



Finalists 2009

Stockholm Junior Water Prize

Argentina, Australia, Belarus, Canada, Chile, China, Finland, France, Germany, Israel, Italy, Japan, Latvia, Mexico, Netherlands, Norway, Republic of Korea, Russian Federation, Singapore, Slovak Republic, South Africa, Spain, Sri Lanka, Sweden, Turkey, Ukraine, United Kingdom, United States and Vietnam



The Stockholm Junior Water Prize

Water and Young People – Linked to the Future

The international Stockholm Junior Water Prize competition brings together bright young scientists from around the world to encourage their continued interest in water issues that connect human and environmental health and sustainable development.

While the global water environment remains in peril, the future depends on our ability to manage this life-sustaining resource. Today's youth are indeed tomorrow's leaders and must be encouraged to pursue water-related careers or our scarce supply risk further erosion.

Now in its 13th year, the Stockholm Junior Water Prize has inspired thousands of young people around the world to develop personal interests, undertake academic study, and often pursue careers in the water or environmental fields. This year, 8000 pre-university people between 15 and 20 years of age entered into national Stockholm Junior Water Prize contests in 30 countries. The finalists at the international competition in Stockholm are the winners of the national contests. During their time in Stockholm, the international finalists receive an opportunity to participate at the World Water Week in Stockholm, where they can meet and learn from the present leaders of the global water community and make life-long friendships with international compatriots who share a passion for water and science.

The prize includes a USD 5000 award, and a custom-made blue crystal sculpture crafted by Swedish glass artisans. The Stockholm International Water Institute (SIWI) administers the competition, which is sponsored globally by ITT Corporation.



Photo: Courtesy of the Royal Court

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



Photo: SIWI

The International Jury

The International Jury includes experts within the field of water who, by committee consensus, appoint the winner of the international contest. The decision is based on the written report and a short presentation of the display material. The Stockholm Water Foundation Board appoints the Jury members.

2009 International Jury members are:

- Dr. Magnus Enell (Chair), Sweden
- Dr. Mercy Dikito-Wachtmeister, Sweden
- Mr. Björn von Euler, USA
- Ms. Charlotte de Fraiture, Ghana
- Dr. Nighisty Ghezae, Sweden
- Ms. Linda Kelly, USA
- Dr. Piet Lens, Netherlands
- Ms. Tabeth Matiza-Chiuta, South Africa
- Ms. Susana Sandoz, Bolivia
- Ms. Helene Brinkenfeldt (Secretary), SIWI, Sweden

Finalists 2009

ARGENTINA

Growing electricity from bacteria

By Mathias Efron, Alan Fernando Moran and Nicolas Azrak

Contaminated effluents can be transformed in usable energy. Mathias, Alan and Nicolas developed a prototype for a microbial fuel cell that could naturally remove bacterial contaminants from water and transform them into electricity. Their simple and novel approach produced a "double benefit": organic matter was removed from water without the use of chemicals and generated a small current of clean power (0.5 volts).

AUSTRALIA

Marine microalgae: Sequest carbon, produce bio-diesel and save freshwater

By Storm Holwill

Storm Holwill's project demonstrated the huge potential for algal bioreactors in marine environments. Seawater microalgae can absorb and sequester carbon dioxide and be converted into bioenergy. Thus, the microalgae can help mitigate climate change and meet rising demand for bioenergy without adding pressure on land and freshwater resources.

BELARUS

Simple, cheap and eco-friendly method to remove iron from water

By Radzivon Tserashkou and Katsiaryna Pestava

High iron levels in drinking water threaten human health. In poor or remote areas, cheap, simple and environmentally safe solutions are needed. Radzivon and Katsiaryna conducted extensive field research in search of applicable methods to remove iron from drinking water in the Belarusian countryside. Their application of commonly available potassium permanganate, ascorbic acid and pure sand successfully and safely removed excessive iron-ions from drinking water.

CANADA

Grasping water: A novel method of inducing precipitation using the Ice Nucleating Protein

By (Mary) Yiyue Zhao

Cloud seeding using silver iodide can induce precipitation in dry regions. Unfortunately, use of the iodide can lead to excessive silver in the soil which damages the health of micro-organisms. Yiyue Zhao explored an environmentally friendly and commercial viable alternative to silver

iodide: the Ice Nucleating Protein (INP) of the bacteria *Pseudomonas syringae*. The results of her research could have major implications on the use of cloud seeding to alleviate drought and clear smog.

CHILE

Clean water, healthy soil: Turning boron pollution into fertiliser

By Alonso Viguera and Marcos Pino

Alonso and Marcos present an effective and natural way to remove boron pollution from water. Their research shows that high concentrations of the aquatic plant algae *Nostoc sp.*, *Chlorophita sp.* and *Lemna minor* are able to remove the boron from the water, which can then be extracted for commercial use as an agricultural fertiliser.

CHINA

"Mr. S": Soil moisture retention eco-fertiliser

By Si Liang and Jiajian Liu

Agriculture uses 70 percent of the world's freshwater. The Chinese team invented a new type of eco-fertiliser that improves soil moisture retention. "Mr. S" is an effective, environmentally friendly, and economical product to conserve agricultural water made from recyclable wastes, including: bagasse, soybean dregs, wood dust, pot ales,

and mushroom farm wastes. When added into the soil, the "Mr. S" eco-fertiliser can instantly supply plants with enough water and continuously retain the soil water.

FINLAND

Impact of oil spills on trout development

By Riina Kilpeläinen and Sanni Nieminen

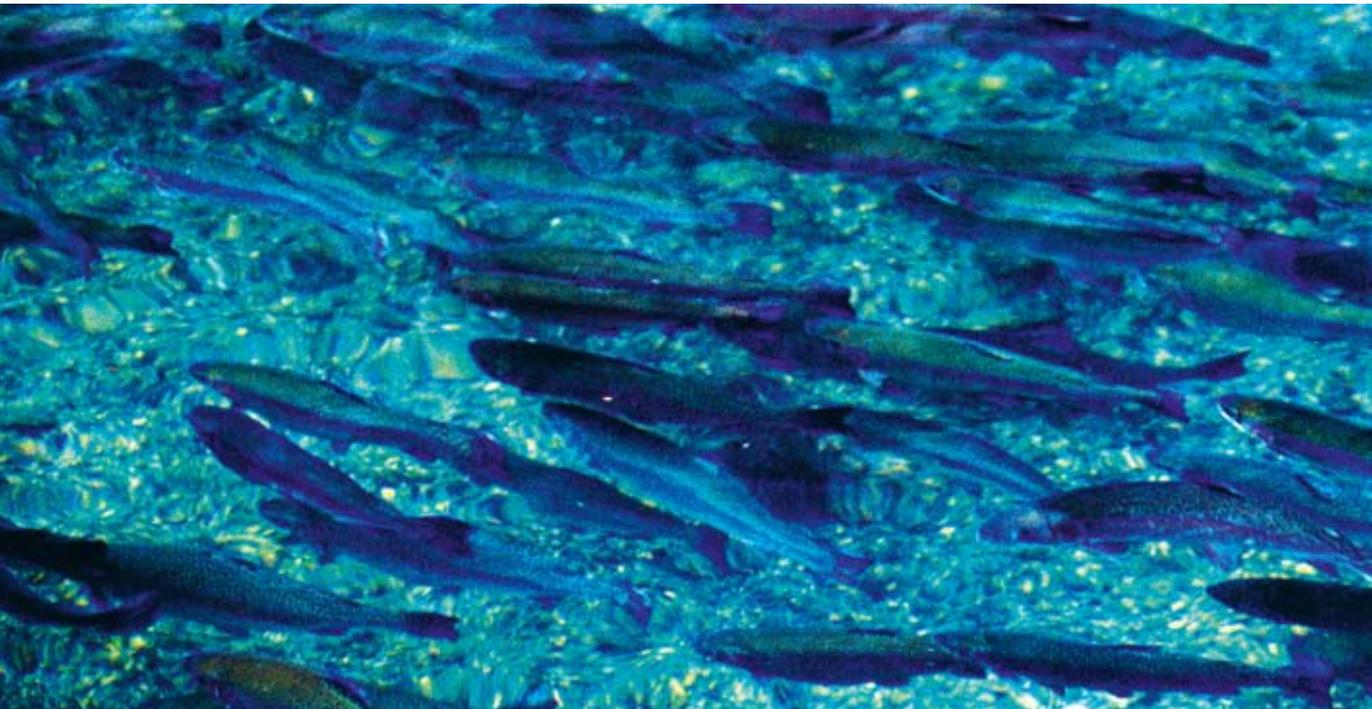
Riina and Sanni's research demonstrated the destructive impact of oil spills on the development of *Salmo trutta* (trout). They sought to learn whether the trout could survive and spawn after an oil spill and found mortality rates among oil exposed eggs to be very high. Their observations showed that speed of oil exposure significantly increases mortality rates, making fast oil spills more dangerous to trout survival.

FRANCE

Protecting biodiversity in rivers: Restoring fish passages and habitats

By Léopold Noto and Damien Maury

Healthy aquatic ecosystems are critical for sustainable development. While water is used for hydropower, irrigation and other uses, habitats for species living within the ecosystem must be maintained. Léopold and Damien researched fish passages, surveyed the best sites to



construct and restore habitats (mainly for trout), and installed 30 prefabricated structures where fish can find shelter and refuge from predators. The first passage was built this spring.

GERMANY

When the sea level rises: Modular weight bearing system of floating concrete pontoons

By Fabian Lutz and Simon Scholl

Fabian and Simon developed a low-cost, applicable and expandable modular system of floating concrete pontoons that can help vulnerable areas protect themselves from floods. Their design features hexagonal pontoons made with highly stable thin walls produced from fibre-reinforced concrete and a load-bearing structure for buildings that can be used in flood-prone areas or on an open expanse of water. The modular system can be assembled quickly and easily transported to the site.

ISRAEL

Detecting water contamination chemical sensors using metal nanoparticle networks

By Emily Elbacham

Chemical contamination of water systems is a major threat to human health. Early identification and quick response to

detect contaminants help avoid catastrophe and prevent interruptions of water supply. Emily Elbacham's project tested the feasibility of nanosensors to detect low concentrations of organic pollutants. Her research showed that inexpensive and easy-to-manufacture prototypes were able to quickly and successfully identify the presence of common pollutants.

ITALY

Wat...er you drinking?

By Omar Pappalardo, Angelica Mammoliti and Lara Miccoli

Omar, Angelica and Lara investigated how individuals consume, use and waste water. Through chemical, physical and microbiological analysis and an algorithm to calculate the daily water requirements per person, they concluded that alternative water sources, such as rain water for irrigation or household use, should be used. They also researched the difference between tap and bottled water and found that, from a health perspective, there was no difference between the two.

JAPAN

Innovative rooftop gardening to cool down the heat island effect

By Tetsuo Ogawa, Nao Wakisaka and Yuka Ishida

The urban heat island effect makes life hotter and harder in many cities. Rooftop gardening can cool urban centres down but is slow to catch on as the plants used can be heavy, costly, and water intensive. Tetsuo, Nao, and Yuka developed innovative, lightweight and water-saving rooftop gardens using drought and climate resistant *Zoysia japonica* plants. They also developed a soil-free system, which uses recycled polystyrene and biodegradable materials to insulate heat flux from rooftops.

LATVIA

Water treating with use of coagulation

By Margarita Dervine

The Latvian project applied laser analysis in an innovative new way to evaluate water quality. The research showed that the quality of water treatment is impacted by the concentration of coagulation in the water. She concluded that lower levels of coagulation concentration worsen the quality of water that undergoes treatment. Margarita's findings can be applied in future evaluations on water quality treatment and can potentially be used to improve the modelling of natural wastewater processes.



Photo: Digital Archive Japan Inc.

MEXICO

Innovative wastewater purification with locally available materials

By Maricruz Jaramillo-Cerón and Loany Janet Escamilla-Acosta

In Mineral de la Reforma, Mexico, dirty wastewater flows down from the river everyday. The wastewater is contaminated and needs to be treated in order to be reused. The Mexican project innovated a new, cost-effective and low-energy consuming alternative for domestic wastewater treatment using natural and locally available materials. The treated water produced in their project passed national quality standards.

NETHERLANDS

AquaLibra: A self-customising water barrier

By Mathijs Mul, Anke Santema and Marieke Droogsm

AquaLibra is a new, purely natural water barrier design that is controlled, activated and determined by the movement of the water body it is located in. It functions like a balance: when seawater levels rises above a critical level, the surplus water lifts up the barrier and a floodgate stops the seawater from flowing into rivers or harbors. The mechanism does not depend on complicated computer systems or human decision-making. Possible applications range from small tidal harbors to large cities in delta regions.

NORWAY

Pollution by Løkken Verk: How does pond water pollution influence cell division in onions?

By Marianne Blikø and Katinka Kummeneje

The ponds of Fagerlivatn and Bjørnlivatn lay near an abandoned mine. Marianne and Katinka performed the Allium test by cultivating onions in water samples from the polluted ponds for one week. The onions short, discolored roots and further disfigurement was observed. Their research reveals metals from the mines have likely polluted Løkken Verk.

REPUBLIC OF KOREA

Yangjae Stream, Seoul: A water quality investigation

By Hee Ku Kang and Yong Kun Ko

The Korean team investigated the Yangjae Stream with analysis of both its physical condition and local perception of its health. Their tests show that the stream water passed legal standards of pH and nitrate levels but contained hazardous levels of bacteria, which made the water no longer potable. Though public sentiment towards the water quality, facility and ecosystems of the Yangjae were positive, the students recommend further research on the bacteria present in the stream.



Photo: Getty Images



RUSSIAN FEDERATION

Improving water supply in Troitskoe Village

By Bulgun Bavkaeva and Vera Boldyreva

In Troitskoe Village, few households have centralised water supply. Freshwater is scarce, local sources are of poor quality and water delivered by trucks is expensive. Bulgun and Vera produced the first inventory and evaluation of water resources in the village and drinking water for local residents. They proposed measures to solve the identified problems and designed a simple, affordable charcoal filter for water purification.

SINGAPORE

Monitoring water turbidity using spectral reflectance

By Hong Nan Kuan, Kai Li Kwoh and Sai Meng Ng

Turbidity is an important measure to determine quality of water. The Singaporean team quantified the relationship between Nephelometric Turbidity Unit (NTU), Total Suspended Solids (TSS), and particle backscattering co-efficients. In a controlled experiment using a water tank, reflectance spectra and turbidity were measured, computed and compared. Their findings can be applied to estimate water turbidity from satellite images over large areas.

SLOVAK REPUBLIC

Suitable substrates for sulphate-reducing bacterial pollution from acid mine drainage treatment

By Jozef Molnár

Jozef Molnár investigated effective options to remove dangerous heavy metals and sulphates from water resulting from acid mine drainage (the outflow of acidic water from mines). His research confirmed that glycerol, saccharose, glucose and whey are all suitable alternative substrates of sodium lactate that can reduce bacterial sulphate. Calcium lactate was found as the most efficient option. Application of these findings can reduce costs and negative environmental impacts to water globally.

SOUTH AFRICA

Auto-mechanical tap: Save more, waste less water

By Mzwakhe Sifundo Xulu and Njabubulo Sible Mbata

The South African team developed an Auto Mechanical Tap that helps rural communities save more and waste less water. The students visited community taps and observed that lots of water was wasted. Their innovative Auto Mechanical Tap is a practical and inexpensive design that automatically closes when the container is full. It can be distributed to communities where water is not available within their households.

SPAIN

Restoring water quality in the Segre River

By Guillem Pascual Pastó

Guillem Pascual Pastó investigated the sources of Segre river pollution. He found dumping, run-off and excessive irrigation withdrawals from agriculture to be the main causes. The project concluded that more modern irrigation techniques, strict regulation of fertilisers, reduced use of hydropower and implementation of urban wastewater treatment plan could restore water quality in the river and its tributaries.

SRI LANKA

Low cost household solution to remove pollutants in drinking water

By M.A. Shashinda Prabath Madurapperuma,
M.S.A. Lahiru Himasha and G.D. Thanuja Perera

The Sri Lankan team developed homemade "activated charcoal" which could be used to produce safe drinking water for rural communities. The cheap and easily maintained homemade charcoal removes 60 percent of the contaminants that the leading industrial activated carbon producer in Sri Lanka does, but at a fraction of the cost. Their project can help more people gain access to acceptable drinking quality.

SWEDEN

Tap water vs. bottled water in Sweden

By Åsa Omstedt, Anthony Abdulahad and Lisa Chung

Sweden may have the best tap water in the world. Yet, bottled water sales increase every year. Why? Does it taste better than tap water? Is it healthier? Åsa, Anthony, and Lisa examined bottled water in Sweden and determined that there is no difference in taste and health impact. After measuring the carbon dioxide emissions associated with bottled water transport, they concluded that bottled water in Sweden is unnecessary and negatively impacts the environment.

TURKEY

Rain: An environmentally-friendly energy alternative

By Ceren Burçak Dag

Ceren Burçak Dag investigated how to generate energy from rain. She carried out a theoretical study to dis-



Stockholm Junior Water Prize Finalists, 2008.

Photo: SIWI

cover the diameter, terminal velocity and height that would be required for falling water drops to generate an electric pulse through piezoelectricity (some materials are able to generate an electric potential in response to applied mechanical stress). Her model and analysis demonstrated how further developments in rain energy technology can be applied to create combined solar, wind, and rain energy panels.

UKRAINE

Tapping freshwater from submarine sources

By Feride Ibraimova

The coastal area of Crimea needs freshwater. Feride Ibraimova proposes that submarine freshwater sources in the sea can be transmitted to the reservoir. She proposed the construction of a large concrete tool (that looks like a big cup placed faced-down) would be placed above the submarine freshwater source. A pipe for freshwater would rise under its own pressure and transmit the water to the reservoir. The proposed solution is economically efficient, environmentally friendly and requires minimal power expenses.



UNITED KINGDOM

Flood DAM®

By Andrew Dunn

Andrew Dunn designed and constructed an innovative domestic flood protection barrier, Flood DAM®, that is inexpensive, recyclable, easy to use and quick to install. The Flood DAM® effectively prevents flooding in households and is an attractive device for families, fire brigades, local councils, and disaster relief. The Flood DAM® was tested with a tank in a river and found that it performed well, although it still requires more extensive testing. Flood DAM® could potentially be applied for broad scale use.

UNITED STATES

Natural organics control aggregation of Mercury Sulfide nanoparticles in freshwater systems

By Eileen Jang

In aquatic environments, Mercury (Hg)-sulfides, such as HgS nanoparticles, are precursors to methylmercury,

the form of Mercury that bioaccumulates in fish and is considered hazardous to human and aquatic health. This study developed a novel aqueous synthesis process for uncapped nanoparticles and identified potential stimulants and controlling factors for HgS nanoparticles. The research deepened the understanding of Mercury in its aqueous phase and furthered the emerging field of nanogeoscience.

VIETNAM

Communicating water source pollution to young people

By Tran Thi Tra Giang, Dang Thi Hoang Ha and Bui Kim Ngan

The Cau River in Vietnam is well-known in Vietnamese poems, stories and novels as the “dreaming river”. Sadly, its beauty is gradually being lost to pollution. The Vietnamese team worked extensively to advocate water conservation, wise water use and management through: 18 video clips, 16 extracurricular activities and a website (www.moitruong.good.to) containing 14 topics, 40 items, 112 articles. To date, the website has had over 3000 visits.

National Organisers and Sponsors

Argentina: Ay SA, Sudamericana de Aguas SA, Instituto Nacional del Agua (INA), ITT Water & Wastewater, Aguas de Santiago, ENOHA, Aguas Cordobesas, EPAS Mendoza, Enersystem, Environmental Resources Management (ERM) Argentina, Ecopreneur

Australia: Australian Water Association (AWA), ITT Water & Wastewater, Tyco Water

Belarus: BirdLife Belarus, Coca-Cola Beverages Belorussiya FE

Canada: Western Canada Water Environment Association, Atlantic Canada Water Works Association, Canadian Water and Wastewater Association, Réseau Environnement, Water Environment Association of Ontario, ITT Water & Wastewater - Canada

Chile: Ministry of Public Works General Water Directorate, National Initiative of Hydrological Proficiency, Embassy of Sweden in Chile, University of Chile, Ministry of Education, National Commission for Environment, Chile, Catholic University of Chile, University of Concepcion, UNESCO International Hydrological Programme (UNESCO-IHP) Chilean chapter, Aguas Andinas Water and Sanitation Company, Fanaloza Bathroom & Plumbing-ware Company, ESSBIO Water and Sanitation

China: Center for Environmental Education and Communications of Ministry of Environmental Protection of China (MEP CEEC), ITT Corporation

Finland: Water Association Finland, The Land and Water Technology Foundation Finland, Kemira Chemicals Ltd., Ekokem Ltd., Helsinki Water Ltd., Uponor Finland Ltd.

France: Office Francais de la Fondation pour l'éducation à l'environnement, ITT Corporation, VEOLIA-Eau, Agence de l'Eau Seine-Normandie, Agence de l'Eau Artois-Picardie, Hydroplus Magazine

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Israel: Faculty of Engineering at Tel Aviv University, The Iby & Aladar Fleischman Faculty of Engineering at Tel Aviv University, The Manuel and Raquel Klachky Foundation, Israel Water Authority

Italy: Federazione delle Associazioni Scientifiche e Tecniche (FAST), Governo Italiano – Presidenza del Consiglio dei Ministri, Ministero Istruzione Università Ricerca, Ministro della gioventù, Ministro per le politiche europee, Fondazione Lombardia per l'Ambiente, Sanofi-Aventis, Sol group, Provincia di Milano, Regione Lombardia, Associazione italiana per l'informatica e il calcolo automatico (AICA), Associazione nazionale italiana per l'automazione (ANIPLA), Foist, CusMiBio, Milset Europe

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Latvia: Education, Youth and Sports Department of Riga City Council, SIA Rigas Udens

Mexico: FEMISCA (Mexican Federation of Environmental Engineering), Secretaria de Medio Ambiente y Recursos Naturales, Gobierno del Distrito Federal, Secretaría de Educacion Pública, Academia Mexicana de Ciencias, Instituto Mexicano de la Juventud, Ericsson, Fundación Coca Cola, ITT Corporation, Sandvik, Comisión Nacional del Agua, Universidad

Nacional Autonoma de México, Alfa Laval, TetraPak, Cámara Suelco Mexicana, FEMISCA, Kemira Chemicals Ltd., CINAM

Netherlands: Netherlands Water Partnership, Ministry of Transport, Public Works and Water Management, Partners for Water

Nigeria: African Initiative for Environment Sustainable Network, Alele Company Ltd., Young Water, Gender Action Team (YWGAT) Joint Fund, Gender and Water Alliance

Norway: VA-yngre, Norsk Hydrologiråd, Norsk Vannforening, Krüger Kaldnes, Norwegian Meteorological Institute, Statkraft, BKK and NVE

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Singapore: Ngee Ann Polytechnic, Lien Foundation, Public Utilities Board Singapore

Slovak Republic: Young Scientists of Slovakia, Bratislava Water Company, Slovak Research and Development Agency, Ministry of Education of the Slovak republic, Ministry of Environment of the Slovak Republic

South Africa: Department of Water Affairs & Forestry, South Africa Water Research Commission, University of KwaZulu-Natal, Cape Technikon, University of Natal, University of Cape Town, WRP Consulting Engineers (Pty) Ltd.

Spain: AGBAR Foundation (Centre d'Estudis i Investigacio del Medi Ambient), Kemira Iberica S.A.

Sri Lanka: ISB Environmental Services, ITT Corporation

Sweden: Stockholm International Water Institute (SIWI), ITT Water & Wastewater, Schwartz Communication, Trosa Tryckeri, Svenskt Vatten, SYVAB, VA-avdelningen i Luleå Kommun, Urban Water, Scandic

Turkey: General Directorate of State Hydraulic Works, Turkey (DSI), The Scientific and Technological Research Council of Turkey (TUBITAK)

Ukraine: Publishing House Ekoinform, Coca-Cola Beverages Ukraine, Santeplast

United Kingdom: Chartered Institution of Water and Environmental Management (CIWEM), Institution of Water Officers and the Company of Water Conservators, United Utilities

United States: Water Environment Federation, ITT Corporation, Delta Air Lines

Vietnam: Vietnam Environment Administration, Vietnam Association for Conservation of Nature and Environment, Newspaper Science and Life, Embassy of Sweden, Hanoi

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Stockholm Junior Water Prize Winners

2008

Joyce Chai, USA, was awarded the prize for her groundbreaking research on the potential dangers posed by silver nanoparticles in consumer products to human and environmental health.

2007

Adriana Alcántara Ruiz, Dalia Graciela Díaz Gómez and Carlos Hernández Mejía, Mexico, were awarded the Prize for a project that developed a novel approach to adsorb lead in industrial wastewater using eggshells, an abundant and inexpensive bio-residual.

2006

Wang Hao, Xiao Yi and Weng Jie, China, won the Prize for their originality and ingenuity in their use of low-cost, ecologically friendly technology to restore a polluted urban river channel.

2005

Pontso Moletsane, Motebele Moshodi and Sechaba Ramabenyane, South Africa, won the Prize for their revolutionary solution to minimise the need for water in small-scale irrigation. They developed a low-current electric soil humidity sensor which uses light detection to control water pipe valves and improve irrigation efficiency.

2004

Tsutomu Kawahira, Daisuke Sunakawa and Kaori Yamaguti, Japan, won the Prize for the development and application of an environmentally friendly organic fertiliser for the Miyako Island. The method is applicable to many places around the world.

2003

Claire Reid, South Africa, won the Prize for an innovative, practical, easily applicable technique for planting and successfully germinating seeds in water-scarce areas to improve rural and peri-urban livelihoods.

2002

Katherine Holt, USA, won the Prize for research that looked at how foreign species could be introduced to benefit the Chesapeake Bay while preserving the bay's native oyster species and meeting national environmental goals.

2001

Magnus Isacson, Johan Nilvebrant and Rasmus Öman, Sweden, won the Prize for their innovative and relevant research on the use of natural materials to remove metals in leachate from landfills.

2000

Ashley Mulroy, USA, won the Prize for a contemporary project that investigated how inefficient wastewater treatment processes can lead not only to antibiotic contamination in American waterways, but also to progressive resistance among harmful bacteria to those same antibiotics that once controlled them.

1999

Rosa Lozano, Elisabeth Pozo and Rocío Ruiz, Spain, won the Prize for an innovative project that used sea urchins, starfish and sea cucumbers to measure the effectiveness of an EU beach protection programme on Spain's western Mediterranean coast.

1998

Robert Franke, Germany, won the Prize for his design of the Aquakat, a solar-powered, flow-through reactor for the treatment of industrial wastewater.

1997

Stephen Tinnin, USA, became the first international Stockholm Junior Water Prize winner for research that investigated the correlation between the reproductive rate of sea urchins and water pollution.



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