area	114 (28.0)
City up to 99 thousand residents	93 (22.9)
City between 100–499 thousand residents	100 (24.6)
City above 500 thousand residents	100 (24.6)

Source: own study.

Taking into consideration the aim of the study, the question about the form of living appears to be of particular importance (Table 3). The current housing status influences the way respondents perceive various tenure forms, cohabitation along with attitude towards ownership or renting. At the time of the study, over 71% of the respondents lived in an apartment/condo. The second most frequently used form were flats/houses rented on the private market (17.2% of the respondents). Subsequently, rooms/flats in dormitories (5.7% of indications), 4.4% dwelled cooperative flats, 1% used social housing (provided either by the commune, social housing associations or employers). The remaining options were indicated by single respondents: living in their parents' house (0.2%), or renting an apartment from friends (0.2%).

Table 3. Structure of respondents according to the current housing status (tenure)

Tenure form	N (%)
I live in an ownership flat/house	289 (71.0)
I live in a cooperative	18 (4.4)
I rent a flat/house in the commercial market	70 (17.2)
I rent from the commune/employer/social housing association	4 (1.0)
I rent a room/I live in a dormitory	23 (5.7)
I rent a flat from my friends	1 (0.2)
I live in my parents' house	1 (0.2)

Source: own study.

RESEARCH RESULTS

With regard to the attributes characterizing the entities of the sharing economy, the authors analyzed the potential of collaborative housing initiatives in this context. By definition, collaborative housing are based on cooperation and sharing, which, according to the authors, somehow predisposes this form of residence to be included in the group of entities involved in the sharing economy. But do they meet all of Curtis's (2021) criteria?

The first prerequisite is incorporating a digital exchange platform. Traditional collaborative housing projects are based primarily on social networks. They are used for exchanging views and developing new initiatives. At the stage of establishing a collaborative housing project, digital technologies are broadly used to connect its prospective members. However, there are no such popular and widely used digital platforms in this form of residence as in the case of short-term renting. There is a considerable loophole in this field. The platform could support the selection of tenants for the collaborative housing project and the process of joining or leaving the project (e.g. finding a new tenant willing to replace the leaving tenant). Such exchange platforms, the so-called choice-based letting (*CBL*) systems operate in the social housing segment (Muczyński, 2011, 2022), for example in the Netherlands, Ireland and England (Suszyńska, 2017; Muczyński & Goraj, 2021).

The second criterion indicated by Curtis (2021), i.e. action aimed at activating the unused resource potential, is fully applicable in the case of collaborative housing. Flats and space there are designed according to the preferences of a specific household, and common space is also rationally used by all residents. Shared laundries, bicycle rooms, places for games and fun, or spaces outside a residential building become a developed and fully used space. There is also an intensive exchange of tools and other belongings between residents. Th reluctance of residents

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to waste space or resources creates great potential for collaborative housing projects to function on sharing economy basis.

Curtis chose non-financial motivation as the third criterion. It does not completely rule out financial rationale, but they should not prevail over social motives. Taking into account the profile of the inhabitants of cooperatives, who often choose this form of residence, their willingness to devote their free time, often shared worldview, the risk of their acting solely for profit is minimal. Therefore there is no fear that this type of projects becomes dominated by commercial entities, as is the case with short-term leases. It seems impossible and irrational for investors to create new housing cooperatives solely for the purpose of quick profit. The design, construction and management process in the case of housing cooperatives is elongated and complicated, and the offer of such space itself cannot be addressed to a mass audience.

The fourth criterion assumes the promotion of temporary access to goods – sharing, lending, exchange, rather than ownership of them. According to Curtis and Mont (2020), the business models of enterprises in this segment should maximize the number of users of the shared good. With regard to collaborative housing, sharing applies to common spaces and spaces outside the building. Even despite the functioning of individual flats on the basis of ownership, these rooms and spaces should be made available for free use for all collaborative housing project participants.

With regard to the assessment of the potential of collaborative housing in Poland on the basis of the study, it is worth highlighting a few key areas.

The respondents were asked about the planned housing career by 2030. Over 45% of the respondents declared that they would buy their own flat or single-family house, 37.6% of the respondents would like to build their own single-family house themselves, and 9.8% of the respondents were willing to decide to rent a flat or a single-family house. Less than 10 out of 407 respondents consider collaborative housing as a plausible future housing form. 4 respondents (1%) took into consideration renting an apartment with common space for work or leisure time, and shared spaces outside the building. Five respondents (1.2%) indicated that they would consider carrying out a housing project with a group of several or a dozen people, where they would be able to commonly design a residential building, plan and design their own flat, along with shared space for work and leisure inside and outside the building. Interestingly, the majority of respondents, despite the lack of a clear willingness to participate in a collaborative housing project, indicated that the benefits of this type of investment, such as competitive price, the possibility to design the building, common space, flat and outdoor facilities, are attractive and could make them decide to join such a project (Table 4).

Table 4. Amenities that attract people to join a collaborative housing project

Function	Factor	N		
		Yes	No	I do not know
Facilities that could potentially attract residents to a collaborative housing project	Lower construction costs of an flat than in a commercial project	326	46	37
	Possibility to design the space outside the building (garden, terrace, parking spaces)	323	70	55
	Possibility to design the flat to suit current needs of the household	301	63	52
	Possibility to choose architectural style	287	84	53
	Impact on the design of the common space in the building (for work, leisure)	278	63	26
	Impact on the neighborhood (prior acquaintance with future residents)	251	89	80

Source: own study.

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In the questionnaire, the respondents were also asked about external factors that would increase their possibility of making a decision to join a collaborative housing project (Table 5). The respondents considered very important the possibility of easier acquisition of investment financing (71.7%) and the cheaper purchase of land from the city/commune (69.5%), as well as information assistance from the city/commune in the implementation of the investment (41%) or the possibility to exchange experiences with other investors in the segment (33.7%). Much less attention was paid to information materials (social media, webinars), which could theoretically increase knowledge and awareness of this type of investment. Only 15% of the respondents thought that such information could increase the possibility of making a decision to join a collaborative housing project. In Poland, collaborative housing projects are not widely known, it is worth emphasizing that the majority of respondents did not come across the idea of collaborative housing (81.1% of the respondents). Perhaps unfamiliarity with this housing form makes the respondents reluctant to consider it in their housing plans.

On the other hand, there is a range of factors discouraging the respondents from joining this type of construction (Table 6). The investment process in collaborative housing is specific and time-consuming in comparison to developer construction (56.5%), requires a lot of involvement of future tenants (28.3%), there is a need to resolve conflicts with future flatmates/ neighbours (62.7%), and active involvement in community management is obligatory (28.3%). In addition to the above, the need for contribution in the process of arrangement of common spaces was also indicated, (18.7%), prohibition of selling the flat for the specified period (0.2%), and the lack of privacy (0.2%).

Table 5. External factors that attract people to join a collaborative housing project

Function	Factor	N (%)
External factors that could potentially attract residents to a collaborative housing project	Possibility of easier acquisition of investment financing	292 (71.7)
	Purchase of land from the city/commune with a discount	283 (69.5)
	Assistance from the city/commune in the implementation of the investment	167 (41.0)
	Possibility to exchange experiences with other investors in the segment	137 (33.7)
	Availability of information materials (social media, webinars)	61 (15.0)
	Location of the building	1 (0.2)
	No factors can attract me to live in a collaborative housing project	11 (2.4)

Source: own study.

Table 6. Factors discouraging people from living in collaborative housing

Function	Factor	N (%)
Factors that could potentially discourage people from living in collaborative housing	Need to resolve conflicts with flatmates/neighbours	255 (62.7)
	Extended process of designing and construction of the building (different expectations and needs of residents)	230 (56.5)
	Involving residents' private time in the design and construction of the building (numerous organizational meetings)	115 (28.3)
	The need for active involvement in the management of the community	115 (28.3)
	Devoting time to arrange common spaces	76 (18.7)
	Current situation in the housing market	1 (0.2)
	Lack of possibility to sell the flat in a specified period	1 (0.2)
	Lack of privacy	1 (0.2)

Source: own study.

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A group of respondents declaring that no incentives would convince them to live in this type of construction (2.4%) was also identified. In the last question, the respondents could express their own opinions/conclusions. They emphasized that:

> "The initiative itself seems very interesting and tempting, taking into account the current housing prices in larger cities. However, the biggest disadvantage of the project is the duration of the construction, and consequently, the changes and complications that arise for those involved in the project.
>
> Shared ownership means compromise, which unfortunately is not beneficial in the long term due to the conflicts that are triggered by the people and their nature. Moreover, private property is economically more profitable than renting in the long run.
>
> When building something yourself, you work for yourself and your family, and you do not have to wait for the opinions of other flatmates, which will only result in waste of time when carrying out the construction and a lot of nerves in case of conflicts".

Despite the general reluctance to live in collaborative housing, the respondents drew attention to the functional features of the flats. They are not typically implemented in fully commercial developer construction, yet can be implemented when making private investments like collaborative housing projects. Over 48% of the respondents pointed to the ecological way of heating a flat and the possibility of using electricity obtained from solar panels.

DISCUSSION AND CONCLUSIONS

In the sharing economy, a key principle is that the resources that are the subject of the transaction are temporarily not used (yet ready to be used). All the positive effects of the sharing economy are based on unused resource capacity and the fact that people offer services using resources they have, but whose use-value is temporarily unused (Gil & Sequera, 2020). In collaborative housing, resources are typically used in a way maximizing their value, e.g. laundries, bicycle rooms, utility rooms, leisure rooms and outdoor space. One may definitely expect that the negative phenomena that occur in short-term rental with the use of digital platforms will not be observed in collaborative housing (Wachsmuth & Weisler, 2018). In this sense, collaborative housing is closely related to the sharing economy, which in its most restrictive assumptions may totally prohibit monetary exchange or remuneration opportunities, since sharing contradicts commodification of exchange (Belk, 2014; Frenken & Schor, 2017; Schor, 2017; Schor & Attwood-Charles, 2017). With regard to the digital platform, which is often the basis of sharing economy entities, there is no dedicated platform for collaborative housing project residents. Social networks ensure the communication of residents, other applications such as Borigo in Denmark are still a niche solution. There are applications supporting the sharing of occasionally used things, such as the American Omni, but direct communication or using social networks in housing cooperatives dominates. There are applications supporting the sharing of occasionally used things, such as Omni in the USA, but direct communication or using social networks prevails among collaborative housing users.

As the research carried out shows, the knowledge and awareness of collaborative housing is still very low among housing market participants. Moreover, it was observed that young people preferred private property over shared property. On the one hand, they declared that they would like to purchase flats at preferential prices, with an easier possibility of obtaining financing, yet on the other hand, they were not willing to engage in a long-term investment process. However, taking into consideration the socioeconomic impact of sharing nowadays, collaborative housing boasts considerable potential to become one of its natural elements, and one of the standard housing forms chosen by people who are ready to share resources.

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