

SIWI STOCKHOLM
JUNIOR
WATER PRIZE

HUNGARY

2017



About the Stockholm Junior Water Prize



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/.

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 blue 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. Mr. János Áder, the 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.ifivizdij.hu.

Previous winners of the national competition

2013: Dézi Kakas, János Béri and Péter Polák Jr. (Fényi Gyula Jesuit Secondary Grammar School, Miskolc) – Project title: The Importance of the Szinva Stream: Biological and Chemical-Physical Examinations

2014: Claudia Li, Lívía Mayer and Nikolett Sebestyén (Eötvös József Grammar School, Tata) – Project title: Our Water is Our Future

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

2016: Dávid Kovács, Ákos Iván Szűcs (Kada Elek Secondary School of Economics, Kecskemét) – Project title: What Can We Gain by Using Grey Water?

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Finalists of the national contest

The Hungarian National Final



The jury during the national final

Sixteen submissions were received for the 2017 Hungarian National Competition. Altogether, there were 33 secondary school students involved, participating either as individual contestants, or as teams of two and three 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 and surface waters, environmental awareness, eutrophication, wastewater treatment. Six 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 20th of May 2017. The finalists were requested to prepare an A0 poster per team 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.

The jury of the SJWP – Hungary 2017

Chair:

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

Members:

- **István Bálint**, Managing Director for Xylem Water Solutions Hungary
- **Adrienne Clement**, Associate Professor at the Budapest University of Technology and Economics
- **Tamás Krámer**, Associate Professor at the Budapest University of Technology and Economics
- **Veronika Major**, director of the VTK Innosystem Plc.
- **Marcell Marschall**, R&D leader of GE Power & Water / Water & Process Technologies
- **Edit Nagy**, Secretary General at the Hungarian Water Utility Association
- **Gábor Szűcs**, advisor to the Office of the President of the Republic
- **Péter Szűcs**, Dean at the University of Miskolc

Secretary:

- **József Gayer**, Chair of GWP Hungary Foundation

Summary of the finalists' projects

ALL DRAINS LEAD TO THE OCEAN

Ádám Fekete, Jázmin Németh and Viktória Rábai –
Szent László High School, Budapest

All drains lead to the ocean – can be heard in the famous movie *Finding Nemo*. The biggest problems of our century are all related to the clearness or the lack of water. The amount of drinkable liquid is decreasing due to the polluting materials which enter ground-water or lakes. Medicines are part of these polluting factors, which are hard to store and filter.

The decreasing population growth is mostly caused by the widely used birth control techniques. The easiest and most reliable way of birth control is using hormonal contraceptive pills. These are based on ethinylestradiol (EE₂) and progestin because these can affect the menstrual cycle and prevent the ovulation.

Despite their usefulness, these pills also have a huge effect on our environment since the unused hormones can get, enter the sewage and then circulate back into the environment.

Nowadays, the filtering of these hormones is almost impossible. There are a few specific filters which can reduce the level of EE₂ and progestin in drinking water but these are too expensive to be widely used. Without these preventive methods, these materials can affect the life of animals and humans. It is also thought that the reduced amount of sperm in men is also a consequence of the oestrogen which enter our body. Although unproven yet, there are studies which pointed out that the feminization of male fish caused them to lose their original aspect and sometimes even start to produce infertile eggs.



Summary of the finalists' projects

UNDERWATER CYCLOPS - MONITORING OF RESERVOIRS HAS NEVER BEEN EASIER

Bence Tóth, Miklós Zsigó and Bálint Szemerszki –
NySzC Bánki Donát Polytechnical High School,
Nyíregyháza

Remotely Operated Underwater Vehicles (ROV) for monitoring and maintaining reservoirs have never been used in Hungary before. A lot of water could be saved by using ROV for maintaining the reservoirs in local water utility companies. We contacted experts from local water utility companies to find ways to cooperate. They showed interest and proposed ideas on how the ROV should be used for water conservation.

We designed and built the Underwater Cyclops –

(ROV). We contacted the local water utility company 'NYÍRSÉGVÍZ ZRT'. We started researching reservoir maintenance and we highlighted this solution for maintaining reservoirs. They instantly gave us some ideas about how these Robots should be used within water utility companies. Then together with the experts of 'NYÍRSÉGVÍZ ZRT' we calculated how much water could be saved by using ROVs.



ENVIRONMENTAL-EFFICIENT REUSING OF BATHWATERS AND THEIR EFFECT TO GERMINATION

Péter Gusztáv Filipcsuk and Boglárka Mezei –
Kisvárdai Bessenyei György High School

Motivation:

The Earth's stable water stock is reducing continuously, and despite this we do not pay enough attention to change this process. With simple methods, we could recycle a huge amount of water, including grey waters. However, grey waters can be recycled in an environmental efficient way as well.

Goals:

65% of the water used in households is grey water, which is justifying the importance of recycling. Because of this, we want to work out efficient, new methods to treat grey waters and take on the advantages are hidden in grey waters.

1. Our goal was to measure the zeta-potential, pH, turbidity, conductivity, total organic carbon of different grey waters. Zeta-potential has a high priority in terms of water cleaning, because it fixes the amount of the

flocculant to treat grey waters. The high absolute of the zeta-potential ensures big repulsive forces between the molecules in the dispersion so it prevents the aggregation, the clumping of molecules. One of the most important steps is to disrupt this disperse system by reducing the surface charge of the molecules, to a lesser value than $|5 \text{ mV}|$. In order to examine the process of coagulation and flocculation, we add coagulants of different quality ($\text{Al}_2(\text{SO}_4)_3$, FeCl_3). With the help of the results, we will study how the amount of coagulant will affect the parameters mentioned above and we will specify the necessary and satisfactory amount of coagulant for treating. With this method, it is possible to separate suspended solids completely, the excessive use of chemicals.

2. We studied the effect of different greywaters on germination. Three plant species were tested three times. The first species was the *Sinapis alba*, which is a widely known and well-studied species. The other two species were the widespread agricultural monocotyledonous *Zea mays*, and the dicotyledonous *Phaseolus vulgaris*. The seeds were treated with different greywaters, such as bathwater with bio detergents, bathwater with bio detergents after coagulation, bathwater with non-bio detergents, bathwater with non-bio detergents after coagulation. The control plants were treated with tap water.

3. Under the 7 day germination period the seedlings were dried and the inorganic components were measured.



„TANKS OF WATER”

Anna Tari, Kristóf Stefán and Nikolett Szabó – Szent László High School, Budapest

In this essay, we would like to talk about the water footprint and its reduction. This is an extremely important topic, but it is also relatively unknown. So we decided to create a board game to help people learn about it. We made a trial run of this game with the help of other schoolmates, and we wrote down our observations and analyzed them. With the help of 17 students from our high school, we were able to test

this board game during the week dedicated to World Water Day. Students between ages 15 and 16 enjoyed playing the game, and they provided a lot of positive feedback. Students between 19-21 had a more mature approach, and they had great thoughts about the pictures.

Summary of the finalists' projects

With the help of our game, the players were able give more thought to the ways in which their eating habits and lifestyles consume water. The students learned quite a bit about their water footprint. They were shocked by the data, for e.g. the water footprint of chocolate, meat and Adidas shoes, which are made of fishing nets. They liked our game because of its creativity, the uniquely decorated homemade water drops made from paper, the pictures and the tasks.

However, they found the game a little slow, and they missed the greatest prize. In order to further develop the game, we collected the players' proposals while making our own observations. In the end, both us as the game makers and the students who played the game, enjoyed the experiences. We also became more conscious of water and invisible water.

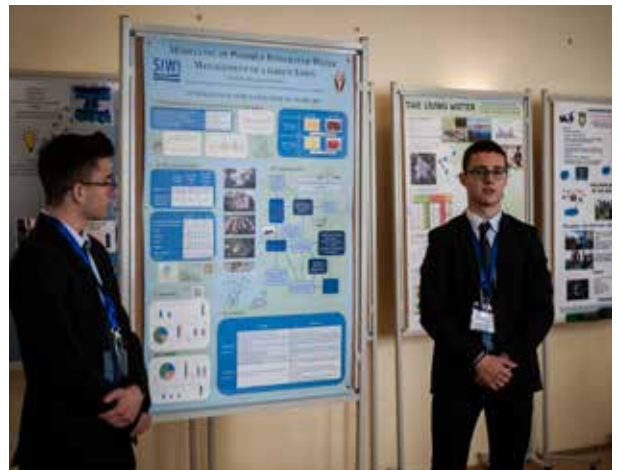


MODELLING OF POSSIBLE INTEGRATED WATER MANAGEMENT OF A GREEN TOWN

Dávid Kovács and Ákos Iván Szűcs – Kada Elek Secondary School of Economics, Kecskemét

We searched for an answer to the following question: how can a modern, sustainable water-saving city be created in one of the neglected districts of Kecskemét with the help of an innovative, environmental-friendly technology?

We modelled the impact of the economical and social utilization of the rainwater collected in that area. Using a calculator, we showed how the change of the area parameter affects the quantity of the collectable rainwater, as well as the assimilation data. Furthermore we introduced the possible and the revealed integrities in a multilevel power model. Our work is a pilot project.



„THE LIVING WATER” THE SOLUTIONS OF THE SURFACE WATER PROTECTION AT THE SZEDRESI ŐS-SÁRVÍZ

Bence Zsolt Rappay – I. Béla Secondary Grammar School, Szekszárd

The topic of environmental protection is getting increasing attention. Thanks to the various researches, surveys and data in this field, people seem to have realized that the resources of the Earth are limited. The issue of being green is very diverse, but maybe the most significant part of it is water.

Due to the effects of the environmental pollution, global warming causes climate change, and as a result serious hydrographical realignment can be observed. Consequently, we need to face the erratic and drastic variations of droughts and floods. Instead of allowing the river pass through the country, we should find a way to store it until the following drought. This way, we could set up a complete, annual water management system in our country.

Although the careful river and canal controls simplified life near these waters, this topic remains fundamental. In our increasingly developing world it is crucial to know the exact amount of water resources that a country has. In the process of monitoring our water supply we

should pay special attention to the endangered oxbow lakes (for example the Szedresi Ős-Sárvíz). Moreover, we should have a closer look at their wildlife and their connection with the separated river or canal.

Currently, the mentioned Szedresi Ős-Sárvíz is an oxbow on a Natura 2000 area. The lakesystem does not have any outside water supply, and only the annual precipitation volume provides the region with water. For this reason, the climate change has a critical effect on the area, so in the droughty periods (particularly in summer) the lake often nearly dries out. This situation has a huge effect both on its wildlife and on the number of the visitors to this region as well.

Because of the above-mentioned reasons, we have chosen the preservation of this lake to be the centre of our research.



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 winners of the Stockholm Junior Water Prize – Hungarian competition 2017 are:

Anna Tari, Kristóf Stefán, Nikolett Szabó (Szent László High School, Budapest) with the project: „Tanks of Water”

Their project “Tanks of Water” deals with the water footprint and its reduction. The team created a board game to help people learn about it and tested the game with students of two age groups. The players were able to give more thought to the ways in which their eating habits and lifestyles consume water. On the basis of the feedback of the players the game can be further developed. The teacher who assisted the team was Mrs. Ildikó Hanga.

The second place went to Bence Tóth, Miklós Zsigó and Bálint Szemerszki (NySzC Bánki Donát Polytechnical High School, Nyíregyháza) for the project: Underwater Cyclops - monitoring of reservoirs has never been easier. The third place was awarded to Ádám Fekete, Jázmin Németh and Viktória Rábai (Szent László High School, Budapest) for the project: All Drains Lead to the Ocean.

All finalists received diplomas and recognition on stage. The members of the first three teams were awarded a six-month subscription to National Geographic. All the finalists were invited to the Budapest Zoo and the Széchenyi Bath as well. The support of the teachers was also recognized on stage.

For the official Award Ceremony of the 2017 Hungarian SJWP competition President János Áder invited the six finalist teams to his office. There, the students shortly explained their results to the President in the presence of the media. Mr. Áder spoke about the importance of involving the young generation into finding solutions for today’s challenges of water management and handed over the SJWP 2017 Hungary Prize to the winners.



The winners of the SJWP Hungary 2017 with their teacher



GWP Central and Eastern Europe Regional Coordinator Richard Müller also greeted the contestants and their teachers



President Áder welcoming the finalists in his office



Finalists with President Áder in the balcony of Sándor palace

The international final

The finalists from the participating countries were invited to the World Water Week in Stockholm. There they actively took part in the global conference through a variety of activities for five consecutive days. A poster exhibition of all student projects gave the finalists an opportunity to discuss their projects with a wide range of conference attendees including researchers, politicians and the media.

This year, representatives from 33 countries competed for the SJWP: Argentina, Australia, Bangladesh, Belarus, Brazil, Canada, Chile, China, Cyprus, Finland, France, Germany, Hungary, Israel, Italy, Japan, Latvia, Mexico, The Netherlands, Nigeria, Norway, Republic of Korea, Russian Federation, Singapore, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, Ukraine, United Kingdom and the United States of America.

A Novel Approach to Rapidly and Sensitive Detect and Purify Water Contaminated with Shigella, E. coli, Salmonella, and Cholera

Ryan Thorpe and Rachel Chang
United States of America

3.4 million deaths occur annually due to waterborne diseases, yet, the conventional methods for bacterial detection take 1-2 days and have detection limits of up to 1000 colonies. This study constructed a more rapid and sensitive method to detect and purify water contaminated with the prevalent waterborne bacterium. These sensors detected 1 CFU of each bacterium in 1 L of water instantaneously, and the purification unit safely eliminated bacterial presence in - 10s. This system could prevent the contraction and outbreak of waterborne diseases and expand potable water throughout the world.

Following the poster presentations, each finalist was interviewed by a jury of international experts, who then decided on the winner.

Hungary was represented by the three-member team formed of Anna Tari, Kristóf Stefán and Nikolett Szabó (Szent László High School, Budapest), with their project "Tanks of Water".

In 2017 President János Áder participated in the World Water Week and attended the Award Ceremony of the international final of the SJWP. There he addressed the audience encouraging the students to continue their studies and activities in the interest of sustainable development.

The 2017 Stockholm Junior Water Prize was awarded to two students from the United States of America (Ryan Thorpe and Rachel Chang) for their innovative approach to Rapidly and Sensitive Detect and Purify Water Contaminated with Shigella, E. coli, Salmonella, and Cholera. H.R.H. Crown Princess Victoria of Sweden presented the prize at an award ceremony during World Water Week in Stockholm on the 29th of August.



The winners of the SJWP 2017 receiving the prize from HRH Crown Princess Victoria

A Diploma of Excellence was awarded to the students from Bangladesh: Aniruddah Chowdhury, Arnab Chakraborty and Rituraj Das Gupta. Their amazing project discussed the reinvention of photocatalysis using TiO₂ in industrial grey water treatment.



The Diploma of Excellence was awarded to the team of Bangladesh



The Hungarian team with its poster



The jury interviewing the Hungarian team



President Áder chatting with the Hungarian team before the Award Ceremony



Finalists are mingling before the welcome dinner



Japanese Team



The group of finalists in front of the City Hall of Stockholm



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Photo credit: SIWI, MTI, GWP Hungary

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