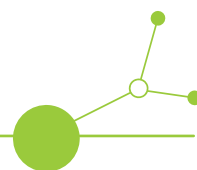


Urban Bathing Water Action Plan

Postás strand, Szentendre, Hungary



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1. Introduction

Urban bathing is becoming increasingly popular as people seek relief from warming summers and more frequent heat waves. Blue spaces in cities also beneficial for improving microclimate and supporting aquatic ecosystems in urban settings. At the same time, urban bathing waters on natural lakes or rivers are under multiple stressors of increasing water scarcity, extreme weather events, pollution from urban runoff, wastewater discharge or animals (dogs, birds). The resulting microbial or chemical water quality deterioration may pose a risk to bathers' health. Protection of public health requires improved knowledge of the potential risks associated with bathing and coordinated action of various stakeholders (e.g. beach operators, municipalities, public health authorities, civil associations, utility operators) to mitigate these risks.

Through the cooperation of the Interreg Central UrbanBlueHealth (www.interreg-central.eu/projects/urbanbluehealth) project partners, a Joint Transnational Strategy was developed, summarising key challenges and strategic goals. The Strategy defines shared goals for improving the safety, resilience and management of urban bathing waters across Central Europe and the purpose of the national action plans (APs) is to translate those strategic objectives into concrete, implementable actions.

Challenges identified in the Joint Transnational Strategy and the Transnational SWOT Analysis correspond directly to goals such as improving risk identification, improving monitoring methodologies, preventing exposure through early warning systems and mitigating pollution sources. Each of the pilots and other national case examples of the UrbanBlueHealth project consortium adapt the Strategy to national priorities, reflecting on the local challenges of each study site.

The main challenges in Hungary, as identified by the Hungarian National Bathing Water Group were microbiological and chemical water pollution climate-change associated changes in water quantity and quality. Regulatory monitoring requirements are insufficient to characterise and prevent exposure to risks associated with water pollution. Improving early warning capacities, risk-based management and better information to the public were also identified as areas for action.

The Hungarian Urban Bathing Water Action Plan (hereinafter referred to as Action Plan) serves as a practical roadmap for implementing strategic goals of UrbanBlueHealth project at the Szentendre pilot site, with an ambition of making it adaptable for similar settings.



2. Local spatial context and key challenges

Szentendre is a city of 28 000 inhabitants, in the Northern agglomeration of the capital, Budapest. It is located on Danube River, on a quiet side branch by Szentendre Island. Postás Beach is a popular recreational location, with a sandy bank in the shade of indigenous trees. It is easily accessible by a 10-minute walk, both from the city centre and the main transportation hub of Szentendre. Postás Beach is a designated bathing site, with adequate infrastructure (dressing cabins, toilets and showers, drinking water, waste collections). Due to its location and natural environment, it attracts many families with children.

Amongst the key challenges, the local (urban) impacts of the climate change are likely to increase in the coming years. According to the National Mitigation Geoinformation System¹ database, the frequency of heat wave days in the 2021-2050 period will increase by 65-71% compared to the 1991-2020 baseline period. Although the city's susceptibility to heat waves remains below the national average due to its proximity to the Danube, it is still increasing significantly; in addition to the 65-71% average frequency increase (i.e. 1-2 more longer heat wave periods per year on average), the frequency of critical heat waves will also increase. Moreover, at least 6-10 days of extreme heat waves are expected in the Szentendre district annually, while hot days will occur an additional 10-15 times per year on average in the region. These urban climate change trends predict intense and more frequent residential use of the Danube Postás beach. Increase of heat waves will also have an impact on water quality due to higher water temperatures.

Danube River is prone to flooding, traditionally in early spring or in early summer, but with climate change, hydrological patterns become more irregular. The site is also exposed to short-term pollution events. Heavy precipitation can wash pollution from urban surfaces into the river, increase run-off through an adjacent Bükkös stream (Bükkös patak) or can lead to combined sewage overflow at the wastewater treatment plant, discharging to the Danube in the proximity of the beach. Short-term pollution events lead to beach closure several time in a bathing season in the past. In 2024, a storm water reservoir was set up that could store combined sewage in case of heavy rainfall that reduced the frequency of combined sewage overflow events significantly. While dogs are not allowed on the beach, however, there is a doggy beach 200 meters downstream, the beach is not fenced off and thus the water can be accessed by animals. Regulatory sampling is carried out once a month before and during the bathing season for *E. coli* and faecal *Enterococci*. Water temperature of Danube as a large river seldom exceeds 25°C and it flows relatively fast, thus, the risk of algal blooms is low.

¹ NATÉR - Nemzeti Alkalmazkodási Térinformatikai Rendszer



3. Synergies of the Action Plan

A greenhouse gas emission inventory and adaptation assessment were prepared for the City of Szentendre according to the methodology accepted by the International Panel on Climate Change ². Building on the environmental survey, a detailed Sustainable Energy and Climate Adaptation Action Plan of Szentendre- SECAP³ (Szentendre Fenntartható Energia és Klíma Akcióterve) was introduced in 2023 to address the challenges identified.

The City of Szentendre also has an approved its Urban Climate Strategy⁴ (Szentendre Klímavédelmi Akcióterve), therefore the current Urban Bathing Water Action Plan should be used together with the SECAP and the city's climate strategy.

² Nemzetközi Éghajlatváltozási Testület <https://www.ipcc.ch/>

³<https://szentendre.hu/wp-content/uploads/2024/02/Szentendre-Fenntarthato-Energia-es-Klima-Akcioterve-SECAP-2023.pdf>

⁴https://szentendre.hu/wp-content/uploads/2023/08/Szentendre-SECAP-terv-230714_FINAL_revOZ.docx



4. Objectives of the Action Plan

The Urban Bathing Water Action Plan applies territorially to Postás beach, because there is no other natural water surface in the city or outside it. The goals listed in points below primarily serve to ensure safe bathing and improve the water quality of the bathing area.

The listed objectives can be achieved in the short and mid-term, partly with municipal resources, partly with national and European Union funds. Furthermore, the actions vary from the implementation of collaborations to the integration in urban planning processes, and technical developments.

List of the objectives are the followings:

1. Improve monitoring scope and frequency for better understanding of health and environmental risks.
2. Strengthen preparedness for short-term pollution events by source identification and development of early warning approaches.
3. Strengthen climate resilience of bathing sites through predictive tools and weather-related risk management.
4. Risk mitigation through pollution source control.
5. Enhance cooperation and communication among institutions, stakeholders, decision makers and strengthen information to the public.
6. Support long-term sustainability through capacity building and gradual integration of risk-based management elements.



5. Action areas and measures



5.1. Improved monitoring and risk Identification

Activities:

- Increase sampling frequency of regulatory compliance monitoring to better capture inherent variability of water quality. In 2026, sampling will be carried out every two weeks.
- Based on the results, the operator of the beach, bathing place (in this case the Aquapalace Ltd.) in cooperation with the local public health authority (Szentendre District Office/Szentendre Járási Hivatal) will decide on the long-term extended monitoring frequency from March till October.
- Based on the pilot activities, expand monitoring of additional parameters (antimicrobial resistance, non-toxigenic *Vibrio cholerae*, nitrate, nitrite, ammonium, pH, and turbidity) in the 2026 bathing season, between May and August.
- Monitoring results from 2024, 2025 and 2026 will be used for deciding a final on the long-term monitoring strategy, specifying the relevant months and parameters of the yearly monitoring.
- Introduction of a rapid (same-day) PCR-based⁵ detection method for Enterococci. The method was developed and tested by the National Center for Public Health and Pharmacy, as part of the pilot activity. The analysis will complement regulatory compliance monitoring in the 2026-bathing season and additional samples will be taken during potential pollution events (e.g. heavy precipitation or flooding). Results will be used to decide if the rapid method can be used as an early warning for pollution events as a long-term intervention.

Responsibility: beach operator (Aquapalace Ltd,) municipality (City of Szentendre), national public health authority (National Center for Public Health and Pharmacy)

Timeline: bathing season from May to August as short term intervention in 2026, and mid-term interventions in at least three consecutive years (2026-2028)

Indicative funding: appr. 10 000 EUR per seasonal monitoring

Resources: national sectoral and regional operation programmes and UrbanBlueHealth project budget until October 2026

⁵ PCR (polymerase chain reaction) is a frequently utilized laboratory nucleic acid amplification analytic-clinical method



5.2. Strengthening preparedness for short-term pollution event

Activities:

- Install and test multi parameter sondes at Postás Beach based on experience from the UrbanBlueHealth project case study (Osijek, CR). Measurement data combined with the laboratory results, hydrological and meteorological data to assess if sensors can provide early warning for short-term sudden pollution or havaria events.
- Define provisional risk thresholds for selected parameters (including hydrological, meteorological and measured parameters) that can trigger sudden actions (e.g. warning to the bathers or beach closure) for couple of days.
- Integrate the outcomes of the pilot action into the existing preparedness plan of Postás Beach.
- Run a simulation exercise before the start of the bathing season to test communication channels and harmonised action of stakeholders. Simulation exercise will incorporate severe weather warning from the meteorological service to the beach operator and the local public health authority, warning from the wastewater treatment operator to the beach operator and the local public health authority on potential combined sewage overflow, information to the public on health hazards and beach closure.

Responsibility: beach operator (Aquapalace Ltd,) municipality (City of Szentendre), national public health authority (National Center for Public Health and Pharmacy), national meteorological service (Hungarian Meteorological Service), wastewater treatment plant operator (Danube Regional Waterworks⁶), disaster management bodies (National Directorate General for Disaster Management) and local civic organisations

Timeline: bathing season from May to August as short term intervention in 2026, and mid-term interventions in at least three consecutive years (2026-2028)

Indicative funding: appr. 45 000 EUR purchasing and installation of the multi parameter sondes, appr. 15 000 EUR yearly maintenance of the equipment

Resources: municipal and or the operator's budget and UrbanBlueHealth project budget until October 2026

⁶ DMRV - Duna Menti Regionális Vízmű Zrt.



5.3. Strengthening climate resilience

Activities:

- Implement sampling during and after extreme weather events (floods, heavy precipitation, low water flow, heatwave) to identify scenarios that lead to water quality deterioration.
- Develop risk management framework for climate-change related scenarios as part of the preparedness plan prepared in co-operation with national authorities and adapted by the municipalities and the beach operators.

Responsibility: beach operator (Aquapalace Ltd,) municipality (City of Szentendre), regional public health authority (Public Health Department of Szentendre District Office), national water-body authority (General Directorate of Water Management⁷)

Timeline: in bathing seasons, from May to August in three consecutive years (2026-2028)

Indicative funding: appr. 12 000 EUR for external experts' contribution

Resources: municipal and or the operator's budget and UrbanBlueHealth project budget until October 2026

⁷ Országos Vízügyi Főigazgatóság in Hungarian



5.4. Risk mitigation through pollution control

Activities:

- Bükkös stream (Bükkös patak) was identified as a significant pollution source during the pilot activity. The Municipality of Szentendre is initiating a project for the revitalisation of Bükkös, which will include control of upstream pollution sources. Results from the pilot action contributes to the intervention planning
- Storm water reservoir was constructed at the wastewater treatment plant in 2024. It requires long-term evaluation if the current capacity of the reservoir is sufficient to prevent combined sewage overflow under changing climate conditions
- Feasibility assessment of lengthening the outfall pipe of the wastewater treatment plant to discharge to midstream to prevent pollution of the beach

Responsibility: beach operator (Aquapalace Ltd,) municipality (City of Szentendre), wastewater treatment plant operator (Danube Regional Waterworks)

Timeline: mid-term interventions in at least three consecutive years (2026-2028)

Indicative funding: appr. 75 000 EUR for feasibility studies and technical plans

Resources: ERDF⁸ and/or Cohesion Fund⁹ and regional and/or sectoral operative programmes

⁸ ERFA - Európai Regionális Fejlesztési Alap

⁹ Kohéziós Alap



5.5. Communication and public awareness

Activities:

- Improve information to the public at the beach on the availability of hygienic facilities and house rules (e.g. ban for dogs and the location of the doggy beach) to prevent on-site pollution.
- Install solar powered electronic signboard at the beach for real-time public information.
- Open a dedicated website for the Postás Beach where project data, early warnings and other information is available.
- Integrate beach related information including health warnings or information on beach closure and reopening in the Szentendre city information application.
- Maintain stakeholder communication channels for early warning as outlined under section 4.2
- Integrated urban and green-network planning which consider the ecological, social (community) and public health impacts and demands.

Responsibility: beach operator (Aquapalace Ltd,) municipality (City of Szentendre), local stakeholders (civil bodies, NGOs)

Timeline: during and beyond the project lifetime, continuously

Indicative funding: appr. 10 000 EUR as staff cost of a municipal communication staff

Resources: UrbanBlueHealth project budget until October 2026 and municipal budget and European (e.g. ESF¹⁰, Interreg CBC¹¹) supports

¹⁰ ESZA - Európai Szociális Alap

¹¹Interreg Határon Átnyúló Programok



5.6. Capacity Building

Activities:

- Hungarian Bathing Water Group meeting in February 2026 in Szentendre to discuss implementation of action plan and propose solutions.
- A national training will be organised in March 2026 for local public health authorities on the outcomes of the pilot action and its implications for bathing water quality regulatory control.
- A workshop will be organised in September 2026 for stakeholders including beach operators, local public health and water authorities, municipalities, and NGOs on bathing water related risks and potential mitigation measures including the solutions developed in UrbanBlueHealth project.
- City of Szentendre will be signatory of the Declaration of Urban Blue Health Initiative.
- Hungarian project partners - the National Center for Public Health and Pharmacy and Aquapalace Ltd. in cooperation with Municipality of Szentendre - will contribute to set-up the transnational Bathing Water Platform.

Responsibility: beach operator (Aquapalace Ltd,) municipality (City of Szentendre), national public health authority (National Center for Public Health and Pharmacy)

Timeframe: during and beyond the project lifetime, continuously

Indicative funding: appr. 10 000 EUR as staff cost of a municipal training staff/or public health officer

Resources: UrbanBlueHealth project budget until October 2026, latter municipal budget



6. Expected Results

Implementation of the Action Plan is expected to significantly improve risk-based management of Postás Beach. More frequent sampling, with a focus on extreme weather events will provide a better understanding of water quality heterogeneity and its implications for bather safety. Introduction of rapid microbial testing method will facilitate more timely response for preventing exposure of bathers to hazardous pollutions.

The use of multiprobe sondes and modelling approaches will enhance early warning capacity for pollution events. Outcomes of the pilot action can be scaled up on a long-term to apply to other bathing sites and thus support climate adaptation.

The established communication platforms, including National Bathing Water Group allow multisectoral cooperation for better risk assessment and management of hazards associated with urban bathing. Local communication channels, including on-site information boards, a dedicated website and city application will support timely and easily accessible information to the public.

Long-term interventions for pollution control (such as the revitalisation of the Bükkös stream and retention of combined sewage overflow) will contribute to improved water quality and bather safety.

The future operation of the National Bathing Water Group is to be continued, because this stakeholder group contribution has been proved its usefulness and necessity to formulate sustainable actions and developments.

Overall, the Action Plan will lead to improved stakeholder engagement and coordination, risk-based management of bathing waters and better public health protection of urban bathers.



7. Abbreviation and Acronyms

CBC	cross border co-operation
ESF	European Social Fund
SECAP	Sustainable Energy and Climate Adaptation Action Plan



KPI*	DESCRIPTION	TARGET VALUE	UNIT
KPI 1	New microbiological/chemical parameters monitored	7	Parameters introduced
KPI 2	High-frequency sampling in 2026	8	Number of sampling occasions
KPI 3	Tested methods for early warning	3	Method tested
KPI 4	Staff trained in risk-based management	15	Number of staff members
KPI 5	Public communication outputs (website updates, warnings, posts)	8	Updates/posts
KPI 6	Organized meetings for raising public awareness or capacity building (workshop, training, dissemination campaign)	3	meetings

* key performance indicator (KPI)