SIWI STOCKHOLM JUNIOR WATER PRIZE

HUNGARY

2016

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/. 2016 marks the 20th jubilee of the competition.

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, Lívia 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

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The jury during the national final

Seventeen entries were received for the 2016 Hungarian National Competition. Altogether, there were 38 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 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 28th of May 2016. 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 2015

Chair:

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

Members:

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

Secretary:

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

Summary of the finalists' projects

Environment-Efficient and Sustainable Reusing of Different Greywater and Deposit Forms

Péter Gusztáv Filipcsuk and Jónás Petra Andrea – Bessenyei György Grammar School of Kisvárda

Motivation: Although water resources are steadily decreasing, people do not make visible efforts to change the situation. A great amount of water, including greywater, can be recycled using simple methods. Greywater can be reused and recycled with either chemical or chemical-free methods.

Targets: 65% of the water used in households is grey water which is a reason for recycling. This is why we would like to elaborate effective and innovative methods for treating greywaters in order to exploit its potential.

Our project aimed several targets:

1. Our aim was to analyse greywater samples from different sources and to measure its zeta-potential, pH, conductivity, turbidity, biological oxygen demand and also the amount of the total organic carbon. The value of zeta-potential is highly important for purification as it determines the amount of clarifier needed to treat greywater. One of the most significant steps of the treatment is to break the stable disperse colloid system by reducing the electrical charge of particles on surface with less than 5 mV. While analysing the process of coagulation and flocculation, different coagulants were added ($Al_2(SO_4)_3$, $FeCl_3$). The result helped us determine to what extent coagulants change the parameters mentioned above and also the quantity of the necessary clarifier. Applying these methods the floating particles can be separated without using too much chemicals.

2. We also aimed to study the possibility of chemical-free recycling and reusing of different types of household greywater (bathwaters and dishwaters). A bio-sandfilter was built in order to solve the problem of greywater-treatment: this equipment can be suitable for purifying household greywater at an adequate level.

3. Approaching the worldwide problem of water from a different perspective, the significance of rainwater cannot be neglected. This is why the qualitative analysis (pH, conductivity, turbidity, the amount of inorganic carbon, acidity) of macro-rainwater (snow and rain) in Kisvárda was carried out. Samples of waters were collected from open ground and also from gutter. The aim was to estimate the cost of rainwater harvesting equipment feasible for one household.

Summary of the finalists' projects

What Can We Gain by Using Grey Water?

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

In Hungary, the efficient use of greywater is in its infancy stage and there are few active greywater systems in public buildings. These buildings mostly use rainwater, just like people in villages. The operation of a greywater system is highly expensive and it is not profitable at the time, because of its continuous (and expensive) maintenance. Moreover, because of the uneven distribution of rainfall in Hungary, water saving is unpredictable. This is probably the reason why greywater systems are not wide spread in the construction industry.

The authors calculated the distribution of water in their school, concluding that water is used in a highly wasteful manner and the outdated school equipment does not help improve environmental awareness.

The concept of greywater, its usability, as well as the technical solutions are unknown to young people. The authors confronted their schoolmates with this fact in a self-made film. The study demonstrates that it is worth using rainwater for toilet flushing in the school, as a lot of money can be saved this way.

Using greywater is not popular in Hungary, but through this work the authors wanted to emphasize the importance of using modern water technology equipment in order to save both water and money. The most important issues from this point of view are the change in attitude and the encouragement of future generations to change water-wasting conditions. In their opinion, the greatest saving can be reached by stopping wasteful usage. In order to accomplish this, we need to draw the attention of the schoolmates to the fact that this is a real problem which can be solved.

Studying the Processes of Eutrophication in the Nyéki-Danube Backwater

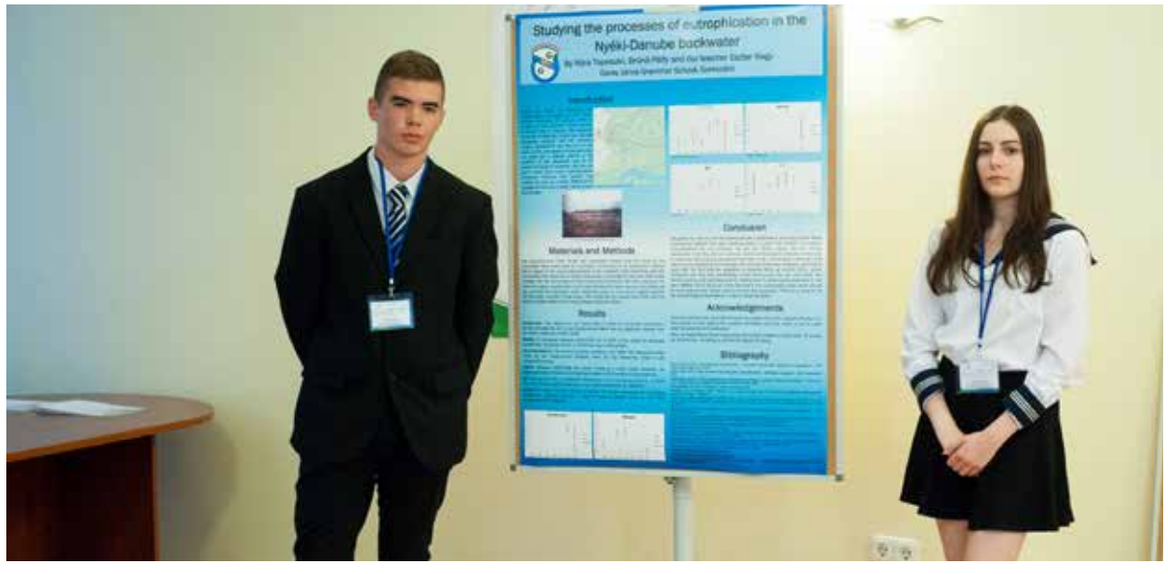
Nóra Topolszki and Brúnó Pálfy –
Garay János Grammar School, Szekszárd

The process of eutrophication refers to the overgrowth of primary productive organisms such as phytoplankton, rooting weeds and certain paludal plants. Normally, this is a very slow process which lasts from the formation of the water until the complete filling of its waterbed. For surface waters, the largest danger is anthropogenic eutrophication whose primary resources are nitrogen and phosphorus compounds accumulated in water, stemmed from chemical fertilizers. The usage of detergents which contain phosphorus and outdated industrial technologies, as well as the release of public waste into natural waters contributes to this nutrient surplus. This has an effect on the entire ecosystem as bacteria living in the water have increased oxygen utilization, so that certain species become extinct while new ones appear. In some cases, this surplus leads to the overgrowth of plankton species which produce toxic compounds.

Gemenc as an environmentally-protected area formed in 1977. It is 18,000 ha wide with natural values important not only for Hungary but for Europe as well, because it has protected our qoundam floodplains in their original forms.

Aside from the Hungarian protection, this area is a part of the Natura 2000 network and it is under the protection of the Ramsar Convention. This is the largest protected area of Hungary, mostly covered by trees. It is a habitat of countless species. Willow-poplar tree groves, oak, ash and elm hardwood groves, countless water plants, and different aquatic, amphibious and terrestrial animals live here. It provides an amazing outleap for anyone. However, the extensive agriculture of Hungary, which also surrounds this site, endangers the area and its beauty.

The goal of this project was to examine the eutrophication processes of this area. The research measured the chemical oxygen requirements, the levels of nitrite and nitrate ions and phosphate content of a deadwater known as Nyéki-Danube and located in a central part of the site. The research was done by using the EcoLabBox environmental measuring test kit. By comparing the results of this research with studies published earlier, the authors hoped to have a realistic view on the eutrophication processes of the recent years and the effects of the antrophogenic activities. Further aims were to draw people's attention to the importance of nature reserve areas and to motivate others to solve this global problem.



Summary of the finalists' projects

The Effect of TiO_2 Coating on Polyacrylanitrile Membrane's Filtration Properties in the Case of Oil in Water Emulsion Filtration

Ádám Halkó – Radnóti Miklós Experiential High School, Szeged

Hungary has favourable geothermal resources, which are mainly used in balneology, in agriculture to heat greenhouses, and in rare cases for district heating. Hot water from geothermal sources contains inorganic and organic pollutants in solution and emulsion form. Among these pollutants are inorganic salts, persistent organic materials, phenols, carbohydrates and oils. The management and purification of the cooled water is an unsolved problem. Since there is no regulation in Hungary which would mandate the reinjection of cooled water, it is treated like wastewater. Also as a result of the rapid growth of petrochemical, pharmaceutical and other industries, the production of oil containing wastewaters is increasing. The oily wastewater has to be treated to meet the standards required by law so that it could be released in either the sewage system or into natural waters.

Membrane filtration is a widely used, researched and developed in water treatment technology. By choosing the right technology, a wide variety of waters or wastewaters can be cleaned efficiently.
The advantages of membrane filtration are low energy requirements with no need of additional chemicals. However, regardless all the advantages, membrane fouling remains a problem, which shortens the lifetime of the membrane. To solve this problem, the development of new types of membranes is necessary. The aim of this work was to prepare a new type of membrane, which can be cleaned without using chemicals. This can be realised by coating the membrane with TiO_2 particles, which under UV irradiation are able to oxidise fouling pollutants. During the experiments, 100mg/L oil in water emulsion was used as model wastewater. A polymeric (polyacrylanitrile, 50kDa) membrane was coated with TiO_2 particles and was used for filtration.

The neat and coated membrane's properties (wettability, permeability) were examined. It was revealed that the coating resulted in more hydrophilic surface without significant change of water permeability. In both cases, the membrane oil removal efficiency was above 90%. However, the coated membrane's surfaces were easier to clean by washing with water from the oil layer due to their more hydrophilic properties. In further experiments following oil filtration, the coated membrane's surface was UV irradiated. As a result, an increase in water permeability was observed, which proves that the pollutants degraded under these circumstances. This means that the coated membrane can be cleaned after oil filtration by using UV irradiation without any chemicals.

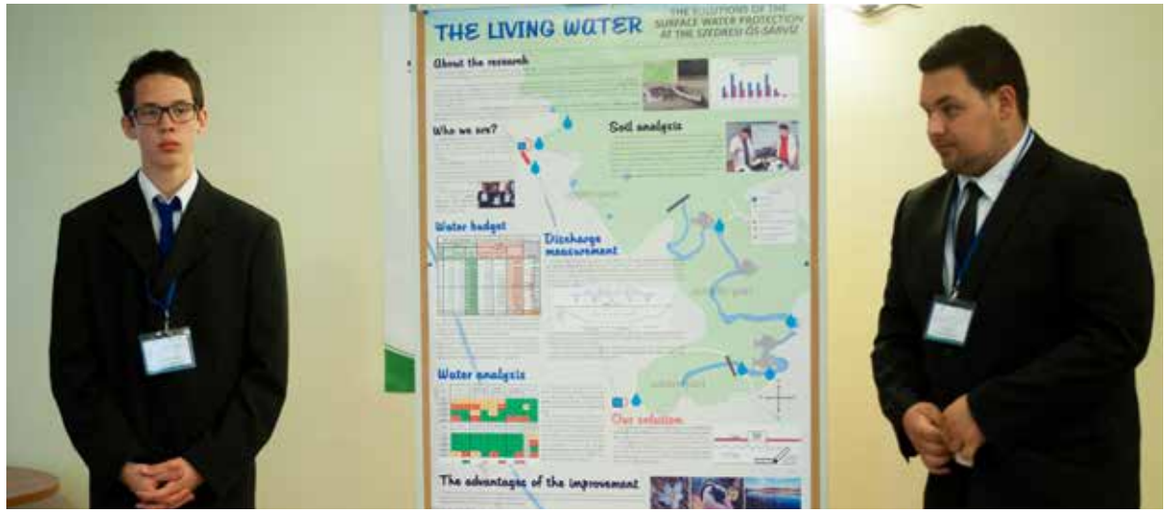
The "Living Water" - The Solutions of the Surface Water Protection at the Szedresi Ős-Sárvíz

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

This research aimed to highlight the importance of the retention of surface waters, especially in the area of the Szedresi Ős-Sárvíz. Nowadays, because of global warming, there are extreme alternations of floods and droughts. Hungary is one of the many countries which needs carefully plan its water management. Instead of letting surface waters run through the country, they should be retained in natural or artificial reservoirs.

This could be possible at the Szedresi Ős-Sárvíz, where the lack of water could be solved with the aid of nearby rivers and a flap weir. Through a survey, the authors revealed the connections between the lake and the inhabitants of the nearby towns. A water balance estimation of the lake was made in order to find out the truth about water shortage. With modelling, soil analysis and surveys the inner and external connections of the oxbow were revealed. The differences of the neutral content between the lake and the nearby rivers were examined with water analysis. Further on, the opportunities of the possible suppliers were researched with water output measuring, and the project hypothesis was supported with calculations.

The nearly constant water level would have a positive effect on the game management of this area, on the watering of plough-lands, on the natural reproduction of the indigenous fish, and last but not least it would improve the relationship between the inhabitants and the lake system.



The result of the National Final

The jury decided on the winner in a closed session. 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 2016 are:

Dávid Kovács and Ákos Iván Szűcs (Kada Elek Secondary School of Economics, Vocational Education Centre in Kecskemét) with the project: What Can We Gain by Using Grey Water?

The project analyzed the unregulated greywater utilization in Hungary. While in public buildings greywater can only rarely be found, using rain-water is widely spread in villages. With this backdrop, the authors investigated rainwater harvesting in local conditions. They justified with calculations the potential savings (in terms of money and water) which could undergo in their school by using rain-water for toilet flushing.
They shared the results with schoolmates and showed them in a short summarizing video how they waste their water and what saving opportunities they have.
The teacher who assisted the team was Mrs. Erika Kiss.

Due to other obligations, the patron of the Hungarian competition, President János Áder, was not present. Therefore, the “SJWP – Hungary 2016” was handed over to the winning team by István Joó, the Ministerial Commissioner of the Budapest Water Summit 2016, the Ministry of Foreign Affairs and Trade.

The second place went to Péter Gusztáv Filipcsuk and Andrea Petra Jónás (Bessenyei György Grammar School of Kisvárda) for the project: Environment-Efficient and Sustainable Reusing of Different Greywater and Deposit Forms. The third place was awarded to Bence Zsolt Rappay and Peter Varga (I. Béla Secondary Grammar School of Szekszárd) for the project: ”The Living Water” - The Solutions of the Surface Water Protection at the Szedresi Ős-Sárvíz.

The Grundfos special prize was awarded to Péter Gusztáv Filipcsuk and Andrea Petra Jónás.

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.

The winners of SJWP Hungary 2016 with their teacher

István Joó Ministerial Commissioner of BWS 2016 addressed the audience

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

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 29 countries competed for the SJWP: Argentina, Australia, Bangladesh, Belarus, Canada, Chile, China, Cyprus, Finland, France, Germany, Hungary, Israel, Italy, Japan, Latvia, Mexico, Nigeria, Norway, the Russian Federation, Singapore, South Africa, Spain, Sweden, Thailand, Turkey, Ukraine, the United Kingdom and the United States of America. 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 two-member team formed of Dávid Kovács and Ákos Iván Szűcs (Kada Elek Secondary School of Economics, Kecskemét), with their project What Can We Gain by Using Grey Water? (see page 6.).

Natural innovative water retention Mimicry Bromeliad (Aechmea aculeatosepala)

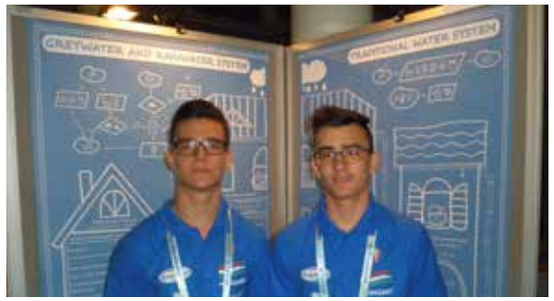
Sureeporn Triphetprapa,
Thidarat Phianchat and Kanjana Komkla
Thailand

The natural innovative water retention mimicry of the Bromeliaceae was investigated to examine the efficacy of the natural water collection by plants, specially in terms of the shape of the plants that can collect and capture the water. The finding indicated that aechmea aculeatosepala constitutes crucial multiple parts to retain water. We adopted to model the mimic water retention device. In the real application, the unit is installed on the rubber tree. It found that soil moisture when the device is installed represents 17.65 per cent greater than that non-installation, and is 57.50 per cent more productive.

The 2016 Stockholm Junior Water Prize was awarded to three students from Thailand (Sureeporn Triphetprapa, Thidarat Phianchat and Kanjana Komkla) for their innovative water retention device which mimics the water retention of the Bromeliad plant. Because the patron of SJWP, H.R.H Crown Princess Victoria, was on maternity leave in 2016, her brother H.R.H. Prince Carl Philip of Sweden presented the prize at an award ceremony during World Water Week in Stockholm.

“The winning project addresses future water security and rural livelihoods using an elegant leap-frog technology which looks simple, but its beauty masks its complexity! The project embodies the theme well through its journey from the idea to application,” the Jury said.

A Diploma of Excellence was awarded to the students from Mexico: Gabriel David Alejandro Trujillo, Eunice Yaneli Masegosa Gaona and Carlos Castellanos Dominguez. Their project – a pilot plant – combined an artificial wetland, electroflocculation process and a purification system to promote the use of reclaim water for small agricultural activities and school uses, such as bathroom discharges and cleansing.



The Hungarian team with its poster

Finalists are mingling before the welcome dinner

The jury interviewing the Hungarian team

Explanation with Japanese precision

The winners of SJWP 2016 receiving the prize from H.R.H Prince Carl Philip

The Diploma of Excellence was awarded to the team of Mexico

The group of finalists with H.R.H Prince Carl Philip

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