Climate-Friendly Cities – Blue-Green Infrastructure Activities

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Abstract. Increasing climate change affects many aspects of cities and their inhabitants. Extreme weather phenomena destroy urban areas, infrastructure and green spaces. Activities taken to improve the resilience of cities and their adaptation to climate change aim to reduce or avoid negative consequences, or to increase the benefits of risks. They are different in character and take different forms, depending on the level of economic and social development, financial, institutional, human, and knowledge resources. The planning and urban development tools and instruments used are also important. An integral part of adaptation activities is the development of modern systems of blue-green urban infrastructure. The experience of the last few years has shown the diversity of applied projects based on natural solutions. They are reflected both in the provisions of climate strategies and in the realizations visible in the urban landscape. The paper focuses on planning and implementation activities that strengthen resilience to climate change, highlight the importance of ecosystem services and shape urban space. The research focuses on polish cities that have undertaken the development of Urban Adaptation Plans (MPA). The aim of this paper is to present the blue-green infrastructure activities included in the MPA, the possibilities for their implementation and to show their role in improving the quality of life in cities, increasing the attractiveness of urban spaces and raising the awareness and involvement of local communities.

1. Introduction
Climate change is occurring with increasing intensity [1]. This is particularly visible in urban areas. Cities as places of maximum concentration of buildings and human settlements are particularly exposed to the nuisance associated with the consequences of these changes. Air circulation disturbances, changes in thermal conditions, extreme weather phenomena such as high (heat) and low (frost) air temperatures; downpours and heavy rains, storms, gusty winds, flooding, flash floods and droughts, destroy urban areas, green areas, are reflected in the landscape, affect people. These phenomena affect many aspects of city functioning – spatial development, infrastructure, construction, communication, transport, power industry, production, services, public space, and residents’ safety. Moreover, they affect the surrounding natural environment and cultural heritage [2]. An increasing number of cities, recognizing the problem, are taking activities to adapt to climate change. The formation of urban adaptation policies covers a wide range of issues, as a result of which they have a different character and take different forms. This diversity depends on the level of economic and social development of the country and region, financial, institutional, human and knowledge resources. Legal regulations, applied planning tools and instruments, as well as organisational and financial capacities are also crucial. The basic task of all the activities undertaken is to protect against the negative effects
of climate change, increase the resilience of cities, but also take advantage of the opportunities they present. Their aim is to activate local communities to co-determine the future of the environment and urban space and to improve the quality of the inhabitants’ life. Adaptation activities can also be seen as a tool to increase the attractiveness of cities and create safe urban spaces. An integral part of adaptation activities is the development of modern systems of blue-green urban infrastructure (BGI). The experience of the last few years has shown the diversity of applied solutions based on natural capital. They are reflected both in the provisions of climate strategies and in the realisations visible in the urban landscape.

The paper focuses on planning and implementation actions that strengthen resilience to climate change, emphasise the importance of ecosystem services and shape urban space. The research focuses on Polish cities that have undertaken the development of Municipal Adaptation Plans (MAP). The aim of the paper is to present the blue-green infrastructure measures included in the MAP, the implementation methods and show their role in improving the quality of life in cities, increasing the attractiveness of urban spaces and raising the awareness and involvement of local communities.

2. Polish planning and strategic actions for adaptation to climate change
The ability to cope with climate risks has become a key development objective and an area for strategic action at international, national, regional, and local levels. At the EU level, various climate change policies and adaptation activities have been adopted. The Paris Agreement [8] and the 2030 Agenda for Sustainable Development [15] have posed significant challenges for many countries in terms of planning, policy, and implementation of climate change adaptation objectives for cities. The policy framework adopted by the EU Council obliged all Member States to develop long-term national strategies, adopt Integrated National Climate and Energy Plans and ensure coherence between these documents. As a result, the climate change phenomenon has gradually become one of the important elements of the development policy of the state and Polish cities. Among the EU documents that significantly impacted the formation of adaptation policy in Poland were „Cancun Adaptation Framework” (CAF), developed in 2007-2010 within the framework of COP16 [12]; the EU White Paper „Adapting to climate change: towards a European framework for action”, COM 2009 [17]1 or the „EU Adaptation Strategy Package”, COM 2013 [5]. Among Polish documents, in addition to the „Strategy for Responsible Development for the period up to 2020, including a perspective up to 2030” (SRD) adopted in 2017 [14] and the „Ecological Policy of the State 2030” (PEP2030) of 2019 [13], the most important document became „SPA 2020 – Strategic Adaptation Plan for Sectors and Areas Sensitive to Climate Change by 2020, including a perspective up to 2030”, adopted in 2013. It was the first document of its kind in Poland directly dedicated to the issue of adaptation to ongoing climate change. It emphasised the need to take legislative, organisational, informational, or scientific measures to ensure sustainable development and effective functioning of the Polish economy and society under changing climate conditions [9]. Among other studies, projects and programmes undertaken to mitigate climate change, which influenced the shaping of the Polish adaptation policy, the following can be highlighted: the research project „Development and implementation of a strategic adaptation plan for sectors and areas vulnerable to climate change – KLIMADA”, executed in 2011-2013 [4]; the work of the Ministry of Environment on operational programmes within the EU financial perspective 2014-2020, carried out in 2013-2015; „Adaptation Manual for Cities. Guidelines for

1 The White Paper laid foundations for preparation of a comprehensive EU strategy to facilitate adaptation of the economies and societies of the Member States to current and expected climate change in the most efficient and economically viable manner. The White Paper became the basis for the development of strategic adaptation plans in individual EU countries [17].

2 This project, carried out by the Institute of Environmental Protection-State Research Institute, was the basis for the preparation of the country’s strategic adaptation plan in two time-perspectives – until 2030 and for the years 2070-2100 [4].
preparing a Municipal Climate Change Adaptation Plan”, 2014-2015 [2]; and programmes on electromobility, green technologies, implementation of green-blue infrastructure investments, air pollution reduction, prosumer energy development, drought mitigation in Poland, etc. All these documents, programmes and projects became the basis for the development of Municipal Climate Change Adaptation Plans.

3. Municipal Climate Change Adaptation Plans (MPA) – strategic and implementation approach

The preparation of Municipal Adaptation Plans (MAP), aimed at limiting or mitigating the effects of the most serious threats resulting from climate change, became part of a project organised and co-financed by the Ministry of the Environment3 [3]. The project carried out by the Institute of Environmental Protection – State Research Institute, the Institute of Ecology of Industrial Areas, the Institute of Meteorology and Water Management – State Research Institute, ARCADIS Poland, started in 2017 and lasted two years. It covered 44 Polish cities, including: 37 cities with a population of more than 100,000, three cities with a population between 90,000 and 100,000, and four cities with a population below 90,000. The selection of 44 cities as a target group, for which it was advisable to develop an MPA in the first place, resulted from the provisions of SPA2020, the complementarity of characteristics characterising the vulnerability of large cities to climate change and the availability of a land cover and land use map.

On the basis of a coherent methodology and guidelines specified by the Ministry of the Environment [2], a team of experts, using participatory methods, together with representatives of local communities, public officials, administrators of urban networks and real estate, activists, scientists and entrepreneurs, prepared documentation comprising: a diagnosis of the current situation, identification of areas of activity of the cities along with an analysis of their vulnerability to climate change and definition of priority undertakings and tasks along with the time of their implementation and estimated costs. Its objective was to assess the vulnerability of the largest Polish cities to climate change and, as a result, to plan actions responding to the identified threats and increasing the cities' resilience to, inter alia, “urban” floods related to sudden and intense precipitation, floods related to river flooding, prolonged droughts, and related lack of or limited access to water, heat waves and violent winds and storms. An additional objective was also to educate and raise awareness of both local authorities and urban communities about the risks forecast. This was the first time in Europe that a systematic action strengthening the resilience of large cities to climate risks was undertaken on such a scale. It was also for the first time in Poland that threats to cities related to climate change were identified in a coherent way on such a scale, that the areas most vulnerable to changes were singled out and that adaptation activities limiting the adverse consequences of those changes were identified. The scale of the actions undertaken (several dozen cities at a time), the support of the Ministry of the Environment for the authorities and local administration and the cooperation of citizens, authorities and experts provided the basis for the effectiveness of the actions undertaken. The Urban Adaptation Plans became a tool for innovative and creative policymaking aimed at increasing cities' resilience to the ongoing environmental changes, but also an instrument of urban policy enabling application for funds for projects (resulting from the MAP) aimed at adapting cities to climate change.

3 The total investment in the project „Development of climate change adaptation plans in cities with more than 100,000 inhabitants” amounted to EUR 7,282,455 with an EU Cohesion Fund contribution of EUR 6,190,087 through the Operational Programme Infrastructure and Environment for the programming period 2014-2020, <https://ec.europa.eu/regional_policy/en/projects/poland/44-polish-cities-increase-their-resilience-against-climate-change> [accessed 20/02/2021].
4. The blue-green infrastructure measures resulting from the MAP

The actions specified in the MAP have been divided into three groups: informational and educational (aimed at promoting knowledge about climate change and good practices for adaptation), organisational (concerning changes in the functioning of cities in terms of management of institutions, relevant services, space and inhabitants' behaviour) and technical (consisting of realisation of investments of adaptation nature, including blue-green infrastructure of the city and changes in its buildings). Most of the actions taken were multidimensional and interdisciplinary, covering different time and space conditions and different approaches to action – from investment, such as infrastructure construction, to soft measures that will have an impact on raising awareness of climate change adaptation, potential threats or will lead to changes in the behaviour of urban communities. Their implementation, especially in the field of modernisation of flood protection systems, efficient management of water resources, coordination of green and blue infrastructure systems, was expected to foster improvements in the functioning and management of the city. The proposed environmental, economic and spatial changes in urban infrastructure or green areas were aimed at improving housing, recreation and investment conditions, determining the comfort and quality of life in the city, as well as reducing the risks resulting from climate change [3]. An important part of the activities of urban adaptation plans referred to the development, strengthening and shaping of blue-green infrastructure (BGI) systems. They aimed to strengthen existing assets and already functioning blue-green infrastructure solutions, but also to build and develop new elements. Their aim was to reduce the negative effects of climate change affecting residential areas, public buildings, green areas, infrastructure and public spaces. The complexity of the solutions consisted in striving to create systems of links between green areas, ecosystem services, rainwater management, but also in raising public awareness of the benefits of BGI. The aim was to strive for the creation of coherent and continuous urban natural systems and sustainable and efficient use of space in cities. The systemic BGI activities enshrined in urban adaptation plans mostly included:

- development and improvement of the quality of green areas – shaping urban green areas, including reservoirs and watercourses (creative, revitalising, recultivating, nursing, protecting, regulating activities), strengthening recreational and leisure functions;
- revitalization of urban public spaces including elements of blue-green infrastructure (creation of multifunctional green areas, which are conducive to the establishment of social ties and development of interpersonal contacts);
- increasing the area of biologically active land, protecting permeable areas including urban soils and natural floodplains from development pressure;
- protection of fresh/cool air generation areas, ventilation aisles;
- construction and/or modernisation of solutions to optimise water consumption – rainwater and snowmelt retention systems, drainage systems, increasing small retention;
- greening of road systems (green stops, woonerfs, various forms of greenery accompanying communication systems), linking pedestrian and cycling communication systems with the system of urban and suburban greenery;

4 Information and education activities included systems for monitoring, data collection, warning and informing the public about hazards, damages and losses; education about the effects of hazards, adaptation measures and climate change; building knowledge exchange platforms and cooperation networks for MPA implementation. Organisational activities included: reviews and updates of strategic and planning documents; strengthening of emergency services taking into account climate change; development of guidelines, procedures, manuals of conduct for municipal services. Technical activities included: construction and development of the blue and green infrastructure system; increasing the share of biologically active area; construction of a system for optimizing water supply and consumption in the city; protection and expansion of ventilation corridors in urban areas; construction of a system of solutions for ensuring thermal comfort of residents; securing endangered buildings and critical infrastructure in the danger zone; changing the function of infrastructural objects located in danger zones; adaptation of the public transport system to the effects of climate change [3].
– introduction into urban planning documents of provisions concerning the requirements for the formation of BGI: designation of biologically active areas, the degree of surface sealing, drainage solutions and the possibility of retaining water, urban ventilation conditions, the degree of greening, accessibility to green areas, restriction or abandonment of their sale, preservation of ecological corridors, natural watercourses and water reservoirs, use of the potential of urban ecosystem services, management of public spaces;
– formulating strategies for the development of green spaces as a basis for framework policies for the shaping of natural systems and the protection of their values and as a tool for planning, preparing and implementing specific investment projects;
– organisation of competitions, educational campaigns and promotion of solutions to strengthen BGI [3].

Some of the proposed adaptation activities were aimed at enhancing ecosystem services or improving the quality of the urban environment in a punctuated manner. Micro-interventions in urban space most often referred to:

– so-called „green architecture” solutions (green roofs, walls, vertical gardens);
– shaping bioretention surfaces in public space solutions (squares and rain gardens, urban meadows);
– the introduction of so-called „refuge areas” (fog curtains, sprinklers, fountains, temporary canopies);
– renewing and introducing greenery in selected urban spaces (green courtyards, squares, pocket parks);
– development and revitalisation of degraded public areas and spaces,
– implementation of nature and education trails, etc.

Some of the activities related directly to raising awareness about climate risks and environmental education for sustainable development. These activities included the implementation of educational, information and promotional undertakings, training in the field of health protection in extreme weather conditions, the organisation of campaigns and social actions aimed at educating residents and activating society to pro-ecological activities.

For all adaptation activities proposed in the MAP, it was assumed that they should be implemented in Polish cities by 2030. The basis for their effectiveness may be the awareness that the applied solutions will determine not only the comfort of everyday life, but also the health and even life of citizens

5. Adaptation activities – the experience of Polish cities with MAP

The implementation activities undertaken by Polish cities so far are based on the opportunities to use tools related to investment financing (EU, national and regional)5. Some of them are the continuation of ideas implemented even before the adoption of the Urban Adaptation Plans. Among the ongoing activities, many are in the field of BGI. A significant part of them is implemented within the

5 The implementation of adaptation actions enshrined in the MPA provides opportunities to obtain funding from EU operational programmes or loans granted by international organisations, i.e. the European Bank for Reconstruction and Development or the International Monetary Fund. In the EU financial perspective 2014-2020, climate change actions were supported by programmes: LIFE, Horizon 2020, Interreg Central Europe, Interreg Europe, the Norwegian Financial Mechanism and the Financial Mechanism of the European Economic Area. At the Polish scale, national and regional financial instruments meet the needs of cities: Operational Programme Infrastructure and Environment, National Fund for Environmental Protection and Water Management, Regional Operational Programmes of Voivodeships and Voivodeship Funds for Environmental Protection and Water Management [16].
Infrastructure and Environment Operational Programme 2014-2020, one of the directions of priority actions of which is „environmental protection, including adaptation to climate change” [7]. Prominent among them are those that concern investments related to sustainable water management, promoting solutions that enable to retain, purify, and distribute water in cities in a natural way. Cities prefer both a systemic approach and spot actions, resulting in various types of programmes, initiatives, or implementation projects. Their role is to improve the comfort of living in cities, increase the attractiveness of urban spaces and raise awareness and involvement of local communities. These include catalogues of good practices and ecological behavior patterns, which have shown how climate change can be dealt with in specific situations and with specific risks. They include a set of blue-green infrastructure advice and actions that will provide substantive and technical support for investment implementation. The catalogue's rules, thanks to their universality, will be possible to implement by various entities, including housing cooperatives, individual property owners, as well as public institutions. Such catalogues were prepared, for example, in Bydgoszcz and Wrocław. In Łódź, the „Deszczówka.info” service and a guide on how to apply nature-friendly solutions that can be used by city residents were developed. Such activities provide support for investors, residents and those who want to actively engage in adaptation activities. Other implementation activities include:

- „Rain is profit” in Bydgoszcz (2017-2021) – an investment project aimed at adapting the rainwater drainage network and rainwater management facilities (retention tanks, rainwater treatment plants, installations for irrigation of green areas) to climate change in the city. As part of the project, a catalogue of advice for residents was also developed to contribute to the introduction of their own solutions related to rainwater retention;
- „Gdynia dialogue on climate”, „Drainage system in Gdansk” or „Gdansk rain gardens” (2017-2021) – initiatives linked to education and information of the inhabitants, as well as specific implementation projects related to flood protection against the threats of storm surges, snowmelt runoff and heavy rainfall in the form of a network of retention tanks, wells, street inlets, streams and ditches, rainwater sewers, flood banks and rain gardens, as well as hydrological monitoring systems. The result is a comprehensive approach to water management in the city;
- „Water with rain in Sosnowiec” (2019) – a programme for property owners who live in the city to obtain grants for the purchase, installation, earthworks or the cost of upgrading the installation and construction of rain gardens of troughs, absorption wells and rainwater tanks;
- „Sponge City” in Legnica (2020-2023) – a program related to small retention, implemented in several stages, concerning inventory of existing greenery, analysis of technical infrastructure and geological and soil conditions, identification of the most beneficial areas in terms of water retention possibilities, implementation of projects accessible to residents, establishment of rainwater retention systems, water gardens, removal and modernisation of selected surfaces impermeable to water, performance of new planting of greenery elements and forms (green walls, flower meadows and fore gardens, pocket parks and butterfly gardens).

These actions, like many others undertaken in Polish cities, referring to the blue aspect of BGI, are part of contemporary trends in urban development of cities, focused on water [10]. Other programmes, projects and initiatives undertaken focus on green infrastructure and investments related to effective greening of urban areas. Prominent among them are:

- Wrocław initiatives: „Developing a strategy for the development of green areas for the areas of Wrocław's housing estates” (2020) – a social project, assuming working out a strategy for the development of green areas for each of the city's housing estates individually; „Grey for Green”

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6 Infrastructure and Environment Operational Programme 2014-2020, supports among others the development of environmental infrastructure, adaptation to climate change, the protection and halting of biodiversity decline and the improvement of the quality of the urban environment [7].
(2014-2020) – a programme concerning the transformation of outdoor areas of schools and kindergartens into student-friendly micro-green areas with the functions of improving air quality, increasing resistance to climate change, noise protection, preserving biodiversity, educating students, employees and parents on the role of greenery in the sustainable development of the city; „Grow Green Wrocław” (2014-2020) – a project aimed at developing a catalogue of demonstration solutions providing shelter from heat, local temperature reduction, improving air quality and enabling the use of rainwater (implementation of pocket parks, green walls and streets);

- Krakow initiatives: „Krakow in Greenery” (2016-2020) – project initiating events in parks and green areas, i.e.: „Exercise in Greenery”, „Picnic in Greenery”, „Cinema on Grass”, „Park-bus in Greenery” or „Beachfront Marina”, the aim of which is to encourage residents and tourists to spend their time actively in green areas and to emphasise the role of organised green areas as centres of social life, bringing together and involving residents, positively influencing the creation of social bonds; „Gardens of Krakow Dwellers” (2018-2021) – implementation throughout the city of a network of pocket parks, accessible to all residents, serving recreation in the broadest sense;

- „Renewal of medium and high greenery” in Legnica (2017-2023) – a city programme initiating cooperation between the city authorities and residents, aimed at engaging the local community in action, resulting in the enrichment of existing urban greenery, introduction of new plantings in places accessible to residents for recreation, including green areas, wastelands and natural plant habitats;

- „Improving the quality of green areas in the area of the City of Zabrze” (2014-2020) – a project for comprehensive management of urban green areas in areas with a low share of green areas in the structure of land use, and characterised by a significant degree of degradation as well. The works to be carried out include mainly maintenance, renovation works, related to new greenery planting and land development for recreational purposes;

- „Rudzki Route – development of green spaces of the City of Ruda Śląska” (2014-2021) – the project assumes the development of greenery in the city area, renovation of parks, squares, replenishment of damaged or neglected greenery and development of post-industrial dumps. These activities are aimed at giving a new character to unused spaces, increasing their usability and accessibility, as well as activating investment in adjacent areas.

Many small initiatives in the field of blue-green infrastructure have been implemented through civic budgets or bottom-up initiatives. These included the shaping of urban green areas, construction and/or modernisation of rainwater drainage solutions, the shaping of bioretention surfaces in public space solutions, the protection of natural floodplains or so-called green architecture solutions. Representative implementations reflecting the needs of residents included numerous woonerfs, transforming streets into enclaves of greenery, places to meet and strengthen local ties, vertical gardens, squares and rain gardens, urban meadows, and green bus stops. In some cities, citizens were given the opportunity to submit projects as part of the so-called 'green budgets', which are part of environmentally friendly urban development. Among the submitted tasks, projects related to the greening of public spaces, systematic revitalisation of squares and parks, creation of flower meadows, rain gardens and small retention reservoirs in city squares and parks dominated. There were also proposals to organise workshops and educational activities in the field of ecology and nature protection7. As part of the Civic Initiatives Project, the Sendzimir Foundation, between 2016 and

7 In Katowice, 128 projects were submitted for the first edition of the green budget in 2020, out of which 54 were selected for implementation. The proposals submitted by residents included: greening bus stops, restoring small retention in parks, arranging green squares, introducing new planting of trees, shrubs and flowers, creating rain gardens, flower meadows, projects for purchasing and installing nesting boxes for city birds, installing insect hotels, as well as eco-workshops and educational and natural activities to raise environmental awareness
2018, implemented with the local communities involvement, 15 initiatives in various parts of Poland. These included „Silesian Rain Gardens” and „Rain Parcel” in Katowice, a vertical garden in Zielona Góra, a small estate park in Opole or „Mid-settlement Oases” in Siemianowice Śląskie. The Foundation also conducted workshops and green lessons at schools, presenting ways to create gardens retaining water and explaining the purpose of their implementation in urban areas.

All strategic and implementation adaptation activities undertaken so far in Polish cities allow for the conclusion that the main chances for their effectiveness have been connected with:

- increased safety and health protection of the population (efficient water management systems, extensive flood protection systems, etc.);
- improving the comfort of urban living and increasing the attractiveness of urban spaces (introducing blue-green infrastructure solutions into urban spaces, reducing thermal risks, etc.);
- ensuring the cohesion and sustainability of the natural spatial network of towns and cities (taking care to protect and ensure appropriate conditions for the development or maintenance of appropriate quality standards of individual elements of the natural environment and their interrelations);
- ensuring coherence of spatial planning with climate change adaptation aspects (spatial planning solutions, flexibility of spatial planning);
- raising awareness, responsibility, and involvement of all adaptation actors in the city – local authorities, municipal services, city dwellers and civil society organisations – in the implementation of actions (adequate education covering the issue of climate change, indicating specific methods to protect against it considering local specificities);
- development of rapid response and warning systems to prepare to cope with risks and limit damage (implementation of a system for monitoring and early warning of threats to infrastructure, agriculture, and elements of the natural environment) [1].

6. Conclusions

Strategic-implementation BGI adaptation activities focus on sustainable and efficient urban development, enhancing the attractiveness of urban spaces, improving the quality of life in cities, and raising the awareness and involvement of local communities. They largely concern architecture, urban planning, green building development, transport infrastructure, adaptation of public spaces or exploitation of the potential of recreational and leisure areas. Their implementation results not only from the need to mitigate the effects of climate change, but also from economic, social, and environmental factors. The implementation of such measures, on the one hand, reduces the risks associated with various threats and, on the other, creates new opportunities that can be used in the future to adapt to climate change. Conclusions from the experience of cities with MAPs made it possible to conclude that planning and implementation actions based on natural capital:

- require adaptation to the individual characteristics and conditions of the city, their specific local identity, individual risks and difficulties, and their effectiveness is based on taking into account the needs and opinions of the inhabitants;
- must not be limited to a closed catalogue of solutions, but must allow individualisation of practices;
- should be cross-sectoral, multi-level, flexible and consistent with other strategic and implementation actions;
- should be based on a systemic approach, complemented by targeted actions;

and shape good habits in terms of recycling and saving resources. The Katowice solutions were modelled, among others, on the positive experience of Lublin, which was the first city in Poland to launch a Green Budget in 2016 [6].
must be supported by appropriate legal, planning, financial, organisational instruments, responsible for creating operational programmes and action plans from which investment and non-investment projects result.

The development of adaptation plans for 44 Polish cities provided a basis for initiating, but also for continuing, actions that had already been initiated. The knowledge and experience gained in planning the adaptation policy may be used by other Polish cities to conduct development policy directed at climate change. The actions taken are only the beginning. In 2020, the Ministry of Climate in Poland initiated a new project “City with climate”, consistent with the “National Environmental Policy 2030” of 2019. Its aim is to mobilise cities for actions that improve the quality of life of their inhabitants and to support cities in their transformation towards climate neutrality and climate resilience. More than 250 cities from across Poland have applied for the research proposed by the ministry, which involves comparing local data on waste management, air quality, green spaces, sustainable mobility and water and sewage management. This provides an opportunity to obtain data for a more sustainable approach to adaptation activities. Their implementation contributes to creating a vision of Polish cities as cities of the future, creative, taking up challenges, resilient and prepared for changes.

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