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THE CONCEPT OF URBAN GREENERY MANAGEMENT BODIES (UGMB) ORGANIZATIONAL STRUCTURE RESPONSIBLE FOR THE IMPLEMENTATION OF GREEN INFRASTRUCTURE IN EU MEMBER STATE OF POLAND

Abstract: The European GREEN SURGE project analyzing the best European practices in urban green infrastructure (GI) management showed that there is a lack of uniform solutions on national levels. The implemented GI are locally initiated and have the scope of selected cities. There is a need to standardize approaches to GI development in all cities of EU member states. An important current goal is to develop organizational assumptions for GI implementation. Standardization of the organizational structure of UGMB is necessary in order to give the right access and management licenses to, for example, create and operate an urban greenery information system. The main objective was to develop an organizational concept for Urban Greenery Management Bodies (UGMB) in line with the Urban Greenery Management System (UGMS) concept and key Green Infrastructure benefits. Three main competency poles responsible for optimal GI implementation are identified e.g. planning (expert body), administration (regulatory body), and field operations (executive body). The proposed concept of UGMB organizational structure can be a model for other EU member states, but also for other countries applying for EU membership.

Keywords: green infrastructure, urban greenery management, spatial data infrastructure, geoportal, city greenery authority

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Introduction

The quality of urban green spaces is a key factor in making cities attractive and viable places to live in. Urban green spaces play an important role in improving the livability of towns and cities (Baycan-Leven & Nijkamp, 2004). Public green spaces are regarded as "oases in concrete jungles" that increase the value of the real estate (Szczepańska et al., 2016). The development of urban greenery was particularly influenced by European Commission guidelines and standards (EC, 2012a; 2013, 2016) recommending the implementation of consistent green policies and the development of Green Infrastructure (GI). The relevant documents often emphasize the importance of green information systems that support the establishment and management of GI (Nowak et al., 2020). Dedicated Geographic Information Systems (GIS) should play an important role in urban greenery management. These systems not only can facilitate GI development, but they can also raise public awareness on the significance of public green spaces in cities. According to Mazza et al. (2011), the importance of GI in cities should be promoted through dedicated campaigns, and best practices should be communicated to the public. Greening projects undertaken in public-private partnerships (PPP) should receive greater support, and payments for ecosystem services should be introduced (Mazza et al., 2011). However, despite extensive research and the availability of GI guidelines, the implementation of green information systems supporting urban greenery management continues to be problematic in the EU (Naumann et al., 2011). These difficulties are associated mainly with lack of funding, insufficient experience in implementing different stages of GI projects, and lack of economic incentives because the benefits of GI are difficult to assess in financial terms. A universal and consistent urban greenery management system (UGMS) has not been developed in Poland to date. Databases on green infrastructure are created individually by Polish cities, subject to their financial capabilities. As a result, decisions concerning urban greenery are usually issued for individual development projects (Biejat, 2017a).

The absence of a comprehensive approach to urban greenery management results from a flawed urban planning system in Poland and a general disregard for public spaces (SAO, 2017). There are no laws mandating the development and implementation of IT systems dedicated to urban greenery management. Natural resources are managed based on the provisions of local strategic documents, local environmental protection programs, and local land use plans. The relevant regulations are often highly generalized, which obstructs the implementation of comprehensive solutions for environmental protection and management. Local regulations have been drafted and implemented by selected Polish cities. For example, Kraków has introduced local standards for the establishment and management of public green spaces (Biejat, 2017a). The implementation of comprehensive solutions for urban greenery management is also problematic due to weak communication between experts, public administration bodies, and local residents, as well as poor access to the relevant data (Sendzimir Foundation, 2019).

Polish conditions in terms of GI implementation do not diverge glaringly from those of other European countries. The European GREEN SURGE (GS) project (Pauleit et al., 2019) analyzing the best European practices in urban green infrastructure management showed that there is a lack of uniform solutions on national levels. The implemented GI are locally initiated and have the scope of selected cities e.g. in Barcelona (Spain), Bari (Italy), Berlin (Germany), Edinburgh (UK), Ljubljana (Slovenia), and Malmö (Sweden). There is a need to standardize approaches to GI development in all cities of EU member states. An important current goal is to develop organizational assumptions for GI implementation. Standardization of the organizational structure of UGMB is necessary in order to give the right access and management licenses to, for example, operate UGMS.

Having in mind the organizational problems mentioned above and assuming as a goal the implementation of the UGMS concept proposed by Dawidowicz et al. (2022), which assumes the use of the land administration system platform referred to as the Integrated Real Estate Information System (IREIS), and the INSPIRE Geoportal service (INSPIRE, 2007) to create a nationwide information system, it is necessary to develop functional assumptions of the UGMB organizational structure responsible for GI implementation in Poland.

A uniform UGMS for the whole country requires a clear model of competencies for establishing, updating databases, and responsibility for the entries made, similarly to a real estate cadastre or a land register. Hence, the main objective was to develop an organizational concept for Urban Greenery Management Bodies (UGMB) in line with the UGMS concept (Dawidowicz et al., 2022) and key Green Infrastructure benefits (EC, 2012b). Therefore, current legal regulations related to the objectives of GI development were reviewed and in-depth interviews were conducted with surveying the employees of public agencies responsible for urban greenery management in five, big Polish cities (Warsaw, Kraków, Poznań, Gdańsk, and Olsztyn) to identify current organizational structures, based on which groups of entities will be distinguished and classified in the context of competence activities.

The proposed organizational concept of UGMB should deliver numerous benefits. Above all, it should enable Polish decision-makers to develop regulations for cohesive standards for creating effective institutional structures as the optimal solution for GI implementation. The UGMB concept should support inter-institutional cooperation towards a comparison of GI policies enacted in different cities, thus facilitating the identification and promotion of green cities. The concept would also play an important role in raising public awareness of the importance UGMB and their competences towards the development of green infrastructure in cities. It also would increase the local residents' sense of responsibility and encourage them to participate in the creation and protection of urban greens (Kronenberg, 2012a) together with UGMB. The proposed concept of UGMB organizational structure can be a model for other EU member states, but also for other countries applying for EU membership.

Desk research – literature review

Organizational structures responsible for greenery management in Poland. Analysis of the reports on GI development (Biejat, 2017a, 2017b) and review of the legal statutes of selected entities responsible for greenery management in Poland (Organizational Regulations ZDZIT Olsztyn, 2022; Organizational Regulations ZZM Kraków, 2022; Organizational Regulations ZZ Warszawa, 2022; Organizational Regulations GZDiZ Gdańsk, 2022; Organizational Regulations ZZM Wrocław, 2022) revealed the current state of organizational structures, which can be described as multi-entity competence. Urban greens are managed by a variety of institutions, often with overlapping competencies, and the planning and management process is not cohesive. The responsibilities of the managing institutions and departments are determined arbitrarily by the local authorities. Municipal greens are managed by environmental protection departments, municipal investment departments, waste management departments, property management departments, road administrators, and building conservation authorities. Polish municipalities adopt local land use plans, environmental protection programs, and local strategies, but cohesive green infrastructure plans are still rarely in place. For many municipalities, urban greenery is not a priority despite the fact that the management of green spaces is one of their statutory responsibilities. Therefore, the budgets for the development of green infrastructure are very modest, and the relevant responsibilities are fragmented (Biejat, 2017b).

More specifically, urban green spaces are managed by different authorities, subject to the size and type of the city. In some cities, urban greenery is managed by the Municipal Gardener. In Kraków, Łódź, and Wrocław, the relevant duties are vested in Urban Greenery Boards which are responsible for maintaining municipal parks, pocket parks, green squares, cemeteries, and roadside vegetation. In other cities, including Jaworzno, urban greens are managed by separate institutions, such as the Municipal Property Management Board or the Municipal Road and Bridge Board. In the Municipal Property Management Board, the Urban Greens Department and the Municipal Gardener are responsible for planning and maintaining green spaces that are open to the public. The remaining greenery, including roadside trees, vegetated roundabouts, selected parks and new projects, are managed by the Municipal Road and Bridge Board. Residential greenery and greenery surrounding public utility buildings such as schools and health care facilities are managed by property administrators.

In Olsztyn, urban greenery is the responsibility of the Municipal Gardener and the Road, Greenery and Transport Authority which maintains urban green spaces, municipal forests, and national forests administered by the Olsztyn Municipality, and the Department of the Environment which deals mainly with environmental protection issues. In Warsaw, urban greens are managed by several institutions. Every city district has an Environmental Protection Department that maintains parks, green squares, and pocket parks. District authorities are also responsible for roadside vegetation. The only exception are roads with public transport where vegetation is managed by the Municipal Road Authority. The Greenery Department of the Capital City of Warsaw administers the

areas taken over from the Municipal Sanitation Board (streets with public transport) as well as areas situated along the banks of the River Vistula. Urban green spaces maintained by district authorities will also be managed by the Greenery Department in the future (Biejat, 2017a).

The concept of Urban Greenery Management System (UGMS). The UGMS concept (Dawidowicz et al., 2022) involves the creation of a universal and standardized information system covering the entire country to support GI development. The concept takes into account the trends and experiences gathered from the analysis of existing green area IT solutions, and the results of the technological architecture analysis of the Integrated Real Estate Information System (IREIS), which is an important element of Poland's Spatial Data Infrastructure (SDI), (Dawidowicz & Źróbek, 2016). The integration of IREIS, INSPIRE Geoportal with UGMS as a sector sub-module (Fig.1) is expected to facilitate the creation of a standardized data model based on ISO 19152 standards for Land Administration Domain Model (LADM), (ISO 19152, 2012; Bydłosz, 2015). This innovative approach involves the development of a national information system for urban green space management, as part of the NSDI (National Spatial Data Infrastructure), and offers a technological perspective on the evolution of SDI and land administration system. This solution closely contributes to the following Sustainable Development Goals (UN-GGIM, 2015): (11) Sustainable cities and communities, (13) Climate action, (15) Life on land.

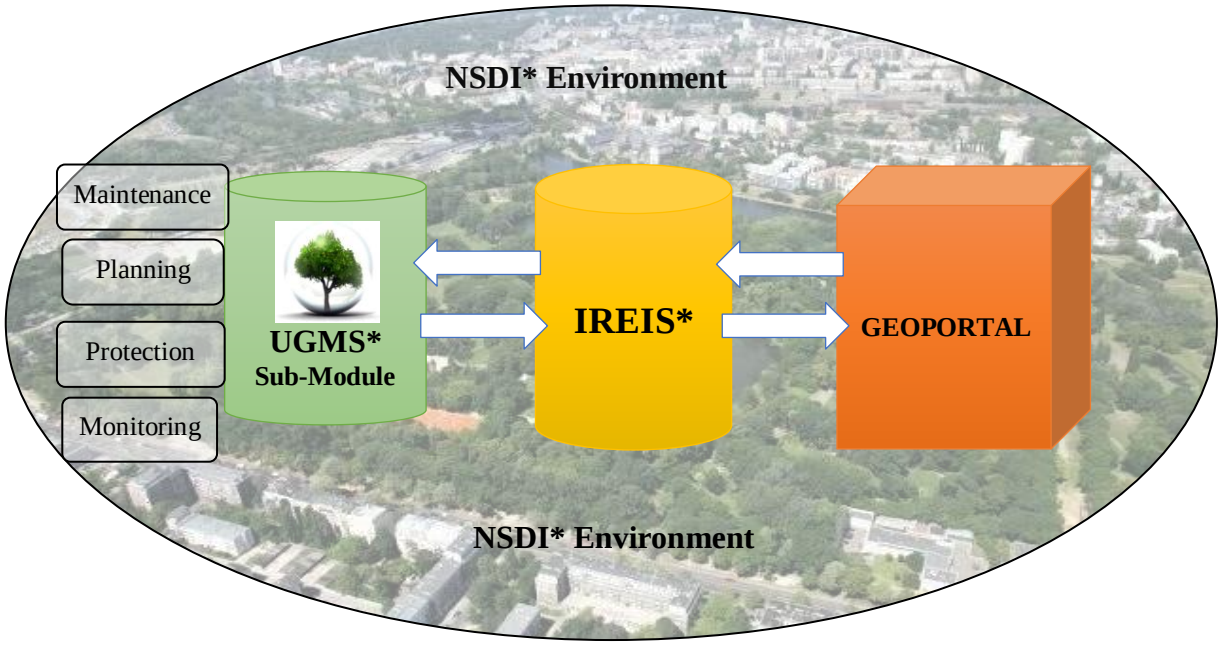
The UGMS database will be based on the results of urban greenery inventories. Selected types of data can also be collected by municipal employees responsible for UG maintenance. The relevant information would be collected with the use of a dedicated inventory form and it would be entered into the database as a UGMS sub-module in the IREIS environment. The data collection process should rely primarily on the existing sources of information from IREIS and Geoportal. The UGMS should cover urban green spaces that are owned, co-owned, or administered by the city.

The main functional assumptions of UGMS are:

- collection and analysis of data concerning green areas,
- monitoring of changes in green areas in the context of adaptation to climate change,
- introduction of green-blue infrastructure solutions to cities,
- identification of ecosystem services provided by trees,
- cooperation between administration units in the management of green areas,
- social participation in the process of creating green areas,
- data analysis for adapting different tree species to changing urban conditions,
- analyses of the benefits provided by trees.

In particular, the UGMS will collect data in 15 thematic groups, i.e.: urban greenery (basic and supplementary data, including maintenance and management of urban greenery), address data, physical attributes of land parcels, legal status (RRR), land and planning, infrastructure, soil and water conditions, nature conservation sites, protected

monuments, climate, environmental pollution and threats, habitats and protected species, technology/machines, market, cooperation, and support.



Abbreviations: UGMS – Urban Greenery Management System, IREIS – Integrated Real Estate Information System, NSDI – National Spatial Data Infrastructure

Fig. 1. The technological environment of UGMS
Source: own elaboration

Materials and methods

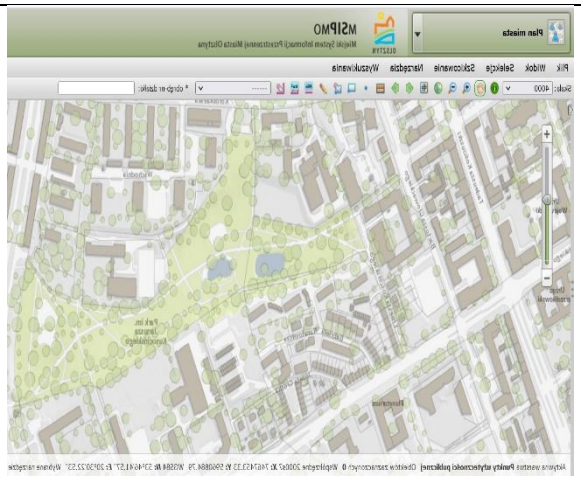
An empirical study was carried out with the involvement of qualitative methods to achieve the research objective of developing a concept of UGMB organizational structure consistent with the concept of UGMS for the entire country and key Green Infrastructure benefits. The research builds on the preliminary results of the developed UGMS concept (Dawidowicz et al., 2022), which was proposed after an in-depth analysis of existing EU green policy documents, national legislation, and good practice in the implementation GI in Poland and selected EU countries. Logically inducing, a model of organizational structure of urban greenery management bodies (UGMB) was proposed based on the model of UGMS functionality developed by Dawidowicz et al. (2022) and analysis of organizational regulations of units responsible for greenery management in selected cities, which were validated during the survey. The digital questionnaire was sent to various institutions dealing with greenery maintenance, i.e. environmental protection departments, urban greenery departments, and city offices in five Polish cities. The survey was conducted in October-December 2020.

Study area

The cities selected for the analysis are regional capitals, the largest cities in five Polish regions (Warszawa, Kraków, Poznań, Gdańsk, and Olsztyn – Fig. 2) and diverse in terms of the state of GI implementation.

Fig. 2. Map of Polish regions. Location of research objects
Source: own elaboration

Each of these cities has a publicly available, customized spatial information system to support greenery management (Fig. 3). Unfortunately, these systems are poor in environmental and greenery information with respect to the dataset highlighted in the UGMS concept.



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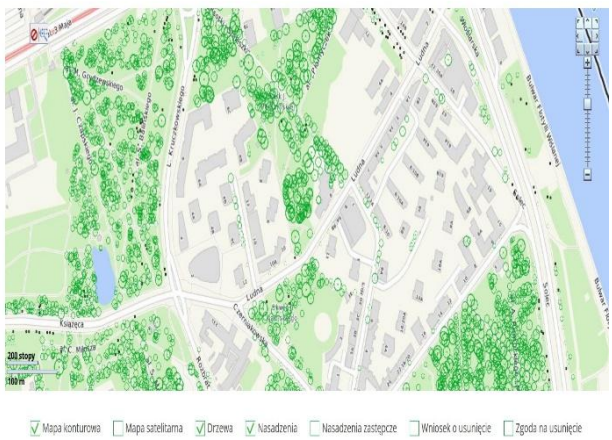

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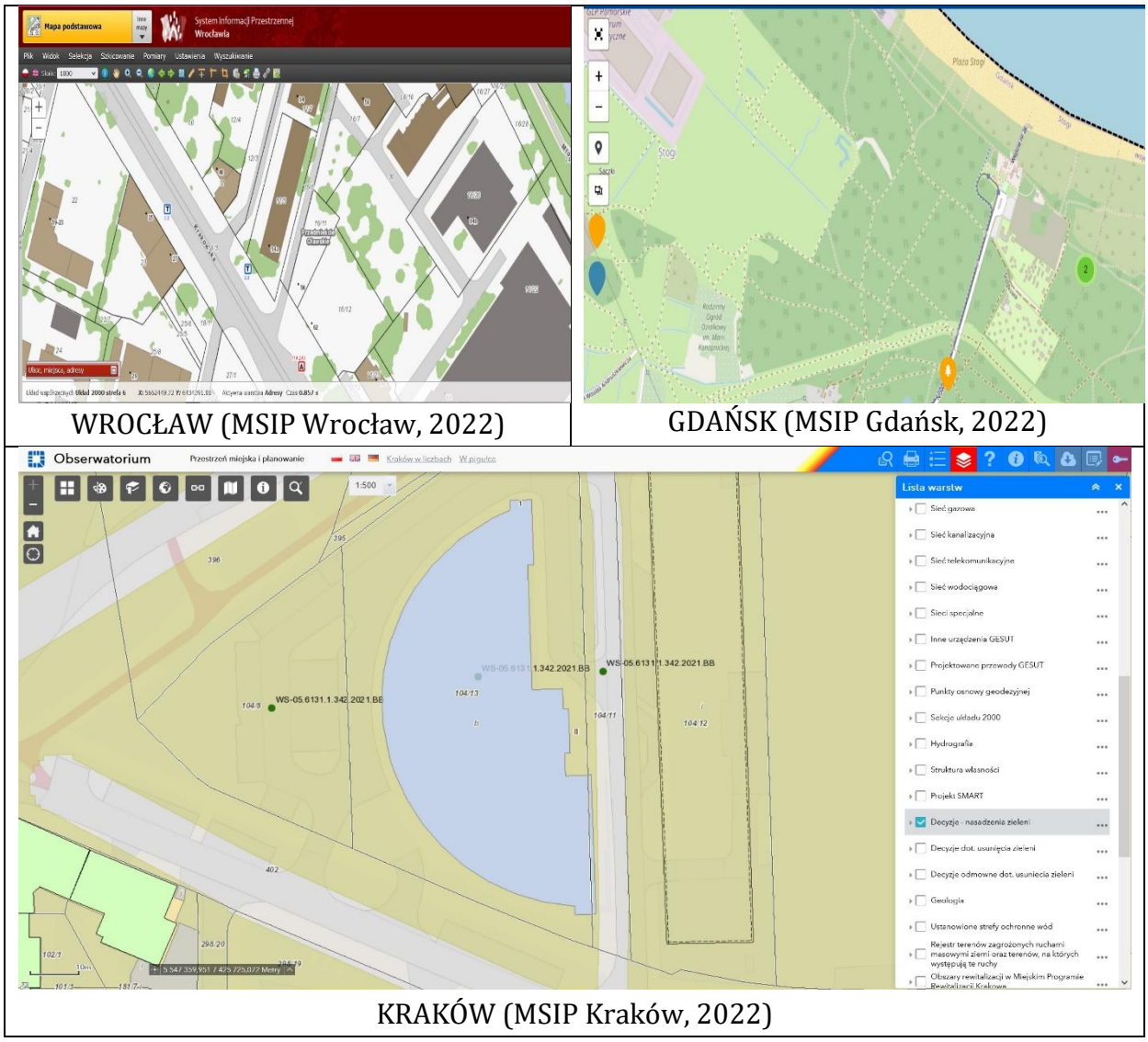


WROCŁAW (MSIP Wrocław, 2022)

GDAŃSK (MSIP Gdańsk, 2022)

KRAKÓW (MSIP Kraków, 2022)

Fig. 3. View of the urban spatial information systems in analyzed cities
Source: own elaboration

Results and discussion

Organization of green space management units. The analysis of the organizational bylaws of the greenery management units showed diversity in the area of hierarchy of entities and their competences. The analysis was presented in tabular form (Table 1).

As can be seen from the comparative analysis in Table 1 most of the organizational units managing urban greenery are organized in the form of budget units. Exceptionally in Olsztyn, the urban greenery planning department is directly subordinated to the President of the City. The analysis of the competencies of the Urban Greenery Management Office allowed for distinguishing 3 competence levels for urban greenery development i.e. for planning, administering, and managing/field operations of urban greenery.

Table 1. Urban greenery management bodies in selected Polish cities

City	The entity responsible for greenery management	Subordinate units	Competencies
Gdańsk	Gdańsk Road and Greenery Authority (GRGA) – Director	1)Deputy Director for Public Space a) Greenery Department, b) Public Space Development Department 2)Deputy Director for Management a) Cleaning Department	1) GRGA manages municipal cemeteries, municipal forests, parks, playgrounds and urban green areas and trees. 2)Construction and maintenance of city information system, management of streetcar and bus infrastructure, construction and maintenance of street lighting and road engineering structures and green areas, construction and maintenance of illumination of historical buildings, buildings and monuments. 3) Issuing opinions or approving investors' intentions on the facilities covered by the activity within the scope specified in special regulations, keeping property records of managed municipal property.
Kraków	Municipal Greenery Authority in Kraków – Director	1.Deputy Director for Greenery. Greenery 1) Forest and Nature Team 2) Investment and Renovation Projects Team 3) Greenery Division, within which there are: 4) Positions for Parks Maintenance 5) Positions for Maintenance of	1) The responsibilities of the City Landscape Architect include creating a consistent image of green areas, integrating the activities of various entities in shaping green areas, and taking action for the harmonious development of the green area system. 2) The scope of responsibilities The Greenery Department is responsible for all matters related to care and maintenance of high and low greenery, removal and planting of trees and shrubs in

		Greenery in Nowa Huta 6) Greenery maintenance positions 7) Position for Maintenance of Urban Greenery 2. City Landscape Architect; 3. Team for Krakow in Greenery 4. Stand-alone position for GIS	roadways, parks, and landscaped areas, together with small architecture.
Olsztyn	Olsztyn Road, Greenery and Transport Authority in Olsztyn (ORGTA) – Director	1) Deputy Director of Maintenance - Greenery maintenance department - Road cleaning and greenery department - Urban Forestry Department	Supervision and maintenance of playgrounds, low greenery, high greenery in road lanes, nature monuments.
	Department of Urban Planning and Architecture of the Olsztyn City Hall – Director	1)Position for urban greenery. Urban greenery 2)Position for image of urban spaces 3)Coordinator for city aesthetics	1) Undertaking activities related to the overall harmonious and aesthetic image of the City. 2) Planning and implementing greenery concepts in the City and supervising the development of city green areas.
Warszawa	Warszawa Greenery Authority (WGA) – Director	1) Green Space Programming Department 2) Green areas maintenance deputy director a) Horticultural Coordination Department b) Divisions of	1) planning, fundraising, programming, designing, constructing, upgrading, and renovating greenways, as well as water facilities and passive protection against flooding, as well as acting as an investor in other investment programs and tasks; 2) carrying out planting, maintenance, inspection and

		garden areas 1-9 c) Department for Project Documentation Arrangements 3) the Deputy Director for Development and Investment a) Greenery Development Department 4) the Deputy Director for Economic and Administrative Affairs a) Administration and Economic Department	undertaking activities related to maintenance of trees, shrubs and low greenery; 3) promoting the landscape of the Capital City of Warsaw, particularly its elements of animate and inanimate nature and public space, as well as activating, initiating and conducting dialogue with the residents of the Capital City of Warsaw.
Wrocław	Municipal Greenery Authority in Wrocław – Director	Assistant Director for Greenery: 1) Greenery Department 2. Land Resources Department 3) Arrangements Department Landscape architect 1) Urban Landscape Architect Department Deputy Director for Investment 1) Investment preparation and execution department 2) Project Manager Department	1) management of green areas, municipal forests, state forests transferred to the Municipality of Wroclaw for management, together with small architecture and water and drainage facilities located in these areas; 2) coordinating activities related to the development, revalorization and revitalization of green areas and conducting repairs and municipal investments in this area; 3) management of water and drainage facilities of the Wrocław Municipality managed by the Management Board; 4) implementation of the following programs: dispersed greenery, improvement of aesthetics and recreational development of the city.

Source: own study

The survey

Survey questionnaires were forwarded by email to 50 sectoral experts, 10 in each analyzed city, and completed questionnaires were returned by 34 respondents. The questionnaire contained open-ended and closed-ended questions relating to daily problems and information needs in urban greenery management. The survey covered administrative units responsible for all levels of GI development, in:

- Olsztyn (Olsztyn Road, Greenery and Transport Authority; Department of Urban Planning and Architecture of the Olsztyn City Office; Chief Landscape Architect),
- Wrocław (Municipal Greenery Authority; Chief Urban Landscape Architect; Department of Urban Greenery; Department of Land Resources; Technical Documentation Department; Investment Department),
- Kraków (Municipal Greenery Authority),
- Warszawa (Warszawa Greenery Authority, including three Garden Zone departments; Real Estate Management Department; Green Landscaping Department; Green Infrastructure Department; Water Department; Participatory Budget Department),
- Gdańsk (Gdańsk Road and Greenery Authority).

The different names of the institutions show the lack of uniformity in the organizational structures of UGMB.

The anonymous survey form consisted of 7 questions, of which questions 6 and 7 were extended questions and concerned the identification of spatial data needs necessary for the tasks and functions of the spatial information system. The first five were metric questions. The first two were about the name of the institution where the respondent works and the city. The third question asked about the length of employment at the current institution broken down into less than 2 years, 2 to 5 years, 5-10 years, 10-15 years, and over 15 years. A significant majority, 72%, of the current UGMB staff consists of employees with 5-10 years of length of employment. This result indicates that these employees are experienced and rather satisfied with their jobs as they have not changed jobs before. The fourth question concerns education with division into those related to maintenance of greenery (compatible with the profession) and others, and the fifth one concerned the type of competence with division into 3 groups of competence: greenery planning, greenery management/execution, administration/regulation. In this case, the responses were rather surprising, as only 61% had a background consistent with their professions, overwhelmingly in planning. The fifth closed choice question with the last option open (other: enter) concerned the type of duties performed in the position. The obtained answers enabled the identification of competencies in relation to the job position. It was assumed that due to the small research group, every answer, even a single one, would be included in the scheme. In this way, particularistic tasks within the three groups of subjects were identified.

The planning entity is responsible for all matters related to the care and maintenance of greenery, as well as the removal and planting of trees and shrubs in

roads, parks, greens, and residential green areas. In addition, his duties include creating a consistent image of green areas, integrating the activities of various entities in the field of shaping green areas, and taking action for the harmonious development of information systems on green areas. Creates reports: on suitability of plant species to changing climatic conditions, on replacement plantings. It strives for the development of green areas and cooperates with other departments for the development of urban greenery. Planning is carried out by a team consisting of specialists in urban planning, landscape architecture, public participation, etc.

The administering entity is responsible for preparing regulations or adapting them to top-down recommendations and providing instructions to the entity directly managing greenery. The administrator creates reports on species of removed trees and reasons for their removal, analyzes data on the availability of places for replacement planting, and creates reports on the amount of replacement planting done by investors. Issues permit for tree removal.

The managing entity consists of inspectors dealing with particular types of greenery and specialists reporting to them. The task of inspectors is to supervise the work of specialists and perform tasks assigned by the planning entity. The specialists' duties include executive activity in the field of urban greenery maintenance, as well as carrying out repairs on urban green areas. The number of inspectors depends on the types of greenery found in the city and their area. In the team of managing entities there is also a person for contact with residents. His task is to receive notifications from residents concerning the need for intervention in the field of greenery maintenance. Residents submit their comments by phone, online or via an app.

Considering the survey responses and relating them to the following key Green Infrastructure benefits (EC, 2012b):

1) Enhanced efficiency of natural resources – Maintenance of soil fertility, Biological control, Pollination, Storage of freshwater resources;
2) Climate change mitigation and adaptation – Carbon storage and sequestration, Temperature control, Storm damage control, Erosion control;
3) Disaster prevention – Reduction of the risk of forest fires, Flood hazard reduction, Regulation of water flows;
4) Water management – Water purification, Water provisioning, Reduction of soil erosion, Maintaining/enhancing soil’s organic matter, Increasing soil fertility and productivity, Mitigating land take, fragmentation and soil sealing, Improving land quality and making land more attractive;
5) Land and soil management – Higher property values;
6) Conservation benefits – Existence value of habitat, species and genetic diversity, Bequest and altruist value of habitat, species and genetic diversity for future generations, Multifunctional resilient agriculture and forestry;
7) Agriculture and forestry – Enhancing pollination, Enhancing pest control;
8) Low-carbon transport and Energy – Better integrated, less fragmented transport solutions;

9) Innovative energy solutions;
10) Investment and employment – Better image, More investment, More employment, Labour productivity;
11) Health and well-being – Air quality and noise regulation, Accessibility for exercise and amenity, Better health and social conditions;
12) Tourism and recreation – Destinations made more attractive, Range and capacity of recreational opportunities;
13) Education – Teaching resource and 'natural laboratory';
14) Resilience – Resilience of ecosystem services;

a list of fit-for-purpose UGMS functionalities has been developed (Table 2).

Table 2. List of UGMS functionalities assigned to different types of tasks urban greenery management bodies (UGMB)

Responsible entity	Duties / tasks	UGMS Functionality
Planning (expert body)	Expenditure planning	Generation of lists of urgent maintenance works
	Expenditure monitoring, planning replacements for the most expensive services	Generation of reports on greenery maintenance costs
	Acquisition of funds from other sources	Generation of reports on the sources of financing for urban greenery
	Monitoring public tenders	Reminders on upcoming public tenders, financial settlements for greenery maintenance services
	Surveying local residents' expectations regarding urban greenery	Generation of reports on participatory greening
	Modifying the list of recommended tree species for urban areas	Generation of reports on tree species damaged by hurricanes
	Modifying the list of recommended tree species for urban areas	Generation of reports on tree species that are most resistant to climate change
	Environmental monitoring / environmental protection plans	Systematic analyses for monitoring urban green areas
	Evaluations of maintenance services and their future consequences	Analyses of tree maintenance services
	Planning replacement plantings	Coordination of replacement plantings

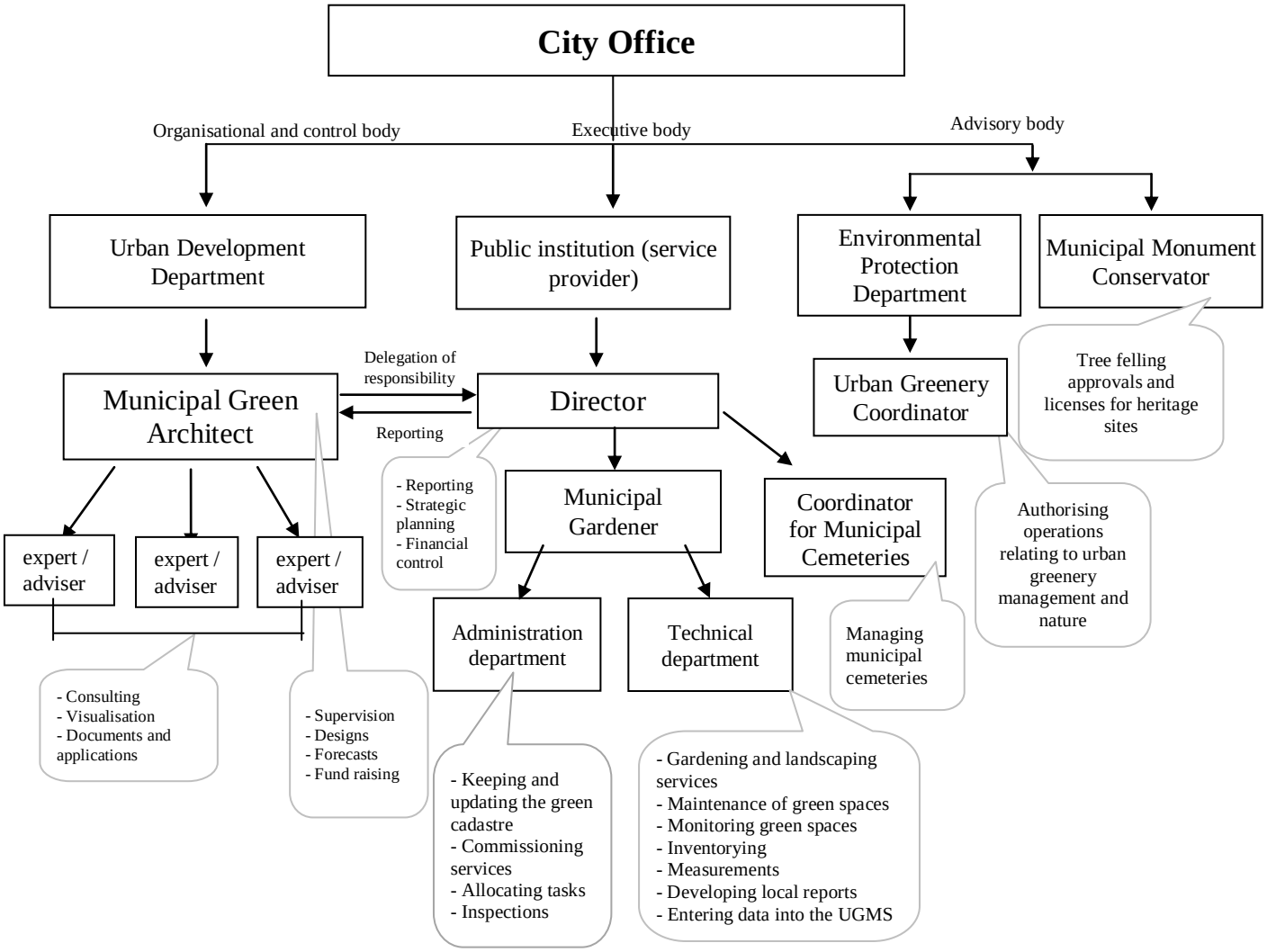
	Expenditure planning, analysis of tree species that require maintenance	Analyses of street tree inventories (range of tasks)
	Recommending changes in municipal regulations	Observance of tree protection laws in urban areas
Administration (regulatory body)	Selection of tree species for planting	Analyses of the number of removed tree species and reasons for removal
	Selection of tree species for replacement plantings	Generation of reports on tree species for replacement plantings
	Monitoring replacement plantings, recommending changes in the existing procedures to eliminate planting defects	Generation of reports on the feasibility of replacement plantings
	Assessment of replacement plantings	Generation of reports on service teams performing replacement plantings
	Analyses of energy benefits, stormwater benefits, esthetic value, and social benefits, air quality control	Generation of reports on ecosystem services
Field operations (executive body)	Planning field operations	Tree safety alerts
		Alerts on upcoming maintenance and planting operations
		Alerts on upcoming greenery development projects
	Coordination of field operations	Inspections of tree and shrub maintenance in a given district

Source: Dawidowicz et al. (2022)

The concept of UGMB organisational structures

In view of the large number of urban green spaces and the considerable fragmentation of the relevant responsibilities (Lisicki, 2009), the proposed UGMS should be a locally-centralized system with a clear division of tasks within the organizational structure of city offices. According to Łukaszkiewicz (2013), the allocation of responsibility to various bodies of local administration and other organizations compromises the effectiveness of management. Diffusion of responsibility leads to a conflict of interest and contributes to erroneous decisions (Łukaszkiewicz, 2013). Effective coordination and management require the division of competencies on the

macro and micro scales. The proposed UGMS will feature a tripartite division of authority in the management of urban green spaces. These powers can be exercised by the existing departments in city offices, but dedicated work posts should be created to guarantee that the collected data is transparent and cohesive when combined from local databases on the national scale. The tripartite system would be composed of organizational and control bodies, executive bodies, and advisory bodies. All three bodies should be represented in every city office (Fig. 4). This setup will ensure harmonization of UGMB structure and allow for future expansion of UGMS towards suburban areas.



Source: own elaboration

In the UGMS locally-centralized organizational hierarchy, urban greenery will be supervised by the Municipal Green Architect who will report only to the city mayor on matters relating to the management of urban green spaces. The Municipal Green Architect will supervise the implementation of a cohesive and long-term policy on urban green spaces and will participate in the development of revitalization strategies and plans, local zoning plans, and other policy papers related to urban greenery. The architect will work closely with other public institutions, city departments, and external

organizations to integrate the process of managing urban green spaces. The architect will supervise a team of experts in landscape architecture, urban management, and other fields. The team will be responsible for developing and maintaining green spaces by participating in public bids, commissioning and inspecting services, maintaining and updating an inventory of green spaces, as well as planning and developing green projects. The environmental protection department in the city office will issue tree felling licenses, indicate the location, number, and species of replacement trees, and will carry out local inspections. The Municipal Monument Conservator will approve tree felling in heritage sites and will issue the appropriate licenses. The Municipal Cemetery Authority will manage green areas in cemeteries.

Discussion and conclusions

The study revealed that the current UGMB in Poland is characterized by a multiplicity and inconsistency of competencies. The lack of uniformity of UGMB structures across the country may make it difficult to develop and implement standardized regulations concerning GI development. Such a disorganized organizational structure will be even more disruptive to the launch of UGMS, because the different divisions of competencies may hinder the allocation of access licenses and the granting of authority to use UGMS. The division of competencies into 3 raisers is universal, as it refers to key Green Infrastructure benefits and can be implemented in other European Union countries. It is necessary to continue to monitor the effectiveness of the implementation of GI principles in cities and emerging concepts in the area of GI development in order to optimize the resource and organization of UGMB.

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