



WATER IS LIFE
SCHOOLS 2024
OAK BAY HIGH SCHOOL



Book of Abstracts



Water is Life dedicated experts



Elin Kelsey, PHD

Elin Kelsey is a leading spokesperson, scholar and educator in the area of evidence-based hope. Elin's work focuses on the reciprocal relationship between humans and the rest of nature, particularly in relation to the emotional implications of the narrative of environmental doom and gloom on children and adults. Her influence can be seen in the hopeful, solutions-focus of her clients including the Monterey Bay Aquarium, and other powerful institutions where she has served as a visiting fellow including the Rachel Carson Center for Environment and Society, and the Rockefeller Foundation.

Passionate about bringing science-based stories of hope and multi-species resilience to the public, Kelsey is a popular keynote speaker and media commentator. In 2014, she co-created #OceanOptimism, a twitter campaign to crowd-source marine conservation solutions which has reached more than 95 million shares to date. In 2019 she served as a Visiting Scholar at Stanford University in the Graduate School of Education, bringing a critical emphasis on hope to an interdisciplinary think tank on environmental issues.

As an Adjunct Faculty member of the University of Victoria School of Environmental Studies, she is spearheading the development of a solutions-oriented paradigm for educating environmental scientists and social scientists. She is a feature writer for Hakai Magazine and a best-selling Children's Book Author. She enjoys serving as an author in residence in schools and leads environmental workshops for teachers, and kindergarten through university students, across North America and around the world.

Eagle Wings Tours



Purpose:

Eagle Wing tours is a local, family-run company acquired by Brett Soberg and his business partner, Don Stewart, in 2005. Environmental stewardship has always been a core value at Eagle Wing Tours. From day one, the owners have believed that by educating the public about the wildlife of the Salish Sea, we can inspire people to make more environmentally responsible choices in their everyday lives!

Today, Eagle Wing Tours is recognized as an industry leader in conservation, sustainable tourism and consistent quality of product. We see each guest as a VIP—someone who by experiencing and learning about the Salish Sea and its wildlife can advocate for the health of ocean ecosystems, no matter where they live. This commitment is why we've enjoyed the #1 position for whale watching in Victoria on Trip Advisor since 2007!

We lead by example. Over the years, we've won national and regional awards for our commitment to guest experience and environmental sustainability. We were the first in the industry to join 1% for the Planet, to adopt carbon neutrality, and to implement a per-guest wildlife fee to support regional research and conservation activities.

Philosophy:

Eagle Wings' top priority is to offer superior-quality tours. They also use their access to the Salish Sea and its wildlife to advocate for and directly support marine conservation and the revitalization of Indigenous culture. They have a concept of their 'four pillars.' Their vision is grouped into four main areas of activity:

Conservation - Through responsible wildlife viewing and innovative community partnerships, their overarching goal is to restore and protect marine ecosystems in the Salish Sea and beyond.

Sustainability - Eagle Wings think and act green. They strive to eliminate their environmental footprint. They're ready to embrace the new vision of regenerative tourism.

Research - Science brings conservation solutions. They cultivate and support community-based research partnerships. They actively conduct and enable research on board their vessels as part of their enhanced guest experience.

Education - Building awareness on and off the water is essential to ocean conservation. Eagle Wings inspires and empowers through the guest experience, their "floating classroom" education program, community outreach, and social media.

Ocean Networks Canada



Mission:

Ocean Networks Canada launches world-leading, next-generation physical and digital infrastructures, grows data services, and fosters partnerships for a bright ocean future and a resilient planet. Ocean Networks Canada enhances life on Earth by providing ocean intelligence that delivers solutions for science, society, and industry. Ocean Networks Canada values integrity, respect, commitment, and innovation.

Purpose:

Ocean Networks Canada (ONC) is a world-leading research and ocean observing facility hosted and owned by the University of Victoria, and managed by the not-for-profit ONC Society. ONC operates unparalleled observatories in the deep ocean and coastal waters of Canada's three coasts—the Arctic, the Pacific and the Atlantic—gathering biological, chemical, geological and physical data to drive solutions for science, industry and society.

ONC's observatories collect data via cabled, mobile and community networks. Our infrastructure supplies Internet connectivity to thousands of subsea instruments up to 300 kilometres offshore, to depths of 2,660 metres. Sensor data are also captured on ferries, gliders, fixed buoys and moorings, and from coastal installations hosting radar, ship traffic sensors, weather stations and onshore cameras. ONC's national coastal community observatory program, developed in collaboration with Indigenous communities and other partners, supports coastal monitoring, school programs, ocean citizen science and youth training.

List of Abstracts**STEM ENVIRONMENTAL SUSTAINABILITY****ES1****THE DISCOVERY AND PRACTICAL USE OF DONG HU PARK'S DECONTAMINATION PRINCIPLES**

Xiaoke Huang, Simeng Chen, Yueyi Ma

Chengdu No. 7 High-school, China

ES2**THE CAUSES AND SUGGESTED SOLUTIONS OF WATER POLLUTION CAUSED BY PLANKTONIC ALGAE IN LAKES- A SAMPLE ON A CERTAIN LAKE IN CHENGDU**

Ruixian Xie, Jingfei Yang, Zifei Yu

Chengdu No. 7 High-school, China

ES3**AQUA WATCHERS**

Rui Xi Li, Xing Nuo Zhang, Si Han Yang, Yi Lin Miao

Chengdu No. 7 High-school, China

ES4**WATER IS LIFE**

Shirin van Ballegooijen, Anoeck de Bonth and Isa verlee

D'Oultremont College, The Netherlands

ES5**THE GROWTH OF FLAT OYSTER IN DIFFERENT SALINITIES**

Nick Stoof, Esja Pleizier and Sam Briejer

D'Oultremont College, The Netherlands

ES6**LEAD CONTAMINATION IN DRINKING WATER: A FOLLOW UP TO THE FLINT WATER CRISIS**

Saahith Reddy, Ada Gong, Katherine Chen, Achyut Reddy, Jocelyn Tian

Detroit Country Day school, USA

ES7**EFFECTS OF AIR POLLUTION ON RIVER ECOSYSTEMS**

Elsa Saffert & Christoff Lindauer

Dillmann-Gymnasium, Germany

ES8**SUSTAINING EAST LAKE: A STUDY ON ENVIRONMENTAL DEVELOPMENT AND PUBLIC SATISFACTION**

Yawei Bu, Yiran Du, Chengxin Geng, Ningxuan Zhang, Kexin Zuo

High School Attached to Wuhan University

ES9**PURIFICATION OF FRESH WATER FROM SEAWATER USING HEAT FROM SOLAR ENERGY & PERCOLATION FROM SILICA**

Peeraya Saejia, Khantharat Pimpisit, Supakorn Wongkularb, Usa Jeenjenkit, Supan Yodyingyong

Mahidol Wittayanusorn School, and Institute of Innovative Learning, Nakhon Pathom, Thailand

ES10**THE IMPACT OF HEAT WAVES TO DUGESIA JAPONICA REGENERATION**

Kirida Korkiat, Chaikasem-anan Chainkulnit, Napasrapee Poldech, Massuwan Pongpramoon, Supanan Sucharit

Mahidol Wittayanusorn School, Nakhon Pathom, Thailand

ES11**HOW DOES CONTAMINATION AFFECT WATER AND WILDLIFE**

Arnau Gauchía, Sandra Fernández, Alexandra Membrilla

Mare de Deu del Carme, Spain

ES12**THE IMPACT OF CLIMATE CHANGE ON MARINE FISH POPULATIONS: A FOCUS ON COD (GADUS MORHUA) AND SEA BASS (DICENTRARCHUS LABRAX)**

Momijn de Fijter and Sophia Caljé

Maurick College, The Netherlands

ES13

ENHANCING SALMON MIGRATION IN DUTCH WATERS: IDENTIFYING OBSTACLES AND SOLUTIONS

Jesse Stienen, Matthijs Froklage, Seph van der Krabben, Mees Nieuwenhuis
Maurick College, The Netherlands

ES14

EFFICIENT WAYS TO COMBAT MICROPLASTICS IN WATER

Kaya van Pruijssen, Noor Voss & Sanne Schoutens
Odulphuslyceum, The Netherlands

ES15

THE EFFECT OF HOT SPRING WATER ON REDUCTION IN ETHANE EMISSIONS FROM RICE CULTIVATION

Miki Sato, Mio Ishihara, Saya Furukawa, Manaka Yamamoto
Shibuya High School, Japan

ES16

MUSSEL FARMING AS A TOOL FOR EUTROPHICATION CONTROL IN COASTAL WATERS

William Kjærsgaard, Marie Louise Petersen
Vordingborg Gymnasium & HF, Denmark

ES17

Coconut Fibre as an Effective and Reusable Biosorbent for the Removal of Edible Oil From Water

Raffles Institution, Singapore

STEWARDSHIP, POLICY AND SOCIAL SUSTAINABILITY

PS1

AN ANALYSIS OF SUSTAINABLE DEVELOPMENT POLICIES OF YANGTZE RIVER

Chenyijia Zhou, Zhining Song, Qingzi Huang, XueYun Liu
High School Attached to Wuhan University

PS2

Nurturing critical scientific thinking through STS education using the case of ALPS treated water

Yuri Nomoto, Momoka Komori, Qianye Zhang (Hina Cho)
Makuhari Senior High School

PS3

Sen's Approach to Improve The Capabilities of Fisherman in North Jakarta

Aurelie Shinele Florenza, Eleazar Nathaniel, Kathleen Lunna Lie
CYS, SMA Santa Laurensia Alam Sutera, Indonesia

TECHNOLOGY AND ENGINEERING FOR SUSTAINABILITY

TES1

WATER IS ESSENTIAL TO LIFE

Junpei Takahashi, Urara Teraoka, Hiyo Fujiki
Makuhari Senior High School, Japan

TES2

BEYOND THE GLASS

Pablo Fajardo, Marck Rodriguez
Collegi Mare de Deu del Carme, Spain

TES3

EUTROPHICATION, THE BIGGEST THREAT TO HEALTHY WATERWAYS

Olivier Mustert & Timme Schoonderwoerd
Odulphuslyceum, The Netherlands

TES4

FROM ALGAE TO ENERGY

Jaycie Bigley, Sam Ramaekers and Jip Reijnen
Odulphuslyceum, The Netherlands

TES5

SUSTAINABLE WATER DEVELOPMENT

Aaron Kiyama, Hanano Miyamoto, Junnosuke Tomita
Shibuya High School, Japan

TES6

Phytoextraction & Phosphorus Remediation: A Canadian Perspective on Water Pollution Mitigation

The Bishop Strachan School, Canada

TES7

Simultaneous Bioremediation of Wastewater and Generation of Electricity using Laccase enzyme from *Trametes versicolor*

Raffles Institution, Singapore

TES8

Medicine residue in water and the effect on *Daphnia*'s

Robert Bos, Goos Wieten, and Mees Dortland
Maurick College, The Netherlands

TES9

Potential of Encapsulated Garbage-Enzyme as Synthetic Dye Waste Bioremediation

Bryant Azura Pang, Clara Marie Felicia Fodianto, Clarissa Abigail Chandra CYS
Santa Laurensia Alam Sutera High School, Indonesia

STEM ENVIRONMENTAL SUSTAINABILITY

ES1

The Discovery And Practical Use of Dong Hu Park's Decontamination Principles

Ruixian Xie, Jingfei Yang, Zifei Yu
Chengdu No. 7 High School, China

Based on the successful experience of underwater ecosystem restoration project of Donghu Park in Chengdu, this study summarises the lower cost and more effective method of urban lake pollution control through the establishment of experimental model and the analysis of experimental data, and tries to apply it to the treatment of other polluted water bodies in the city, in order to reduce the treatment cost and increase its environmental benefit and to realise the virtuous cycle of regional ecology.



ES2

The Causes and Suggested Solutions of Water Pollution Caused By Planktonic Algae in Lakes- A Sample on a Certain Lake in Chengdu

Xiaoke Huang, Simeng Chen, Yueyi Ma
Chengdu No. 7 High School, China

This study investigates the causes of phytoplankton pollution in a lake in Chengdu, using it as a case study. Hypotheses were formulated based on field investigations, and experimental designs were implemented, employing a controlled variable approach, to validate these hypotheses. Finally, focusing on the identified issues, targeted remedial measures were proposed, with continuous efforts in practice to enhance their feasibility.

ES3

Leveraging Nature's Design: Optimising Non-Urban Sewage Treatment in Chengdu with Wetlands and Rain Gardens

Rui Xi Li, Xing Nuo Zhang, Si Han Yang, Yi Lin Miao
Chengdu No. 7 High School, China

Sewage disposal is a crucial aspect of urban development. Despite being a highly urbanised megacity, Chengdu still has over 90% of its area classified as non-urban. The cost of constructing sewage pipelines for centralised treatment in these areas is prohibitively high, and there are limitations in feasibility and efficiency. To address this issue, we have adopted the design principles of leveraging nature and proposed new sewage disposal strategies in the form of artificial wetlands and rainwater gardens.

In collaboration with relevant design experts, we collected water samples on site and created a miniature model of an artificial wetland. We employed professional methods to measure and analyse pollutant indicators, providing modification suggestions for the existing system. In conclusion, our study aims to contribute to sustainable sewage treatment practices in Chengdu by exploring the potential of artificial wetlands and rainwater gardens.



d'Oultremont
COLLEGE

ES4

Addressing the Issues around Sustainability of Drinking Water Supply

Shirin van Ballegooijen, Anoeck de Bonth and Isa verlee
D'outremont College - Netherlands

The Netherlands is known for its abundance of water, so access to clean drinking water may seem obvious, but behind this apparent abundance lies a growing problem. This issue has been looming for decades, yet unfortunately, the Netherlands has allowed it to persist without taking substantial preventive measures. We continue to use drinking water for purposes where alternatives exist, such as toilet flushing, irrigation, and other activities. Our drinking water is also becoming increasingly contaminated, with instances of microplastics in water, a significant PFAS issue, and companies contributing to this pollution. A substantial future population growth will lead to increased demand for water, surpassing the available supply.

Furthermore, groundwater, our most efficient method of producing drinking water, is becoming a scarce resource that may no longer be sustainable in the long term. This is because we discovered how scarce groundwater is too late. Recognizing these problems and guided by advice from companies addressing these issues, we have decided to create more awareness on how the new generation can mitigate the drinking water problem in our country. This involves conducting practical experiments, consulting with businesses and personal contacts, and conducting extensive research on alternatives abroad from which we can learn.

ES5

The Growth Of The Flat Oyster In Different Salinities

Nick Stoof, Esja Pleizier and Sam Briejer
D'Oultremont College, The Netherlands

The ocean provides biodiversity, absorbs greenhouse gases, and provides about half of the oxygen we breathe. Many marine animals depend on coral reefs or oyster reefs. Oyster reefs remove nitrogen compounds from the water and contribute to biodiversity. Unfortunately, oyster reefs are not doing well. They are disappearing because of overfishing and a predator called the oyster borer. We want to bring oyster reefs back to the Netherlands and other countries by investigating whether they can live in more extreme conditions.

We will accomplish this by releasing them in low and high salinity environments. They normally live in areas with salinities around 35‰. We are going to see if they can survive and grow at salinities of 10‰, 20‰, 30‰ and 40‰. Additionally, we will measure the oysters so we can observe growth. Our goal is to see if we can also release oyster reefs in areas with different salinities than they are normally used to.



ES6

Lead Contamination in Drinking Water: A Follow Up to The Flint Water Crisis

Saahith Reddy, Ada Gong, Katherine Chen, Achyut Reddy, Jocelyn Tian
Detroit Country Day school, USA

Recent climatic alterations have profoundly impacted water temperatures in the Great Lakes, calling for a detailed analysis to understand the breadth and implications of these changes. This study utilises extensive buoy data sets, providing continuous, almost instantaneous (data collection every six minutes), and high-resolution temperature readings, to quantify the temporal changes in the water temperature of the Great Lakes. By using Microsoft Excel for data processing and analysis, we aggregated buoy data by year using Pivot Tables. Our methodology includes importing data collected per year into Excel, aggregating the data, performing formatting procedures to ensure the data will be processable, and drawing conclusions to analyse the data after the processing. This study emphasises the value of buoy data in monitoring environmental changes and the essence of performing complex ecological data analysis. The results of this investigation hope to provide crucial insights into the varying temporal dynamics of the Great Lakes, with implications for local ecosystems, water management policies, and climate change mitigation strategies.

ES7

Effects of Air Pollution on River Ecosystems

Elsa Saffert & Christoff Lindauer
Dillmann-Gymnasium, Germany

Stuttgart, through its annual exceeding of the limits for nitrogen dioxide emissions, counts to one of the most polluted cities in Germany.

Hence, we question ourselves, what effects does this continuously changing air condition have on an ecosystem. Therefore, we examine a compact lake, called “Feuersee” in the centre of Stuttgart, which, due to the poor water conditions, gets emptied regularly.

Our inquiry wants to reveal the species which can endure in this hostile urban ecosystem, but also how critical the living condition in this contaminated water body is.

We will exhibit the certain flora and fauna within the confines of a city grappling with high levels of pollution.

This study aims to assess the water quality of the “Feuersee” using a diverse array of testing methods: Sedimentation rates will be measured to evaluate particle deposition, and turbidity will be examined using a photometer to quantify suspended particles. Furthermore, we want to determine the pH levels with test stripes to reveal the water acidity. Nitrate, chlorine, and other chemical concentrations will also be assessed through specialised test stripes.

Additionally, microscopic examination will identify aquatic microorganisms.

The type and quantity of plants and organisms in the lake will also be investigated, providing further insight into water quality.

This approach ensures a comprehensive understanding of the lake’s ecological health.

ES8

Sustaining East Lake: A Study on Environmental Development and Public Satisfaction

Yawei Bu, Yiran Du, Chengxin Geng, Ningxuan Zhang, Kexin Zuo
High School attached to Wuhan University, China

The East Lake in Wuhan, Hubei Province, China, boasts a profound history and rich cultural significance. This study is dedicated to advancing the sustainable development of the East Lake water environment. Our investigation included surveys and interviews with relevant personnel. We also used data which was collected and analysed on public satisfaction with governance outcomes in the East Lake area.

The results suggest that the water quality in East Lake has consistently improved each year, thanks to government funding, policy initiatives, and societal engagement. Recent years have witnessed a growing involvement of social forces, aligning with the nation's heightened focus on water resources and environmental awareness. As the importance of aquatic ecological preservation grows, there is a parallel rise in the national happiness index.

In essence, the local authorities prioritise the sustainable development of the East Lake water environment, implementing proactive measures. A collective effort from all segments of society is imperative for East Lake to forge a better and enduring future.

**MWIT**
Mahidol Wittayanusorn School

ES9

Purification of Fresh Water from Seawater Using Heat from Solar Energy and Percolation through Silica

Peeraya Saejia 1*, Khantharat Pinpisit 1, Supakorn Wongkularb 1, Usa Jeenjenkit 1,
Supan Yodyingyong 2

1 Mahidol Wittayanusorn School, Phutthamonthon, Nakhon Pathom, Thailand

2 Institute of Innovative Learning, Mahidol University, Phutthamonthon, Nakhon Pathom, Thailand

Due to the problem of water scarcity, a significant portion of the population is unable to access fresh water. Approximately 71% of the Earth's surface is covered by water with the majority 96.5% in seawater form. Only 3.5% is fresh water, suitable for consumption. If we could produce fresh water from seawater, it could significantly increase the available fresh water supply. Producing fresh water from seawater using reverse osmosis requires energy, involves complexity, and comes with high costs. This project aims to develop a low-cost invention for desalinating using evaporation and condensation methods. The experiment utilises hydrophilic porous silica synthesised from a sodium silicate solution. The silica's porous structure effectively transports seawater to its upper surface, and the insulation aspect of the design minimises energy loss, thereby expediting the evaporation process. To further optimise solar energy absorption and enhance the evaporation rate, carbon black is introduced into the silica structure during synthesis. This modification surpasses the original methods in efficiency and found that silica with 23% of carbon had an evaporation rate of 517.19 ml.hr⁻¹m⁻² which is higher than the ordinary method (300 ml.hr⁻¹m⁻²) and resulting in no problem of microorganisms, bacteria, and dust.

ES10**The Impact of Heat Waves to Dugesia Japonica Regeneration**

Kirida Korkiat^{1*}, Chaikasem-anan Chaikulnit¹, Napasrapee Poldech¹,
Massuwan Pongpramoon¹, Supanan Sucharit¹

Mahidol Witthayanusorn School, Phutthamonthon, Nakhon Pathom, Thailand

Heat waves, prolonged periods of high-temperature air, have well-documented impacts on the environment and humans, yet research on their effects on non-human species is limited. Our research focused on studying the effect of a heat wave on cell regeneration using planarians as models. Planarians are an animal from the phylum Platyhelminthes with a high ability to regenerate after amputation. To study the impact, *Dugesia japonica* was used as a regeneration model to examine the regeneration rate at different temperatures. Planarians were divided into three different parts: head, body, and tail, using the pharynx as a standard. All of them were incubated at two sets of different temperatures for seven days. The results showed that at 33°C and 35°C, planarians died within a few days. However, planarians could live and regenerate at 25°C and 30°C. The regeneration rate was higher at 25°C. The middle pieces, which include the pharynx, could regenerate more than other parts because of their greater amount of neoblasts. In conclusion, temperature affects the regeneration of planarians. Further studies will develop conditions representing heat waves to apply the regeneration of planarians.

**ES11****How Does Contamination Affect Water and Wildlife?**

Arnau Gauchía, Sandra Fernández, Alexandra Membrilla

Mare de Deu del Carme, Spain

Contamination has been the focus of research over the past few years, examining its impact on us in every possible way. What we as a society sometimes ignore is how this affects the other ecosystems, like the ocean. That is why our goal with this research is to increase our own awareness and the awareness of as many people as possible about every change we need to make if we want marine life to keep growing as it has always done. For this project, the main focus has been on the biological aspect, which involves how this problem impacts ocean wildlife. This especially includes some of the marine animals in the greatest danger from contamination as well as the different types of contamination that can cause a decline in wildlife.

In order to do this, we have also searched out the major consequences of this problem, and possible effects on the ocean and marine life if we don't take action, and why all this world is so important.

However, without some sort of solution, all efforts will be useless. That is why we are also providing some suggestions to extend the timeframe until a definitive solution is made by the most powerful forces, if there is any.

ES12

The Impact of Climate Change on Marine Fish Populations: A Focus on Cod (*Gadus morhua*) and Sea Bass (*Dicentrarchus labrax*)

Momijn de Fijter and Sophia Caljé

Maurick College, The Netherlands

Climate change is a major problem for the world's seas. The seas are becoming warmer due to climate change, which has major consequences for fish such as cod (*Gadus morhua*) and sea bass (*Dicentrarchus labrax*). These fish are important for people who fish and are important for the ecosystem they live in.

Because the sea is getting warmer, cod are moving to other places. This means there are fewer codfish in the places where they normally live. At the same time, more sea bass are found in these places. That may be because the quality of water and food are getting better for them. These changes are very important for the ecosystem and the economy. If there are fewer cod, it is bad for people who fish. It may also have an effect on how the ecosystem is balanced. More sea bass may offer new opportunities for fishery but will also cause new problems for the ecosystem. It is important to understand these changes and make smart plans to keep the sea healthy and protect the ecosystem and the fishery for the future.

 maurick college

ES13

Enhancing Salmon Migration in Dutch Waters: Identifying Obstacles and Solutions

Jesse Stienen, Matthijs Froklage, Sef van der Krabben, Mees Nieuwenhuis

Maurick College, Vught, the Netherlands

Our research focuses on the obstacles encountered by salmon during their migration from Dutch waters to the North Sea and vice versa, and on potential solutions to reduce these obstacles. These obstacles can range from physical barriers such as dams and sluices to pollution and changes in water temperature and quality. By identifying and understanding these obstacles, we aim to find ways to improve salmon migration routes and increase their reproductive success. Possible solutions include building fish passages, reducing water pollution, and improving overall habitat quality. By addressing these obstacles, we hope to strengthen salmon populations in Dutch waters and contribute to the conservation of this important fish species.

ES14

Efficient Ways to Combat Microplastics in Water

Kaya van Pruijssen, Noor Voss & Sanne Schoutens

Odulphuslyceum, the Netherlands

There is a steady increase in microplastics in water, which impacts people and the environment to a certain extent. We will investigate the influence of these microplastics by asking the following question: “What influence do microplastics in surface water have on aquatic organisms?” To answer this question, we will place water fleas (*Daphnia*) in different types of water during a certain period of time. We will introduce them into different concentrations of microplastics in tap water. We are going to determine the concentrations of microplastics by adding our own plastic "shavings" by the number of grams. We will then look at a possible change in heart rate of the water fleas. We will also look at the swimming speed and development of these organisms. We expect microplastics to have an influence on the water flea. Arno van 't Hoog writes in *The Visionair* (2017) that scientists have examined water fleas by putting microplastics into water. They observed that the water fleas ate the microplastics and subsequently grew less well or lost weight. By looking not only at growth, but also at the heart rate and swimming speed. We hope to see the correlation between these factors.



ES15

The Effect of Hot Spring Water on Reduction in Ethane Emissions from Rice Cultivation

Miki Sato, Mio Ishihara, Saya Furukawa, Manaka Yamamoto

Shibuya High School, Japan

Rice paddies currently produce 40% of Japan's total methane emissions. Methane is a greenhouse gas, as well as a hazardous pollutant, which is 28 times more potent at warming than carbon dioxide, contributing to global climate change. This research suggests a new sustainable agricultural method using Japanese hot spring water that contains iron in rice paddy fields. The presence of iron has been proven to interfere with methanogenic activity. Therefore, by using this hot spring water, this research aims to hinder the activity of methanogens (methane-releasing bacteria) found within rice paddies and establish a new method to reduce methane emissions during rice cultivation. This study will examine methane emissions from rice paddies under a controlled environment, using hot spring water that contains iron, as well as tap water. Throughout the growth process, methane gas levels will be measured and compared in order to understand the effects that iron-containing hot spring water has on methane emissions in rice paddies. It can be hypothesised that the total amount of methane released by the rice crops grown with hot spring water that contains iron will be less than those grown with plain water.

ES16

Mussel Farming as a Tool for Eutrophication Control in Coastal Waters

William Kjærsgaard, Marie Louise Petersen

Vordingborg Gymnasium & HF, Denmark

This paper examines the environmental challenges connected with eutrophication in Danish waters through an examination of the ability of blue mussels (*Mytilus edulis*) to filtrate water. Eutrophication characterised by an excessive concentration of nutrients in coastal marine habitats which leads to algae bloom, poses a significant ecological threat. Previous research has indicated that mussels can play a key role in the reduction of the algae concentrations. The purpose of our experiment was to show this theoretical ability of filtration under controlled laboratory conditions. We used recently collected blue mussels from the coastal area of Vordingborg, fed them *Rhodomonas* algae and measured the algae concentrations before and after exposing them to the mussels. The results indicated a moderate reduction in the algae concentrations after exposing them to the mussels, which indicates a certain degree of filtration. The results contribute to the scientific understanding of the potential of blue mussels in combating eutrophication. Even though the ability to filtrate was limited in this experiment, it supports the idea that mussels can be a part of the solution of the eutrophication problem as it provides practical evidence in support of theories of biological eutrophication control and emphasises the need for further studies to optimise the conditions for the filtration efficiency of the mussels.



ES17

Coconut Fibre as an Effective and Reusable Biosorbent for the Removal of Edible Oil From Water

Raffles Institution Singapore

Biochar is an effective material for the adsorption of many pollutants from water, including oil-based pollutants. However, heat-treatment of samples to form biochar and recollection after adsorption necessitates high production costs and energy consumption – hindering scalability. Therefore, we seek to prototype a biochar product for edible oil adsorption that is low-cost, accessible and reusable, while retaining superior adsorption capacity. In this study, coconut fibre samples with different degrees of heat-treatment contained in polyester material were prepared for repeated edible oil sorption, comparing the tradeoff between adsorption capacity, reuse effectiveness, and the simplification of adsorbent production (reducing or eliminating heat-treatment of samples). C250 and C500 samples were prepared by heating at 250 °C and 500 °C respectively, while C samples were not heat-treated. Elemental analysis of C, C250, and C500 samples showed carbon content of 65.5%, 71.1%, and 80.2% respectively. C, C250, and C500 samples exhibited initial oil adsorption capacities of 14 300 mg/g, 13 700 mg/g, and 12 500 mg/g respectively — the coconut fibres contained in polyester material system as a whole had adsorption capacities on par with commercial adsorbents. One-way ANOVA analysis revealed that the samples exhibited comparable adsorption capacity irregardless of heat-treatment. The Pseudo-second-order model provided the best fit to the kinetic studies of all samples, revealing chemisorption as the predominant adsorption mechanism. Reusability studies also showed that the C samples had a significantly higher reuse capacity than the other 2 samples. Thus, this investigation revealed the potential of raw unheated coconut fibre contained in polyester material as a low-cost, effective, and sustainable biosorbent for the remediation of edible oil-contaminated water.

**COMMUNITIES AND SOCIAL
RESPONSIBILITY**

AND

**STEWARDSHIP, POLICY, AND ECONOMIC
SUSTAINABILITY**

PS1

An Analysis of Sustainable Development Policies of Yangtze River

Chenyijia Zhou, Zhining Song, Qingzi Huang, XueYun Liu

Highschool Attached to Wuhan University

The Yangtze River, renowned as China's longest and the world's third-longest river, originates in the Tanggula Mountains and empties into the East China Sea, playing a crucial role as the cradle of Chinese civilization. This study delves into the evolving sustainable development policies of the Yangtze River, recognizing their contemporary relevance and positive influence on shaping China's emerging economic belt.

Our research integrates data collection, questionnaires for reliable insights, and on-site fieldwork to increase the depth of understanding. Structured into three key parts, our paper initially explores the historical changes in Yangtze River policy since China's founding, and outlines the content and factors driving these changes. Subsequently, we analyse the impacts of these policies on people's lives. The final section outlines a forward-looking vision for the sustainable development policies of the Yangtze River, emphasising their significance in fostering high-quality economic development.

This study highlights how sustainable development policies benefit the Yangtze River, emphasising their role in advancing economic prosperity. It also encourages active involvement in preserving the river, promoting a balance between economic growth and environmental conservation.



学校法人 渋谷教育学園
幕張中学校・高等学校
Makuhari Junior and Senior High School

PS2

Nurturing critical scientific thinking through STS education using the case of ALPS treated water

Yuri Nomoto, Momoka Komori, Qianye Zhang (Hina Cho)

Makuhari Senior High School, Japan

TEPCO began its initial release of 'ALPS (Advanced Liquid Processing System) treated water' in F1 (Fukushima Daiichi Nuclear Plant) in August 2023. As feared by the public, the news caused neighbouring countries to impose restrictions on Japanese seafood imports, a two billion dollar monetary loss to the market. Additionally, the time between the F1 disaster and release of treated water caused a massive delay in infrastructure reconstruction. Prior to the release, IAEA (International Atomic Energy Agency) reports suggested no adverse health issues would be caused from consuming Fukushima's marine products. However, misinformation from various media outlets caused the public, within and outside of Japan, to equate treated water as a highly contaminated substance, causing the reputational damage.

To reduce the recurrence of such reputational damage, our goal is to find a method to secure transparency of information, so that users can receive reliable information regardless of where they live. In order to research this, we will be looking into the differences in responses depending on the country or prefecture as well as the effect the 2011 F1 disaster had on the impression of treated water.

PS3

Sen's Approach to Improve The Capabilities of Fisherman in North Jakarta

Aurelie Shinelle Florenza, Eleazar Nathaniel, Kathleen Lunna Lie

SMA Santa Laurensia Alam Sutera

Email: adistia.kartika@santa-laurensia.sch.id

Indonesia possesses a vast abundance of maritime resources to support the growth of the country's fisheries industry, contributing 3.1% (2021) of the country's overall gross domestic product. However, the prosperity, otherwise ability amongst local fishermen to reach their full potential is still relatively low. This particular issue is signified by monthly income below the regional minimum wage, frequent conflicts with market intermediaries, inadequate infrastructure, despite the resources available. This in relation to Amartya Sen's capability approach shows limitations in their capabilities to achieve the functionings those resources provide. Such endeavors still seem to persist even with the presence of non-governmental organizations (NGO) advocating for the improvement of welfare amongst fishermen. As such this research aims to assess the possible factors that limit the capabilities of fishermen whilst investigating the efforts of local NGOs in developing those capabilities, and how the theory of Sen's capability approach can be applied to formulate a model by which the capability sets of local fishermen can be expanded. The data needed for this research will be obtained through a qualitative descriptive method through interviews and participant observation of selected fishermen within the vicinity of the Rumah Kerang organization in the Cilincing sub district situated in North Jakarta and representatives from the Indonesian Traditional Fishermen's Union (Kesatuan Nelayan Tradisional Indonesia).

TECHNOLOGY AND ENGINEERING FOR SUSTAINABILITY

TES1

The Research of New Water Purification Technology by the Use of Natural Power

Junpei Takahashi, Urara Teraoka, Hiyo Fujiki
Makuhari Senior High School, Japan

Water is essential to life. Today, approximately 2.2 million people in the world die annually from unsanitary water. In order to reduce these risks, the aim of this study is to suggest new innovations in water purification technology. There are a number of problems that prevent these advanced technologies from actually being introduced and becoming solutions.

The first problem is the large installation and maintenance costs. The more advanced the technology, the higher the cost and the more maintenance is required. The second is a technical problem. No purification technology can remove all contaminants perfectly. Differing environmental conditions will often force new technology to be developed, creating a major hardware burden. This creates another third problem. The tendency to be satisfied with a problem's conditions or solutions often hinders the ability to reach a fundamental solution. For example, developing country A successfully purifies water with bacillus subtilis natto so does not perform the necessary process of filtration. In another example, developed country B is satisfied with the purification process and so does not notice industrial water problems.

Our goal in developing new water purification technologies is to solve all of these problems in one, streamlined process.



TES2

A Sustainable Aquarium Project as an Environmental Educational Tool

Pablo Fajardo, Marck Rodriguez
Mare de Deu del Carme

Beyond the Glass, a groundbreaking sustainable aquarium project. This initiative goes beyond the traditional aquarium concept to emphasise environmental protection, ecological balance and community engagement. The aquarium would use advanced technologies such as efficient water filtration, lighting systems and sustainable building materials to ensure optimal conditions for marine life while minimising its environmental footprint. By emphasising natural habitats, Beyond the Glass would not only showcase the beauty of the ocean, but it would also promote the well-being of the species that live there.

In addition to its commitment to sustainability, Beyond the Glass would have an educational center offering programs and exhibitions that raise awareness of ocean conservation and biodiversity. We would partner with local institutions to enhance its impact and allow it to act as a catalyst for positive change.

The project's success would depend not only on economics but also on its contribution to public awareness, marine research and conservation efforts. By inspiring visitors to become stewards of the ocean, Beyond the Glass demonstrates the potential for entertainment spaces to play a key role in environmental protection and demonstrates the harmonious blending of technology, ecology and community engagement in pursuit of a more sustainable and inspiring future.

TES3

Eutrophication, The Biggest Threat to Healthy Waterways

Olivier Mustert & Timme Schoonderwoerd

Odulphuslyceum, the Netherlands

Beyond the Glass, a groundbreaking sustainable aquarium project. This initiative goes beyond the traditional aquarium concept to emphasise environmental protection, ecological balance and community engagement. The aquarium would use advanced technologies such as efficient water filtration, lighting systems and sustainable building materials to ensure optimal conditions for marine life while minimising its environmental footprint. By emphasising natural habitats, Beyond the Glass would not only showcase the beauty of the ocean, but it would also promote the well-being of the species that live there.

In addition to its commitment to sustainability, Beyond the Glass would have an educational centre offering programs and exhibitions that raise awareness of ocean conservation and biodiversity. We would partner with local institutions to enhance its impact and allow it to act as a catalyst for positive change.

The project's success would depend not only on economics but also on its contribution to public awareness, marine research and conservation efforts. By inspiring visitors to become stewards of the ocean, Beyond the Glass demonstrates the potential for entertainment spaces to play a key role in environmental protection and demonstrates the harmonious blending of technology, ecology and community engagement in pursuit of a more sustainable and inspiring future



TES4

From Algae to Energy

Jaycie Bigley, Sam Ramaekers and Jip Reijnen

Odulphuslyceum, the Netherlands

We are all well aware of the global energy problem; the greenhouse emissions are currently harming our planet. One of the modern day solutions is solar panels. Solar panels are typically made out of silicon. When exposed to sunlight photons, silicon releases electrons that generate an electric charge. The silicon in solar cells is produced through a reduction process that involves significant, water and hazardous chemicals. Which can be harmful to the environment. We are looking to innovate the solar panel by using algae. The key to algae's potential as a new energy source lies in their use of photosynthesis, during which electrons are produced. Algae produces electrons in this process. By splitting water molecules, the oxygen atoms are released into the air, while the H^+ atoms produce an electron during this process. These electrons can be transferred using an aluminium anode and copper cathode. We will conduct research to determine if this process can be used to create an effective solar panel and serve as a new source of green energy.

TES5

Sustainable Water Development

Aaron Kiyama, Hanano Miyamoto, Junnosuke Tomita
Shibuya High School, Japan

Water-based infrastructure is an integral component of sustainable cities. Yet many coastal and waterfront city populations, especially those in developing nations, are faced with the danger of global sea level rise (SLR) resulting from climate change, which continues to affect more than 600 million people worldwide.

This study will examine the applicability of Japan's water diversion technology, including state-of-the-art infrastructure such as the Metropolitan Area Outer Underground Discharge Channel, in cities that are projected to be submerged in the near future per the Intergovernmental Panel on Climate Change (IPCC) 6th Assessment Report (AR6), chiefly the capital region of Dhaka in Bangladesh. We will also analyse results from previous examples of Japan's successes and failures in flood mitigation and prevention, as well as look at the possible modern-day suitability of traditional Japanese expertise in coexisting with water.

We hypothesise that a combination of both new and old technologies will have a positive effect on upholding the cultures that have thrived around rivers and oceans. Such action with both immediate and long-term repercussions is needed to stop these vulnerable areas from becoming permanently uninhabitable and causing irreparable damage to the well-being of citizens.



THE BISHOP STRACHAN SCHOOL

TES6

Phytoextraction & Phosphorus Remediation: A Canadian Perspective on Water Pollution Mitigation

The Bishop Strachan School

This paper delves into phytoextraction, a component of phytoremediation, presenting an environmentally conscious approach to address water pollution, specifically targeting elevated phosphorus levels within Canada. Historically plagued by water pollution from various sources such as urban and agricultural runoff, Canada's waters face excess phosphorus, leading to issues like eutrophication and algae blooms. Phosphorus is essential for plant and aquatic life but in excess, it can disrupt aquatic ecosystems. This paper focuses on the application of phytoextraction to mitigate phosphorus levels, with an emphasis on native plants in Canada. Through cultivating and testing native wetland plants, the study aims to identify effective native specifically for phosphorus accumulation, offering a sustainable alternative to conventional remediation methods. Moreover, it also attempts to highlight the significance of preserving and utilizing indigenous flora. Beyond its localized application, this research aspires to create a cost effective approach to combat water pollution, extending its implications to other water bodies. Understanding the importance of phosphorus balance is integral in developing strategies that maintain ecological harmony while addressing pollution concerns.

TES7

Simultaneous Bioremediation of Wastewater and Generation of Electricity using Laccase enzyme from *Trametes versicolor*

Raffles Institution Singapore

Industrial effluents are one of the main sources of water pollution in Singapore, and dye pollution is prevalent in neighbouring countries Malaysia and Indonesia. As textile industries heavily dispose of their dye in wastewater with the increase in textile production demand, Singapore's waters stand a high risk of even more dye pollution. Therefore, it is essential for textile industries and even wastewater treatment facilities to treat dye-polluted water more efficiently before disposing of them. As Singapore is small, it lacks natural energy resources, and it is thus important to find renewable and sustainable sources of electricity. This study explored a possible prototype in which laccase enzyme from *Trametes versicolor* was identified for simultaneous bioremediation of wastewater and generation of electricity. The effect of the concentration of fabric dyes and different pH levels of the solution was investigated by determining enzymatic activity. Different concentrations of dye were used in the first experiment in which the average voltage and absorbance level of each setup was measured. Different pH levels of the solution were used in the second experiment in which the average voltage and absorbance level of each setup was also measured. Our findings showed that the laccase enzyme is able to bioremediate wastewater at dye concentrations of up to 20% and at pH 5.0, while simultaneously generating electricity. These results can potentially be utilised by textile industries to bioremediate wastewater and generate electricity in optimum environments.

maurick college



TES 8

Medicine residue in water and the effect on *Daphnia*'s

Robert Bos, Goos Wieten and Mees Dortland

Maurick College, The Netherlands

Drug residues in water are a growing problem that impacts the environment and animal health. As people use more and more medications, their remains inadvertently end up in waters such as rivers and lakes. These residues, which are created, for example, by flushing or discharging medicines, pose possible risks to animals in the water and possibly also to humans. To tackle this problem it is important to understand where the drug residues come from, how they spread and what the possible consequences are and how we can reduce them

TES9

Potential of Encapsulated Garbage-Enzyme as Synthetic Dye Waste Bioremediation

Bryant Azura Pang, Clara Marie Felicia Fodianto, Clarissa Abigail Chandra
Children of Eco-Enzyme, Santa Laurensia Alam Sutera High School, Indonesia

59% of 564 river areas in Indonesia are severely polluted. One of the causes of this pollution comes from synthetic dyes. These dyes can harm the environment and human health as they produce non-biodegradable waste and contain pathogenic bacteria. In order to optimize bioremediation potential of garbage enzymes which are known to already have bioremediating abilities, encapsulation method by extrusion process was chosen. To determine this, different variations of encapsulated garbage-enzymes concentration (0.1%, 0.5% and 1%) are used, while a non-encapsulated garbage-enzyme is used as the control. These encapsulated garbage-enzymes will be tested for growth towards synthetic dyes, comparing its performance with non-encapsulated garbage-enzymes. The indicators of these tests include pH, total dissolved solid (TDS), conductivity, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), and UV-Vis spectrophotometry with Nessler's reagent to test for ammonia. Optimum encapsulated garbage-enzyme concentration will be tested on the environment.