WATER IS LIFE SCHOOLS

Book of Abstracts

Water is Life Conference 2022 – Online Edition

By Raffles Institution, Singapore & Maurick College, The Netherlands

Water is Life dedicated experts

Prof. dr. ir. W.S.J (Wim) Uijttewaal
My curiosity is triggered by the great consequences of turbulence as we find them in our daily life. Whether it is the ever-changing weather patterns, the mixing of olive oil with vinegar in making a salad dressing, or the incredibility shaped planforms of natural rivers, all large-scale mixing and transport processes are governed by the complex turbulent motions, that work sometimes in our advantage but can often be a nuisance as in the case of e.g. cycling against the wind.

In hydraulic engineering the effects of turbulence are obvious, but it is often treated in a rather empirical way by parameterizing it as a diffusion process. However, in the interaction with boundaries, (sediment, rock), and obstacles (vegetation, bridge piers) local processes dominate the interaction stresses. I consider it therefore important to make an attempt to understand what is going on at small spatial and temporal scales and translate this to large scale of applications. The Environmental Fluid Mechanics Laboratory at TUDelft is well equipped for this research and perfectly embedded in our Hydraulic Engineering department in which a wide range of expertise is present.

Specialties:
Shallow flows: mixing layers, groyne fields, bends, lateral expansions, roughness variations
Rapidly varying flows: weirs, bed forms, innundated flood planes
Sediment transport: particle turbulence interaction, river mophodynamics
Fluid Structure interation: stability of breakwaters, vegetated flows, scour around obstacles
Experimental techniques: ADV, LDA, PI

Professor Otto Spijkers

Otto Spijkers is professor of international law at Wuhan University's China Institute of Boundary and Ocean Studies as well as its Research Institute of Environmental Law, and founding staff member of its International Water Law Academy. He is managing editor of the Chinese Journal of Environmental Law.

Prior to joining Wuhan University, he worked at the Utrecht Centre for Water, Oceans and Sustainability Law and Netherlands Institute for the Law of the Sea of Utrecht University, Netherlands. He was visiting lecturer *inter alia* at Peking University Law School, Xiamen University's China International Water Law Programme, the *Università degli Studi di Salerno* (Italy), and the *Université Catholique d'Afrique Centrale* (Yaoundé, Cameroon).
He wrote his doctoral dissertation, entitled The United Nations, the Evolution of Global Values and International Law, at the Grotius Centre for International Legal Studies of Leiden University.

He has published over a hundred articles and books. A full list can be found on the ORCID-page: https://orcid.org/0000-0003-4384-314X.

He worked as public services coordinator at the Peace Palace Library, as international consultant and coordinator for the United Nations International Law Fellowship Programme, as intern for the Appeals Chamber of the International Criminal Tribunal for Rwanda, and as intern for the Office of Legal Affairs of United Nations Headquarters.

Otto Spijkers studied the basics of international relations at the University of Sussex. He then studied international law at the University of Amsterdam, New York University School of Law (exchange student), and the Hague Academy of International Law (2009 session). He studied philosophy at the University of Amsterdam and the University of Malta (exchange). He obtained a Diplôme approfondi de langue française.

Professor Kim Irvine

Kim Irvine is an Associate Professor in the Faculty of Architecture and Planning, Thammasat University, Thailand. Between 2012 and 2020 he was an Associate Professor at the National Institute of Education, Nanyang Technological University (NTU), Singapore, and also a Cluster Leader with the Environmental Process Modelling Centre of the Nanyang Environment and Water Research Institute (NEWRI), NTU.

Previously, he had been a Professor in the Department of Geography and Planning, Buffalo State, State University of New York. He was at Buffalo State for 25 years, starting in 1988, and while there concurrently held several other professional positions, including: Hydrologic Scientist at the U.S. Army Corps of Engineers, Buffalo District; Associate Director, Great Lakes Center, Buffalo State; Director of the Center for Southeast Asia Environment and Sustainable Development, Buffalo State; and Adjunct Professor in Environmental Engineering and Management at Asian Institute of Technology (2010-present). He was Chair of the Buffalo State Geography and Planning Department, 2000-2009.

Dr. Irvine's research focuses on applied hydrologic process and watershed pollutant modelling; Nature-based Solutions; smart city planning; and integration of hydrologic modelling with architectural design. The research has been conducted in Canada, the U.S., Cambodia, Thailand, Vietnam, Singapore, Malaysia, Indonesia, Sri Lanka, and Japan. He was awarded the New York Water Environment Association, Environmental Science Award in 2013, which is given to an Association Member who has made a significant impact in water quality management, environmental engineering and/or water and sewer infrastructure development.

He received an NIE Excellence in Teaching Commendation, 2018, and was granted a Bualuang ASEAN Fellowship Award in 2020 to conduct research on water sensitive urban design in the Faculty of Architecture and Planning, Thammasat University. Dr. Irvine has been a member of the Science Advisory Committee, International Foundation for Science since 2011.

Professor Vladan Babovic
National University of Singapore

Vladan is a leading scientist in the field of hydroinformatics where he has been spearheading research in artificial intelligence, machine learning and computer modeling of hydraulics and hydrological phenomena from 1990s. In more recent years, his work on real options pertaining to decision-making under deep uncertainties in climate-related domain is gaining wider recognition.

In addition to being a leading researcher and educator, Vladan is a scientist entrepreneur who secured research funding several applied and fundamental research organisations, as well as VC investments for several start-up companies.

Vladan is a Chartered Engineer and a Member of the Institution of Engineers (Singapore)

Honours & Awards

Fellow, International Water Association
Council Member, International Association for Hydro-Environmental Research and Engineering
Albert Winsemius Award for entrepreneurship and scientific leadership
Arthur Thomas Ippen Award, International Association for Hydro-Environmental Research and Engineering
Talent Award, Danish Academy of Technical Sciences
Jaroslav Cerni Award as the best Civil Engineering Graduate

Professor Glen Kowach
Associate Professor & Director of Genaral Chemistry
Chemistry and Biochemistry

My research interests in solid state inorganic chemistry include the deposition of crystalline and morphous thin films,growth of single crystals, fabrication of nanocomposite glasses, and exploration of novel electronic, magnetic and optical materials. The focus of this research includes synthesis and atomic structure determination and is enhanced by collaboration to characterize physical properties

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Gabriel Araújo[1], Matheus Silva[1], Rebecca Beutler[1], Cristina Vianna[2], Wagner Silva[2].
Students[1] and teachers[2]
Centro Federal de Educação Tecnológica de Minas Gerais Unidade Varginha, Minas Gerais, Brazil.

SPE1

DUJIANGYAN IRRIGATION SYSTEM

Zhang Jinfei, Gao Ruofei, Zhang Xibei, Yang Xun
Chengdu No.7 High School, China

STEM ENVIRONMENTAL SUSTAINABILITY

Live and Video Presentation
Category: STEM Environmental Sustainability

ES1

Grey Water Reuse for Agricultural Purposes

Tanatswa Makwembere, Rudairo Chinguwa, Stacey Revai
Arundel School, Zimbabwe

Globally, grey water is an often under-utilised resource despite there being increasing levels of water stress and scarcity. Arundel School has a grey water collection system which sources its grey water from the onsite boarding facilities and kitchen. As the water has no further use after collection, the research will focus on filtering the grey water and analysing the growth of selected plants which will be watered by it. The filtration system will be constructed from readily available local materials which will include three re-purposed refuse bins fitted with a filtering screen and different textured sand for the filtration purpose. The bins will be connected to a network of PVC pipes leading to a storage tank for the filtered grey water. The filtered grey water will then be directed through a drip-irrigation system to water selected indigenous plants. A control using borehole water will be placed nearby. It is anticipated that the plants will grow healthy with minimal stunted growth. By filtering the grey water, a neglected resource is utilised, contributing to a reduction in water usage while promoting the growth of indigenous plants which can be transplanted to beautify the School and later, the public spaces areas in the surrounding community

Live and Video Presentation
Category: STEM Environmental Sustainability

ES2

AWAS (Automatic Water System) as a clean water distribution device to mitigate the impact of climate change

Muhammad Rizky Pratama, Mochammad Annas Firmansyah
Center for Young Scientists – MAN 1 Jembrana

In the last 50 years, climate change has caused extreme weather such as drought and other natural disasters. Affected communities by this disaster experience scarcity of clean water. They often scramble and fight over the government's limited source of clean water aid. This problem could be solved by utilizing technological tools and Internet of Things (IoT) to distribute clean water to affected communities. In this research, a prototype based on IoT and data from Family Card *(Kartu Keluarga)* aimed to distribute clean water evenly to communities-affected areas named AWAS (Automatic Water System). AWAS will be controlled using a website application, database, and Wi-Fi that uses NodeMCU ESP8266 water flow sensor, and LCD 16 x 2 I2C. The database will contain the Family Card number, name, address, and gender of the water recipient. The result from the database will be inserted into the AWAS program and shown on the website application to manage and operate AWAS. In conclusion, this prototype is expected to be a solution for distributing clean water to communities affected by natural disasters caused by climate change.

Live and Video Presentation
Category: STEM Environmental Sustainability

ES3

Utilization of banana bunches biochar as an adsorbent to reduce phosphate levels in hand washing wastewater during the COVID-19 pandemic

Keitaro Budi Lesmana, Nayla Jauza Shaliha
Center for Young Scientists – SMA Doremi Excellent School

Coronavirus disease is a global health problem that is being faced today. One of the efforts that can be done to prevent its spread is to wash your hands with soap and water. This increase in handwashing activities with soap and water creates a waste problem for the environment. So, steps are needed to treat this waste, namely using biochar. Biochar is a carbon-rich solid material from the conversion of organic waste to agricultural or plantation biomass. One example of organic waste is banana bunches. This study aims to determine the quality of hand washing wastewater in terms of phosphate levels, before and after treatment with the addition of biochar with adsorption times of 1 day, 3 days, and 5 days. Phosphate levels of handwashing wastewater without biochar were 15.63 mg/L, and phosphate levels of handwashing wastewater at adsorption times of 1 day, 3 days, and 5 days were 9.64; 9.87; and 15.32 mg/L. The results showed that there was a decrease in phosphate levels with the application of biochar and the effective adsorption time was 1 day.

Live and Video Presentation
Category: STEM Environmental Sustainability

ES4

Water Resource of JiuZhai Valley

Jiang Ruoxi, Wang Tianyi, Li Kexin, Chen Yuanzhuo
Chengdu No.7 High School, China

To further understand the utilization of water resources in our hometown, we conduct the research about the solutions to the decrease of water and unreasonable utilization.
The scale of water in JiuZhai valley has been in a declining tendency since the 1980s owing to the following four reasons, the leak of underground water, the increasing permeation of surrounding lakes, the augmentation of evaporation, and the decrease of natural precipitation.
We have carried out adequate researches to make a hypothesis that the first three statements are real causes for the fact that the climate in this area has changed significantly due to the atmospheric circulation and the abnormal change of the wet monsoon. Moreover, Jiuzhai Valley has received an increasing number of tourists ever since it became a popular scenic spot, which accounts for its regional climate change and the decrease of water resources.
We shall visit JiuZhai Valley in person while cooperating with the local Weather and Tourism Bureau to get the latest statistics and make prospective forecasts. In this way we hope to draw a conclusion that great importance should be attached to it while further protection and restoration are needed.

Live and Video Presentation
Category: STEM Environmental Sustainability

ES5

Is it possible to predict blue-green algea?

Zoë van den Tillaart, Evy Verhoeven, Marlies van Helvoirt and Lotte Kraneveld.
D'Oultremont College, The Netherlands

We can no longer recreate because of blue green algae. Can we predict and perhaps even prevent blue-green-algae? It is important for the future to keep the water clean and to keep checking that it continues to go well, so that we can prevent people from getting sick. We want to control the water with blue-green algae. We want to check if it is possible to predict blue-green algae in advance with measurements and if it is economically cheaper to prevent it. We want tot analyze the water for substances that cause blue-green algae with the right materials and we want tot involve people who have had tot deal with blue-green algae before. We expect to be able to predict blue-green algae. And to find out whether it is also safe for people and the environment and is economically smart if you do something against blue-green algae.

Live and Video Presentation
Category: STEM Environmental Sustainability

ES6

PFAS in the Great Lakes Detroit Country Day School Yellowjackets

Solene DeGaynor, Sophie Endrud, Bashar Fakhoury, Catherine Hiemstra
Detroit Country Day school, USA

PFAS or Per- and Polyfluoroalkyl Substances have become an increasingly potent issue in the Great Lakes region. Found in everyday objects such as fast-food wrappers, nonstick cookware, and cleaning products, the rising levels of these harmful chemicals have begun to worry researchers across Michigan. They are known as “forever chemicals" because they do not break down in the human body. PFAS have been linked to a plethora of health issues in human beings including cancer, liver damage, decreased fertility, and increased risk of asthma and thyroid disease. Therefore, they must be monitored for the sake of public safety. In order to better understand the levels of these chemicals in our water system, we will test PFAS levels in a variety of water samples. We will then be able to assess the toxicity of the water for both human consumption and the surrounding wildlife based on the known danger levels of PFAS in water. Understanding the level of PFAS in our waterways will also help us create comprehensive solutions on how to extract these chemicals from our Great Lakes.

ES7

Effects of air pollution on river ecosystems

Benjamin Bührmann, Lisett Düll, Manuel König, Frederike Schmidt
Dillmann-Gymnasium, Germany

The inner-city traffic junction “Neckartor” located in Stuttgart, reports the highest air pollution values in Germany. Monitoring air pollution is key to understand its harm to our environment, but is it possible to detect pollution in the water caused by traffic? Our research focuses on water pollution through traffic in the river “Neckar” located in Stuttgart. Not only are we interested in whether local marine wildlife is threatened by tire abrasion or other emissions but also whether a lower flow velocity at restored riverbanks help to reduce pollution. Water samples are to be taken regularly at various points from the Neckar and analysed for gas concentration and other parameters. Furthermore, a permanent measuring station, automated via microcontroller, is planned, which will detect and store alterations in water quality. This data will be compared to the concentrations at the “Neckartor” air monitoring station”. The Parameters are expected not to change simultaneously but delayed in relation to the air measurement values. Additionally, it is assumed, that restored riverbank areas help reduce the particle concentration as the particles sink and are bound in the sediment. As a result, our investigations may detect the need for protective actions of local marine wildlife.

Live and Video Presentation
Category: STEM Environmental Sustainability

ES8

Development of high sensitivity portable test kit for multiple detection of metal ions with minimal amount analysis towards environmental awareness

Passanan Thungprue, Benyapha Attichartpatsorn, Lalittaphat Na-ubon Kiattipoom Rodpun (project advisor), Amara Apilux (project advisor)
Mahidol Wittayanusorn School, Nakhon Pathom, Thailand

Heavy metal contamination in the environment is a crucial issue to be concerned. However, the methods for metal analyses require high-priced instruments and are usually limited to laboratories. Therefore, we aim to develop a paper-based sensor device portable kit which is sensitive and selective to metal ions and can be used on the field for rapid and effective detection of heavy metals in water resources. Herein, the fluorescence properties of cadmium telluride quantum dots (CdTe QDs) in the presence of L-cysteine were employed to study the quenching results of copper and mercury ions. A mixture of CdTe QDs, Britton-Robinson buffer and L-cysteine hydrochloride was coated on the device. A calibration curve of Hg^{2+} and Cu^{2+} detection was generated. By using sodium diethyldithiocarbamate and ammonium hydroxide, Hg^{2+} and Cu^{2+} can be exclusively detected in the existence of one another. The device portable kit is designed to be used in on-field detection. After applying the sample, the result is visible under the UV-blacklight and the color intensity can be interpreted in Adobe Photoshop. The results of each ion can be precisely analyzed. Our method also uses low-cost materials and is suitable for heavy metals analysis in the environment.

Live and Video Presentation
Category: STEM Environmental Sustainability

ES9

Immobilisation of tannic acid onto activated carbon from durian peels to improve Cu(II) ion removal

Kanrawi Yaemchabok, Puri Janyacharoen Sarote Boonseng (project advisor)
Mahidol Wittayanusorn School, Nakhon Pathom, Thailand

Recently, many methods such as electrocoagulation, ion exchange, bioreactor, adsorption technique have been used for wastewater treatment. Among them, an activated carbon (AC) and modified AC, which are adsorption materials, have been extensively studied to remove metal ions from wastewater. In this research, the AC was prepared from durian peels using H2SO4 as activating agents. Tannic acid, which is commercially accessible, was used to modify the adsorption properties of AC prepared from durian peels (D-AC). A Cu(II) removal from synthetic wastewater was investigated to evaluate the adsorption properties of the tannic acid immobilized activated carbon production from durian peels (TA-AC). The D-AC and TA-AC were analyzed using Fourier Transform Infrared Spectroscopy (FTIR). The concentration of the Cu(II) in the solution was determined through flame atomic absorption spectrometer. The effects of different experimental factors such contact time, adsorbent dosage, and temperature were studied. The data were used to calculate chemical kinetics and thermodynamics. Batch adsorption showed that TA-AC was more effective than D-AC in terms of removal percentage, with an equilibrium contact time after 60 minutes. To follow the adsorption processes, two simplified kinetic models were chosen: pseudo-first-order and pseudo-second-order equations. The Cu(II) adsorption on adsorbents followed the pseudo-second-order kinetic model. Langmuir and Freundlich isotherms were used to analysis the Cu(II) adsorption. A comparison of these isotherms indicated that the Freundlich equation is the better model for describing the Cu(II) adsorption on TA-AC. The thermodynamic study showed that the Cu(II) adsorption process is endothermic, confirmed by the positive enthalpy.

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ES10

Water Scarcity in the Planet

Anna Gras, Berta Palet, Maialen Arques, Martí Gómez, Rubén Miño
Mare de Deu del Carme, Spain

It is often said that water is life. Even so, most of us usually forget to preserve this essential resource. Millions of people need help, and millionaires are willing to donate money for the cause, yet it is not as easy as it may seem. It requires a huge effort. How can we end water scarcity?
In order to answer a question of this magnitude, we must get to know the importance of water in multiple fields. Our team will carry out experiments to confirm or disprove our hypothesis. By working in a laboratory or carrying out mock-ups will be vital to discover the real importance of water. We will continue with the research of where and why water is still not available for such a large number of people.
Therefore, our main objective is not only to research but also to try to get to help for the ones in need. We really look forward to discovering new technologies and techniques to achieve it.

Live and Video Presentation
Category: STEM Environmental Sustainability

ES11

Dike erosion

Yvar van Helvoort, Kieran de Visser
Maurick College, The Netherlands

Dike erosion is a crucial issue in coastal flood risk management. Because sea levels are rising, dikes are more important than ever. We asked ourselves: “What is the effect of dike incline on the erosion of the dike?”. To test this, we got a rectangular plastic tub in which we can built a dike. To create waves, we use a custom speaker which can push down on plate. That platen creates waves that have an impact on the dike. This research can save a lot of lives by protecting them from the sea.

Live and Video Presentation
Category: STEM Environmental Sustainability

ES12

Analysis of a future salmon spawning habitat

Idyn MacLucas, Kiera van den Berg, Camellia Lagan, Alex Longe
Oak Bay High School, Canada

Bowker Creek is an urban waterway flowing by our school, Oak Bay High. The creek runs for eight kilometers through Victoria, though only 2.5 kilometers of it are daylighted. A group of community members recently have been able to begin to repopulate a downstream site of Bowker Creek with salmon eggs, through a combination of restoration efforts and environmental monitoring. Our goal is to conduct an analysis comparing the new salmon egg placement site with a site upstream at the high school . There are some differences between the two locations, foremost among them is that the school site is a newer restoration site and still has a running track on one side. To compare the two sites we will use the Streamkeepers protocol, developed by the Pacific Streamkeepers Federation. The protocol will be divided into four units, an introductory creek analysis, habitat assessment, water quality survey and invertebrates survey. Based on the results of our analysis, we expect to be able to set up a plan for future groups to improve the riparian ecosystem at Oak Bay High School, resulting in a better salmon spawning habitat. Ideally, this plan will allow for a salmon run in Bowker creek at Oak Bay High School, something that hasn't been seen in over 100 years

Live and Video Presentation
Category: STEM Environmental Sustainability

ES13

Restoration of a potential future salmon spawning habitat

Trinity Dorion, Max Zolbrod, Taya Covaneiro, Bronte Thurbide, Luxy Johnston
Oak Bay High School, Canada

Bowker Creek is an eight kilometer long, 30% daylighted, and highly modified urban waterway in Greater Victoria. Historically (pre 20th Century), Bowker Creek was an active salmon run to both Chum and Coho species. In 2015, an 80 metre stretch of the riparian habitat was restored along Bowker Creek. However, due to over use by various stakeholders (students, staff, community members and wildlife), certain areas of the riparian zone have not flourished as anticipated. How can we successfully restore the riparian habitat while maintaining public access? With increased shaded areas, distinct pathways, fencing, and signage, native plants such as nootka rose, willow trees, and red osier dogwoods will have the opportunity to thrive in enclosed areas. The proposed zig-zag, mulch pathways will ensure less erosion, and guarantee stakeholders are limited to certain sections of the creek bank. After restoring the riparian habitat of this stretch of Bowker Creek, the native plants will allow for plenty of shade over the creek, and be dense enough that stakeholders are uninterested in venturing into the native landscape. The students, staff, community members, animals and especially salmon will coexist comfortably in Bowker Creek's riparian habitat

Live and Video Presentation
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ES14

Biochar Derived from Chopsticks as an Effective Biosorbent for Pollutant Removal from Wastewater

Sarah NG, Eleanor Chan, Faith Ang
Raffles Institution, Singapore

Pollutants such as methylene blue and bisphenol A (BPA) have been found in wastewater, and pose a threat to the human health and the ecosystem. Removing pollutants from wastewater can be carried out through different methods, but a sustainable method of doing so should involve the use of readily available, low cost materials that can be processed through a method that is not energy-intensive. Carbon-rich solids such as biochar have been found to be effective in reducing the levels of such pollutants in wastewater, though experiments using disposable chopsticks as a precursor have not been documented before. Hence, our aim is to evaluate the effectiveness of biochar derived from chopsticks and thereafter test the effect of pyrolysis temperature on the adsorption of various pollutants from wastewater. 2 types of biochar, derived separately from bamboo and wooden chopsticks and pyrolysed at either 200ºC or 500ºC will be used as absorbents for methylene blue and BPA in water. The mixture of solution and adsorbent will be shaken before being analysed using a UV-Vis spectrometer. We hypothesise that biochar made from wooden chopsticks and pyrolysed at high temperatures (500ºC) will be the most effective in removing pollutants from wastewater.

Live and Video Presentation
Category: STEM Environmental Sustainability

ES15

An investigation into the effects of varying pyrolysis temperatures and chitosan modification on the effectiveness of a banana peel biochar in adsorbing tetracycline hydrochloride from a synthetic solution.

John-Paul Wee Yi De, Anand Jaswanth
Raffles Institution, Singapore

The widespread use of tetracycline in animal livestock and human disease treatment has caused a sharp rise in tetracycline pollution of water. This can lead to toxicity in humans and antibiotic resistance. As such, our research aims to investigate if banana peels, a common waste material, can be repurposed into biochar to effectively remove tetracycline and whether chitosan-modification and pyrolysis temperature variations will improve its efficacy. We hypothesize that banana peel biochar will effectively remove tetracycline hydrochloride, with the high pyrolysis temperature chitosan-modified variant being the most effective. 4 types of biochar were prepared – pure banana peel and chitosan-modified biochar which were pyrolysed separately at 493K and 873K. Each of the 4 types of biochar will be added to separate 100 mg/L tetracycline hydrochloride solutions. These solutions are left to sit in a shaking apparatus for 24 hours. At various time points, samples are removed for spectrophotometry to determine the remaining concentration of tetracycline hydrochloride. High-temperature pyrolysis and chitosan-modification are expected to increase the rate of adsorption and total amount adsorbed by the biochar.

Communities and Soscial Sustainability

Stewardship, Policy and Economic Sustainability

Live and Video Presentation
Category: Communities and Social Sustainability

CS1

Survival at School: An Investigation Into Water Resources in Times of Natural Disasters

Hannah Tajima, Haruna Oka, Chisato Nagaoka, Yusei Kondo
Makuhari Senior High School, Japan

The Great East Japan Earthquake, which occurred in 2011 and permanently damaged Makuhari, caused the area surrounding our school to be plagued by liquefaction, in conjunction with severe water shortages due to turbid water and water outages. The disaster prompted us to ask the questions: Is it possible to reduce the damage caused by such natural disasters in Japan, an earthquake-prone country? Is there any way to supply clean water in a more efficient way? This project will investigate the likely effects on Makuhari's water systems and water supply if another disaster strikes and causes damage to waterworks facilities and shortages of water needed to sustain our lives. We aim to prove how it is possible to deal with the effects of natural disasters on the water supply using readily available materials. Our research will involve investigating Makuhari's geographical features, and the impacts past disasters have had on the region. Moreover, we will explore the current disaster-response methods to identify any drawbacks and consider the alternatives that would fix these problems. We will also experiment with manifold methods of water testing in order to ascertain which method is the most practical in times of crisis.

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CS2

Virtual Water and Japan's Hidden Dependency

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Japan is currently the country with the most virtual water imports, yet we are not informed of this situation. we believe the lack of education at a young age regarding water imports is what is leading people to overrate Japan's access to water. Therefore, we would like to look into the education of water in our country, along with what we can do to improve it. Targeting elementary school children who have flexible mindsets, we will first visit schools and give lectures on virtual water and the current situation in Japan. We will then also introduce "Virtual Water Awareness Week" to the schools and students, where they will be able to incorporate daily-life actions that could be done to reduce the amount of virtual water we use. With the cooperation of Prof. Oki from The University of Tokyo, we hope to spread awareness and accurate information towards this issue so that our next generation will become more aware of the status quo and Japan's hydrological cycle.

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CS3

An Estimate of the Reputational Damage to Fukushima's Fishery Industry Following the Release of ALPS Treated Water

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Ever since the 2011 Tohoku earthquake, Fukushima has been linked to the devastation of the subsequent TEPCO nuclear reactor meltdown. Their industries still suffer from consequential reputational damage. Considering the earthquake's harms on Fukushima's industries, we hypothesize that a similar problem will occur when the ALPS treated water is released in 2023.
The ALPS treated water is water that has passed through the Advanced Liquid Processing System, a multi-nuclide removal system which removes radioactive materials from contaminated water. We aim to prove that any damages from this release will be purely reputational and estimate the extent of this damage. To do this, we will not only utilize the scientific data provided by TEPCO and the Japanese government, but also interview those supporting the fishery industry and the economy of Fukushima. Considering that the release of the ALPS treated water is a controversial topic, we will look at statistics and anecdotal evidence from both sides of the issue. We hope that our research will serve as a basis for the prevention of such damage from happening when the water is released

CS4

Wastewater as a Tool to Better Understand and Manage Infectious Disease

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In light of the COVID-19 pandemic around the globe, scientists have been paying extended attention to the virus transmission through wastewater collection and treatment. Pathogens could enter urban sewage systems from human waste, animal farming, and hospital effluents. It has become crucial to assess the potential exposure and transmission of viruses like SARS-CoV-2 through wastewater systems. Successful strategies to control the spread of this pathogen rely on effective surveillance. As viruses have the potential to adsorb on surfaces with certain pH, the interaction between SARS-CoV-2 and solid particles implies their behaviour in sewage sludge and their concentration by water treatment. In the study, we investigate the current methodologies used to monitor and analyze the statistics of SARS-CoV-2 in wastewater. To understand the dynamics of SARS-CoV-2 outbreaks, risk analysis and modeling in the research are significant.

CS5

The taste of plants and what could influence it

Puck de Quay and Minou Ruijters from the Maurick College, the Netherlands.
Maurick College, The Netherlands

Taste factors can be influenced by various circumstances and by altering those circumstances we can measure the scientific outcome and whether you can also taste the difference.
We will be using tomatoes as they are easy to use in the experiment, rich of taste and do not take long to grow. For the experiment itself we will be measuring the amount of sugar and the PH-value with a refractometer and a pH-meter. We are expecting that with less nutrients, the tomatoes will produce less sugar and therefore will have a higher pH-value. The other way around with more nutrients.

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CS6

The Impact of Water on Wuhan in Light of Local Conditions

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Wuhan is located on the Changjiang River (also known as Yangtze River). Roughly 25% of the city's area consists of lakes, of which the East Lake is the largest urban one. Water thus has an enormous impact on peoples' lives. The rationale of our project is to understand better how peoples' lives in Wuhan are influenced by water from three aspects. The first is the impact of water on Wuhan's economic development. The second is the impact on Wuhan's position as a transportation hub. And the third is the impact of water on peoples' personal lives. We will focus on recent changes in the water quality of the East Lake and how this change has influenced Wuhan and its inhabitants. We will interview people living around the East Lake – both ordinary people, officials, and water (law) experts – to learn about their experiences with the changes of the water quality. We hope to promote the residents' awareness of the importance of cherishing and preserving the precious water resources in Wuhan, and we – the Yellow Cranes – expect to have fun and foster our comprehensive skills through the project.

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CS7

Circular economy: transforming wastes into goods and changing behavior for charity

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The circular economy concept is based on strategies to achieve principles related to reusing, recycling, redesigning, repurposing, remanufacturing, refurbishing, and recovering water and waste materials to preserve natural resources. It provides the conditions to encourage economic and social actors to adopt strategies toward sustainability. Therefore, our community was motivated to contribute to three TerraCycle enterprise programs: disposing of unused cleaning sponges, writing materials, and plastic toys in a proper way. However, the main goal was not only to collect hard recycling wastes but also to bring awareness to our community. The most important was to convey the concept that garbage no longer exists and the productive process must work repurposing the wastes generated. Some trash bins were used to collect the waste and placed in the school and in one condominium. Besides the bins, a thermometer sticker was used to indicate in means of temperature the number of collected wastes in grams. After six months approximately 20 kg of waste were delivered to TerraCycle. The primary data shows that the community is more alert to proper waste disposal, avoiding the accumulation of long last decomposing materials into landfills and therefore contributing to protecting the water resources.

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CS8

Varginha urban springs, state of preservation, and perspectives for reality changing.

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Water springs are generally associated with rural areas; however, urban springs are also co-responsible not only for the volume but also for the water quality in the hydrographic basins. Therefore, the goal of the project was to map, and determine the degree of ecological preservation of urban springs located in Varginha city, Minas Gerais state, Brazil. By field visits and following two specific methodologies, the degree of ecological preservation of springs was determined by a simplified index of environmental impact. Among 20 investigated springs, 20% were properly preserved and 80% had unsatisfactory ecological preservation status. The main negative aspects are concerned with the presence of garbage, and the absence of riparian forests of a suitable size. Therefore, this research project indicates the need to mobilize authorities and society to protect their valuable water resources. The work contributed to a reflection based on concrete data acquired during the study, being fundamental in raising awareness and contributing in an important way to sustainable practices and behavior change related to environmental issues. In addition, the methodology of learning by projects allows the integration of different subjects, unifying knowledge and avoiding its fragmentation.

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SPE1

DuJiangYan Irrigation System

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DuJiangYan Irrigation System, created more than 2000 years ago, irrigates the land of more than 670,000 hectares, ensuring the water supply for industrial and agricultural production till today. However, problems still exist. Major issues are the shortage of the irrigated water resources and the water pollution. Projected methods we plan to adopt contain consulting relevant files, on-the-spot investigation, interviewing local staff, and conducting experiments. We infer that real causes for the first two statements of the problems are the weak awareness of the water conservation, the aging of the facilities, the overexploitation and the rising demands for water. We expect to verify the existence and severity of the problems.