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Climate change issues in the policies of the EU and Polish cities

SUMMARY This article presents the assumptions of climate policy and the mechanisms of its implementation in selected Polish cities. The analysis addresses two levels: the EU and the municipal level. Initially, a qualitative analysis was conducted on key documents from the European Union and strategies and plans from Polish cities, followed by their comparison against the current trends in climate policy shaped by the European Union and the United Nations. The study highlights the most significant official documents influencing contemporary discourse on climate change. Three large Polish provincial centers – Bydgoszcz, Gdańsk, and Wrocław – were selected as case studies. The article discusses selected examples of European climate policy implementation in these cities, with a focus on actions taken by local governments. The study enables the formulation of general conclusions regarding the inclusion of climate change issues in legislation at both the European Union and municipal levels in Poland. It demonstrates the increased importance of climate policy in European legislation and the manner in which Polish cities implement its provisions, typically through infrastructure investments. These expenditures are often reduced by repurposing the existing infrastructure.

KEYWORDS anthropogenic climate change, urban policy, European Union policy, urban development, sustainable development

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Introduction

In recent years, there has been a significant increase in social awareness regarding climate change (e.g., Center for Public Opinion Research, 2018; European Investment Bank, 2023; Imedio, 2023). This awareness is driven, in part, by the growing frequency of extreme natural phenomena. Heat waves during summer cause droughts and pose severe health risks, leading to a rise in diagnoses of heat strokes and heart attacks. Sudden heavy rainfalls result in flooding, while high winds and tornadoes cause substantial damage to human environments. To counteract these extreme events, the European Union (EU) introduces legal regulations that member states incorporate into their national laws. Local governments then undertake projects aligned with these regulations to minimize the risks associated with natural extremes.

This article examines the complexity and evolution of climate change issues within EU policies and their implementation in the laws of Poland's municipal governments. Three large urban centers – Bydgoszcz, Gdańsk, and Wrocław – were selected as case studies. The analysis is based on a review of relevant literature and documents at both the EU and municipal levels, as well as a comparative analysis of the selected cases.

European Union climate policy

Climate policy assumes a consensus among scientists about the human impact on global climate and a commitment by countries to mitigate it through specific actions (Wojtal, 2019). The European Union's climate policy originated during the European integration process in the 1970s and environmental policy discussions by the European Council, where environmental protection was linked to economic considerations. The 1987 *Single European Act* formalized environmental policy in Title VII, establishing its initial framework. The 1993 *Maastricht Treaty* increased the significance of environmental policy in EU activities. The 1999 *Treaty of Amsterdam* incorporated environmental protection into all EU sectoral strategies, elevating the political importance of sustainable development. The 2007 *Lisbon Treaty* further developed this by emphasizing the fight against climate change. It established two key principles: the prevention of environmental contamination by potential emitters and the polluter's responsibility to pay for environmental damage (Kurrer, 2022).

EU climate policy efforts have evolved into seven main lines of action over the decades. The first is general environmental protection. The second and third are closely linked: decarbonization (reducing the impact of carbon dioxide, the major greenhouse gas) and non-CO_2 emissions reduction (reducing emissions of other greenhouse gases) (Wojtal, 2019). The fourth line of action is achieving climate neutrality, aiming for Europe to balance its greenhouse gas emissions with absorption (Kurrer, 2022). The next two directions are fundamental to broader sustainability policy: cost-effectiveness and social equity. The seventh line considers climate policy separately from environmental issues, focusing on the climate impacts of sectors such as energy, agriculture, defense, and industry, and their effects on current and future generations (Wojtal, 2019).

The presented assumptions aim to achieve a low-carbon economy while maintaining competitiveness. In 2011, a plan was developed, divided into several sectors. The first sector involves transitioning the energy industry towards continuous improvements in efficiency, enhancing safety, and reducing emissions. The second sector focuses on mobility development, based on new public and personal transportation technologies with reduced environmental impact. Examples include the mass adoption of hydrogen, hybrid, and electric vehicles, supported by an intelligent operating system. The third sector emphasizes energy-efficient and low-emission sustainable construction that meets increasingly stringent environmental requirements.

The fourth sector is industry, which includes measures such as reducing air pollutants like nitrous oxide and methane. The large-scale implementation of carbon capture and storage technologies is also recommended. Additionally, emissions should be constantly monitor and efforts should be implemented to prevent their potential transfer abroad. The final sector is agriculture, which aims to restore biodiversity, including peatlands and wetlands that are able to capture carbon dioxide from the air and store it in soil and trees (Action Plan, 2011, pp. 7–11). Attention is given to transitioning from traditional to zero-tillage farming, which reduces soil erosion, fuel requirements, and labor (Ćwik, 2022). This sector focuses on low-emission food production, considering the growing global population. It also emphasizes the sustainable development of natural areas while managing the negative impacts of land use on water resources, soils, and biodiversity. Additionally, it considers the increasing demand for animal feed, timber, paper products, and bioproducts (Action Plan, 2011, p. 11).

The discussed trends are described and implemented within the framework of the European Green Deal, launched in December 2019. It is an integral part

of the EU's implementation of the UN General Assembly's resolution adopted on September 25, 2015, *Transforming Our World: The 2030 Agenda for Sustainable Development*, which established the Sustainable Development Goals. These goals are divided into five areas, one of which is titled *Planet*. This area describes the will to protect Earth through uniform consumption, production, and management of natural resources, and taking urgent action on climate change, with the welfare of present and future generations in mind. The *Agenda* contains 17 Sustainable Development Goals and 169 related tasks, establishing a holistic approach to climate policy. It is one of many components of sustainable development (Resolution adopted by the General Assembly, 2015).

The European Green Deal aims to achieve climate neutrality by 2050, as stipulated in the 2016 *Paris Agreement*. This contributed to the entry into force of the *European Climate Law* in 2021. The Ready for 55 legislative package amends and updates EU laws in line with climate goals. It outlines several objectives. One is to reduce net greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels, with the aim of achieving negative emissions over time. Another objective is EU climate neutrality by 2050. *Fit for 55* is divided into 11 parts, designed to meet climate goals ambitiously, coherently, and sustainably (*Fit for 55*, 2023). Its individual elements are currently under negotiation and may change (*Fit for 55*, 2023; Yougova, 2023). This requires member states to continuously monitor the current climate policy situation.

The dynamic nature of the discussed topic is evidenced by the revisions adopted in March 2023, increasing the target for member countries' net greenhouse gas reduction commitments from 29% to 40% compared to 2005 emissions in sectors not covered by the Emissions Trading Scheme (ETS). Countries must consider annual commitments for the 2021–2030 period, cost-effectiveness, and GDP per capita. Many countries have adopted a new 2030 target approximately 10 percentage points higher than previous agreements. The highest reduction commitments were made by Luxembourg, Sweden, Denmark, Finland, and Germany, aiming for a 50% reduction. Notably, even Bulgaria adopted a 10% reduction target, having previously decided on none. Malta was the only country to maintain its target of 19%, regularly exceeding its allowance limit between 2013 and 2019, but purchasing the right to do so from Bulgaria under the "polluter pays" principle (*Gotowi na 55*, 2023). Other countries that could not meet their targets used allowances from previous years, such as Austria, Cyprus, and Estonia. Germany used its 2020 emission rights in advance to meet its 2019 commitment (EU Action Report, 2022, pp. 13–14).

Poland aligned with the policy of most member states, increasing its target from 7% to 17.7% (European Parliament, 2023). According to projections, this will enable Poland to exceed its emission reduction commitments by 2030, which would not have been possible without additional measures (EU Action Report, 2022, p. 17). From 2004 to 2016, Poland maintained greenhouse gas emissions in the energy (including transportation), industrial-utility, agriculture, and waste sectors at a similar level of around 400 Mt of carbon dioxide equivalent. However, the ratio of economic growth to emissivity significantly improved, with GDP growing while reducing associated pollution (Jeszke, 2018, pp. 10–13). In 2021, Germany emitted 679 Mt of carbon dioxide, ranking first in the EU. Italy was second with 337 Mt, and Poland was third with 331 Mt, despite its population being 2.17 times smaller than Germany's and 1.55 times smaller than Italy's (Global Carbon Project, 2023). This indicates a substantial potential for further greenhouse gas emission reductions in Poland.

Analysis of city documents

Authorities in large Polish cities are increasingly attentive to the ongoing climate changes. Urban communities must frequently contend with the catastrophic effects of environmental conditions. To illustrate the practices employed by cities, an analysis was conducted on urban policies, including climate adaptation plans and planning documents such as studies on conditions and directions of spatial development (Table 1).

Table 1. City documents analyzed

City	Title	Year	Challenges of climate change	Actions taken
Bydgoszcz	*Study of Conditions and Directions of Spatial Development of the City of Bydgoszcz*	2009	Anthropogenic activities – water pollution, air pollution, noise emissions	Increase of biologically active areas; realization of green routes
	Plan for adaptation of the city of Bydgoszcz to climate change until 2030	2019	Increased air temperature; heat waves; heavy rainfall; severe storms; air pollution	Educating the public; securing infrastructure in the danger zone; reducing emissions; developing green spaces; investing in low-carbon transport; water retention
	Bydgoszcz 2030 Development Strategy	2020	Anthropogenic activities – air pollution	Introduction of the principle of sustainable development; publicly accessible urban greenery; proper water management, including rainwater retention; reducing energy consumption
	Sustainable energy and climate action plan (SECAP) for the city of Bydgoszcz until 2030	2021	Increased air temperature; drought; flood risks; landslides; air pollution; increased energy consumption	Modernization of old water supply and stormwater drainage networks; replacement of public transport fleets; use of RES; increase of green areas; education
Gdańsk	*Gdańsk Water Policy*	2018	Anthropogenic activity	Sustainable development of waterfront areas (the idea of green wedges); water retention
	Study of Conditions and Directions of Spatial Development of the City of Gdańsk	2019	Lack of indicated challenges	Preservation of current green spaces; use of RES; expansion of water drainage and retention; OSTAB sites;[3] promotion of active mobility; expansion of rail transport; inward development of the city
	Plan of adaptation of the city of Gdańsk to climate change until 2030	2019	Flood hazards; landslides; heat waves	Education of the public; infrastructure investments to protect against the effects of climate change
	Gdańsk 2030 Plus City Development Strategy	2022	Anthropogenic activities; flood risks from rivers and streams	Development of green areas; expansion of water drainage and retention; OSTAB sites; reduction of greenhouse gas emissions

[3] City-wide System of Biologically Active Areas.

City	Title	Year	Challenges of climate change	Actions taken
Wrocław	*Study of Conditions and Directions of Spatial Development of the City of Wrocław*	2018	Anthropogenic activities; natural disasters	City focused on ecology; sustainable public transport; proper water management; use of RES
	Plan for adaptation of the city of Wrocław to climate change until 2030	2019	Rising air temperatures; heat waves; heavy rainfall	Education of the public; sustainable land use planning; infrastructure investments to protect against the effects of climate change
	Strategy Wrocław 2030	2020	anthropogenic activity	Implementation of the idea of sustainable development; education; inward development of the city; development of ecological means of transport; proper management of water; elimination of pollution; increase of green areas

Source: own study.

In their planning and strategic documents, the authorities of the selected three Polish cities pay special attention to anthropogenic activities (Table 1). Urban areas experience the problems of excessive noise levels, harmful daily concentrations of particulate matter PM_{10} and $PM_{2.5}$, and surface water pollution. This is partly due to suburbanization and associated urban sprawl, visible since the 1990s and intensified in the early 2000s. Anthropogenic pressure contributes to the occurrence of extreme phenomena such as heatwaves and heat islands forming on paved areas. The increase in air temperature results in droughts, while heavy rainfalls can cause local flooding and landslides.

To minimize the effects of climate change, city authorities undertake appropriate actions. One of them is increasing green areas to lower ambient temperatures, which prevents the formation of urban heat islands and absorbs rainwater and meltwater. That is why the authorities of the analyzed cities emphasize the need for proper water management, especially the creation of retention reservoirs. Old sewage and water supply networks are to be modernized to increase their capacity. Another focus is on energy sourcing, with the recommended use of renewable energy sources (RES) that emit fewer pollutants than conventional systems. Documents also mention the significance of more ecological means of transport and supporting sustainable mobility, primarily based on public transport. Cities are expanding tram networks, and in the case of Gdańsk, the urban railway network. The foundation for implementing actions to minimize

the effects of climate change is education. Urban authorities emphasize raising awareness among both younger and older residents.

Examples of municipal projects

Bydgoszcz – ecomurals

Several murals have been created on the walls of buildings in Bydgoszcz using photocatalytic paints, including in the Błonie housing development and on Przemysłowa Street (Czerniak, 2021; Pieczyńska, 2022). As a photocatalyst, the paints typically use titanium dioxide, which converts poisonous oxides to less harmful substances. This compound has the property of absorbing pollutants from the air – mainly nitrogen dioxide, a derivative of exhaust gases or smog (Ksit & Pilch, 2021, p. 73). It is estimated that 1 m^2 of surface painted with photocatalytic paints is capable of absorbing about 0.4 g of harmful matter in one day. This is comparable to the amount absorbed by one tree per day (Postrzednik, 2021). Thus, ecomurals in a city can serve a dual role – they beautify urban space and help clean the air (Kaus, 2020, p. 17; Ksit & Pilch, 2021, p. 73).

Gdańsk – reservoirs

In Gdańsk, great attention is paid to proper water management, which is influenced, among other things, by streams flowing through the city area (Gdańsk Water Policy, 2018, pp. 7–8). In order to prevent local flooding, retention reservoirs are being built in the urban area. Their function is to retain rainwater or snowmelt to relieve the burden on the sewage system. Later, the accumulated water can be used for irrigation. In addition, green areas are created around retention reservoirs to lower the air temperature during hot days, and also serve a recreational function for the surrounding population (Ostrowska & Sałdak, 2015, pp. 217–218). In Gdańsk, there are currently 56 of them, located near the city's streams (List of Retention Reservoirs, 2023). Recently, a facility of this type located on Subisława Street in the Żabianka – Jelitkowo – Wejhera – Tysiąclecia districts has been upgraded. The aim was to increase its surface area so that the reservoir would be able to accommodate a larger volume of rainwater or snowmelt (Public Communication Team, 2022).

Wrocław – green tracks

In Wrocław, green tracks are used on selected existing streetcar routes. An example is the arterial running on Haller Avenue (Krzeszowski, 2021; Pieczyńska, 2022). The technology is also used on newly constructed sections, including those located in Popowice (Pasiewicz, 2022). Green tracks are the answer to combating the negative effects of transportation in cities. Their use brings many tangible benefits to the environment. It is noticeable that noise and vibrations caused by streetcars are minimized; pollution from exhaust fumes and solar radiation are also absorbed. In addition, the vegetation used shows water retention capabilities, which reduces the risk of local flooding (Puzdrakiewicz, 2017, p. 75). Green tracks mainly use mixtures of grasses and sedums, which come in a variety of colors. This makes it possible to match the appearance of the infrastructure with the area in which it is located. The advantage of sedums is that they do not require significant human intervention, i.e. they do not need to be mowed or watered (Gisterek, 2021, p. 139; Michalkowska & Osowska, 2022, p. 13).

Conclusions

Climate policy is a complex area of EU internal policy, shaped over the past 50 years. It is formulated not only at the EU level but also by the United Nations, with both entities drawing similar conclusions regarding the environment. It is the duty and key interest of EU member states to adhere to this policy, though interests may be perceived differently by individual authorities (e.g., Abnett, 2023). Large Polish cities develop appropriate legal acts related to EU climate policy, with residents being the primary beneficiaries. Due to different circumstances, the actions taken vary in scale and issues addressed. A universal principle for all described examples from the cities is seeking environmental benefits, including minimizing damage to urban areas from extreme phenomena. This is done with minimal expenditure and by enhancing existing infrastructure. The intention to meet the increasing demands of EU climate goals necessitates the exploration of new areas for implementation. This will benefit both the residents of member state cities and, universally, the global climate.

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Problematyka zmian klimatu w politykach UE i polskich miast

STRESZCZENIE Celem artykułu jest przedstawienie założeń polityki klimatycznej oraz mechanizmów jej realizacji na przykładzie wybranych polskich miast. Problematyka dotyczy dwóch poziomów – unijnego oraz miejskiego. W pierwszej kolejności dokonano analizy jakościowej kluczowych dokumentów Unii Europejskiej oraz strategii i planów miast Polski. Następnie odniesiono się do bieżących trendów polityki klimatycznej kształtowanych przez Unię Europejską oraz Organizację Narodów Zjednoczonych. Przedstawiono najważniejsze dokumenty urzędowe, tworzące współczesny dyskurs odnoszący się do zmian klimatu. Jako studium przypadku wybrano trzy duże ośrodki o charakterze wojewódzkim – Bydgoszcz, Gdańsk oraz Wrocław i omówiono wybrane przykłady implementacji polityki europejskiej w zakresie klimatycznym. Skupiono się na działaniach podejmowanych przez samorządy. Przeprowadzone badanie pozwoliło sformułować wnioski natury ogólnej. Dotyczyły one zagadnienia ujmowania problematyki zmian klimatu w prawie na poziomach UE oraz miejskim w Polsce. Wykazano wzrost znaczenia polityki klimatycznej w prawodawstwie europejskim. Ukazano sposób, w jaki polskie

miasta implementują jej postanowienia. Ich działania zwykle polegają na inwestycjach infrastrukturalnych. Wysokość nakładów na ten cel jest redukowana przez przemodelowanie sposobu użytkowania istniejącej infrastruktury.

SŁOWA KLUCZOWE antropogeniczne zmiany klimatu, polityka miejska, polityka Unii Europejskiej, rozwój miast, zrównoważony rozwój

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