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UrbanBlueHealth

CONCEPT OF PILOT ACTIVITIES

Poland (NIOM-PP3; MOSiR-AP)

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1. Introduction

The objective of the UrbanBlueHealth project is to focus stakeholders' attention on the health-related aspects of the urban natural bathing sites environment, to develop action plans aimed at improving bathing water quality, and to build capacity while strengthening cooperation among institutions involved in the maintenance and management of urban natural bathing sites.

Łódź, one of the largest cities in Poland, is located in the central part of the country. Although as many as 20 small rivers and streams flow through the city, all of them are confined to underground channels in the city centre. The global rise in temperatures has led citizens to seek respite in nature, preferably by water and surrounded by greenery. As there are only three natural urban bathing sites available in Łódź, the city authorities focus on providing citizens the clean and healthy recreational environment.

The pilot activity in Łódź as part of the UrbanBlueHealth project is aimed to practically test the selected solution for improving bathing water quality. The pilot will be conducted at the Stefański Ponds, a bathing site designated on a natural pond fed by two small rivers. In Poland, uncontrolled discharges of municipal wastewater into ditches, streams, or rivers still occur. There is also a lack of control over pollutants from agricultural runoff within river catchments. Chemical and biological contaminants, mainly originating from agriculture, are carried by surface waters and accumulate in natural standing water bodies such as urban ponds. Additionally, global climate change caused an increase in temperature and a reduction in water volume, which contributes to a higher frequency of algal blooms (excessive growth of algae), disrupts local ecosystems, and decreases their self-purification capacity.

The ponds where the pilot activity will be carried out in Łódź are fed by two small rivers, one of which carries a significant load of chemical and biological pollutants. Therefore, following a literature review and a series of consultations with a team of hydrobiologists from the University of Łódź, as well as with municipal institutions managing urban bathing sites and experienced in implementing various solutions to improve bathing water quality, a decision was made to test the effectiveness of a water aeration device.

During the pilot activity, water quality at the Stefański Ponds will be analysed both prior to the installation of the aeration system and throughout its operation during the entire bathing season. A range of physical, chemical, and biological parameters will be analysed, with particular emphasis on pathogenic and opportunistic bacteria as well as the presence of antibiotic resistance genes. The activities will aim to determine whether aeration improves bathing water quality and reduces the frequency of algal blooms during the summer season, thereby increasing the accessibility of the bathing site for residents.

In Poland, the quality of bathing water is regulated by the Regulation of the Minister of Health of 17 January 2019 on the supervision of bathing water quality and water at sites occasionally used for bathing (Journal of Laws 2024, item 255). The regulation is aligned with EU Directive 2006/7/EC and applies to water at bathing sites and sites occasionally used for bathing. The regulation specifies the scope and methods for testing bathing water quality. In Poland, all natural water bodies are owned by the State Water Holding Wody Polskie. The monitoring of bathing water quality is the responsibility of the State Sanitary Inspection. The results of water quality tests at individual bathing sites are published on the website https://sk.gis.gov.pl/ (Bathing Service), which features an interactive map indicating bathing sites and daily up-to-date information on whether a site is open.

2. Concept of pilot activities in Łódź

Initial information about the pilot action

Area executing pilot action	Stawy Stefańskiego, Łódź, Poland
Partners	Nofer Institute of Occupational Medicine (NIOM – PP3), Municipal Sport and Recreation Centre (MOSiR – AS)

The importance of pilot action

The justification for the selection of the pilot action	The Stefański Ponds in Łódź are fed by two small rivers, one of which carries a substantial load of chemical and biological pollutants. In Poland, uncontrolled discharges of municipal wastewater into ditches, streams, or rivers still occur. There is also a lack of oversight regarding pollutants originating from agricultural runoff within river catchments. Chemical and biological contaminants, primarily from agricultural activities, are transported by surface waters and accumulate in natural standing water bodies such as urban ponds. Additionally, global climate change has resulted in increased temperatures and reduced water volumes (drought), which contributes to a higher frequency of algal blooms (excessive algal growth), disrupts local ecosystems, and diminishes their self-purification capacity. The pilot action will improve the health conditions of recreational environments in densely populated urban areas during periods of heatwaves. The Stefański Ponds constitute an ideal location for testing these interventions. The anticipated outcome will be the strengthening of the public health protection system, particularly with regard to vulnerable populations such as children.
The justification for the choice of the selected methods	The purpose of water aeration is to deliver oxygen to the deeper layers of the water in order to enhance the natural self-purification processes within the ecosystem of the Stefański Ponds. This solution appears to be the most cost-effective and efficient in the climatic conditions of Central Europe's temperate zone. It enables the use of technology to reinforce natural processes within the ecosystem, which have been disrupted as a result of global temperature increases.

	Since the pond is fed by two rivers, in addition to aeration, a water pollution warning system for the inflowing water will also be tested. Conductivity, dissolved oxygen, and temperature recorders will be installed at the inlets of both rivers. According to the literature, these parameters correlate well with chemical and biological pollution. Such water monitoring can serve as an early warning system for water contamination at the bathing site. As a result, it will be possible to undertake additional measures to prevent contamination of the bathing water and to protect the health of its users.

Pilot action objective and components

PA concept/summary including technical description	The aeration device will be carefully selected to ensure its efficiency meets the specific needs of the bathing site at Stefański Ponds. The selection process will take into account the following parameters: the depth of the reservoir, the characteristics of the pond bed (degree of silt accumulation), the location of river inlets in relation to the bathing area, and the overall size of the bathing site. The effects of the device's operation will be assessed through water quality testing before its installation and during its operation in the swimming season. The scope of these tests has been preliminarily determined in cooperation with a team of hydrobiologists from the UNESCO Chair for Ecohydrology and Applied Ecology at the University of Łódź. Comparing the water quality test results before and after the activation of the aeration device will allow for an evaluation of the effectiveness of oxygenation as a method for improving bathing water quality.
Monitoring water quality throughout the Pilot Activity	The planned scope of the bathing water tests includes: • measurement of physical water parameters, including: temperature, pH, oxygen content, and conductivity; • measurement of chemical water parameters, including: analysis of ionic forms of biogenic

	compounds and other dissolved substances (ion chromatography); • taxonomic analyses of microorganisms, with identification of pathogenic and opportunistic bacteria, as well as indicators of sanitary water quality (NGS 16S rRNA sequencing); • qualitative and quantitative genetic analyses (PCR and qPCR) to assess the overall abundance of bacteria and cyanobacteria, including potential antibiotic resistance; • analysis of phytoplankton and zooplankton.
Regular testing for key water quality parameters	Water samples as part of the pilot testing will be collected at three sampling locations, six times during the period from April to September. Additionally, to evaluate the effectiveness of the bathing water treatment method, the results of water quality monitoring conducted in accordance with the regulations in force in Poland will also be utilized.
Collecting and processing data on water quality parameters	Conducting a comparative analysis of water quality data, identifying trends, peak contamination periods, and correlations with heat waves. Producing a report summarizing the findings for further use. Timeframe: after the bathing season.
Responsibilities	NIOM is responsible for the i. equipment ordering and surveillance under the proper installation; ii. contraction of the water quality testing laboratory (external contractor), supervision over timely sampling and analysis, final processing of result. MOSiR in Lodz is responsible for the installation, maintenance and continuous operation of aeration equipment and water parameters loggers.

Key issues addressed in the pilot phase

The impact of climate change on water quality	Climate change is expected to intensify water quality issues by altering rainfall patterns, increasing temperatures, and changing the

	frequency and intensity of extreme weather events such as floods and droughts. These changes can affect the Stefański Ponds water quality in multiple ways, by promoting harmful algal blooms, increasing sediment runoff from surrounding areas, and intensifying the release of pollutants. Additionally, rising water temperatures could foster the growth of waterborne pathogens and parasites that pose health risks to people using the river for recreational activities. The Pilot Activity inhibits the potential negative impact of climate change on water quality. An aeration device will be installed in the Stefański Ponds to supply oxygen into deeper water layers, which can inhibit or even stop algae blooms and support the natural self-purification processes in this ecosystem.
Raising awareness among local communities	Public awareness of the health and environmental risks associated with water pollution is limited. Local communities may not be fully aware of the impact of pollution on water quality or the potential risks posed by pollution present in recreational water. There is a possibility of contamination of water in the Stefański Ponds by chemical and microbiological contaminants flowing into the reservoir with rivers. Agricultural pollution (manure and inorganic fertilizers) as well as sewage discharges are important. The results of the Pilot Activity will be used to raise awareness among stakeholders on the importance of water quality and its direct impact on public health, as well as other communication activities for local communities (information campaigns directed to various community groups).
Early warning system for water quality	To better prepare for and respond to sudden changes in water quality, an early warning system will be tested. This system will be based on continuous monitoring of water quality parameters and real-time data collection to indicate their correlation with pollution of inflowing river water. In the event of pollution spikes, such as after heavy rains or sewage flows, the system could alert local authorities to fast reaction focused on the human health protection (eg. closing bathing site, implement water treatment solutions, publish the alert for public). The implementation of an early warning system should improve public

	safety and support prevention of the waterborne diseases, especially in the face of increasing climate variability.

Summary of the pilot action

Summary and future steps	The UrbanBlueHealth pilot action in Łódź will focus on implementing bathing water aeration and monitoring key parameters of river water flowing into the pond (conductivity, oxygen concentration, and temperature). The Pilot will be conducted at the Stefański Ponds in Łódź during the 2025 bathing season. The Pilot Activity aims to test the effectiveness of water aeration as a method for bathing water treatment. Additionally, the monitoring of conductivity, oxygen concentration, and temperature values will be analysed to determine their correlation with pollution levels in the river water flowing into the pond. The outcome will confirm or deny the hypothesis regarding the utility of water quality monitors as an early warning system for bathing water contamination. Testing the efficacy of aeration and monitoring system through extended analyses of physical, chemical, and biological parameters will be conducted from April to September 2025. The collected data will be crucial for developing a comprehensive water quality management strategy, which may be applied to future interventions and long-term planning to enhance the health conditions of urban summer recreational environments. The results will enable the developing of future strategies aimed at improving water quality, ensuring healthy recreational environment, and promoting sustainable urban water management in Poland and Central European countries. The tested solution will contribute to the successful implementation of the UrbanBlueHealth initiative, advancing safer and more sustainable urban water practices in the long term.