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Rooftop garden of the Warsaw University Library building

Contemporary Cities Facing Climate Change

The high numbers of residents and dense urban fabric of buildings and infrastructure found in cities mean that extreme weather events have a particularly severe impact on them. Furthermore, urban development is itself an important element of climate change.

WARSAW UNIVERSITY LIBRARY, JADWIGA ANTONIAK-SADLAKOWSKA

Agnieszka Sobol, PhD
is involved with interdisciplinary urban development. She is the author of over 60 scientific publications and winner of a nationwide competition for the best PhD in the field in 2010. She serves as an expert for many public institutions, is a member of the Polish Association of Environmental and Resource Economists and leads the Residents' Association of the Zagajnik District in the city of Katowice. She works towards raising civic and environmental awareness.
agnieszka.sobol14@gmail.com

Agnieszka Sobol

Institute of Urban and Regional Development

Climate change is a global phenomenon, although it presents in different ways in different regions. Europeans, who once generally enjoyed a moderate climate, are seeing growing numbers of adverse weather events, and global warming is exerting an increasing impact on local weather conditions.

Heatwaves, torrential rainfall and tornadoes are increasingly affecting cities and their residents. Forecasts by climate scientists are by no means optimistic. The latest report published by the Intergovernmental Panel on Climate Change (IPCC) states unequivocally that the current rate of development poses a real danger to urban regions. The IPCC has published warnings in all its five previous reports, but the one from 2021 is the most alarming. Scientists are also reporting more and more evidence linking extreme weather events with climate change and anthropogenic activity. The relatively new science of climatology, i.e. attribution science, leaves us in no doubt that our planet's climate is being destabilized by human activity. Additionally, Earth's climate has already undergone rapid, extensive changes and some of their effects are irreversible.

Cities are facing a major, urgent challenge to adapt and change the direction of development, taking into account both existing and predicted climate effects. The 2021 IPCC report sounds a wake-up call for humankind and stresses the urgent need for cities to adopt zero-emissions policies.

The potential for mitigation and adaptation varies from city to city and depends on many environmental, infrastructure, social and economic elements. What will be key is collectively making the most of all available resources to protect cities against climate change.

Focused on nature

Our search for answers to the latest challenges of mitigating and adapting to climate change is increas-

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The main square and city hall of the Polish town of Skierniewice, 2017

ingly leading us to develop nature-based solutions (NBS). Such solutions are inspired by watching processes and phenomena occurring in nature, and then putting similar mechanisms into effect in social and economic processes. NBS also involve understanding the impact of ecosystem services on urban development. Such services involve the functioning of ecosystems and bring direct and indirect benefits for the society and the economy. Current experiences of cities implementing NBS indicate that they can help bring together social, economic, and environmental aims, since they benefit the local residents while being both environmentally friendly and economically beneficial.

Blue-green infrastructure

One important way of providing solutions rooted in nature is known as "blue-green infrastructure" (BGI). It is defined as a multifunctional network of spaces covered in vegetation (green) or water (blue), helping to resolve urban and climatic challenges by building in harmony with natural functions. It is designed and managed in a way to provide a variety of benefits to the ecosystem. The aim of BGI is to provide an ecological framework to bolster the social, economic, and ecological health of the environment.

Using BGI improves cities' ability to adapt to the changing climate, and the combination of nature-based solutions brings mutual benefits. Trees have an important role to play in cities: they protect against wind and noise, provide shade and thermal protection, and when they are planted near buildings they act as "natural air conditioners" by preventing the overheating of buildings and infrastructure. On a more local level, BGI also helps prevent the formation of urban heat islands (UHI). Green spaces also have a major impact on biodiversity. Trees and other plants form complex ecosystems important for the long-term quality and endurance of the environment.

Shifting towards water

As well as such thermal radiation imbalances and the risk of UHIs, cities also suffer from poor water balance. In urban regions, there is little recognition of the causes of floods and droughts. Rational water use is

an urgent problem, since many cities are experiencing systematic reduction of groundwater levels, which increases the threat of drought. According to the "Polish Waters" State Water Holding, 46.2% of cities in the country are experiencing water shortages. This fact is already stimulating the pursuit of various new concepts, such as that of "sponge cities." The aim of BGI is to improve local water retention by managing rainfall using methods such as ponds, ditches, reservoirs, rain gardens, marshes, swamps, peatland, green roofs, and vertical gardens. BGI also helps combat air and water pollution.

Water also plays an important role in recreation and making cities more attractive. In recent years, many cities in Poland have been rebuilding their relationships with rivers, with riverside developments flourishing in Warsaw, Kraków, Bydgoszcz, Wrocław, Olsztyn and Szczecin. For city dwellers, green and blue spaces provide opportunities for recreation and social interaction, as well as bringing health benefits. The development and management of natural ecosystems in cities have also been significant during the pandemic, since the situation has encouraged locals to seek closer contact with nature, as shown by the boom in urban gardening.

The concrete plague

In Polish cities, there is a notable lack of projects adroitly combining ecosystem services with engineering solutions. The predominance of the latter makes itself directly felt in the overwhelming presence of concrete. Excessive intervention in the natural world intensifies environmental problems in cities. This also detracts from the climate resilience of urban regions. NBS aim to replace paving such as tarmac and concrete with permeable surfaces, including biologically active surfaces.

In Polish cities, spatial planning is under-harnessed as a means of adapting to climate change. There is a lack of fundamental understanding and monitoring of such issues such as the impermeable sealing of urban surfaces. Instruments of spatial planning, including building decisions, unfortunately completely ignore aspects crucial for bolstering a city's climate resilience. While investment pressure is a key element of urban development, we must not downplay the threat of climate change. Mitigation and adaptation to climate change should be urgent concerns of spatial planning in Poland.

City residents have a greatly instrumental role to play in shaping resilient cities. Their initiatives, both in the private and public spheres (as civic projects), improve cities' ability to adapt to climate change. One of the fastest-growing types of civic initiatives supporting BGI involves the greening of urban spaces through planting trees, flower meadows, rain gardens, and green walls and roofs. They owe their popularity to their attractiveness and the growing social cognizance of environmental protection issues.

Urban climate policies

Nature-based solutions in cities are a key part of the European Green Deal. They are also included in Poland's National Environmental Policy 2030 – Development Strategy in the Area of the Environment and Water Management (PEP2030), as well as in the latest National Urban Policy. Legislation is also being developed to boost climate resilience, such as a special anti-drought act. It focuses on NBS, including BGI and activities aiming to "de-concrete" Polish cities. A complex approach is required, involving activities on a local, microscale in cities and land restoration outside urban regions.

In order to build greater climate resistance, it is necessary to implement wide-reaching NBS in Polish cities, including planning and operational activities. The cities with the most extensive pro-climate initiatives include Kraków, Wrocław, Bydgoszcz, and Gdańsk. Wide-reaching programs on a national scale include the project *Developing Urban Plans for Adapting to Climate Change*, run between 2017 and 2019 on the initiative of the Ministry of Climate in cities with over 100,000 inhabitants. As a result, 44 cities participating in the project received documentation assessing climate threats and an analysis of climate risk. They also received packages of measures concerning investment, including preventive and remedial activities concerning functional links, important from the perspective of adapting to climate change. Additionally, in order to implement the policies of PEP2030, in 2020 the Ministry of Climate launched the *City with Climate* initiative aiming to improve quality of life in cities and support the process of transformation towards climate neutrality, through the use of such tools as BGI.

Such initiatives show the growing importance of introducing blue-green infrastructure in cities. However, the scale of investment remains insufficient. It is expected that the concept of NBS will become more widespread in Polish cities in tandem with the updates of the National Urban Policy slated for the first half of 2022. An interdisciplinary team of experts on the environment and adaptation to climate change, functioning at the Urban Policy Observatory of the Institute of Urban and Regional Development, has prepared recommendations for nationwide urban policies with a major emphasis on the development of BGI.

Climate change is already playing an important role in the lives of cities. Our actions must be decisive and ambitious. One of the key directions needs to be a closer integration of urban and natural environments, with blue-green infrastructure at the forefront. Let's rise to the challenge and make Polish cities green! ■

Further reading:

Aktualizacja Krajowej Polityki Miejskiej, Środowisko i adaptacja do zmian klimatu [Updating the National Urban Policy: The Environment and Adaptation to Climate Change], Polish Institute for Urban and Rural Development.

https://obserwatorium.miasta.pl/aktualizacja-kpm-wyzwania-i-rozwiazania/srodowisko-wyzwania-i-rozwiazania/

Climate Change 2021: the Physical Science Basis. Report of the Intergovernmental Panel on Climate Change (IPCC). https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/

The European Green Deal: Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions, COM (2019) 640 final, Brussels, 11 Dec. 2019. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52019DC0640&from=EN

"State Ecology Policy 2030," Polish Ministry of the Climate, 2019.

Raport o stanie miast: Środowisko i adaptacja do zmian klimatu [Report on the Condition of Cities: The Environment and Adaptation to Climate Change], ed. A. Rzeńca, A. Sobol, P. Ogórek, Polish Institute for Urban and Rural Development, 2021.

"Draft Update of the National Urban Policy 2023," Polish Ministry of Funds and Regional Policy, Strategy Department.

https://www.funduszeeuropejskie.gov.pl/media/95365/kpm2023.pdf