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ADAPTABILITY IN ENVIRONMENTAL POLICY AT THE COMMUNE LEVEL CARRIED OUT IN POLAND BASED ON THE EXAMPLE OF THE URBAN PLAN OF ADAPTATION TO CLIMATE CHANGES

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Abstract

The effects of the observed climate changes constitute a real problem in the surrounding environment due to the scale and frequency of natural catastrophic events. This state of affairs prompts various types of entities, including institutions, to undertake adaptation measures as part of environmental policy, both at the international and local levels. In Poland, the entities responsible for the implementation of this policy at the local level are, inter alia, the voivodeship, the powiat and the commune authorities. The authors present the Urban Adaptation Plans (MPA for short) prepared in 44 Polish cities, which can be an example of a document where the main goal is to increase the adaptability of cities to a changing climate.

On the basis of the identified list of types of adaptation measures provided for in all prepared Urban Adaptation Plans, the pragmatic nature of the implemented adaptation measures has been demonstrated, which will not cause any changes to basic attributes of the social and ecological system of cities. Thus, 44 cities in Poland will manage the process of gradual adaptation up to 2024, i.e., until when the Urban Adaptation Plans will require updating.

Keywords: climate change, environmental policy, adaptability, commune, natural threats, Urban Adaptation Plan

Introduction

The environmental policy of Polish cities implemented so far focuses both on environmental protection and on the elimination, or reduction, of specific threats caused by the functioning of local communities (e.g., water pollution, generation of municipal waste, destruction of green areas). As projects in the environmental area most often do not refer to the prediction of changes in meteorological and hydrological conditions determining the conditions for the functioning and development of local communities, the measures taken nowadays to adapt to changing climatic conditions become all the more important.

In the 21st century, many Polish cities struggle with the effects of various natural events, such as: floods from the sea and rivers, droughts, heat waves and frosts, hurricane winds and violent downpours. At the same time, it is expected that the occurring climate changes will seriously limit the development of these cities due to the scale and frequency of individual natural events. Thus, the effects of climate change constitute a real problem in the surrounding environment and are increasingly becoming the target of environmental policy measures at both international and local levels.

In 2013, the Polish government adopted the “Strategic adaptation plan for sectors and areas sensitive to climate change by 2020 with a perspective by 2030”. This document recognizes that one of the key tasks is to shape the resilience of Polish cities to recognized climate threats. Therefore, the Ministry of the Environment established a wide partnership of the authorities of 44 cities, and the experts and stakeholders under the project: *Development of Urban Climate Changes Adaptation Plans for cities with more than 100,000 inhabitants*. residents (Project for short). Thus, Urban Adaptation Plans (MPAs) concerning adaptation to climate change were developed for 44 cities in Poland (*Plany adaptacji do zmian klimatu 44 miast Polski 2018*: 4), and then, in 2018–2019 the plans were approved by most of the Polish cities which participated in the project.

The project was implemented in 2017–2019 and the following cities participated in it: Białystok, Bielsko-Biała, Bydgoszcz, Bytom, Chorzów, Czeladź, Częstochowa, Dąbrowa Górnicza, Elbląg, Gdańsk, Gdynia, Gliwice, Gorzów Wielkopolski, Grudziądz, Jaworzno, Kalisz, Katowice, Kielce, Kraków, Legnica, Lublin, Łódź, Mysłowice, Olsztyn, Opole, Płock, Poznań, Radom, Ruda Śląska, Rybnik, Rzeszów, Siemianowice Śląskie, Słupsk, Sopot, Sosnowiec, Szczecin, Tarnów, Toruń, Tychy, Wałbrzych, Włocławek, Wrocław, Zabrze, Zielona Góra. In addition, among 44 cities participating in the Project, there were also 7 cities with a population of less than 100,000, namely: Czeladź, Grudziądz, Jaworzno, Mysłowice, Siemianowice Śląskie, Słupsk and Sopot. The City of Warsaw did not participate in the Project, for which the project entitled *Preparation of a strategy for adaptation to climate change in a metropolitan city using a climate map and social participation – ADAPTCITY (Strategia adaptacji do zmian klimatu dla m.st. Warszawy do roku 2030 z perspektywą do roku 2050, Miejski Plan Adaptacji)*.

The MPA Project was carried out by the leader of the consortium – the Institute of Environmental Protection – National Research Institute and consortium members: the Institute of Meteorology and Water Management – National Research Institute, the Institute for Ecology of Industrial Areas, and the international consulting and engineering company Arcadis Sp. z o.o.

450 experts from national research institutes and a consulting company, many representatives of the executive authority of individual cities / communes (they were both

vice-presidents of cities, managers and key employees of many strategic departments of city councils accounting for approx. 700 urban experts), as well as numerous representatives of local communities and representatives of non-governmental organizations also participated in the Project, and subsequently in the development of the final shape of the document.

The main goal of the MPA Project was to increase the resilience of cities to threats related to climate change, where the key tasks included:

- identification of the most serious climatic threats to cities;
- assessment of cities' vulnerability to identified threats;
- development of optional lists of adaptation measures reducing the vulnerability of cities to climate change and selection of the most effective package of adaptation measures;
- development of urban plans for adaptation to climate change, and
- preparation of environmental assessments of adaptation plans for individual cities (Dumieński et. al. 2019: 193).

Therefore, the objective of the paper is to analyse Urban Adaptation Plans (MPA) concerning climate change based on the proposed lists of adaptation measures for individual 44 cities in Poland, and indicating the meaning and importance of gradual adaptation in defining communal organs' activities in selected areas as complementary to environmental policies implemented on the communal level.

Environmental policy executed in Poland at commune level

Environmental policy is a sequence of decisions, and then actions (or their omissions), taken by specific entities (actors) of that policy (Antoszewski 1999: 12), leading to deterioration, maintenance or improvement of the condition and functions of the natural environment in relation to the broadly understood social system and its participants (Lisowska 2005: 27; Lisowska 2012: 173). These decisions should be created, and then implemented, in stages, starting with identifying the problem and ending with the identification and enforcement of the necessary measures. Today, the subjects of this policy are individual (individuals) and collective entities, such as international organizations, pressure groups, political organizations, as well as the state itself, including state bodies and institutions (more Lisowska 2017: 49–55). However, the subject of environmental policy understood in this way is the environment.

The concept of “environment” includes not only the natural elements surrounding humans, determined by physical, biological, chemical, and geographical conditions, but also those that arose in the course of human social development and everything that was produced or processed by humans and has permanently entered the cultural heritage of generations (Bukowska–Gorgoni et al. 1974: 115), and has an impact on human lives (Odum 1977).

It should be clearly emphasized that the essence of contemporary environmental policy is not so much the protection and regulation of access to limited environmental resources, but the making of specific decisions, and then actions due to the functions that the environment performs in relation to humans. Three basic functions are indicated, namely: the utility function of providing natural resources for the creation of economic goods and energy; a service function, related to the ability to assimilate pollution, i.e., absorbing the

side effects of human social and economic activity, and an aesthetic and cultural function, conditioned by the provision of experiences and content by the environment, which come from contact with the beauty of the surrounding nature (Lisowska 2012: 174).

In addition to the activities determined by the functions that the environment plays in relation to humans, environmental policy is also based on undertaking protective measures.

Environmental protection is defined as certain actions (or the lack thereof) and behaviours of various entities (individuals, bodies and states, international organizations) which are not limited only to creating optimal conditions for human physical and cultural development (Grzybowski 1972: 26, Bukowska-Gorgoni et al. : 115, Brzeziński 1975), but also lead to projects aimed at the proper exploitation of natural resources and refer to the protection of the environment itself against various dangers which are a side effect of modern civilization (such as: radiation, waste, noise, vibration, chemical substances, extraordinary and ordinary threats) (Łustacz 1981: 28–36).

Actions taken as part of the environmental policy understood in this way should concern:

- the rational shaping of the environment and management of environmental resources in accordance with the principle of sustainable development;
- preventing pollution, and
- restoring natural elements to their proper condition (Art. 3 (13) of the Act on Environmental Protection 2001),
- as well as protection of man himself as an element of the environment against changing environmental conditions resulting from various types of environmental threats occurring today (regardless of the fact that man is the perpetrator of the observed catastrophic natural events, including those related to climate change).

The environmental policy is implemented by various entities, at the international, regional, and local levels. In Poland, the entities responsible for the implementation of this policy at the local level are, among others, voivodship, powiat and commune authorities (Trzcńska: chapter II; Lisowska 2017: 49–55), where the commune itself is treated as a separate level of the administrative division of the state.

Since 1990, at the municipal level, tasks in the field of, broadly understood, environmental issues are carried out by the municipal council, commune administrator, or mayor (Lisowska 2017: 49–55). It should be emphasized, however, that the commune is also a self-governing community, inhabited by a certain number of people. This means that the subjects of the environmental policy are not only the community itself (the commune as an institution), but also the people living there. Each resident of a commune may make a number of decisions, and then actions, aimed at environmental protection, which result from the current specific axionormative system.

The tasks of the commune self-government in the field of environmental protection are directly executive tasks, which concern carrying out activities having a direct impact on the state of the environment. They involve both environmental protection and the elimination or reduction of specific threats caused by the functioning of local communities (e.g., water pollution, generation of municipal waste, destruction of green areas). These tasks are of their own nature, because they are caused by the activities of the self-government community that causes specific threats. Performing these tasks is not only in the self-interest of the commune, but also in the interest of the general public. In terms of

content, deadlines, and order of performance, these tasks should be formed by commune councils and performed by executive bodies (Górski 2009: 82, 86–87).

The duties of the commune authorities performing tasks in the field of environmental protection result primarily from the Environmental Protection Law Act (Ustawa z dnia 27 kwietnia 2001 r. Prawo ochrony środowiska), the Nature Protection Act (Ustawa z dnia 16 kwietnia 2004 r. o ochronie przyrody), and the Waste Act (Ustawa z dnia 14 grudnia 2012 r. o odpadach) and the Act on the provision of information on the environment and its protection, public participation in environmental protection, as well as on environmental impact assessments (Ustawa z 3.10.2008 r. o udostępnianiu informacji o środowisku i jego ochronie, udziale społeczeństwa w ochronie środowiska oraz o ocenach oddziaływania na środowisko). The fact that these regulations are considered particularly important due to the specificity of contemporary environmental policy is due to two aspects. Firstly, these laws provide for and regulate the tasks and obligations of the commune in the area in question, and secondly, they relate to environmental issues in a detailed scope. It is worth adding to the aforementioned regulations, the Act on maintaining cleanliness and order in municipalities (Ustawa z dnia 13 września 1996r. o utrzymaniu czystości i porządku w gminach), which does not directly refer to environmental issues, but empowers the municipal authorities with powers indirectly defining the activities of the commune in the field of environmental protection.

Thus, the executive organ of the commune (commune administrator or mayor) is responsible for measures related to protection of both the environment and nature (Lisowska 2017: 49–55) and they may develop and issue various acts of local law, as well as perform tasks based on other documents concerning environmental protection, including those based on communal environmental protection programmes.

The environmental protection programme is adopted by the commune council (Art. 18 (1) of the environmental protection law, 2001), where previously the commune administrator or mayor was obliged to ensure the possibility of public participation in the proceedings, the subject of which is the preparation of the environmental protection programme. They are developed every four years, and the activities envisaged therein should cover the following years. Reports on the implementation of the programmes are to be prepared and presented to the commune council every two years.

In Poland, programming of environmental protection at the municipal level takes place in the vast majority of Polish municipalities. It is especially visible among communes located in areas of environmental threats, including different types of climate threats.

Since programming in Poland covers environmental protection strategies at the national level and local strategic goals (included in programmes, strategies, and programming documents), the strategies in the field of environmental protection can be considered both in a general sense – as an element of state or local government policy, and detailed – being a document defining long-term goals of specific protective measures (Poskrobko, Poskrobko 2012: 187). In the first case, municipal environmental protection programmes should clarify the state policy in the environmental field, and in the second case, they should take into account the locality of environmental problems (Górski 2009: 85).

In this context, the Urban Adaptation Plans prepared in 44 Polish cities deserve attention, as they may become both a component of the environmental policy implemented at the commune level in Poland, and may also be treated as the basis for updating and/or creating municipal environmental protection programmes.

Moreover, the MPA is a document which, in essence, refers to a kind of novelty in the understanding of contemporary environmental policy. The activities proposed in the MPA are undertakings which not so much protect the environment against human activity that is detrimental to it, but introduce protection of the human being against extreme natural phenomena. And protection of citizens is possible, inter alia, by undertaking adaptation measures in the environmental area, often involving the use of the natural environment to mitigate the effects of extreme natural (weather) phenomena.

Evaluation of the current condition of adaptability and measures planned in MPA to improve adaptability of cities participating in the MPA Project

It should be noted that inhabitants of the 44 cities included in the MPA Project account for 30% of the entire population of Poland and a half of the Polish urban population. Large urban centres have a number of common features that are important in assessing their sensitivity to climate change. Urban areas are characterized by a high population density and a significant concentration of urban functions and the infrastructure responsible for its functioning. Many features common to Polish cities allowed for the development of a uniform methodology for the preparation of Urban Adaptation Plans (*Plany adaptacji do zmian klimatu 44 miast Polski 2018: 14*).

Adaptation is a managed or spontaneous process aimed at making the commune resistant to all types of climate threats, and the course of the process is dependent on many features of the commune. The proposed understanding of adaptability is consistent with the definition by Walker (Walker et. al. 2009: 12), who defined adaptability as the capacity of the system's actors to adapt to changing conditions and to influence resilience" (more on adaptation: Smit et al., 2000: 223–251; Sienkiewicz-Małyjurek 2015: 218; Smit et al. 2006:282–292; Millenium Ecosystem Assessment 2006: 599; Gallopın 2007: 2; Walker et. al. 2009; Moser & Ekstorm 2010: 22026–22031; Gersonius 2012: 25–28; IPCC 2012: 556; MPA 2017: 8).

The main determinants of a commune's adaptability are the commune's adaptive potential, taking into account the quantity and quality of resources available to the commune as an institution and its adaptive capacity.

Adaptation potential is the result of the specific features of a given system and its components, but also resources that the system has and can use in the adaptation process (in order to obtain a higher level of adaptability – Dumieński et. al. 2019: 32–33). On the other hand, the adaptive capacity manifests itself primarily in the ability of local commune leaders to activate the resources owned by the commune in order to deal rationally with various types of climate threats. This ability depends, inter alia, on the way the community is organized at each level of its organization, as well as on the skills and coordination of activities by relevant entities (Gendźwiłł 2017: 30–49). Thus, the indicated determinant characterizes the activities of specific persons / entities participating in the creation of environmental policy through decisions and then actions, and not the commune perceived through the prism of institution attributes.

Adaptation can be of a different nature. And so, depending on the time of implementation, it can be anticipatory or reactive, and depending on the degree of spontaneity,

autonomous, or planned (Fankhauser et. Al., 1999: 67–78; Smith et al., 2000: 223–251). The IPCC Report indicates gradual adaptation, which preserves the essence and integrity of a system or process on a given scale, and transformational adaptation, which changes the basic attributes of the socio-ecological system in anticipation of climate change and its effects (IPCC).

When assessing the adaptability of the city as part of the MPA Project, a multi-criteria assessment of the city's adaptation potential was carried out, because it is the city's adaptive potential activated by local leaders that directly affects the scale of the adverse consequences of extreme weather events in the city.

The assessment of the adaptability of individual cities participating in the MPA Project was carried out on the basis of the following criteria:

1. the financial condition of the city, which may allow for the initiation of actions increasing the adaptation potential of the city, as well as for undertaking informational, educational, and organizational activities, triggering the willingness of the city's inhabitants to participate in the planning process and implementation of activities reducing the risk of hazardous meteorological and hydrological phenomena, whose scale and frequency is increasing due to climate change;
2. social capital, manifested in local communities having various potential to undertake adaptive actions (social potential, including political, cultural, organizational, economic, environmental potential), as well as these communities having the ability to activate these potentials and to subsequently implement specific projects limiting the occurrence of unfavourable climate changes (Dumieński et. al. 2019: 33; Kotarski 2013: 12–13);
3. the level of preparation of municipal services to react in the event of an extreme natural phenomenon, but also after it has receded, when municipal services are expected to efficiently remove the adverse effects of this event and immediately restore the conditions for the normal functioning of the city;
4. the quality of the system of informing and warning the city community about environmental hazards, which is required to provide accurate and properly prepared forecasts and unambiguous communication of warnings using all available communication channels, ensuring wide availability of information among city residents;
5. the quality of the system of municipal institutions and facilities in the health care and education sectors, ensuring the availability and adequate quality of medical services in situations of differentiated extreme weather events;
6. the quality of cooperation with neighbouring municipalities in the field of crisis management, which will allow for effective coordination of preventive intervention, and revitalization activities in sectors / areas of the city (but also surrounding municipalities) affected by extreme weather conditions;
7. the effectiveness of activities carried out in the city so far in order to protect and shape the city's ecosystem (blue and green infrastructure), which in essence is the city's ally in mitigating the effects of adverse weather phenomena;
8. the quality of the base supporting the innovation of undertaken and planned activities, with particular emphasis on those centres (entities) where communities are concentrated and / or values related to crossing one's own borders are formed and transgressive actions are encouraged (Bartosz et al. 2011). Such a base may turn out to be irreplaceable when, in the face of the expected threats resulting from climate

change, it will be necessary to resort to adaptation measures that will change the basic attributes of the socio-ecological system of cities in anticipation of climate change and its effects.

The majority of the cities participating in the project most often obtained average scores for all analyzed criteria used to assess their adaptability. The most numerous group of cities received the highest rating due to the quality of their cooperation with neighbouring municipalities in the field of crisis management, as well as the quality of the system of informing and warning the city's community about environmental threats. On the other hand, as many as ¼ of the cities obtained a low rating in terms of social capital and the quality of the system of municipal institutions and institutions in the health care and education sectors. It is worth noting that 16 cities (out of 44 cities participating in the MPA Project) were highly rated in terms of the quality of their infrastructure supporting the innovation of undertaken and planned activities, as well as the level of preparation of municipal services to react in the event of an extreme natural phenomenon. Table 1 lists assessments of adaptability of the cities participating in the MPA project according to the above criteria.

Table 1. Assessment of the cities' adaptive potential using the eight criteria (1 – low, 2 – medium, 3 – high level)

City	Financial potential	social capital	level of preparation of municipal services to react in the event of an extreme natural phenomenon	quality of the system of informing and warning the city community about environmental hazards	Network and equipment of municipal institutions and facilities in the health care and education sectors (hospitals, schools, preschools)	Organisation of cooperation with neighbouring municipalities in the field of crisis management (access to rescue equipment and staff)	Systemic approach to protection and shaping of municipal ecosystems (blue-green infrastructure)	Existing innovation base: science and research institutes, universities, eco-innovative companies
Białystok	2	2	2	1	3	3	2	2
Bielsko-Biała	2	2	2	3	2	3	2	2
Bydgoszcz	2	2	3	3	2	3	2	2
Bytom	1	1	2	3	1	2	3	1
Chorzów	2	1	3	3	2	3	3	2
Czeladź	2	1	2	3	2	2	2	1
Częstochowa	1	2	2	2	2	3	1	2
Dąbrowa Górnicza	2	3	1	2	2	3	2	3
Elbląg	2	2	3	2	2	2	2	2
Gdańsk	2	2	2	2	2	2	2	2
Gdynia	1	1	3	2	2	3	2	2
Gliwice	2	3	2	3	2	2	2	3

Gorzów W.	2	2	2	3	2	2	2	1
Grudziądz	2	1	2	3	1	3	2	1
Jaworzno	2	2	2	3	2	3	2	3
Kalisz	2	1	2	2	1	3	1	2
Katowice	2	3	2	3	2	3	3	3
Kielce	2	2	3	2	2	3	1	2
Kraków	2	3	3	3	2	3	2	3
Legnica	2	2	3	3	1	3	2	2
Lublin	2	3	3	2	2	3	2	3
Łódź	2	2	2	2	2	2	3	3
Mysłowice	1	2	3	3	1	3	2	2
Olsztyn	3	2	3	2	3	3	3	3
Opole	2	3	3	2	2	3	2	2
Płock	3	1	2	3	1	3	2	1
Poznań	3	3	3	3	2	2	3	3
Radom	3	2	3	3	3	2	3	3
Ruda Śląska	2	2	3	3	2	3	3	3
Rybnik	3	2	2	3	2	3	2	2
Rzeszów	2	2	2	2	2	3	1	2
Siemianowice Śląskie	1	1	2	2	1	3	3	1
Słupsk	3	2	2	2	1	3	3	2
Sopot	3	2	3	2	2	2	3	3
Sosnowiec	2	1	2	2	1	3	2	3
Szczecin	3	3	2	1	2	2	2	2
Tarnów	2	2	2	3	2	3	2	2
Toruń	3	3	2	3	2	2	2	3
Tychy	3	2	2	3	2	3	2	2
Wałbrzych	2	1	2	2	2	2	2	1
Włocławek	3	1	3	3	2	3	2	2
Wrocław	2	2	2	2	2	3	2	2
Zabrze	2	1	2	3	2	3	2	3
Zielona Góra	2	3	2	2	1	3	2	3

The city, in the face of more and more dangerous atmospheric and hydrological phenomena resulting from climate change, should rationally manage the process of building adaptation potential and developing the ability to activate it in order to minimize the adverse consequences of these phenomena. Within the MPA Project, each participating city had a plan of a gradual adaptation process developed (ensuring the character and integrity of municipal systems), to enhance its resilience (thus reducing susceptibility) to climate change by increasing adaptability of the municipal infrastructure and shaping social awareness and civic attitudes. These activities are usually informative-educational, organizational, or technical (table 2).

Table 2. Informative-educational, organizational, and technical activities of building adaptation potential and developing the ability to activate it in order to minimize the adverse consequences of dangerous phenomena.

informative-educational activities	<ul style="list-style-type: none"> ▪ transfer of knowledge about natural hazards ▪ transfer of knowledge about ways to prevent or reduce the adverse effects of catastrophic natural phenomena ▪ transfer of knowledge about the functioning systems for monitoring and warning about dangerous weather phenomena ▪ promoting good practices among city residents in the area of shaping the environment, the shape and functions of which will enable the reduction of unfavourable consequences of the occurrence of dangerous natural phenomena ▪ creating a friendly climate for the implementation of adaptation measures by presenting planned and already undertaken adaptation measures and the benefits that the residents can expect
organizational activities	<ul style="list-style-type: none"> ▪ creation of systems for monitoring and collecting data on threats related to climate change and its effects ▪ review and update of plans, programmes, and strategies in terms of the city's needs for adaptation to climate change ▪ building a cooperation network for the implementation of the urban adaptation plan (among the inhabitants and organizations operating in the city, but also among external partners, such as associations of municipalities, twin cities, etc.) ▪ liquidation or change of functions of infrastructure objects located in zones affected by natural hazards ▪ development of recommendations for the existing facilities located in the area at risk of flooding from rivers or from the sea in terms of possible methods of protection against losses due to flooding ▪ adapting the organization of the city traffic system to the needs of adaptation to climate change ▪ optimization of the municipal water supply and water consumption system in the city, ▪ protection and expansion of fresh / cool air generating areas, ventilation corridors in urban areas ▪ development of planning / town planning guidelines for shaping space, taking into account the needs of adaptation to climate change ▪ building a system of solutions to ensure thermal comfort of residents ▪ construction and development of the blue and green infrastructure system ▪ development of guidelines taking into account the needs of adaptation to climate change in the process of purchasing goods or services run by the city (including construction services) ▪ adaptation of the public transport system to the effects of climate change ▪ increasing the share of biologically active surface by limiting impermeable surfaces in the city, or unsealing them ▪ strengthening emergency services in order to increase the effectiveness of their actions in situations of responding to extreme climate phenomena

technical activities	<ul style="list-style-type: none"> ▪ building of systems for monitoring and collecting data on threats related to climate change and its effects ▪ liquidation or change of functions of infrastructure objects located in zones affected by natural hazards ▪ adapting the organization of the city traffic system to the needs of adaptation to climate change ▪ construction and development of the blue and green infrastructure system ▪ adaptation of the public transport system to the effects of climate change ▪ increasing the share of biologically active surface by limiting impermeable surfaces in the city, or unsealing them ▪ modernization or expansion of the active and passive flood protection system protecting the city areas against river floods ▪ reconstruction of sections of dunes and storm surge dikes damaged as a result of storm surges and development of the system protecting the city against floods from the sea ▪ modernization of the sewage system protecting cities against urban floods
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Harmonized information and educational activities strengthen the adaptive potential of cities by creating a culture of common concern for city safety. Educational activities that build the social potential of inhabitants include the transfer of knowledge about natural hazards and ways to prevent or reduce the adverse effects of catastrophic natural phenomena. They also include strengthening the competences of residents and organizations operating in the city in the field of obtaining available information about the spatial distribution of unfavourable natural phenomena in the city, as well as about the functioning systems for monitoring and warning about dangerous weather phenomena. Information activities are used to create a friendly climate for the implementation of adaptation measures by presenting planned, and already undertaken adaptation measures, and the benefits that the residents can expect. The purpose of the information activities is also to promote good practices among city residents in the area of shaping the environment, the shape and functions of which will enable the reduction of unfavourable consequences of the occurrence of dangerous natural phenomena. These two types of activities, developing the social potential of city residents, should accompany the organizational and technical activities undertaken by cities, ensuring understanding and acceptance of specific organizational and technical activities (*Plany adaptacji do zmian klimatu 44 miast Polski 2018: 14*), which strengthen the infrastructural adaptive potential of cities.

Organizational activities include introducing changes in spatial planning and organization of public space, changes in local law leading to an increase of the city's resistance to natural hazards, and the creation of guidelines for the conduct of city residents and various types of entities in emergency situations. The organizational activities used in the Urban Adaptation Plans include:

- creation of systems for monitoring and collecting data on threats related to climate change and its effects;

- review and update of plans, programmes, and strategies in terms of the city's needs for adaptation to climate change;
- building a cooperation network for the implementation of the urban adaptation plan (among the inhabitants and organizations operating in the city, but also among external partners, such as associations of municipalities, twin cities, etc.);
- liquidation or change of functions of infrastructure objects located in zones affected by natural hazards;
- development of recommendations for the existing facilities located in the area at risk of flooding from rivers or from the sea in terms of possible methods of protection against losses due to flooding;
- adapting the organization of the city traffic system to the needs of adaptation to climate change;
- optimization of the municipal water supply and water consumption system in the city;
- protection and expansion of fresh / cool air generating areas, ventilation corridors in urban areas;
- development of planning / town planning guidelines for shaping space, taking into account the needs of adaptation to climate change;
- building a system of solutions to ensure the thermal comfort of residents;
- construction and development of the blue and green infrastructure system;
- development of guidelines taking into account the needs of adaptation to climate change in the process of purchasing goods or services run by the city (including construction services);
- adaptation of the public transport system to the effects of climate change;
- increasing the share of biologically active surface by limiting impermeable surfaces in the city or unsealing them;
- strengthening emergency services in order to increase the effectiveness of their actions in situations of responding to extreme climate phenomena (*Plany adaptacji do zmian klimatu 44 miast Polski 2018: 15*).

Technical activities envisaged in urban adaptation plans, usually the most capital-intensive, are activities that are expected to have significant effects in adapting the city to climate change. This group of activities includes technical activities accompanying the implementation of many of the above-mentioned organizational activities as well as activities concerning:

- modernization or expansion of the active and passive flood protection system protecting the city areas against river floods;
- reconstruction of sections of dunes and storm surge dikes damaged as a result of storm surges and development of the system protecting the city against floods from the sea;
- modernization of the sewage system protecting cities against urban floods (*Plany adaptacji do zmian klimatu 44 miast Polski 2018: 15*).

The purpose of the adaptation of cities in Poland to climate change is to protect the lives and health of their inhabitants as well as to reduce the costs of liquidating the effects of damage to their infrastructure and restoring the normal functioning of cities after extreme natural phenomena have subsided. The Project assessed the cost of various types of adaptation measures in all 44 cities at about PLN 30 billion, the spending of which was

planned until 2030, while the benefits of these measures were estimated at almost PLN 150 billion (*Plany adaptacji do zmian klimatu 44 miast Polski 2018*: 3).

Summary

Referring to the adopted definition of the concept of adaptation, as a freely running process aimed at immunizing the commune against various types of climate threats, it can be stated that urban adaptation plans prepared under the MPA Project are documents that guarantee the implementation of environmental policy within the framework of specific measures. However, it should be emphasized that the objectives of these activities are not only projects aimed at protecting the environment against human activity, but most of all protection against the environment itself, and more specifically against adverse natural events, including those related to climate change. Thus, the prepared Urban Adaptation Plans for 44 cities in Poland can be treated as documents bringing specific solutions to the environmental policy implemented at the municipal level in Poland today. Indeed, individual MPAs not only include the assessment and prediction of the most important natural hazards that may limit the future development of cities, but also the diagnosis of their current adaptation potential, which can be activated in the adaptation process. Most cities currently assess their adaptation potential as medium, i.e., insufficient to significantly reduce the adverse consequences of extreme weather phenomena.

It is also worth noting that the planned adaptation activities in individual urban adaptation plans will not lead to changes in the basic attributes of the social and ecological system of cities, which will allow cities to manage gradual adaptation. However, taking into account the changing natural circumstances, this model of adaptation may be insufficient, and it might be necessary to implement solutions characteristic of transformational adaptation.

References

- Antoszewski, Andrzej (1999), "Ochrona środowiska w systemie politycznym", w: Halina Lisicka (red.), *Ochrona środowiska w polityce*, Wrocław: Towarzystwo Naukowa Prawa Ochrony Środowiska.
- Bartosz, Bogna, Keplinger, Alicja, Straś-Remanowska, Maria, eds. (2011), *Prace Psychologiczne LX, Transgresja – innowacje – twórczość*, Wrocław: Wydawnictwo Uniwersytetu Wrocławskiego.
- Birkmann, Jörn (2011), *First- and second-order adaptation to natural hazards and extreme events in the context of climate change*, *Natural Hazards*, 58 (2).
- Brzeziński, Wojciech (1975), *Ochrona prawna naturalnego środowiska człowieka*, Warszawa: Państwowe Wydawnictwo Naukowe.
- Bukowska – Gorgoni, Krystyna, Pruszyński, Jan, P (1974), "Środowisko naturalne a dobra kultury", *Studia Iuridica*, nr 2.
- Dumieński, Grzegorz, Lisowska, Alicja, Tiukało, Andrzej (2017), *Ocena zrównowżenia polityki przeciwpowodziowej państwa z wykorzystaniem zintegrowanego ryzyka środowiskowego* w: Ryszard F Sadowski, Zbigniew Łepko (red.), *Theoria i praxis zrównoważonego rozwoju. 30 lat od ogłoszenia Raportu Brundtland*, Warszawa: Towarzystwo Naukowe Franciszka Salezego.

- Dumieński, Grzegorz, Lisowska, Alicja, Tiukało, Andrzej (2019), *Adaptability of a socio-ecological system. The case of a Polish municipality at risk of flood*, Prace Geograficzne, 159.
- Dumieński, Grzegorz, Lisowska, Alicja, Tiukało, Andrzej (2019), *Zagrożenia klimatyczne 44 miast w Polsce na podstawie Miejskich Planów Adaptacji do zmian klimatu*, w: Longina Chojnacka – Ożga, Halina Lorenc (red.), *Współczesne problemy klimatu Polski*, Warszawa: seria publikacji naukowo-badawczych IMGW-PIB.
- Fankhauser, Samuel, Smith, Joel B, Tol, Richard SJ (1999), *Weathering climate change: some simple rules to guide adaptation decisions*, Ecological Economics, 30.
- Gendźwiłł, Adam (2017), *Zdecentralizowana adaptacja? Opinie władz lokalnych o zmianach klimatu i lokalnej polityce adaptacji do zmian*, Studia Regionalne i Lokalne, 2 (68)
- Gersonius, Barry (2012), *The resilience approach to climate adaptation applied for flood risk*, CRC Press/Balkema.
- Górski, Marek (2009), *Zarządzanie sprawami ochrony środowiska*, w: Marek Górski (red.), *Prawo ochrony środowiska*, Warszawa: Oficyna Wolters Kluwer business.
- Grzybowski, Stefan (1972), *Problematyka ochrony środowiska człowieka a przepisy prawa cywilnego*, "Państwo i Prawo", z. 1.
- IPCC (2012), *Managing the risks of extreme events and disasters to advance climate change adaptation. A special report of working groups I and II of the Intergovernmental Panel on Climate Change*, UK and New York: Cambridge University Press, Cambridge, IPCC: file:///C:/Users/renata/Desktop/Artykuł/sr15_glossary.pdf (19.07.2020).
- Kotarski, Hubert (2013), *Kapitał ludzki i kapitał społeczny a rozwój województwa podkarpackiego*, Rzeszów: Wydawnictwo Uniwersytetu Rzeszowskiego.
- Lisowska, Alicja (2005), *Polityka ochrony środowiska Unii Europejskiej. Podstawy instytucjonalne i programowe*, Wrocław: Wydawnictwo Uniwersytetu Wrocławskiego.
- Lisowska, Alicja (2017), "Cechy polityki ochrony środowiska na poziomie gminy", *Samorząd Terytorialny*, nr 4 (316).
- Lisowska, Alicja (2012), *Badania nad polityką środowiskową – aspekty metodologiczne i wymiar empiryczny* w: Halina Lisicka, Alicja Lisowska (red.), *Konflikty środowiskowe i sposoby ich rozstrzygnięcia*, Wrocław: Towarzystwo Naukowe Prawa Ochrony Środowiska.
- Łustacz, Leon (1981), *Polityczne i prawne problemy ochrony środowiska*, Warszawa: Wydawnictwo Uniwersytetu Warszawskiego.
- Millenium Ecosystem Assessment (2005), *Ecosystems and Human Well-Being: Policy Responses*, Washington DC: Island Press.
- Moser, Susanne C, Ekstrom, Julia A (2010), *A framework to diagnose barriers to climate change adaptation*, PNAS, 107 (51).
- MPA, Miejskie Plany Adaptacji do Zmian Klimatu (2017), *Metodyka opracowania projektu Miejskiego Planu Adaptacji na podstawie oferty do Zamówienia pn. Opracowanie planów adaptacji do zmian klimatu w miastach powyżej 100 tys. mieszkańców; zasób własny*, Warszawa: IMGW-PIB.
- Odum, Eugene P (1977), *Podstawy ekologii*, Warszawa: Państwowe Wydawnictwo Rolnicze i Leśne.
- Plany adaptacji do zmian klimatu 44 miast Polski*, Publikacja podsumowująca (2018), Warszawa, http://44mpa.pl/wp-content/uploads/2018/12/MPA_NET-PL-20-12.pdf.

- Poskrobko, Bazyli, Poskrobko, Tomasz (2012), *Zarządzanie środowiskiem w Polsce*, Warszawa: Polskie Wydawnictwo Ekonomiczne.
- Sienkiewicz-Małyjurek, Katarzyna (2015), *Skuteczne zarządzanie kryzysowe*, Warszawa: Wydawnictwo Difin.
- Skomra, Witold ed. (2015), *Metodyka oceny ryzyka na potrzeby systemu zarządzania kryzysowego RP*, Warszawa: Bel Studio.
- Smit, Barry, Burton, Ian, Klein, Richard JT, Wandel, Johanna (2000), *An anatomy of adaptation to climate change and variability*, *Climate Change*, 45 (1).
- Smit, Barry, Wandel, Johanna (2006), *Adaptation, adaptive capacity and vulnerability*, *Global Environmental Change*, 16 (3).
- Strategia adaptacji do zmian klimatu dla m.st. Warszawy do roku 2030 z perspektywą do roku 2050, Miejski Plan Adaptacji* (2019), Raport podsumowujący Projekt pn. "Przygotowanie strategii adaptacji do zmian klimatu miasta metropolitalnego przy wykorzystaniu mapy klimatycznej i partycypacji społecznej", w skrócie ADAPTCITY, Warszawa, http://adaptcity.pl/wp-content/uploads/2019/02/strategia_adaptacji_25.02.2019_0.pdf.
- Trzcńska, Diana, ed. (2016), *Organy ochrony środowiska w Polsce i Unii Europejskiej*, Gdańsk: Wydawnictwo Uniwersytetu Gdańskiego.
- Ustawa z 3.10.2008 r. o udostępnianiu informacji o środowisku i jego ochronie, udziale społeczeństwa w ochronie środowiska oraz o ocenach oddziaływania na środowisko (tekst jedn.: Dz.U. z 2016 r. poz. 353 ze zm.).
- Ustawa z dnia 13 września 1996r. o utrzymaniu czystości i porządku w gminach (Dz.U. Nr 132, poz. 622 ze zm.)
- Ustawa z dnia 14 grudnia 2012 r. o odpadach
- Ustawa z dnia 16 kwietnia 2004 r. o ochronie przyrody (Dz.U. nr 92, poz. 880 ze zm.)
- Ustawa z dnia 27 kwietnia 2001 r. Prawo ochrony środowiska (Dz.U. nr 62, poz.627 ze zm.)
- Ustawa z dnia 27 kwietnia 2001 r. Prawo ochrony środowiska (Dz.U. nr 62, poz.627 ze zm.)
- Walker, Brian H, Abel, Nick, Anderies, John M, Ryan, Paul (2009), *Resilience, adaptability, and transformability in the Goulburn-Broken Catchment, Australia*, *Ecology & Society*, 14 (1).