



**Stockholm *Junior*  
Water Prize**

**HUNGARY**

2024





The Stockholm Junior Water Prize (SJWP) was established in 1997 and is an annual competition open to young people between ages 15 and 20, who have conducted water-related projects focusing on local, regional, national or global topics of environmental, scientific, social or technological importance. The Stockholm International Water Institute administers the Stockholm Junior Water Prize and it serves as its secretariat ([www.siwi.org/prizes/stockholmjuniorwaterprize/](http://www.siwi.org/prizes/stockholmjuniorwaterprize/)). The Stockholm Junior Water Prize consists of two parts: the National Competition and the International Final. All participating countries organize their own National Competition. The winner proceeds to the International Final in Stockholm. As a result of the competitions, thousands of young people around the world develop personal interests, undertake academic studies and often pursue careers in water or environment-related fields.

The International Final takes place during the World Water Week in Stockholm, an ample event where water people from all over the world meet. This generates many opportunities for networking and exposure. The efforts of the participating countries are highlighted globally.

The winner of the Stockholm Junior Water Prize receives a 15,000 USD award, a crystal prize sculpture, a diploma, as well as the stay in Stockholm. Nevertheless, the participation is what genuinely matters.

H.R.H. Crown Princess Victoria of Sweden is the Patron of the Stockholm Junior Water Prize.

**HUNGARY AND THE SJWP**

Hungary joined the SJWP in 2013. Dr. János Áder, the former President of the Republic, has been the patron of the competition since 2014. The national organizer of the SJWP is the GWP Hungary Foundation in agreement with the Stockholm International Water

Institute. Details of the competition are available at [www.ifvizdij.hu](http://www.ifvizdij.hu).

**Previous winners of the national competition**

2013: Dézi Kakas, János Béri and Péter Polák Jr. (Fényi Gyula Jezsuita Gimnázium és Kollégium, Miskolc) – Project title: The Importance of the Szinva Stream: Biological and Chemical-Physical Examinations

2014: Claudia Li, Livia Mayer and Nikolett Sebestyén (Eötvös József Gimnázium és Kollégium, Tata) – Project title: Our Water is Our Future

2015: Márton Czikkely, Tamás Gergely Iványi and Tamás Márkus (Városmajori Gimnázium, Budapest) – Project title: The Secrets of Drinking Water – How to Combat Polyethylene Terephthalate

2016: Dávid Kovács and Ákos Iván Szűcs (Kecskeméti SZC Kada Elek Technikum, Kecskemét) – Project title: What Can We Gain by Using Grey Water?

2017: Anna Tari, Kristóf Stefán and Nikolett Szabó (Kőbányai Szent László Gimnázium, Budapest) – Project title: „Tanks of Water”

2018: Bence Zsolt Rappay (I. Béla Gimnázium, Szekszárd) – Project title: „Hillside water management and possibilities of melioration in the Csatári-valley”

2019: Eszter Kun (Móricz Zsigmond Gimnázium, Szentendre) – Project title: „Growing plants, growing minds with educational aquaponics system”

2020: Dóra Alexandra Gyémánt and László Török (Radnóti Miklós Kísérleti Gimnázium, Szeged) – Project title: „Detecting the toxin production of the Microcystis species in hungarian lakes”

2021: Emília Kovács (Kisvárdai Bessenyei György Gimnázium, Kisvárd) – Project title: „Fermentation of alfalfa brown juice and its environmental friendly reusing”

2022: Balázs Andócsi and Olivér Herceg (Béla I. Grammar School, Szekszárd) – Project title: „Development of a Protection Method Against Soil Erosion and Water Conservation in Szekszárd”

2023: Benedek Jandó (Veres Pálné Gimnázium, Budapest) – Project title: „Relations between composition of fishes and hydromorphological variables in a very large river”

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Finalists



Jury members during the national final



#### THE JURY OF THE SJWP – HUNGARY 2024

Thirteen entries were received for the 2024 Hungarian National Competition. Altogether, there were twenty-one secondary school students involved, participating either as individual contestants, or as teams of two members. The projects were written in English, according to the requirements of the call and dealt with different topics, such as water reuse, the quality of drinking water and of surface waters, environmental awareness, eutrophication, wastewater treatment. Five projects were selected by the jury for the national final on the basis of the SJWP judging criteria. The Hungarian National Final was organised at the Hungarian Water Utility Association (MaVíz) in Budapest on the 25th of May 2024. The finalists were requested to prepare a Power Point presentation displaying the results of their project.

During the final, the contestants presented their main findings and answered the jury's questions. Approximately 15 minutes per team were allocated. The presentations and the interviews were conducted in English.

#### Chair:

- *András Szöllősi-Nagy*, professor, National University of Public Service

#### Members:

- *Sándor Baranya*, associate professor, Budapest University of Technology and Economics
  - *Anna Bérczi-Siket*, consultant
  - *Adrienne Clement*, associate professor, Budapest University of Technology and Economics
  - *Tamás Gampel*, business development director, Xylem Water Solution Hungary
  - *Veronika Major*, vice president, MaSzeSz
  - *Edit Nagy*, secretary general, Hungarian Water Utility Association
  - *Zsolt Edgár Rasztovits*, regional business development manager, MOLEAER
  - *Szilvia Szalóki*, consultant
  - *Danka Thalmeinerova*, consultant
- Secretary:
- *Monika Jetzin*, GWP Hungary Foundation

#### INSPECTING BANNED HERBICIDE IN SURFACE WATERS

*Tímea Gergely, Eszter Lénárt* – Kecskeméti Református Gimnázium, Kecskemét a

“In today's world, the most burning questions are mostly related to environmental pollution and protection. Most fields of science intend to improve the quality of life, so most of them are connected to this matter today. We have many reasons to protect surface waters, such as lakes, rivers and streams that host diverse ecosystems. Polluting these bodies of water can lead to loss of biodiversity, which is why it is such a priority. The water near agricultural lands is at high risk due to the possible contamination caused by used herbicides and pesticides even at low concentrations. These chemicals can stay in the water for dangerous periods of time, because they don't break down easily. Preserving the right water quality is a priority because even at low concentrations herbicides can be harmful to aquatic life, causing

reproductive problems and developmental abnormalities. Nowadays we can observe an increase in the usage of herbicides due to the increasing demand and market. To meet this demand more and more chemicals are introduced that have artificial qualities that stand far from natural ones. The use is highly regulated of these herbicides in the European Union, but it is a known fact, that they still can be found in waters. Numerous scientists, such as Tyrone Hayes and K.R. Tamsamani have researched this problem. To make a difference the access to the results and findings of these studies cannot be limited to the scientific community. They have to be integrated into the everyday life. The best method is to introduce these problems to the youth at young age. In our study, we focused on a prohibited herbicide that can still be found in surrounding surface waters in Bács-Kiskun County. We inspected two widely used pesticides, Metolachrol and Atrazine. Our study aims to shine on whether people are aware that they may contribute to long-lasting environmental problems through their shopping habits.



**IMPROVING THE WATER RETENTION PROPERTIES OF SOILS**

*Benedek Sánta, Márton Frei – Szekszárdi I. Béla Gimnázium, Szekszárd*

„In recent years, climate change has significantly increased the length of dry periods and the frequency of flash floods. This has reduced the soil's ability to retain precipitation over long periods. By testing soil and soil mixtures, we would like to make proposals to increase their water retention capacity, so that we can retain more water in agricultural areas and thus shift the water balance of our country in a positive direction. Soil moisture retention is on a negative trend across Europe and the world. In Hungary, the moisture content of soils is also decreasing (Pinke, 2022). In Hungary, the number of extreme precipitation events and the length of consecutive dry periods have increased proportionally over the last 30 years (Kis, 2021). The caused damage could be reduced by retaining inland water. In the case of drought, the solution is a combination of water recharge and increasing the amount of water infiltrating into the soil and adaptation (Somlyódy, 2011) Soil water absorption and drainage is a complex process in which processes of

different directions and magnitudes take place. The soil itself is a passive water source, only able to provide the plant with what it can store from precipitation or absorb from groundwater. Because the distribution of precipitation is uneven, the soil must have the capacity to bind water against gravity, but not to the extent that the plant cannot absorb it (Kocsis, 2012). In order to help solve these problems at the end of September 2022, we came up with the theme of our project, which aims to propose ways to increase the water-holding capacity of our soils. Our aim is to help agricultural crop production and thus a more economical food supply for the country. We have also sought the views of farmers' experts on the extreme weather, who have confirmed the above facts, and local news portals are increasingly reporting on the subject. Our aim is to detect the problem locally by analysing meteorological data and to propose ways of increasing water retention capacity by examining the properties of the soils in our environment. Our hypothesis is that the soil improvers that can be formed in the country can increase the water-holding capacity of our soils to such an extent that our water balance would move towards equilibrium or even positive, and our agricultural production would become more reliable by maintaining soil moisture.”

**A DROP OF AWARENESS IRRIGATES THE FUTURE**

*Sihem Hadjadj-Aoul, Zsófia Blanka Back – Kossuth Lajos Gimnázium, Budapest*

“The future is in our hands, and if we do not take action, then who will?”

Among the 17 Sustainable Development Goals (SDGs) identified by the UN in 2005, water issues are specifically mentioned. [1] Among these, the issues of clean drinking water, sanitation and hygiene are mentioned, but the organisation also mentions the conditions of animals living in aquatic habitats. Our project has been set up with this in mind. The current generation lacks motivation to address this issue because in today's world, everyone wants to see immediate results, and water purification is not a process that yields instant outcomes.

We would like to investigate how we can help spreading such information more widely through social media. This lack of immediate results decrease motivation, especially among the youth. That's the reason why we think that we should change the curriculum in our education system with innovative classes which are about the crisis of the Earth.

We have ideas that can reduce the lack of interest of young people. In the school we should have project-based lessons presented by us and competent experts and from the beginning onwards, we take into account the progress based on tests. The second idea was to launch campaigns. We want to encourage people not just to sit and wait, but to do something about. Our goal was to show, it is possible to bring the world of social media in the classroom, and to create informed, conscious and active citizens.”



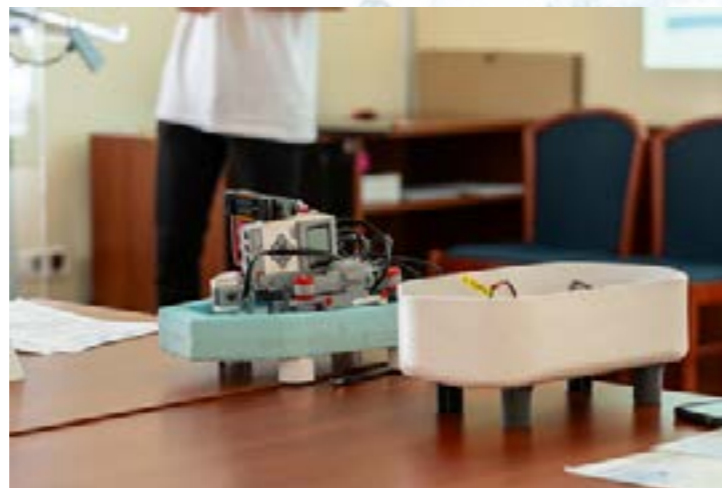
**F-SHIP FLEET SUSTAINABLE AND ENERGY EFFICIENT PROPULSION FOR SHIPS**

*Gergő Orosz, Dalma Kamilla Zsigó – Kállósemjéni Diákokért és Ifjakért Egyesület, Kállósemjén*

“Our research, based on an old, forgotten idea, is very encouraging. The models work, but further research is needed to determine the geometry of the rotor. According to the owner of the basic idea, it is conceivable that the principle would not even work in real ship sizes.



The team's goal was to create a fleet of ships that could perform their tasks of transporting people and moving people with the least environmental stress. Another advantage of the propulsion system is its quiet operation, which is a huge advantage in holiday destinations. A quiet, slow boat that does not disturb the water is also a great opportunity for researchers. Similarly, the use of renewable energy sources, especially solar energy, is an advantage of this type of vessel, which can significantly reduce operating costs. In calm, quiet waters, the vessel can be operated by remote control or with pre-programmed routes.”



**BIOREFINERY OF PHOSPHORUS FROM EUTROPHIC WATER: A CIRCULAR ECONOMY APPROACH**

*Balázs Kristóf – Kisvárdai Bessenyei György Gimnázium és Kollégium, Kisvárd*

“Phosphorus is a vital nutrient for plant growth, playing a crucial role in various physiological processes, including energy transfer, nucleic acid synthesis, and root development. As an essential component of DNA, RNA, and ATP, phosphorus is indispensable for the overall health and productivity of plants. Despite its significance, phosphorus is considered a non-renewable resource with limited global reserves. The primary source of phosphorus is phosphate rock, and the extraction and production processes are energy-intensive. The finite nature of phosphorus resources raises concerns about future availability and sustainability, emphasizing the need for efficient phosphorus management.

Thus, the present study, aims at benefit from the phosphorus present in eutrophic water through two aquatic plants (i.e., Pistia stratiotes and duckweed). This study investigates the feasibility of growing these aquatic plants on different water types. The focus is on observing the growth patterns, leaf protein production, and the generation of brown juice as potential by-products containing high phosphorus content and a possible plant growth biostimulant. The study aims to provide insights into sustainable phosphorus utilization and recovery from eutrophic water within the context of a circular economy.”



## THE RESULT OF THE NATIONAL FINAL

The jury decided on the winner in a closed session and announced the result on the spot. The decision was based on the same judging criteria used during the international final (Relevance, Creativity, Methodology, Subject Knowledge, Practical Skills, Report and Presentation), considering both the written project and the presentation, including the interview. The winner of the Stockholm Junior Water Prize – Hungarian competition 2024 is:

*Balázs Kristóf* (Kisvárdai Bessenyei György Gimnázium és Kollégium, Kisvárdai) with the project: *“Biorefinery of phosphorus from eutrophic water: A circular economy approach”*



The winner of the SJWP Hungary 2024

This year, the Diploma of Honor went to *Gergő Orosz* and *Dalma Kamilla Zsigó* (Kállósemjéni Diákokért és Ifjakért Egyesület, Kállósemjén) for the project: *„F-Ship fleet sustainable and energy efficient propulsion for ships”*.



The winner of the Diploma of Honor 2024



The jury and the winner of the National Contest

## THE INTERNATIONAL FINAL

The Stockholm Junior Water Prize 2024 edition is held in person. This year, representatives from 30 countries competed for the SJWP: Argentina, Australia, Bangladesh, Benin, Brazil, Canada, China, Cyprus, Czech Republic, Denmark, Germany, Hungary, Israel, India, Italy, Japan, Mexico, Netherlands, Nigeria, Norway, Republic of Korea, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, Ukraine, United Kingdom and the United States of America.

Hungary was represented by a one-member team formed of Balázs Kristóf (Kisvárdai Bessenyei György Gimnázium és Kollégium) with his project *“Biorefinery of phosphorus from eutrophic water: A circular economy approach.”*

The 2024 Stockholm Junior Water Prize was awarded to the team from the United Kingdom, Christopher Whitfeld and Wenqi (Jonathan) Zhao. H.R.H. Crown Princess Victoria of Sweden announced the winner during a ceremony at World Water Week in Stockholm on 27th August.



The winners of SJWP 2024 with H.R.H Crown Princess Victoria

**PFASolve: An integrated framework for the detection and filtration of perfluoroalkyl substances from surface water in the Thames Basin**

*Christopher Whitfeld and Wenqi (Jonathan) Zhao*  
United Kingdom

“PFAS pollution is a growing concern worldwide, with no equitable solution in the Thames Basin. We developed a geospatial neural network, predicting PFAS values to within 10% of experimentally validated values. With those predictions, we designed and tested a point-of-use filtration device to be installed on taps. Observing a 93% reduction in PFAS concentration, we reduce PFAS to below health limits of 4 ng/l. Further, we optimised the design, where a 10mm depth of activated carbon allows for 2.5 months of usage, with minimal impact on flow rate and introducing no impurities. Not only do we reduce the devastating impacts of PFAS pollution, but we present a potential solution that is accessible for all.”

The Diploma of Excellence was awarded to Shanni Valeria Mora Fajardo and Rosa Mendoza Sosa from Mexico for the project: “Reuse of Inked Water with Homemade Filtration to Produce Veggie Gardens”. The project was: “We conducted a diagnosis of the community issues in Teotitlán del Valle, focusing primarily on the scarcity of water for productive activities. The principal economic activity, rug production, utilizes clean water for dyeing with both natural and synthetic dyes, leading to the disposal of untreated inked water. Employing the Logical Framework approach, we proposed the development of a home filter to facilitate the reuse of inked water in vegetable cultivation. This project entails the evaluation of filtered water samples from homemade filters designed specifically for natural and synthetic dyes. Through experimental and observational assessments, we measured pH levels and coloration before and after filtration, noting variations with pH values ranging from 7 to 8. The filtered water was subsequently used for the germination of spinach and radish seeds, with further experimentation planned for other appropriate vegetables. The objective of this project is to

establish a sustainable system that enhances family economies and nutrition, contributes to environmental conservation, and provides a viable water reuse strategy for the community.”



The winners of the Diploma of Excellence

This was the fifth year the new prize, the People’s Choice Award was given to Manoel José Nunes Neto from Brazil for the project: “Aquatic Rover: an Autonomous Vehicle for Water Quality: a Low-cost Portable Tool”.



The winner of the People Choice Award



Crown Princess and Balázs



Balázs at the International Final



Stockholm Junior Water Prize 2024 finalists with H.R.H Crown Princess Victoria of Sweden



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