

# PLANNING AND STRATEGIC TOOLS FOR ADAPTING URBAN AREAS TO CLIMATE CHANGE IN POLAND

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## Abstract

Shaping the development policy of states, regions and cities, referring to broadly understood issues related to the climate change adaptation process, is connected with the necessity of creating new and constantly updated planning and strategic documents and adjusting their provisions to the current needs, global civilisation processes and challenges as well as regional and local specifics. One of the important elements of the adaptation policy is to take into account the problem of urbanised areas adaptation to climate change and management of the built and natural environment resources. The subject of this paper are the planning and strategic tools used in development policy to adapt urbanised areas to climate change. The aim is to indicate the possibilities and limitations of planning instruments in the context of adaptation to climate change and to indicate their coherence in the context of implementation activities. The research includes the planning and strategic instruments developed in the area of sustainable management of the built and natural environment in recent years in Poland, with particular reference to the example of the Metropolis GZM.

**Keywords:** Planning tools; Strategic tools; Urbanised areas; Built environment; Adaptation to climate change; Sustainable management, Metropolis GZM.

## 1. INTRODUCTION

Climate change is one of the factors that, over the past decade or so, has significantly influenced the way urban areas are planned and managed, and impacted the formulation of urban strategies and policies, with the method they are implemented, financed, and monitored. Cities, as places of maximum buildings and human concentrations, are particularly vulnerable to the nuisances associated with climate change. Changes in thermal conditions and disturbances in air circulation, as well as all extreme weather phenomena, extremely high (heat) and extremely low (frost) air temperatures, downpours and heavy rains, thunderstorms, gusty winds or floods, flooding, and droughts in particular, have become dangerous for infrastructure, construction, transport, energy, production, ser-

vices and many other aspects of city functioning [1]. An increasing frequency of these phenomena begins to hinder proper functioning and economic development, causes imbalances in natural and built environment systems, and poses a threat to the health and lives of residents. Given that the basis of the Polish development policy is the paradigm of sustainable development, adaptation to climate change has become part of the smart development of urbanised areas. The ongoing changes should be considered not only in the context of socio-economic processes, but also in the context of spatial development. Rational spatial management is one of the most important instruments of intervention that make it possible not only to effectively protect urbanised areas from the effects of climate change, but also to shape their space in such a way as to equip them with the characteristics

of adaptability to possible climate change. Regulations and actions implemented in this sphere co-determine the quality of the built and natural environment, define solutions and ways of intervention important in the long-term perspective. They aim to limit the negative effects of climate change affecting various sectors of the spatial economy. This involves the spatial planning of various functional and spatial zones and related building facilities, including development areas, compact inner-city buildings (quarters), residential housing (concrete-block buildings), buildings and zones under conservation protection, industrial and industrial infrastructure zones with industrial facilities, administrative zones with public utility facilities, degraded, post-industrial areas and others. The vulnerability of individual sectors should be considered in relation to their planning, design, construction, technologies, and materials used, as well as maintenance and monitoring. Effective prevention and management of spatial conflicts in urban areas is an integral part of the strategic urban policy of cities and regions, which indicates the directions of their development. These policies aim to achieve a vision of safe, healthy, competitive, and innovative cities, that are well managed, resource efficient, caring for identity, spatial order and architecture, the cities of civil society [2].

The ability to cope with climate risks has become a key development objective and an area of strategic action undertaken on an international, national, regional, and local scale. Considering processes related to adaptation to climate change and its impacts has therefore become part of development policy. Spatial planning is one of the basic instruments for addressing climate issues in urban areas, and the selection of appropriate planning tools and urban and architectural solutions is part of the implementation of this policy [3]. The diversity of actions taken depends on the level of economic and social development, financial, institutional, human and knowledge resources. This raises questions about the possibilities and limitations of planning instruments in the context of climate change adaptation and the effectiveness of their implementation in urban areas. Answering these questions is the aim of this research. The research concerns a review and analysis of the Polish planning-strategic instruments, records of adaptation actions inscribed in various spatial scales, with a particular focus on the example of the Metropolis GZM.

## 2. MATERIALS AND METHODS

The problem addressed in the paper is an issue researched and analysed by representatives of various fields of science. The interdisciplinary approach to the topic is related to the influence of climate threats on various aspects of functioning of the built and natural environment and human health and life. It leads from purely theoretical considerations carried out at various levels of administration, through conscious climate and energy policy undertaken by global organisations, development of planning and strategic documents in various time perspectives, up to implementation of specific adaptation measures at various spatial scales. At the European Union level, many documents refer to policy solutions and instruments to adapt urbanised areas to climate change [4, 5, 6, 7]. On the Polish scale, the implementation of the EU climate policy is reflected in documents that translate into supra-local and local contexts [8, 9, 10, 11, 12]. The urban context together with the issues concerning detailed analysis of climatic and hydrological data and strategic and implementation actions has been analysed and described in the most consistent manner in the documents of the “Urban Adaptation Plans” (UAPs) developed for 44 Polish cities [13]. The supra-local context presented in this paper on the example of the Metropolis GZM area, includes the issue of the impact of climate change on highly urbanised and industrialised areas [14, 15]. The issues discussed in the paper are also the subject of separate studies. Among them, studies on climate hazard and risk analysis [1] and the relationship between climate issues and urbanized areas [16, 17] take a special place. Some studies review good practices implemented on different spatial scales [18]. Others place the issue in the context of the role of spatial planning in urban adaptation to climate change [19].

Taking into account that the subject of research in this paper are spatial policy tools and documents, in order to review and analyse them applied methods, techniques and research tools were adequate to the object and purpose of the study. The research material was limited to strategies, plans and documents developed in Poland in the context of adaptation of the built environment to climate change. As a case study the Metropolis GZM (Upper Silesian and Zagłębie Metropolitan Area), located in the southern part of Poland in the Silesian Voivodeship, has been taken into account. The research used the logical argumentation method, which was based on a critical analysis of spatial policy documents conducted at

the national, regional, and local scale, as well as an analysis of the current legal status concerning spatial planning and the possibility of applying measures related to climate change adaptation. The analysis criteria included, in particular, the hierarchy of documents and the consistency of spatial policies undertaken at different spatial scales, as well as a description of the nature, purpose and scope of individual planning and strategic provisions. To achieve the research objectives, research techniques such as literature review and planning and strategic documentation, description, data interpretation and case study were selected.

### 3. RESULTS

#### 3.1. The European context

Climate change issues figure prominently in the policies pursued by the European Union countries. The EU seeks to promote broad global action through climate conferences, climate conventions, international fora, policies and initiatives at international and EU level. Starting with the “United Nations Framework Convention on Climate Change” (UNFCCC or FCCC) signed in 1992 in Rio de Janeiro, through the reviews of its implementation by the Conferences of the Parties (COPs), including 1997 “Kyoto Protocol” (COP 3) [20], the “Cancun Adaptation Framework” (CAF) being developed between 2007 and 2010 as part of COP 16 [5], to the European Union’s (EU) socio-economic growth strategy – “Europe 2020 Strategy” [21]. Over the years, the European Commissions have developed strategies, programmes and action plans on smart and sustainable development and climate in the broadest sense. An important document was the EU “White Paper. Adapting to climate change: towards a European framework for action”, COM 2009, which set out a framework for action on adaptation and laid foundations for preparation of the comprehensive EU strategy to facilitate the adaptation of the member states economies and societies to current and expected climate change in the most efficient and cost-effective way. The White Paper became the basis for the development of strategic adaptation plans in individual EU countries [6].

Given the dynamics of the changes taking place, the European Union, through its climate policy, has begun the process of transforming cities and building a climate-resilient society. As a result, it is urban policy that will be crucial for the implementation of adaptation policy in the EU Member States. Current

climate action is based on the so-called “European Green Deal” – a package of measures including, inter alia, significant reductions in greenhouse gas emissions, investment in cutting-edge research and innovation, and protection of Europe’s environment, which aim to make Europe climate-neutral by 2050 [22]. In 2013, “EU Adaptation Strategy Package” was adopted by the European Commission with the aim of making Europe more resilient to climate change [7]. “The EU Adaptation Strategy” focuses on promoting the member states action to develop comprehensive adaptation strategies, promoting adaptation action in key vulnerable sectors, closing knowledge gaps on adaptation and further developing the “European Climate Change Adaptation Platform” [23]. The strategy aims to enhance the preparedness and capacity of all levels of governance to respond to the impacts of climate change. Under the EU governance system, all Member States have been required to adopt integrated “National energy and climate plans for 2021–2030”, as well as to develop “Long-term national strategies” and ensure coherence between these strategies and national energy and climate plans.

Important findings for European countries include the “European Union’s climate and energy policy framework developed until 2030” and “policy assumptions and targets for 2021–2030”. They enable the countries of the Community to make the transition to a low-carbon economy and to fulfil the obligations arising from the commitments adopted in 2015: “Paris Agreement – defining a multilateral framework for climate protection beyond 2020” [24] and the “2030 Agenda for Sustainable Development” [25]. This has presented many countries with significant planning, policy and implementation challenges in adapting cities and urbanised areas to climate change and highlighting the role of subnational governments, civil society, and the private sector in addressing climate change. Urban climate policy challenges are also included in other documents adopted in 2020, such as the “New Leipzig Charter” [26] and the “EU Territorial Agenda 2030” [27], as well as in initiatives such as the “European Bauhaus” (2020) [28], supporting the implementation of the “European Green Deal”. They set directions for the development of European cities, emphasise the need for their transformation and identify principles for good urban planning and management and for ensuring good living conditions for all European citizens. The objectives set out in these documents address social, technical, political and economic issues and

require an integrated approach to planning for climate change mitigation and sustainable development.

### 3.2. The Polish context – three spatial scales

Poland is a geographically and spatially diverse country. The urban network is made up mainly of small and medium-sized towns and cities, as well as 39 centres with populations in excess of 100 000. These towns and cities differ in terms of their natural conditions, type of development or management method, which influence the way they respond to climate change-related phenomena. Climate risks affect urban areas directly, but also rural areas and open spaces. The hazards that occur most frequently in Polish urban areas include heat, frost, intense rainfall and storms, urban floods, river floods, sea floods, land-slides, droughts, and windstorms. In recent years, it is possible to observe, *inter alia*, a high variability of air temperatures (systematically increasing temperature – about 0.7°C per 100 years, with an observed upward trend maintained since the late 1970s), as well as the changing nature of precipitation (greater violence in the warm season and short-lived and intense precipitation that causes flash urban and river floods) [29]. Many of these hazards are becoming important constraints to the development of urban areas.

#### 3.2.1. National scale

The phenomenon of climate change has gradually become one of the important elements of the Polish development policy. Among the national documents to significantly influence the formation of the medium- and long-term adaptation policy in Poland were: “National Spatial Development Concept 2030” adopted in 2011 [8], the “Strategy for Responsible Development up to 2020, including the perspective until 2030”, adopted in 2017 [9], and the “National Environmental Policy 2030” of 2019 [10]. Among the main objectives of the spatial policy related to the issue of adaptation of urbanised areas to climate change in the national documents, the following are most often mentioned: increasing the resilience of spatial structures to natural hazards, achieving and maintaining high quality of the natural environment and landscape values, and restoring and consolidating spatial order associated with increasing the quality of life, as well as the implementation of low-carbon urban strategies and strategies related to improving air quality. The adaptation objectives, directions

and measures set out in the documents emphasise the need to develop and implement strategic/planning documents in the field of water management, climate change adaptation plans for urbanised areas, construction of the necessary flood prevention infrastructure and small retention facilities, renaturalisation of rivers and their valleys and the development of green and blue infrastructure in urbanised areas. These documents promote modern urban space management, based on the principle of sustainable use of resources, ensuring high architectural and urban planning standards and protecting natural and cultural values. Among the directions of intervention the following play an important role: rational management and management of land and resources, creation of conditions for development of areas, legal and financial mechanisms favourable to the use of various resources and the implementation of innovative technologies, development of infrastructure favourable to the protection of urbanised areas against flood and drought, and also the development of blue-green infrastructure and infrastructure supporting the provision of public services, increasing the attractiveness of urbanised areas [8, 9, 10]. This requires parallel actions of legal, institutional and investment nature.

The first document in Poland that was directly dedicated to the issue of adaptation to the ongoing climate change became the “Strategic Adaptation Plan for Sectors and Areas Sensitive to Climate Change by 2020. with an Outlook to 2030”, adopted in 2013 (SPA 2020) [11]. Its elaboration resulted from the provisions of the “White Paper: Adaptation to Climate Change: A European Framework for Action” COM (2009)147 [6] and the “EU Climate Change Adaptation Strategy” COM (2013)216 [7]. SPA 2020 stresses the need to take legislative, organisational, informational, and scientific actions “to ensure sustainable development and effective functioning of the Polish economy and society under the changing climate conditions” [11]. The document identifies priority directions of adaptation actions to be taken in the areas most vulnerable to climate change, such as water management, agriculture, forestry, biodiversity, health, energy, construction and spatial management, urban areas, transport, mountain areas and coastal zones. The proposed objectives, directions of activities and specific actions included in the long-term vision on adaptation to climate change refer both to technical undertakings (infrastructural investments) and changes in legal regulations (changes in the spatial planning system

and applied procedures) [11]. Achieving sustainable development and effective functioning of the economy and society under climate change conditions is possible through the implementation of actions of a horizontal nature. The key, identified areas of intervention include the adoption of a new Water Law, the introduction of mandatory spatial development plans at regional and local level especially for flood areas and areas at risk of flooding, adaptation of legal acts and technical regulations to changes, streamlining management structures and strategic planning (including adaptation measures in strategic and operational documents at national, regional and local level), developing rules for the development of protected areas and areas exposed to flood risk, taking into account the need to increase green areas and water areas and ventilation corridors in urban development plans. SPA 2020 indicates the importance of developing climate change adaptation plans in cities with population over 100,000, with the simultaneous assumption that their effectiveness will be greater when they cover functional areas of cities [11]. The objectives, directions of actions and specific activities proposed in SPA 2020 corresponded with other strategic documents, in particular with the Country Development Strategy 2020, complementing them with a system for implementing the strategic plan, indicating the entities responsible and the indicators for monitoring and assessing the implementation of the objectives.

Documents at the national level indicate the need for an adaptation policy that embodies the regional and local specificities of individual areas. References to the development policy conducted on a regional scale are included in the “National Strategy for Regional Development 2030” of 2019. The process of adaptation to climate change is presented here both in the context of threats and development opportunities for regions (creating demand for new types of services related to activities minimising the negative effects of climate change, i.e. designing blue-green infrastructure). A key role in counteracting climate change was ascribed to shaping natural spatial structures that ensure cohesion of the most valuable natural areas and increase resilience of the most valuable areas. The impact of well-designed adaptation solutions on social aspects – recreation and improvement of the quality of life of inhabitants and the development of areas based on ecosystem services – was also highlighted [12].

The role of adaptation of cities to climate change was also emphasised by the “National Urban Policy

2023”, which assumes the development of Polish cities towards efficiency of management, spatial compactness, sustainability of development, social, economic, and spatial cohesion and competitiveness on a supra-regional scale. The document draws attention to the need for comprehensive revitalisation of degraded areas, respect for resources and their sustainable management, striving for spatial order, transition to a low-carbon economy, building “green” cities, managing open spaces, increasing energy efficiency, environmental protection and adaptation to climate change. This approach highlights the specific role of spatial planning [2].

Among other Polish studies, projects and programmes undertaken to mitigate climate change, 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”, carried out in 2011–2013 [30]; “Adaptation Manual for Cities. Guidelines for preparing a Urban Adaptation Plan”, 2014–2015 [31], development and implementation of “Urban Adaptation Plans in cities with more than 100,000 inhabitants in Poland” – a project of the Ministry of Climate implemented in 2017–2019 [13], or the Ministry's work on operational programmes under the EU financial perspective 2014–2020 and 2021–2027. In 2020, the Ministry of Climate also initiated the “City with Climate” project consistent with the “State Environmental Policy 2030” of 2019. The aim of the project is to mobilise cities for actions focused on the quality of life of their inhabitants’ improvement and cities support in their transformation towards climate neutrality and resilience to climate change. More than 250 Polish cities, including both cities with up to 100,000 inhabitants and cities with more than 100,000 inhabitants, have applied for the survey proposed by the Ministry, which involves comparing local data on waste management, air quality, green spaces, sustainable mobility and water and sewage management. The study is to compare local data on waste management, air quality, green areas, sustainable mobility and water and wastewater management [32].

### 3.2.2. Supra-local scale

Poland's regions are diverse in their geographical, social, economic, cultural, and demographic characteristics. This determines their individual vulnerability/resilience to the effects of climate change. It is therefore necessary to consider the regional specificity when planning measures and developing adapta-

tion strategies. Adaptation measures must be reflected in the development policy of voivodships, functional areas, metropolises, and agglomerations. Among the planning and strategic tools important from the point of view of the conducted development policy one can distinguish: provincial development strategies, environmental protection programmes, spatial management plans or small retention programmes [13, 14]. Among the directions of the proposed strategic provisions dominate those which propose to develop the regions based on strengthening the resilience of the built and natural environment to climate-related threats. An important role is seen in the extension and construction of environmental protection infrastructure, reduction of environmental risk under the conditions of climate change, regeneration of the natural environment, its resources and components, revitalisation of degraded areas, including post-industrial areas, creation of high-quality public spaces, rational management of water resources, ensuring ecological safety to the inhabitants of the regions. The specific supra-local conditions direct the proposed objectives and measures towards individual solutions. In post-industrial regions, attention is drawn, e.g. to multifaceted negative effects of mining on water levels in rivers and their impact on increasing or causing flood hazards, high degree of land transformation, high share of sealed surfaces causing an increase in the intensity of surface run-off or high degree of degradation of individual elements of the natural environment, which translates into low quality of life of the inhabitants.

On a supra-local scale, the issue of management of urbanised areas is addressed including: adjustment of the way of development and land use to the needs of water re-sources protection, regulation of sewage and waste management and elimination of the existing sources of pollution resulting from intensive agricultural use and industrial activity; implementation of technical activities in the field of small retention; maintenance and increase of retention in drainage basins through: protection of natural areas, preservation of the spatial continuity of the natural system, renaturalisation of rivers and streams; reclamation and revitalisation of degraded areas and their integration with the surroundings; creation of well-developed public spaces, including green areas favouring integration of the local community, counteracting segregation and social exclusion, attracting tourists and investors.

On the supra-local scale, a key role is played by the preparation and updating of planning and strategic

documents with provisions on adaptation and mitigation to climate change and the implementation of integrated adaptation strategies/plans. Many of the proposed provisions are based on a comprehensive, systemic approach to preventing climate risks, but they are based on actions taken in cities, which are complementary, and their impact is local.

### 3.2.3. Local scale

The strategic and planning documents developed at the local level contain a diagnosis of the current socio-economic situation of individual cities, define the outlines of the spatial policy pursued, outline the conditions and perspectives for further development, and contain objectives and actions related directly or indirectly to climate change and relating to urban areas and the quality of life of the inhabitants. The provisions of the urban development strategies, local spatial development plans, local revitalisation programmes, studies of spatial development conditions and directions, environmental protection programmes or crisis management plans contain provisions that constitute the basis for adaptation measures.

The most important document in recent years aimed at adaptation policy are the Urban Adaptation Plans (UAPs), aimed at limiting or mitigating the effects of the most serious threats resulting from climate change. The preparation of UAPs has become part of a project organised and co-financed by the Ministry of Environment and 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, between 2017 and 2019 [13]. UAPs were developed for 44 Polish cities, including: 37 cities with more than 100,000 inhabitants, 3 cities with 90 to 100,000 inhabitants and four cities with less than 90,000 inhabitants. The selection of 44 cities as a target group for which it was first recommended to prepare UAPs resulted from the provisions of SPA 2020, the complementarity of features characterising the vulnerability of large cities to climate change and the availability of land use and land cover maps. On the basis of a coherent methodology and guidelines specified by the Ministry, a team of experts, using participatory methods, together with representatives of the local community, officials, administrators of urban networks and properties, activists, scientists, entrepreneurs, prepared documentation including: a diagnosis of the current situation, identification of areas of

activity of the cities together with an analysis of their vulnerability to climate change and definition of priority undertakings and tasks together with the time of their implementation and estimated costs [31]. The aim of the study was to assess the vulnerability of the largest Polish cities to climate change and, as a result, to plan activities responding to the identified threats and increasing the resilience of the cities to, e.g., “urban” floods related to sudden and intense precipitation, floods related to river flooding, prolonged droughts and related lack or limitation of 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 measures 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. “Urban Adaptation Plans” have become a tool for innovative and creative policy-making aimed at increasing cities’ resilience to the ongoing environmental changes, but also an instrument of urban policy enabling application of funds for projects aimed at adapting cities to climate change. Their effectiveness can be assessed by the number of implemented adaptation measures in particular Polish cities.

### 3.3. Case study of the GZM

The Metropolis GZM (Upper Silesian and Zagłębie Metropolitan Area), located in the southern part of Poland in the Silesian Voivodeship, comprises 41 cities and communes with a total area of 2500 sq km, inhabited by 2.3 million people [33].

Metropolis GZM area focuses on tasks resulting from the provisions of the “Act on the Metropolitan Association” [34], based on development of priorities and trends resulting from national and regional strategic documents. This act equipped the Metropolis GZM area, as the only metropolitan area in Poland, with spatial planning tools. The Metropolis GZM was created when most strategic

documents at all levels of the hierarchy had already been defined and were in the process of implementation with a perspective of implementation by 2020, 2022, 2025, 2027 or 2030. Therefore, the “Strategic Action Program of Metropolis GZM until 2022” developed in 2018 [35] – an important document common for the entire metropolitan area, defining development activities in the short term – considered the strategic provisions of already existing documents: “Strategy for Responsible Development”, “Program for Silesia, National Urban Policy 2023”, “Strategy for Development of Southern Poland in the Area of Małopolskie and Śląskie Voivodeships until 2020”, “Development Strategy of the Silesian Voivodeship Śląskie 2020+”, “Strategy for Integrated Territorial Investments of the Association entitled”, “The Association of Municipalities and Districts of the Central Subregion of the Silesian Voivodeship”, “The Concept of the National Spatial Management 2030”, “The Spatial Management Plan of the Silesian Voivodeship 2020+”, strategies of the counties located in the metropolitan area and the metropolitan member communes, selected sectoral strategies [35]. Some of the actions proposed therein concerned the prevention of and adaptation to climate change. The specificity of these activities was related to the post-industrial heritage of the region and the associated environmental burden resulting from mining and quarrying activities in the Metropolitan area, as well as the large stock of post-industrial sites and sites already reclaimed but insufficiently developed [36]. The specificity of the region has forced the need for a comprehensive approach to issues related to water and green areas management, ensuring adequate air quality, reclamation and transformation of degraded land, space, energy, and waste management. One of the important priorities set for 2018–2022 became shaping spatial order and moving towards a sustainable, “green” Metropolis. This priority resulted directly from the tasks listed in Article 12. paragraph 1. of the “Act of 9 March 2017 on the metropolitan association in the Silesian Voivodeship” [34]. Among the programme assumptions and planned strategic activities related to adaptation of the Metropolis area to climate change, an important role was given to the proper orientation of spatial policy of the member municipalities. The spatial, socio-economic cohesion in the metropolitan area was to be ensured by the “Framework Study of Conditions and Directions for Spatial Development of the Metropolitan Union” – an instrument for shaping and conducting spatial policy at the metropolitan level. The scope and procedure for the preparation of the Study was defined by

the “Act on spatial planning and development” [37]. The document, being a multi-element spatial database on various information concerning the area of the GZM, was to be a directional document for the spatial policy of the municipalities belonging to the metropolitan association. Its purpose was to support the management process of the metropolitan area, and its findings were transposed to the studies of conditions and directions for spatial development of each of the member municipalities. In the 2021 updated “Programme of strategic activities of the Metropolis GZM until 2022” [38], the task relating to the Framework Study was merged with the task relating to the development of the “Development Strategy for the Metropolis GZM for the years 2021–27 with an outlook until 2035” – a strategic and planning tool supporting the management process of the metropolitan area for sustainable social and economic development and strengthening of the spatial and functional cohesion of individual communes. It is intended that the Strategy document will provide a framework for detailed development activities of the metropolitan area, set out priorities and directions for the development of the metropolitan association in the socio-economic and spatial-functional areas and indicate activities to be implemented in the coming years. The document is to integrate strategic and spatial planning. On the one hand it should be a tool for integrating, initiating, and coordinating initiatives taken by individual communes and the Metropolitan Office, and on the other hand it should be a document for communication with the environment, including the self-government of the Silesian Voivodeship, government administration and the European Commission, as well as a basis for applying for external financial resources [38]. The basis for Metropolis GZM experiences in adaptation activities are the strategic and planning documents developed at the local level. The most important strategic and implementation documents relating directly to the issue of climate change adaptation are the “Urban Adaptation Plans” developed at the local scale, in 2017–2019, for 12 cities of the GZM, include Bytom, Chorzów, Dąbrowa Górnicza, Gliwice, Katowice, Ruda Śląska, Sosnowiec, Tychy, Zabrze, Mysłowice, Siemianowice Śląskie, Czeladź [15]. Their basic strategic objective is to raise/increase the adaptation potential of cities to the effects of climate change by introducing modern infrastructure and designing public space in such a way that would foster the development of the economy and the living comfort of inhabitants. Among the organisational measures concerning spatial planning, some of the UAPs (con-

cerning the cities of Bytom, Chorzów, Katowice, Ruda Śląska, Sosnowiec, Mysłowice, Siemianowice Śląskie and Czeladź) define the need to develop planning/urban planning guidelines in the shaping of public space. These guidelines are to specify the criteria for shaping urban public spaces and define parametric relations between the basic indicators of urbanised land development, i.e. designation of biologically active surfaces, the degree of surface sealing in public spaces, restriction (or abandonment) of the sale of green areas by the municipality; admissibility of certain material solutions, consideration of sunlight conditions, drainage solutions and water retention possibilities; space accessibility; increase in the safety of users (urban monitoring, information system in urban spaces). Ultimately, the planning/zoning guidelines in shaping public spaces, in addition to being included in “urban revitalisation programmes”, are to be the basis for defining provisions to be included in urban planning documents, i.e. “studies of conditions and directions of spatial development”, “local spatial development plans”, or “decisions on the location of public purposes”. The introduction of such provisions in planning documents may force the selection of urban planning and architectural solutions closely related to the adaptation of urbanised areas to climate change, strengthening the resilience of cities to the possible negative effects of climate change, as well as ensuring safety and higher living comfort for their inhabitants. The implementation of individual guidelines requires active consultation with key stake-holders and entities participating in their implementation or involved in individual activities, as well as the implementation of ongoing monitoring and control of the application of guidelines enshrined in local plans [15]. An example of a document that clarified the scope of the guidelines is the “Urban Adaptation Plan for Czeladź” [39]. The document identifies four sub-activities for the development of planning/urban planning guidelines: coverage of the whole city by “local spatial development plans” with indications and prohibitions and orders for adaptation to climate change; development of a master plan for a coherent greenery system; development of guidelines for adaptation to climate change for the city’s transport system; and control of compatibility and sustainability of investments with local spatial development plans. For each of them, a range of activities has been defined, including: development of “local spatial development plans” for uniform urban areas; avoiding development of plans for small areas; delimitation of compact development and business activity areas within

the city where the necessary technical infrastructure networks exist; introduction of isolating green belts; analysis of the existing condition of green areas, urban space requirements, and residents' expectations; provision in the "local spatial development plans" regarding: preservation of environmentally valuable areas and facilities and ecological corridors, delimitation of developed green areas for all housing estates, preservation of the city's ventilation corridors, and ensuring the minimum biologically active area for all zoning purposes. It was also indicated that there was a need to run public campaigns on spatial development and the need for all investors to observe the provisions of "local spatial development plans", to monitor investments during construction, and to carry out regular inspections of completed investments to ensure that the provisions are observed [39]. The "Urban Adaptation Plans" will also form the basis of the framework policy in the scope of shaping the natural system and protection of natural values through preparation of "Greenery Development Strategy for the cities" (Gliwice, Tychy) or the concept of system shaping of the blue-green infrastructure in the cities (Katowice, Mysłowice, Siemianowice Śląskie, Czeladź). It is assumed that the "Green Areas Development Strategy" document should contain provisions on the implementation of investments in the development of new and revalorisation of existing green areas, as well as the maintenance, care, and management of green areas. It should be a tool for planning, preparing, and implementing specific investment projects, introducing changes to "Long-Term Investment Plans" and "Long-Term Financial Forecasts of the Cities", as well as facilitating the planning of future City Budgets in the scope of expenditures on publicly available greenery in the cities. In addition, the findings contained in the strategy document are to be a guideline for newly drawn up local plans and will also apply when updating the existing planning documents. Also, the systemic concept of shaping the blue-green infrastructure in cities will require the introduction of specific provisions to local documents, programmes and concepts (i.e. master plans, revitalisation programmes, urban and architectural concepts, etc.). Its provisions would concern, among others, the requirements of preserving ecological corridors, natural watercourses, and water reservoirs, increasing the retention capacity of the city, biodiversity, recreational opportunities for residents, improving their health and using the potential of urban ecosystem services [15].

Another measure in the scope of spatial policy, urban development policy and management in the cities, provided for in the UAP, are activities related to including the issue of climate change in the cities' strategic and planning documents in order to adapt them to the forecast climate conditions (the cities of Chorzów, Gliwice, Katowice, Ruda Śląska, Sosnowiec, Zabrze, Mysłowice, Siemianowice Śląskie have taken this measure into account). The plans, programmes and strategies adopted in the cities, such as: studies of conditions and directions of spatial development, local spatial development plans, city development strategies, revitalisation programmes, water and sewage management, including rainwater management, programmes of small retention, air protection, environmental protection, low emission management plans, plans for supplying heat, electric energy and gas fuels or plans for crisis management are to be reviewed, updated or prepared [15].

The preparation of the "Urban Adaptation Plans" for 12 cities of the Metropolis GZM is the beginning of planning and strategic activities in respect of climate change. It will be important for Metropolis GZM as a region to create and implement a coherent strategy of adaptation to climate change that will be compatible both with the UAPs of the individual cities of the metropolis and with the regional adaptation strategy developed for the whole Silesian Voivodeship. In the Marshal's Office of the Silesia Voivodeship in Katowice, in the Department of Regional Projects, the Climate Office has been established. Its task is to initiate and conduct climate issues on the regional level, build cooperation on different levels of administration in the field of prevention and adaptation to climate changes as well as to develop and implement activities and projects in the field of climate change prevention and mitigation. One of the tasks is to develop a "Regional Climate Change Adaptation Plan for the Silesia Voivodeship". This plan is intended to become an operational document supporting the implementation of the "Development Strategy of the Silesia Voivodeship "Silesia 2030" – Green Silesia". The implementation of the measure is foreseen within Phase I of the COALA project, funded by the LIFE Programme, with implementation from January 2022 to June 2024 [40].

In the Metropolis GZM area, effectiveness of the regional approach to climate issues will depend on the degree of individual member communes involvement which is particularly difficult in the case of a polycentric layout of the metropolis, and the strengthening of the role of spatial planning on the

**Table 1.**  
**The most important documents of the spatial planning system in Poland taking into account climate change issues**

National documents	Regional documents	Local documents
<ul style="list-style-type: none"> <li>• National Spatial Development Concept 2030,</li> <li>• Strategy for Responsible Development up to 2020, including a perspective up to 2030,</li> <li>• National Ecological Policy 2030,</li> <li>• Strategic Adaptation Plan for Climate Change Vulnerable Sectors and Areas up to 2020, including a perspective up to 2030,</li> <li>• National Strategy for Regional Development 2030,</li> <li>• National Urban Policy 2023.</li> </ul>	<ul style="list-style-type: none"> <li>• Voivodship Land Use Plan,</li> <li>• Regional Development Strategy,</li> <li>• Inner Voivodship Development Programme,</li> <li>• Voivodship Environmental Protection Programme,</li> <li>• Regional Operational Programme of the Voivodship,</li> <li>• Small Retention Programme for the Voivodship,</li> <li>• Framework study of the conditions and directions of spatial development of the metropolitan association.</li> </ul>	<ul style="list-style-type: none"> <li>• Urban development strategy,</li> <li>• The study of conditions and directions of spatial development,</li> <li>• Local development plan,</li> <li>• Urban Adaptation Plan,</li> <li>• Communal revitalisation programme,</li> <li>• Urban Revitalisation Programme,</li> <li>• Environmental Programme,</li> <li>• Programme of Care of Monuments,</li> <li>• Long-term programme for the management of the commune's housing stock,</li> <li>• City Emergency Management Plan,</li> <li>• Low Carbon Management Plan,</li> <li>• Strategy for solving social problems of the city.</li> </ul>

\* Currently, the Ministry of Development, Labour and Technology is working on a reform of the spatial planning system in Poland, which envisages the introduction of a new, two-tier spatial planning system, translating into changes in planning instruments.

metropolitan scale. It will also be important to introduce appropriate legal regulations binding urban development planning in the context of climate change (in relation to the provisions of the “Strategic Adaptation Plan for Sectors and Areas Sensitive to Climate Change by 2020”, with an annual perspective), to implement the already prepared “Urban Adaptation Plans” for the cities of the Metropolis GZM and to integrate them with the documents prepared for the remaining cities and for the entire voivodeship.

#### 4. DISCUSSION

Climate change requires new approaches in urban development policies. More and more cities, recognising the problem of climate change and its impacts on public spaces and the safety of their citizens, are undertaking strategic and planning activities for adaptation to climate change. The development of sustainable adaptation policies covers a wide range of issues and is based on the involvement of a diverse group of public partners, scientific institutions, and civil society organisations. These issues are addressed at different spatial scales and are driven by legal regulations, planning tools, organisational and financial capacities. The conditions for shaping adaptation policy result from strategic and programme documents developed at the national level, which are translated to the regional and local levels (Table 1).

As a result, the actions taken also have a different degree of reflection in the development policy, starting from the national scale, through regional to local

actions concerning urbanised areas (Table 2).

All actions taken must be coordinated with each other. The implementation of the adaptation policy requires ensuring its coherence with the national, regional and urban development policy expressed in strategic and planning documents. Adaptation measures belong to development projects that lead to an improvement in the quality of life, activation of inhabitants and economic development. Their implementation contributes to the creation of the vision of cities of the future as creative, challenge-taking, resilient and prepared for change. The main opportunities for the effectiveness of adaptation measures in urbanised areas are:

- increased safety and health protection of the population (efficient water management systems, extensive flood protection systems, etc.),
- improving urban living comfort (introducing blue-green infrastructure solutions into urban spaces, reducing thermal risks, etc.),
- ensuring the cohesion and sustainability of the natural spatial matrix 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 interrelationships),
- ensuring coherence of spatial planning with climate change adaptation aspects (land-use solutions, flexibility of spatial planning),
- raising awareness, responsibility and involvement of communities and local authorities in the implementation of actions (adequate education cover-

**Table 2.**  
**Development policy issues in Polish planning and strategic documents taking into account climate change in spatial aspect, own work**

National documents	Regional documents	Local documents
<ul style="list-style-type: none"> <li>• sustainable development,</li> <li>• spatial coherence,</li> <li>• restoring and consolidating spatial order associated with improved quality of life,</li> <li>• climate change mitigation,</li> <li>• adaptation to climate change,</li> <li>• disaster risk management,</li> <li>• sustainable water management,</li> <li>• modern urban transport and communication systems,</li> <li>• increasing the resilience of spatial structures to natural hazards,</li> <li>• achieving, maintaining and protecting a high quality of the natural environment and landscape values,</li> <li>• implementation of low-carbon urban strategies and strategies to improve air quality</li> <li>• energy security.</li> </ul>	<ul style="list-style-type: none"> <li>• shaping spatial order,</li> <li>• sustainable urban mobility,</li> <li>• improving the quality of life of residents,</li> <li>• tackling low emissions,</li> <li>• construction and expansion of environmental protection infrastructure,</li> <li>• reducing environmental risks under climate change conditions,</li> <li>• regeneration of the environment, its resources, and its components,</li> <li>• revitalisation of degraded areas, including post-industrial areas,</li> <li>• creating high quality public spaces,</li> <li>• rational management of water resources,</li> <li>• ensuring the environmental safety of residents.</li> </ul>	<ul style="list-style-type: none"> <li>• spatial integration of public spaces,</li> <li>• revitalising neighbourhoods,</li> <li>• development of open spaces,</li> <li>• development of new leisure spaces, rainwater management,</li> <li>• reclamation of industrial sites,</li> <li>• preventing uncontrolled suburbanisation,</li> <li>• multiple use of land,</li> <li>• minimising the effects of the urban heat island,</li> <li>• sustainable land management.</li> </ul>

ing the issue of climate change, indicating specific methods of protection against it, taking into account local specificities),

- development of rapid response and warning systems to prepare to face risks and limit damage (implementation of a system for monitoring and early warning of risks in the area of infrastructure, agriculture and elements of the natural environment) [41].

It is also important to consider in planning documents, especially those constituting acts of local law, the need to increase green areas and water areas, nature revitalisation – in particular the restoration of degraded green areas and water bodies to their original functions, the introduction of ventilation corridors, the adaptation of sanitary installations and sewage networks to climate change and small urban retention [11].

When analysing the adaptability of urbanised areas, it is important to take into account location-specific conditions, regional specificities and local identity. It is also important to be aware of and assess the weaknesses in urban policies, opportunities to enter into dialogue with the public, and space management [31]. The problem on the national scale is inconsistency of legal regulations, including the Act on planning and spatial development with other acts; lack of climate and aerosanitary indicators; lack of solutions protecting green areas; lack of planning/urban planning guidelines and standards in the field of ventilation, green areas, shaping public spaces or shaping a

compact city. Another problem is the lack of flexibility of planning documents and the lack of integration of strategic and planning documents. In Poland, climate change planning takes place mainly at the strategic level, with too little translation into spatial planning [3].

A weakness of the spatial policy pursued at the local level is the insufficient coverage of urbanised areas with local plans or their poor quality. This is compounded by: fragmentariness, covering small areas with plans, misuse of decisions on development conditions, low flexibility of local plan provisions, small possibilities to introduce individual provisions adjusted to the needs of the place, insufficient level of detail in provisions concerning effective planning of open areas and protection of naturally valuable objects or ecological corridors, designation of areas of arranged greenery, ensuring minimum biologically active area for areas with different purposes; development of urban ventilation corridors, allocation of too much land for construction purposes, land speculation, sealing of urban land, impoverishment of ecosystem services, inefficient use of space, degradation of suburban landscape, insufficient scope of implementation of programmes for revitalisation of degraded urban areas, and finally the lack of coherent mechanisms and guide-lines concerning planning in relation to adaptation to climate change [3].

For a coherent implementation of adaptation changes in urbanised spaces, in addition to changes in the spatial planning system and the adaptation of related planning and strategic tools, a proactive atti-

tude of regional and local authorities and long-term and integrated planning at the strategic and planning level are necessary. The policy of local authorities should be supported by planning, strategic and programme documents of regional and national level. The basis is the adoption of good quality planning documents, including the development of climate change adaptation plans for all cities and regions. “Urban Adaptation Plans” should be embedded in legislation and have a legal basis for considering climate change adaptation needs (with reference to local legislation) and each urban investment implemented should be assessed from an adaptation perspective. At the local scale, the basis is the adoption of new, or updating of existing, local plans that contain the necessary provisions to prevent climate risks and take advantage of the opportunities they present. These documents must be based on a thorough analysis of baseline data covering environmental, economic, and social issues and developed in transparent procedures with the active participation of citizens.

## 5. SUMMARY

Climate change requires a new approach to the role of spatial planning in conducting adaptation policy in relation to urbanised areas, exercising control over them and shaping their proper development. It is necessary to have a systematic approach to the changes and to strengthen the role of spatial planning as a basic instrument of spatial management. Priority development areas that include adaptation measures should relate to ordering spatial management, restoring the ability to develop through revitalisation of degraded urban areas, sustainable resource management, increasing the ability of cities to create development, growth, and employment. Actions taken should imply a broad spectrum of long-term natural impacts, modelling and forecasting of development options and functions in relation to climate change, taking into account quality of life, air quality, prevention of heat island formation, water retention, and be in line with the idea of blue-green infrastructure embedded in the socio-economic context. Adaptation measures should be in line with the provisions of adaptation strategies and development policies and be reflected in the most important strategic and planning documents defined on a national, supra-local and urban scale. The actions taken require coordination and involvement of many entities and institutions responsible for their implementation. A key role is played by local governments, which manage infrastructure, resources, and environmental protec-

tion. Local authorities are also responsible for the territorial coordination of adaptation measures. Tools are therefore needed to support local governments in planning and managing activities aimed at mitigation and adaptation to climate change, to enable adaptation solutions and to provide a basis for their implementation.

To sum up, spatial planning and related instruments for the implementation of adaptation policy is one of the most important instruments of intervention that make it possible to effectively protect urbanised areas from the effects of climate change and to shape space in such a way as to protect its resources and equip it with the characteristics of adaptability to projected climate change.

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