CES Steering Group on Climate Change-Related Statistics
Case studies on measuring climate change adaptation: Poland

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METHODS FOR ASSESSING ADAPTATION TO CLIMATE CHANGE ACTIVITIES FOCUSED ON URBAN GREEN INFRASTRUCTURE

Anna Romańczak, Maciej Sadowski, Institute of Environmental Protection – National Research Institute of Poland, anna.romanczak@ios.edu.pl; maciej.sadowski@ios.edu.pl

Country	**Poland**
Short description	Green Infrastructure is one of the solutions to increase the resilience of cities to climate risks. Green areas are improving the quality of life in the city, mitigate extreme temperature, urban heat island effect, reduce the risk of flooding caused by heavy rainfall. Nature-based solutions also often provide benefits beyond adaptation in areas such as decarbonization, economic growth, and health. The aim of the research is to identify applied methods for assessing urban green infrastructure and evaluation the methods used to assess local adaptation to climate change.
Keywords	
Thematic area	• **Health** • **Human settlements and housing**
Characteristics of the reference area	• **Urban**
Type of statistical product or activity	• **Indicator(s)** • **Data analysis**
Adaptation approaches	• **"Green" adaptation – nature-based or ecosystem-based solutions**
Concepts covered/measured	• **Adaptation measures**
Hazard type covered	• **Drought** • **Heatwave** • **Flash flood**

Description of the activity

Outputs

Monitoring and evaluation of adaptation at a local level, such as city, is a relatively new issue, seen as crucial for the implementation of adaptation in urban areas. It is indicated that one of the challenges of this process is the selection of appropriate indicators for adaptation evaluation. Experience with monitoring adaptation policies confirms the need for research on methods for assessing changes in resilience to climate change impacts, and research on methods for determining the effectiveness of adaptation actions.

The analyses of strategies to increase green infrastructure in urban spaces provided information on the approach taken to monitor and evaluate the implementation of green solutions. Methods based on indicators and standards are usually used to assess the effects of green infrastructure implementation policies. Indicators for the adaptation of urban space to meteorological hazards (heatwaves) and indicators for assessing the climate-resilient of spatial structures mostly refer to the number of introduced solutions or transformed spaces - their total area or the share of new nature-

based solutions in the total area of the city. For the assessment of social and environmental effects of NBS, indicators of proximity and availability of blue-green areas for local communities are applicable. One example is the percentage of city residents with access to green areas of a certain size within a given distance, for example, 300 m. Another is the area of green space per capita. The achievement of the objective is measured by the increase in the value of the indicator, sometimes defined in relation to a set benchmark. Several strategies take a systematic approach to the development of urban green infrastructure. There are also standards for the share of greenery as a percentage of the area, including green roofs and green facades. An ecological standard is also applied for new construction projects and renovation and construction works interfering with the structure of buildings. The indicator defines the ratio of the area which must have the characteristics of a green area (biologically active area) to the total area of the site.

Relevance in the context of climate change adaptation in Poland

Green Infrastructure plays an important role in solving many challenges, from the heat island effect, to reduce the risk of flooding caused by heavy rainfall, to improving public health. Cities have used green practices to increase community resilience by planning for, and adapting to, emerging climate change impacts. Practices such as green roofs, urban forestry green facades, green lanes, rain gardens, pocket gardens are familiar to local governments as strategies to enhance sustainability and quality of life. Due to multifunctionality of green infrastructure are increasingly being used as best practices in climate adaptation.

Conclusions

The intended objectives of a green infrastructure strategy or project arising from the multifunctionality may not be achieved if they are not properly designed, planned or maintained. Decisive for the functionality of green infrastructure are parameters concerning location, accessibility and management. Lack of proper planning can lead to an uneven distribution of green spaces across the city, which can exacerbate social exclusion or lead to discrimination due to unequal access to nature. A central location in the city or easy access to natural areas, on the other hand, may make these areas vulnerable to intensive recreational use.

Several issues may hinder the adoption of a uniform approach to the assessment of strategies or actions by local authorities. The attribution of impacts to different causes and the adaptation of evaluation measures to changing reference points are considered problematic. The development of a universal set of indicators for evaluation may also be difficult to achieve due to the differing needs and objectives of local authorities. There are views that local indicators defined by a range of different stakeholders provide better insight, while the development of indicators at regional level may be an appropriate approach to assessing closely located areas. The collection of data by different departments and stakeholders can further complicate the process; the monitored information needs to be collated, organized and structured in order to provide a basis for the evaluation of a plan or action.

Way forward

The aim of further research is to apply indicators of accessibility to green space to assess local adaptation to climate change. The research will cover two selected cities in Poland.

Stakeholders

The research is conducted by The Institute of Environmental Protection – National Research Institute (Warsaw, Poland).

Example of the statistical output

In 2021, a preliminary study was conducted to identify applied methods for assessing urban green infrastructure. In 2022, it is planned to analyse methods for determining the effectiveness of adaptation actions in two cities in Poland.

List of indicators used for assessment of urban green infrastructure in terms of adaptation to climate change

Group of indicators	Indicators	Objectives	Monitoring	Strategy/Plans
Availability of public service infrastructure adapted to climate change	**New green infrastructure area: green roofs, green walls, rain gardens, neighbourhood gardens) [m2].**	Increase	in the middle and at the end of the project	Urban Adaptation Plans (Ostrołęka)
	Share of parks, green areas and housing estate greenery in the city [%]	Increase		
	Forest cover [%]	Increase		
	Number of squares and plazas converted into so-called climate squares and plazas [units]	Increase		
Adaptation to thermal hazards	**Area of land designated for ventilation corridors [ha]**	Increase	in the middle and at the end of the project	Urban Adaptation Plans (Białystok)
	New green infrastructure area (squares, estate parks, green roofs, green walls, rain gardens, neighbourhood gardens, etc.) [sq.m./year]	Increase		
	Number of squares and plazas converted into so-called climate squares and plazas [units]	Increase		
	Green and blue infrastructure area in urban areas [sq m]	Increase		
Resilience to temperature	**Number of blue-green infrastructure available to inhabitants [units].**	Increase	in the middle and at the end of the project	Urban Adaptation Plans (Dąbrowa Górnicza)
	Green areas available for residents [sq km]	Increase		
	Relative change in area of blue-green infrastructure in the city [%]	Increase		
Increase the city's resilience to extreme thermal meteorological phenomena	**New green infrastructure area (squares, estate parks, green roofs, green walls, rain gardens, neighbourhood gardens, etc.) [sq m]**	Increase	in the middle and at the end of the project	Urban Adaptation Plans (Gorzów Wielkopolski, Kalisz)
	Number of squares and plazas converted into so-called climate squares and plazas [units]	Increase		
	Share of people living in more than 300 metres distance to green recreational areas [%]	Decrease		

	Share of "green stops" in the total number of public transport stops [units].	Increase		
	Share of area of green and blue infrastructure in spatial development [%]	Increase		
Ay of urban green area	**Maximum distance of the residence to the nearest green area**	The distance of a green area ≥3 ha from the place of residence in the city centre should not exceed 800 m, while on the edge of city 1 km		Spatial Planning and Development Study for Łódź
Attributes of the green areas	**Number of trees planted [units]**	Number and location of trees with a minimum height of 3 m (9 million)		Map of tree crown (Warsaw)
	Height of plants [m]	a minimum of 3 m		
	Proportion of tree crowns to land area [%]	7 sq m crown coverage (32%)		

More details

Data sources used	Local databank
Frequency	One time activity
Coverage (national/subnational)	Subnational/local