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AWARENESS AND DEVELOPMENT OF GREEN-BLUE INFRASTRUCTURE IN THE PROCESS OF URBAN MANAGEMENT IN THE GZM AREA IN THE LIGHT OF OWN RESEARCH

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Purpose: Aggressive urbanisation is drastically reducing the area of green-blue resources in cities, leading to threats of flooding from heavy rains and drought due to the high degree of pavement sealing. Setting a new direction for urban space management is becoming necessary, emphasising designating new areas for tree planting and water retention. To ensure this process's effectiveness, it is crucial to be aware of the importance and necessity of increasing green-blue infrastructure in urban spaces in the face of climate change. The purpose of this article is to present the results of a survey conducted among people holding public functions in local government, i.e. mayors, councillors, employees of offices, as well as residents of the Górnośląsko-Zagłębiowska Metropolia (GZM) regarding awareness of the importance and development of green-blue infrastructure in urban spaces in the process of city management.
Design/methodology/approach: The research problem is to identify the prevalence of certain beliefs and thoughts among residents and city and municipal leaders of the GZM regarding the importance and benefits of developing green-blue infrastructure in urban space. A quantitative research method (questionnaire survey) was used to carry out the research, as well as the method of analysis and criticism of the literature.
Findings: As a result of the analysis of the survey questionnaires filled out by respondents, it was discovered that residents see the need to take measures to develop blue-green infrastructure in the cities and municipalities of the GZM and consider them valuable. A particular group of residents - those who also hold a position in local government do not differ in their assessment of the issues studied from those who live in the GZM; they only declare greater knowledge of green-green infrastructure and actions taken by local governments in this regard.
Practical implications: The results of the research can support mayors in managing a city, taking into account concern for the comfort of residents in an increasingly urbanised area and exposure to various weather anomalies in urban space. **Social implications:** The study's results will help increase the belief that action is needed for climate adaptation and green-blue infrastructure development.
Originality /value: For several years, the scientific discourse on public management at the local level has seen a view of the need to adapt urban spaces to climate change. The research fills the knowledge gap in identifying the beliefs and thoughts of city and municipal leaders of the GZM, as well as residents' expectations regarding the development of public space, including the development of green-blue infrastructure.
Keywords: urban management, green-blue infrastructure, urban planning and management.
JEL Classification: R11, R58, H70.

1. Introduction

How urban space is developed results from many different conditions, and its effects are subject to evaluation and public acceptance. In the last decade, one can see a trend in urban space planning towards greater recognition of the role and importance of the natural environment in urban space (Valente de Macedo et al., 2021; Hou et al., 2024)[1]. Unfortunately, the solutions put in place are not always sufficient due to a lack of awareness of the importance of green-blue infrastructure (GBI) in modern urban space.

Modern urban space management requires constant concern for diminishing natural resources and consistent replenishment by implementing new infrastructure, such as retention basins or rain gardens (Panagopoulos et al., 2018, pp. 9, 58). Modern urban management also involves the designation of areas for tree planting, the quantitative development of public green areas, and the dissemination of solutions to reduce the effects of so-called "concreting" (e.g., by creating *pocket parks*) so that greenery becomes an essential and integral city-creative factor. Actions taken by local governments in public spaces should be combined with support for grassroots residents' initiatives to create a synergy between local authorities and residents.

In urban space management, implementation and maintenance costs play an essential role, which, in the case of nature-based solutions (NbS) are smaller than the costs of the so-called *grey* infrastructure (http://ec.europa.eu). However, awareness of this fact does not seem to be widespread among local government officials and residents.

Planning and management of urban space based on the development of green-blue natural and infrastructural resources is first and foremost:

- increasing the quantity of resources (creating new infrastructure),
- increasing the quality of resources (cleaning up the wooded areas),
- designating new infrastructural resources in the areas most affected by concretions (uncovering watercourses, creating rain gardens).

To effectively implement the measures mentioned above in urban space, it is necessary to start with their planning, which will be effective only when the local society is convinced of the rightness of their introduction. Therefore, it is reasonable to ask whether the city administrators and residents are convinced of the necessity of green-blue infrastructure development in modern city management. It is also important to diagnose what external and internal factors influence the local community's beliefs about the causes of climate change in the modern world, the real and effective possibilities of counteracting it, and the broadly understood formation of spatial order. The research part attempted to answer these questions, preceded by a critical analysis of domestic and foreign literature on the importance of green-blue natural and infrastructural resources in urban space. The research part that presents the collected results for the first time ends the conclusions of the study.

[1] The maintenance and development of green-blue resources varies at the level of continents, countries, but also regions.

2. Literature Review

Urban space, especially the inner city, is a phenomenon that combines the interests of various stakeholder groups with different attitudes towards participation in the socio-spatial life of the city - property owners, residents and tourists (among them people with disabilities), but also entrepreneurs, corporations and environmentalists - whose expectations architects and urban planners are trying to put into practice. It is worth noting that a seemingly homogeneous group of residents of the same city may show radically different expectations of public space resulting, for example, from their age, family situation, material status or work. Every day in the urban space, the essential public life processes occur and intermingle with the private processes - on a strongly differentiated and large scale, creating a complex and unique urban structure. L. Wirth defined urban space as a compilation of 3 components – *society, technology and ecological order* while noting the multiplicity and diversity of attitudes, as well as social perceptions (Wirth, 1996). Conscious and rational management of urban space originates in the beliefs of the entire collective of the local community, which are changing due to various factors. Therefore, it is expedient to learn about them and shape them in a way that is appropriate to the following climate changes, keeping in mind the concern for the common good. A. Harasimowicz represents a similar voice, noting the need to create environmental infrastructure in urban space, which involves an inevitable increase in public spending (Harasimowicz, 2015, p. 27). Unlike urban areas, rural space does not interfere so drastically with the natural environment, which will result in less social tension in the approach to public space development. S. Gzell rightly notes that the discourse on the city and its future is moving toward the conclusion that regardless of the factors analysed, policies and development plans cannot depend solely on the work of so-called narrow specialists and experts. The interpretation of urban development must be characterised by holistic intersectoral integration, assuming (Kmak, 2018, p. 137):

- *in economics* – taking care to meet actual needs, not whims,
- *in relation to nature* – sustainability,
- *in technology* – relying on the best use of human knowledge,
- *in the creation of institutional order* – applying the principles of decentralisation and subsidiarity,
- *in achieving spatial order* – creating socially agreed instruments.

The shaping of urban space, including the development of green-blue natural and infrastructural resources, should be carried out so that residents are convinced of the expediency of the measures taken and accept them. It is also important to make residents aware that investments in this area respond to real, local and global needs in the context of climate change adaptation *(e.g., as part of ongoing public consultations or information campaigns).*

Urban space management (Naumann et al., 2020, p. 6)[2] focused on improving the quality of the urban natural environment due to the following reasons:

- the need to take action in the area of adaptation to climate change is occurring with increasing intensity. Given the high concentration of people and infrastructure, urban spaces are particularly vulnerable to the negative effects of these changes. Each city, due to its unique and diverse characteristics (social, spatial, economic), has a different vulnerability to the effects of climate change (Hill et al., 2011, p. 13)[3],
- the positive impact of the city's green-blue resources on the life and functioning of modern residents (Song, 2018),
- the need to increase the efficiency of public spending by synchronising and synergising the implementation of multiple objectives contributing to sustainable spatial development (so-called integrated urban development concepts).

According to a study conducted by Public for Spaces, developed urban space affects the quality of life and health of residents, attracts investment and develops entrepreneurship, becomes a venue for cultural events, develops tourism, improves safety and a sense of security, and determines the level of self-organisation of society (Stangel, 2013). A. Holub points out that urban space is becoming a consumer good, which is related to the increasing number of events held in public spaces and the fact that the public is looking for places that guarantee them a high sense of security (Hołub, 2005). In turn, scientific research confirms that climate change is occurring and will intensify in urban areas, and its symptoms will intensify (IPPC, 2018).

3. Methods

A quantitative survey was conducted using the CAWI method between 9.06 and 27.08.2024. The link to the questionnaire was sent out electronically to representatives holding local government functions and residents in 40 cities and municipalities in the GZM. The survey questionnaire was sent to the official e-mail addresses of city and municipality mayors, while to residents – mainly students and lecturers, the distribution was carried out through the staff of the WSB Academy in Dąbrowa Górnicza.

[2] It is increasingly referred to in the literature as urban management, emphasising an interdisciplinary and coordinated approach. It is increasingly proposed to understand urban planning as a discipline not limited to spatial issues but encompassing the complex context of processes, structures and problems of the urban environment and its impact on residents.

[3] E. Hill and a group of researchers point to what is known as a resilience path. If a negative event occurs and the city maintains its growth path (growth path), the city is considered shock-resistant. In a situation where the occurrence of a negative event affects the direction of the city's growth path, however, assuming that the city rebuilds its growth capacity after suffering a shock, it is considered resilient (resilient). In the event that it does not rebuild its development capacity, it is a non-resilient city.

As a result of the completed surveys, a total of 90 surveys were received back, i.e. 83 complete surveys (with no missing data) and seven surveys in which at least seven questions were completed (in addition to the metric questions) – 51 surveys were from residents who do not have a public function in the local government, 39 surveys from residents who are also representatives of the local government. The maximum error of estimation for the entire sample of respondents (n = 90), assuming the size of the GZM population at 2 million 250 thousand residents, is 10% at a confidence level of 95%. As a result of an intensive campaign to obtain completed questionnaires addressed to representatives of 41 cities and municipalities forming the GZM, we reached 24. This means that a satisfactory survey return of 59% was achieved. The largest number of responses came from Dąbrowa Górnicza (n = 4), Katowice and Piekary Śląskie (n = 3). One or two surveys each came from the other cities. The surveys included 13 chiefs or employees responsible for environmental affairs, nine chiefs or employees responsible for investment and infrastructure development, eight mayors, four councillors, three chiefs/employees responsible for urban planning, and two deputy mayors. The largest proportion of respondents had been in office for more than 15 years (38.5%), up to 3 years (20.5%) or between 5 and 10 years (18%).

Table 1.
Spatial structure of respondents who took part in the survey

No.	City of performing local government functions	N	No.	City of performing local government functions	n
1	Będzin	1	14	Piekary Śląskie	3
2	Bieruń	2	15	Pilchowice	1
3	Bobrowniki	2	16	Pyskowice	1
4	Bojszowy	1	17	Radzionków	1
5	Czeladź	2	18	Ruda Śląska	1
6	Dąbrowa Górnicza	4	19	Siemianowice Śląskie	1
7	Katowice	3	20	Siewierz	1
8	Kobiór	1	21	Sławków	1
9	Lędziny	1	22	Sośnicowice	1
10	Łaziska Górne	2	23	Zabrze	2
11	Mierzęcice	2	24	Zbrosławice	1
12	Mikołów	1	25	*Not indicated*	2
13	Ożarowice	1		**Total**	**39**

Source: own elaboration based on the collected data.

The sociodemographic characteristics of the respondents are shown in Table 2. The statement in bold shows the dominant category.

Table 2.
Sociodemographic characteristics of respondents who took part in the survey

	Local government officials n (%)	Residents n (%)
Age		
26-35	8 (21)	15 (29)
36-45	10 (26)	11 (22)
46-55	13 (33)	17 (33)
56-65	6 (15)	8 (16)
65+	2 (5)	0 (0)
Marital status		
married	34 (87)	17 (33)
single	3 (8)	17 (33)
in a civil partnership	1 (3)	13 (25)
divorced/separated	1 (3)	4 (8)
Having children		
none	4 (10)	31 (61)
one	21 (54)	11 (22)
two	12 (31)	9 (18)
three	2 (5)	0 (0)
Attitude towards faith and church		
I am a nonbeliever, and I am not interested in matters of faith and religion.	1 (3)	4 (8)
I am a nonbeliever because I believe that the teachings of the churches are wrong.	0 (0)	5 (10)
I am a believer, and I follow the church's instructions	6 (15)	9 (18)
I am a believer, but I practice my faith in my own way	12 (31)	19 (37)
I do not want to answer	20 (51)	14 (27)

Source: own compilation based on collected data.

The questions in the submitted survey questionnaire addressed the following issues:

1. beliefs related to ecology and climate change (determining the level of importance of taking pro-environmental actions, declaring the perception of climate change and determining its causes, determining the factors affecting the formation of attitudes towards ecology),
2. knowledge of green-blue infrastructure (ability to define what GBI is and what its functions are, knowledge of the implementation of GBI investments and their evaluation),
3. beliefs about the development of green-blue infrastructure (recognising the positive impact of GBI on urban space and counteracting climate change, and identifying the benefits of GBI development),
4. priorities of the local government (selecting priority tasks for the local government and determining the position of GBI development among them, determining the legitimacy of financing GBI development from the city budget),
5. activities related to developing green-blue infrastructure and their importance (determining the legitimacy and urgency of preventing climate change, determining the importance and how to shape GBI).

The study focused on testing the differences between the studied groups and presenting their views on environmental issues and green-blue infrastructure development. It was hypothesised that there are differences between residents and representatives in public office in their beliefs about the importance of pro-environmental measures, their assessment of the legitimacy of undertaking green-blue infrastructure development, and their knowledge of the BGI issue. It was assumed that local government officials would be more knowledgeable about BGI issues and its functions, more convinced of the positive consequences of BGI development, and consequently more likely to declare the need to carry out related tasks. On the other hand, it was assumed that there would be no differences in beliefs related to climate change and the need to counteract it, as well as with regard to factors shaping pro-environmental attitudes.

4. Results

The results of the conducted research are divided into five parts, which are as follows:

a) Beliefs related to ecology and climate change

Nine out of ten total respondents (91%) indicated that **it was important to some degree for them to take pro-environmental measures in their daily lives** (45.5% - rather important, 45.5% - definitely important). The responses did not differ significantly between the groups of respondents - residents and local government officials (Chi-square $p < 0.05$). It was similar to the answers to the question, "**Do you notice any negative climate changes taking place in the modern world?**". A total of 82% indicated that they do. Nearly half (47%) answered "definitely yes".

Overall, the factors that had **the greatest influence on the respondents' present attitude toward ecology** were observation of environmental changes (61% of respondents), life experiences (41%), upbringing and rules in the family home (40%), school education (29%), acquired education (28%), and social pro-environmental campaigns (23%). Less than 15% of respondents selected other factors.

Of the listed weather phenomena, the general public considered the following to be **the greatest threat**: heavy rains causing flooding and waterlogging (57% of respondents), heat (52%), drought (37%), as well as strong, gusty winds (28%) and hailstorms (23%). Other phenomena were selected by less than 20% of respondents.

A significantly higher percentage of residents indicated that inconvenient weather events affected immediate family members (29% vs. 8%). On the other hand, local residents were more likely to deny having suffered from weather phenomena (72% vs. 45%). The study groups did not differ significantly in terms of self-declaration (Chi-square $p > 0.05$).

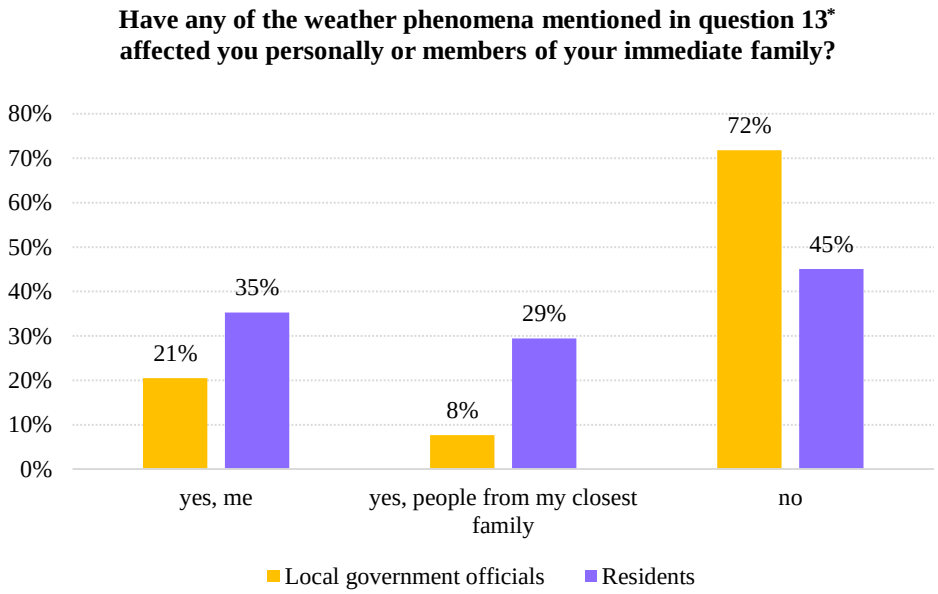

Figure 1. Beliefs related to ecology and climate change.

Source: own compilation based on collected data.

Half of the respondents (51%) were of the opinion that **the effects of nuisance weather phenomena can be effectively prevented at the local or regional level**—36% answered "rather yes", 16% answered "definitely yes". One in ten respondents (12%) indicated that determining this was difficult for them. In this case, the responses of residents and local government officials were very similar.

In response to the question "**who do you think is responsible for climate change in the modern world**?" the highest percentages of respondents overall chose the following answers: companies and industries (46%), global corporations (44%), the public (44%), national policymakers (31%), naturally occurring climate processes (30%). Other responses were selected by less than 10% of respondents.

b) Knowledge of green-blue infrastructure

A significant difference between the groups of respondents can be demonstrated with regard to questions concerning **knowledge of GBI** – what it is and what functions it performs (Chi-square $p < 0.05$; Mann-Whitney U $p < 0.05$). Here, as expected, local government officials are the group that was far less likely to declare that they could not identify these two issues.

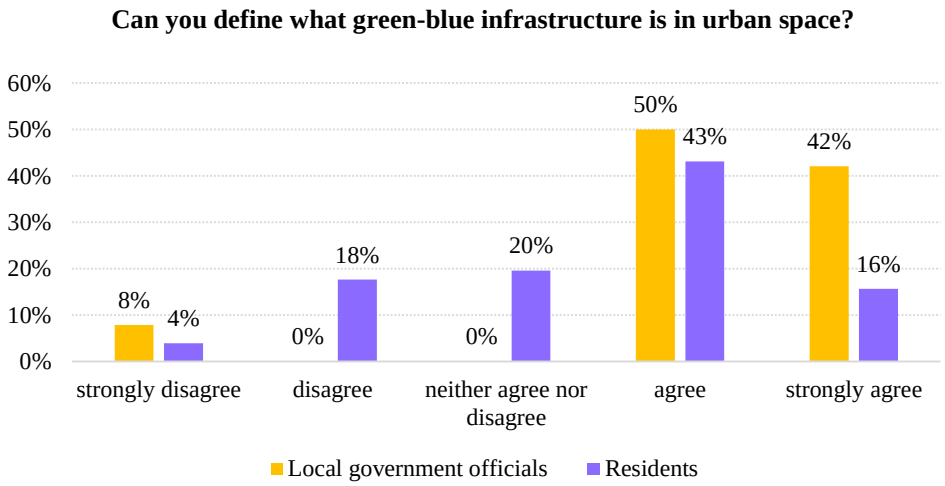

Figure 2. Knowledge of green-blue infrastructure (1).

Source: own compilation based on collected data.

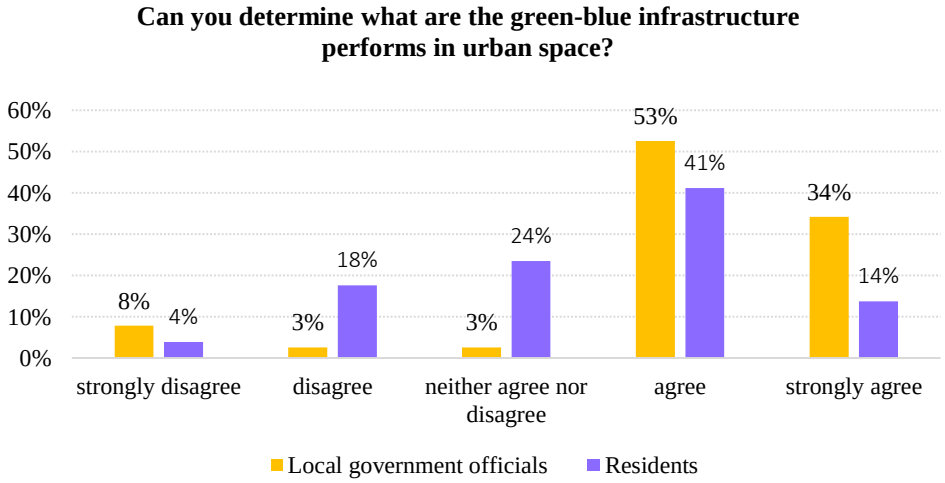

Figure 3. Knowledge of green-blue infrastructure (2).

Source: own compilation based on collected data.

The surveyed groups also differ in indicating **whether green-blue infrastructure investments have been made in their city** (Chi-square $p < 0.01$; Cramer's V: 0.4; $p = 0.01$). According to 42% of local government officials, they have been implemented. More than half of the residents had no knowledge of this.

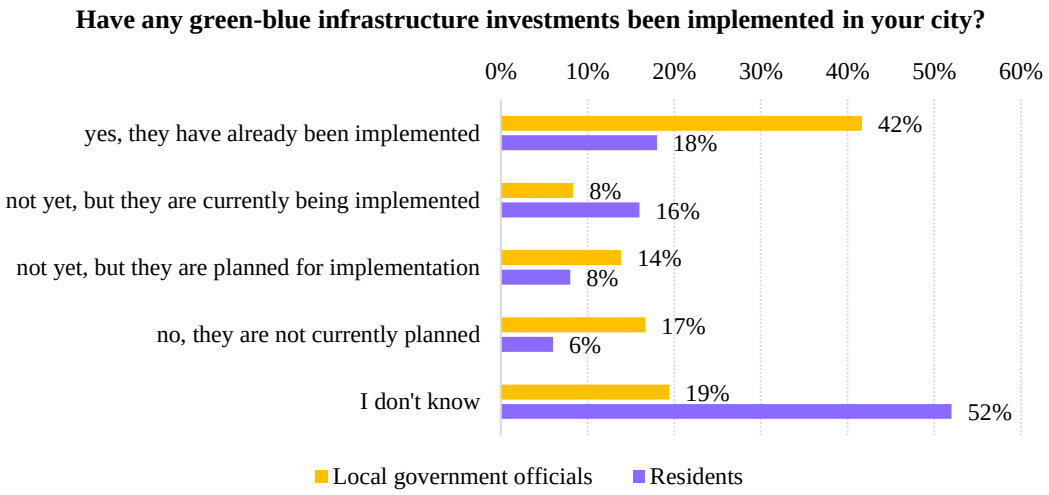

Figure 4. Knowledge of green-blue infrastructure (2).

Source: own compilation based on collected data.

The **assessment of whether the investments made are sufficient** (the answer was given only by respondents who indicated that investments are currently being made or have been made before) does not differ significantly (Chi-square $p > 0.05$) between the groups of respondents. Opinions are divided —40% considered GBI investments insufficient, 37% sufficient, and slightly more than one-fifth (23%) hesitated.

c) Beliefs about green-blue infrastructure development

Respondents, regardless of the group (Chi-square $p > 0.05$), believe that the development of **GBI can improve the comfort of living in urban space** (97% positive responses overall), **impact climate change adaptation** (86%), **counteract negative climate change** (84%), and **reduce the carbon footprint** (71%). If GBI is shaped in the right way, according to respondents, **it can influence local sustainability in urban space** (91%).

Among the benefits that respondents thought GBI development could bring were water retention (69% of respondents indicated this answer), water, air and soil purification (49%), and improved scenic qualities and potential for tourism and recreation development (48%) were the most frequently cited.

d) Priorities of the local government

Green-blue infrastructure development was ranked first among the five areas of choice. According to more than two-thirds of respondents (69%), it is a priority. In second place with a slightly lower percentage (62%) was the development of road infrastructure conditioning safety improvements. The only area on which the surveyed groups differed (Chi-square $p < 0.05$) was the development of administration, particularly e-government services - according to 16% of residents and 0% of local government officials, it should be prioritised.

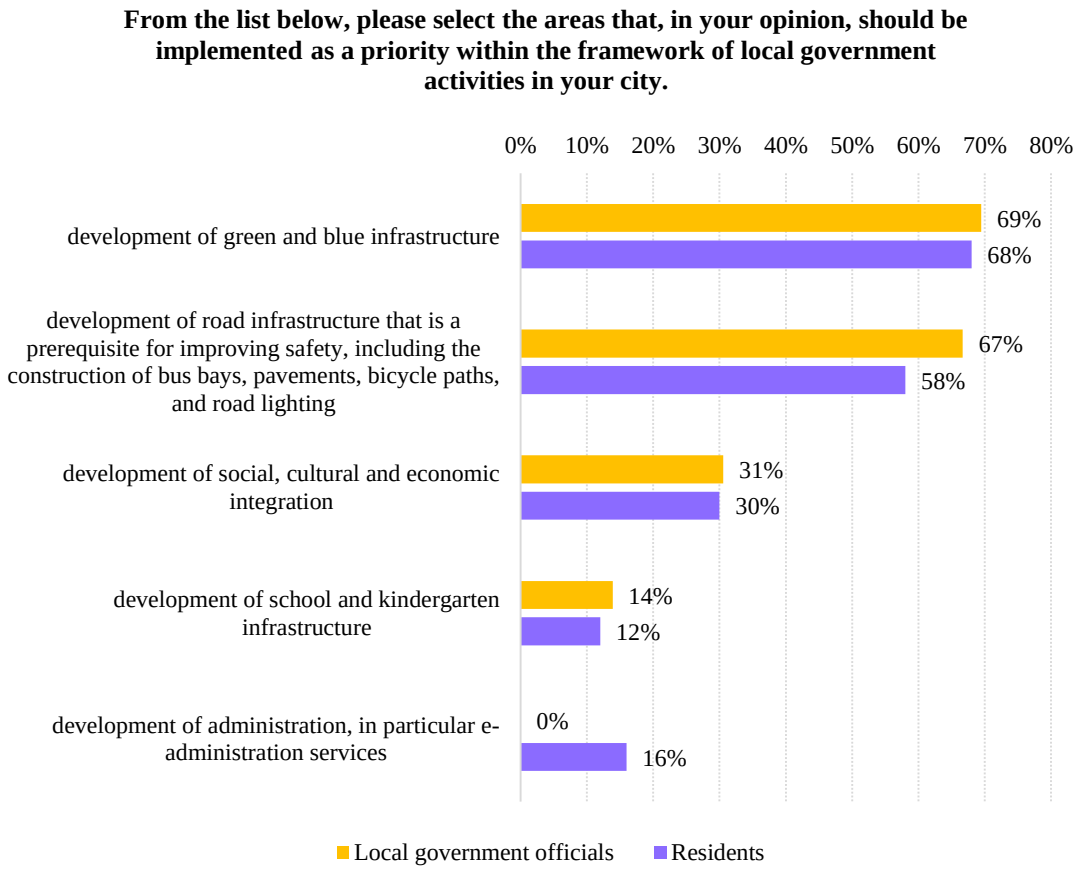

Figure 5. Priorities of the local government.

Source: own compilation based on collected data.

Regardless of the group, respondents also agreed **that developing green-blue infrastructure due to modern climate change should be an absolute priority within the framework of local government activities**. Nearly three-quarters of respondents (73%) agreed with this statement, while one in ten respondents (10%) held the opposite view.

A slightly lower percentage of respondents declared that **the development of green-blue infrastructure, in the absence of direct needs and expectations reported in this regard by residents, should be financed and implemented from the city or municipal budget**. Among the responses, “rather yes” (37%) and “definitely yes” (30%) prevailed - bringing the total to two-thirds of those convinced of this need (67%). One in five respondents (20%) had no definite opinion on this issue (answer “neither no nor yes”).

e) Green-blue infrastructure development activities

Regardless of the group, respondents agreed that **the GZM area requires urgent action to adapt to climate change**. Half of the respondents (49% overall) answered "rather yes", while a third (32%) answered "definitely yes". The opposite view was held by 7% of respondents. Respondents were also convinced that developing **green-blue infrastructure in their city requires expert support**. More than half indicated that there was rather such a need (54%). One-third were strongly convinced of this (33%).

Among the **landscape elements that respondents believe should create green-blue infrastructure in urban space**, respondents primarily identified squares and city parks (59%), strips of trees and shrubs—including rows along roads and avenues (48%), bodies of water (43%), and rain gardens (34%).

Due to undertaking GBI tasks as part of their professional activities, self-government respondents were significantly more likely to declare initiating the implementation of such activities (31% vs. 6%). Residents were significantly more likely to indicate that they neither support nor initiate such activities (46% vs. 22%). In contrast, the surveyed groups did not differ in their support for GBI-related activities.

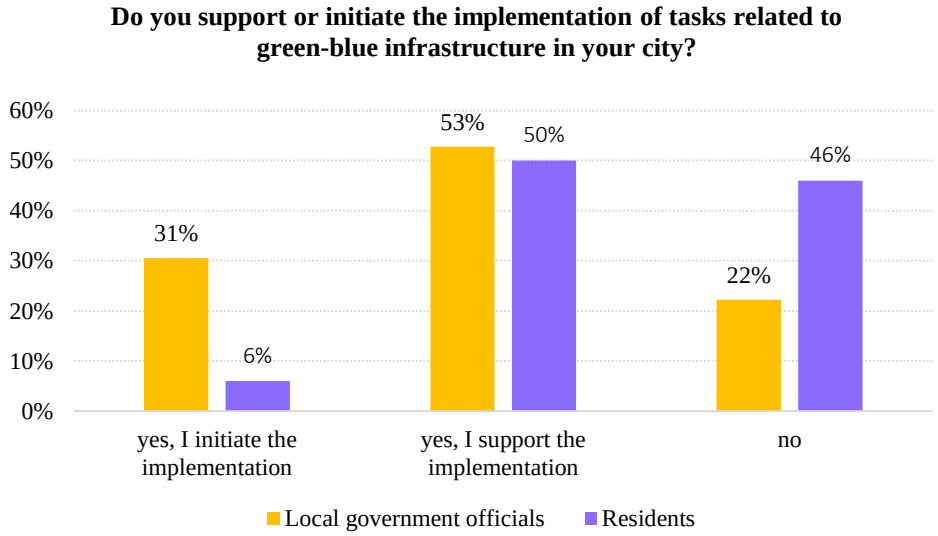

Figure 6. Green-blue infrastructure development activities (1).

Source: own compilation based on collected data.

The respondent groups - residents and local government officials - **did not differ in their assessment of the importance of shaping green-blue infrastructure in contemporary urban space to reduce the effects of climate change** (Chi-square: $p > 0.05$; Mann-Whitney U: $p > 0.05$). Both groups are convinced of the importance of shaping the GBI, with “rather important” (46% among local government officials and 44% among residents) and “definitely important” (41 and 44%) prevailing among the responses.

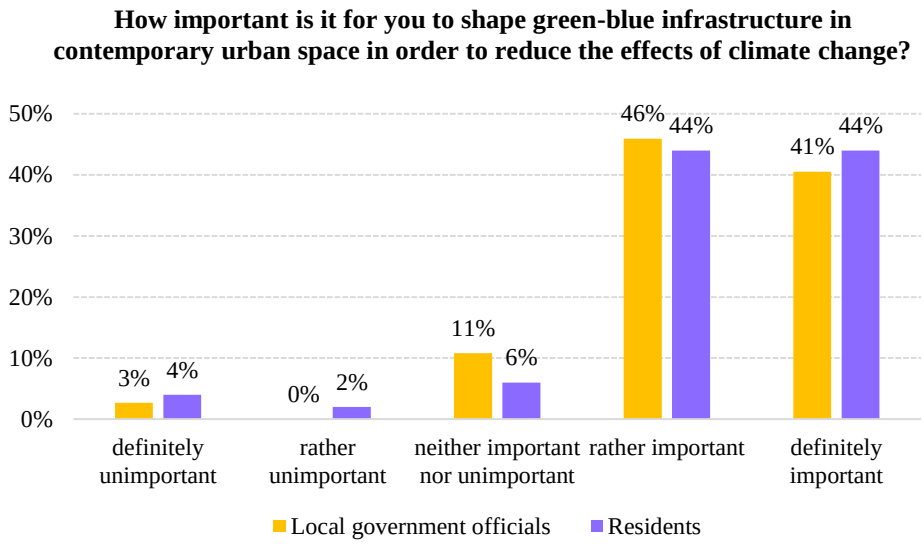

Figure 7. Green-blue infrastructure development activities (2).

Source: own compilation based on collected data.

Among local government officials, perceptions of the level of importance of shaping green-blue infrastructure in contemporary urban space to reduce the effects of climate change were primarily related to whether proper shaping of green-blue infrastructure can affect local sustainability in the city of residence (Sperman's Rho: 0.59; $p < 0.01$), whether GBI development can counteract negative climate change (Sperman's rho: 0.54; $p < 0.01$), and whether it has an impact on climate change adaptation (Sperman's rho: 0.53; $p < 0.01$). A significant relationship was also shown with respondents' declaration of perceiving negative climate change occurring worldwide (Sperman's rho: 0.53; $p < 0.01$). Also significant was the ability to define what green-blue infrastructure is in urban space (Spearman's rho: 0.58; $p < 0.01$) and what its functions are (Spearman's rho: 0.52; $p < 0.01$) and whether the respondent answered in the negative to the question regarding supporting or initiating the implementation of green-blue infrastructure tasks (Cramer's V: 0.57; $p = 0.01$).

Among residents, the assessment of the level of importance of shaping green-blue infrastructure in contemporary urban space in order to reduce the effects of climate change was primarily related to the perception of whether the proper shaping of green-blue infrastructure can have an impact on sustainable local development in the city of residence (Sperman's rho: 0.56; $p < 0.01$) and whether the development of GBI can improve the comfort of life in urban space (Sperman's rho: 0.52; $p < 0.01$). For residents, unlike local government officials, the declared level of knowledge about GBI was not associated with the assessment of the level of importance of shaping GBI in urban space ($p > 0.05$). No relationship was also demonstrated in relation to the assessment of the importance of taking pro-ecological actions in everyday life ($p = 0.06$).

In both groups, none of the studied sociodemographic characteristics (age, marital status, number of children, attitude to religion, functions held in local government and the time of performing them) showed any significant correlation with the assessment of the importance of shaping green and blue infrastructure.

The correlation coefficients for all studied factors are presented in Tables 3 and 4.

Table 3.
The correlation coefficients for all studied factors (1)

How important is it for you to shape green-blue infrastructure in contemporary urban space in order to reduce the effects of climate change?	**Local government officials**			**Residents**		
	Spearman's rho	P	N	Spearman's rho	p	n
Do you think proper green and blue infrastructure shaping can impact sustainable local development in your city?	0,59	0,00	36	0,56	0,00	50
Are you able to define what green-blue infrastructure is in urban space?	0,58	0,00	37	0,14	0,34	50
Can developing green-blue infrastructure in urban spaces, such as retention reservoirs, rain gardens, permeable surfaces, and green areas, counteract negative climate change?	0,54	0,00	37	0,40	0,00	50
Do you notice any negative climate changes taking place in the modern world?	0,53	0,00	37	0,50	0,00	50
In your opinion, does the development of green and blue infrastructure in your city impact adaptation to climate change?	0,53	0,00	34	0,46	0,00	49
Can you determine what functions the green-blue infrastructure performs in urban space?	0,52	0,00	37	0,03	0,84	50
How important is it for you to undertake pro-ecological (environmental) activities in your everyday life?	0,50	0,00	37	0,26	0,06	50
In your opinion, due to contemporary climate change, should the development of green and blue infrastructure be an absolute priority within the framework of local government activities in your city?	0,45	0,01	36	0,39	0,01	50
Do you think that the GZM area requires urgent action to adapt to climate change?	0,44	0,01	37	0,49	0,00	50
Do you think that the development of green and blue infrastructure can improve the comfort of life in urban spaces?	0,37	0,03	37	0,52	0,00	50
In your opinion, should the development of green and blue infrastructure be financed and implemented from the city budget in the absence of direct needs reported by residents?	0,25	0,14	36	0,22	0,12	50
Do you think that the area of the GZM is a friendly place to live?	0,22	0,19	37	-0,04	0,76	50
Do you think that the effects of the weather phenomena mentioned in question 13 can be effectively prevented at the local or regional level?	0,02	0,92	37	0,30	0,04	50
In your opinion, does the development of green and blue infrastructure in your city require support in the form of expert knowledge?	0,22	0,20	34	0,27	0,06	49
In your opinion, does developing green and blue infrastructure in your city impact reducing the carbon footprint?	0,23	0,19	34	0,38	0,01	49

Table 4.
The correlation coefficients for all studied factors (2)

How important is it for you to shape green-blue infrastructure in contemporary urban space in order to reduce the effects of climate change?	Local government officials			Residents		
	Phi/ Cramer's V	P	n	Phi/ Cramers' V	p	n
How old are you?	0,64/0,37	0,08	37	0,37/0,26	0,55	50
What is your marital status?	0,55/032	0,28	37	0,56/032	0,21	50
Do you have children?	0,50/ 029	0,41	37	0,28/0,20	0,86	50
Which of the following descriptions [of religiosity] best fits your situation?	0,44/0,31	0,49	18	0,55/039	0,21	36
What is your role in local government?	0,55/0,32	0,51	37	n/a	n/a	n/a
How long have you been working in the indicated position in local government?	0,54/0,31	0,56	37	n/a	n/a	n/a
Have any green-blue infrastructure investments been implemented in your city?	0,70/0,40	0,13	36	0,75/0,37	0,03	50
Do you think investments in your city's green and blue infrastructure are sufficient?	0,55/039	0,71	18	0,70/0,40	0,51	17
Do you support or initiate the implementation of GBI tasks in your city? [yes, it initiates the implementation]	0,38/038	0,17	36	0,13/0,13	0,93	50
Do you support or initiate the implementation of GBI tasks in your city? [yes, I support the implementation]	0,38/038	0,17	36	0,26/0,26	0,48	50
Do you support or initiate the implementation of GBI tasks in your city? [no]	0,57/0,57	0,01	36	0,25/0,25	0,52	50

5. Conclusions

The analysed survey results allowed us to establish the lack of differences between the surveyed groups, i.e. residents of GZM who do not hold a public office in local government and residents who are also representatives of local government authorities. Among the residents, both the level of acceptance of solutions in the field of green-blue infrastructure, as well as the assessment of the necessity of its development and the belief in its effectiveness, were high. Residents see the positive effects of implementing GBI solutions and recognise their potential in the field of environmental protection and combating climate change. The development of green-blue infrastructure was considered a priority among the authorities' activities. There was also strong support for financing such activities from the city budget. Another argument may also be the perception of the urgency of actions related to adaptation to climate change in the GZM area. Therefore, it can be assumed that among the residents of GZM, there is a high awareness of the justification for GBI actions and a high potential for supporting them. It is also possible to define the area of support for the authorities' activities through grassroots initiatives undertaken by residents as a development area.

In the context of GBI, the role of local government officials – apart from their professional activity directly related to infrastructure development – can be seen primarily in providing current information on planned and implemented investments in the field of GBI and justifying the actions taken – with an emphasis on the positive consequences of GBI. Next, local government officials should provide knowledge of what green-blue infrastructure is and what its functions are. Additionally, in these roles, local government officials can be supported by experts in climate policy, sustainable development, urban planning and urban infrastructure planning. From the perspective of residents, in practice, the development of GBI should focus primarily on preventing weather phenomena such as floods and droughts – currently considered the greatest threats.

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References

1. Gzell, S. (2018). Praktyka planistyczna, a naukowe metody badania miasta. In: M. Kmak, Zarządzanie przestrzenią miasta - wybrane aspekty. *Przedsiębiorczość i Zarządzanie, vol. XIX, no. 4, Part II.* SAN Publishing, p. 137.
2. Harasimowicz, A. (2015). Efekty aglomeracji -czynnik czy bariera rozwoju miast? Analiza wybranych aspektów w świetle literatury przedmiotu. *Studia Miejskie, No. 20*, p. 27.
3. Hill, E., Clair, T.S., Wial, H., Wolman, H., Atkins, P., Blumenthal, P., Ficenec, S., Friedhoff, A. (2011). *Economic Shocks and Regional Economic Resilience*. Building Resilient Regions, Institute of Governmental Studies, University of California, p. 13.
4. Hołub, A. (2005). Współczesna przestrzeń publiczna. In: M. Kochanowski (ed.), *Przestrzeń publiczna miasta postindustrialnego.* Gdańsk: Wydawnictwo Urbanista.
5. Hou, W., Li, X. (2024). Assessing urban green infrastructure: A simple and practical measure of its spatial distribution equity and a comprehensive evaluation. *Ecological Indicators, vol. 158*. Retrieved from: https://doi.org/10.1016/j.ecolind.2023.111408.
6. http://ec.europa.eu/environment/nature/ecosystems/index_en.htm, 6.01.2024.

7. Naumann, S., Davis, M., Iwaszuk, E., Freundt, M., Mederake, L. (2020). *Błękitno-zielona infrastruktura dla łagodzenia zmian klimatu w miastach*. Ecologic Institute & Fundacja Sendzimira, p. 6.
8. Panagopoulos, T., Jankovska, I., Boștenaru Dan, M. (2018). *Urban green infrastructure: The role of urban agriculture in city resilience.* Urban. Arhit. Constr., pp. 9, 58.
9. Song, C., Ikei, H., Miyazaki, Y. (2018). Physiological Effects of Visual Stimulation with Forest Imagery. *Int. J. Environ. Res. Public Health, 15(2).* Retrieved from: https://doi.org/10.3390/ijerph15020213
10. Special Report on Global Warming of 1.5 ºC (2018). Intergovernmental Panel on Climate Change (IPPC).
11. Stangel, M. (2013). *Kształtowanie współczesnych obszarów miejskich w kontekście zrównoważonego rozwoju.* Gliwice: Wydawnictwo Politechniki Śląskiej.
12. Valente de Macedo, L., Picavet, M., Puppim de Oliveira, J., Shih, W. (2021). Urban green and blue infrastructure: A critical analysis of research on developing countries. *Journal of Cleaner Production, vol. 313*. Retrieved from: https://doi.org/10.1016/j.jclepro.2021. 127898
13. Wirth, L. (1996). Urbanism as a Way of Life. *The American Journal of Sociology, vol. 44, no. 1*.