

# TRPNP 2021

## Online International Seminar

December 11 - 12, 2021

3<sup>rd</sup> ASEAN - Japan Meeting Point of  
Collaboration by Stakeholders and Researchers  
for Reducing Environmental Problems  
in ASEAN Countries

## Seminar Book

Prevention  
and  
Reduction of  
Natural  
Disasters

1



Improvement  
on Urban  
Environmental  
Problems

2



Environmental  
Preservation  
and  
Sustainable  
Development

3



Prevention  
and Reduction  
of NCDs by  
Functional  
Food and  
Health Control

4

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Kagawa  
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# Table of Content

Preface	4
About TRPNEP Seminars	7
<b>Special Lecture</b>	8
BCG Economy and Product Development	9
Professor Patchanee Yasurin, Dean, Theophane Venard School of Biotechnology, Assumption University (Thailand)	
<b>Oral Presentations</b>	10
From Shrimp Shell Waste to Chitosan as Versatile Biomaterials for Food and Pharmaceutical Applications	11
Dr. Waralee Watcharin, Assumption University (Thailand)	
Tracking Community Infection Dynamics of COVID-19 by Monitoring SARS-CoV-2 RNA from Wastewater	12
Dr. Masaru Ihara, Kochi University (Japan)	
Flood Risk Management in Urban Drainage System Based on QPE by Weather Radars	13
Mr. Nakazawa, Kochi University (Japan)	
Ecological Risk from Antibiotics in Pig Farming and Its Mitigation During Pond Treatment in Thailand	14
Dr. Rathborey Chan, Institute of Technology of Cambodia and Kasetsart University (Thailand)	
Water Demand Management for Industrial and Urban Areas in Eastern Economic Corridor (EEC) Zone in Thailand	15
Prof. Chavalit Ratanatamskul, Chulalongkorn University (Thailand)	
Evaluation of Persistent Organic Pollutants in fish of Tonle Sap Lake, Cambodia	16
Dr. Phoeung Chanleakhena, University of Health Sciences (Cambodia)	
Natural Disasters in the ASEAN Region: Approach for Prevention and Reduction Measures	17
Dr. Shafi Noor Islam, Universiti Brunei Darussalam (Brunei Darussalam)	
Development of Telemedicine Network System in Kagawa and Its Global Implementation	18
Professor Hideto Yokoi, Kagawa University (Japan)	
Cardioprotective Effect of D-allulose in Prediabetes is Through Cardiac Mitochondrial Protection	19
Professor Nipon Chattipakorn, Chiang Mai University (Thailand)	
Study on the Impact of the New Operation Rules on the Safety of Wonogiri Multipurpose Dam	20
Tira Arifah Kusuma Dewi, Universitas Gadjah Mada (Indonesia)	
Applications of LPWAN Technology in Slopes and Rivers for Disaster Mitigation	21
Achmad Hafidz, Ehime University (Japan)	

Thoron (Rn-220) Exhalation Rate from Soil Building Material into Room Air of Earthen Dwellings	22
Dương Nguyen-Thuy, VNU University of Science, Vietnam National University (Vietnam)	
The Potential of Indonesian Tuber and Traditional Food as Immunomodulatory Functional Foods	23
Sellen Gurusmatika, Ehime University (Japan)	
<b>Display Booths</b>	24
Overview of Experiments in Rock Mechanics Laborator	25
Achmad Hafidz, Ehime University	
Experiment to Purify Turbid Water with Sheet-shaped Kapok Fiber Using an Artificial Channel	26
Kenji OKAZAKI, Civil Engineering Research Institute for Cold Region, Public Works Research Institute	
The Construct Methods of Steel Pipe Pile Bridge and Overseas Business Development	27
Chen Li-Ting, Kochi Marutaka Co.,Ltd.	
ASTRAEA Allulose – Functional Rare Sugar That Provides People’s Wellness and Healthy Life	28
Rikitaro Watanabe (Mr.) / Shigehiro Hayashi (Mr.), Matsutani Chemical Industry Co., Ltd.	
Perinatal telemedicine platform Melody i and Mobile Fetal Monitor iCTG	29
Yhuko Ogata, Melody International Ltd.	
A Recent Case of a Natural Disaster in Japan (Debris Flow and River Flooding Caused by Heavy Rain)	30
Kazunari Kimura, Naiba Co., Ltd.	
Green Technologies for Environmental Remediation in Vietnam: Some Case Studies from Laboratory to Pilot Scale	31
Nguyen Thi Hoang Ha, VNU University of Science	
Research Opportunities with the Universiti Brunei Darussalam	32
Assoc. Prof. Dr. Basilios Tsikouras, Universiti Brunei Darussalam	
Microwave Pyrolysis of Plastic Waste into Fuel	33
Dr. Shaifulazuar Bin Rozali, Universiti Malaya	
Thermoelectric Energy Harvester for Self-Powered Smart Window Application	34
Faiz Salleh, Universiti Malaya	
Study of Water Contact Angle on the Temperature and Productivity of Solar Still	35
Nursyahirah Mohd Shatar, University of Malaya	
Kennarey Seang_University of Health Sciences	36
Kennarey Seang, University of Health Sciences	
SRIREP Project, Research Institute for Humanity and Nature (RIHN)	37
Myo Han Htun, SRIREP Project, Research Institute for Humanity and Nature (RIHN)	

# Preface

## About TRPNEP

In recent years, the ASEAN countries have been developing the concerns towards problems such as "frequent natural disasters", "urban environmental problems", "environmental disruption and pollution caused by overexploitation of natural resources" and "health problems derived from environmental problems and food safety as well as the ill-responsive regional health care due to these problems" in along with their economic growth. And these raised the awareness on "sustainable usage of resources", "environmental problems which cross the borders" "safety and security of global food and health" of developed countries, and the importance of endeavor for border-crossing common problem have been acknowledged. In order to solve these problems, transdisciplinary research (TDR) among Japan and ASEAN countries is essential.

Therefore, three Japanese universities: Ehime, Kagawa and Kochi universities and the universities of ASEAN countries: Indonesia, Vietnam, Thailand, Myanmar, Malaysia and Brunei will be exchanged and collaborated to evaluate each scientifically and practically discover the comprehensive solution by TDR for recent years' various natural disasters which have been a problem, the deteriorating urban environmental problems, damaged resources and disruption of nature caused by environmental pollution and development, and current situation of health problems caused by poverty as well as environmental degradation of ASEAN countries. This research activity will also increase the possibility for young researchers in performing the independent research at their home countries in future.

Our research are supported by Japan Society for the Promotion of Science (JSPS).



Stephan Müller PEXEL  
pexel.com



## Transdisciplinary Research

TDR research will be performed for implementing the specific research method and comprehensive solution for characteristic as well as urgent environmental problems of targeted country and social issues derived from these environmental problems:

- Prevention and Reduction of Natural Disasters (volcanoes, earthquake and tsunami, floods, slope disaster, etc.) and prevention and reduction of disasters
- Improvement on Urban Environmental Problems (ground subsidence, water pollution inland and sea areas, garbage problem, etc.)
- Sustainable development and environmental preservation (overexploitation of natural resources, land and sea areas pollution due to mineral resources development, etc.) and
- Food safety and health (handling the health problem due to poverty and environmental degradation).



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## Specialized Fields of Collaborative Research

- |  |                                      |
|--|--------------------------------------|
| Global Environmental Science               | Cell Physiology                      |
| International Law                          | Public Health                        |
| Regional Studies                           | Pediatrics                           |
| Oceanography                               | Medical Informatics                  |
| Environmental Restoration Science          | Public Policy                        |
| Applied Geology                            | Industrial Development               |
| Safety and Occupational Health Engineering | Catalyst and Resource Chemistry      |
| Rock Mechanics                             | Marine Environmental Studies         |
| Immunology                                 | Aquatic Ecology                      |
| Agricultural Chemistry                     | Environmental Water Quality          |
| Food Science                               | Sediment and Hydraulics              |
| Functional Food Science                    | Sewer Engineering                    |
| Resource Production                        | Basin Water Environmental Management |
| Educational Science                        |                                      |

## Significance of TRPNEP Network

In the past, the series of research exchanges have been conducted between 3 Japanese Universities (Ehime, Kochi and Kagawa) and some of universities from the ASEAN countries: 1) Brunei Darussalam, 2) Cambodia, 3) Republic of Indonesia, 4) Malaysia, 5) Republic of the Union of Myanmar, 6) Kingdom of Thailand and 7) Vietnam and the research results have been published in prominent international journals and received the high evaluations by domestically and internationally. However, many of the research projects were monodisciplinary or multidisciplinary, and the presentation of the path to social problem solving by TDR and its implementation have not been made. The research has been performed independently in the fields and organizations but have not conducted as a wide range of research exchange cross-departmentally with the field of social science and science.

Therefore, in this project, Ehime University will become the hub of dispatching the information related to research and cooperation and will construct the ASEAN TDR network of environmental problems by utilizing the past advanced research results to develop TDR that leads to solving environmental problems and related problems.

The results obtained from the research exchange with ASEAN countries by this project will contribute to further improvement of the level of research in this field, and also contribute to the development of problem-solving TDR in Asia. In addition, further expansion of academic and human exchanges is expected as the network of TDR exchanges centering on ASEAN countries to spread further. Through such research exchanges, it is possible to be able to train and produce the necessary human resources for promoting research on environmental science of integrated humanities and sciences, which in turn leads to an improvement in the standards of science and education and research in the developing countries.

Research collaboration between researchers from Japan and ASEAN universities are as follow.

### Japan

Ehime University  
Kagawa University  
Kochi University

### Brunei Darussalam

Universiti Brunei Darussalam  
RIPAS Hospital  
Health Promotion Unit, Ministry of Health

### Cambodia

University of Health Sciences Cambodia

### Republic of Indonesia

Bandung Institute of Technology  
Gadjah Mada University  
Bogor Agricultural University  
State University of Gorontalo

### Malaysia

University of Malaya

### Republic of the Union of Myanmar

University of Medicine 1  
Myanmar Maritime University  
Yangon Children's Hospital

### Kingdom of Thailand

Chiang Mai University  
Kasetsart University  
Chulalongkorn University  
Rajamangala University  
Assumption University

### Vietnam

Vietnam National University  
Nong Lam University

## About TRPNP Seminars

To make better outcomes for the societies and reduce environmental problems, we have been holding TRPNP Seminars as a meeting point for the collaboration between stakeholders and researchers of Japan and ASEAN countries since 2018.

The purposes of those seminar are 1) to make more informative and worthwhile about the understanding of environmental and health issues in ASEAN countries, 2) to share, discuss, exhibit, and exchange your experience expertise, and innovation, and the outcomes of transdisciplinary research and practice, and 3) to engage for future collaborations between/ among scientists and researchers, and other non-academic stakeholders from the private and public organizations for the reduction of environmental and health problems in Southeast Asia.

The 1<sup>st</sup> TRPNP Seminar (TRPNP 2018) was held at Bandung Institute of Technology (ITB), Bandung, Indonesia on December 8 ~ 9, 2018. The 2<sup>nd</sup> TRPNP Seminar (TRPNP 2019) was held on December 11, 2019 at Hilton Nay Pyi Taw Hotel, Nay Pyi Taw City, Myanmar.

This 3<sup>rd</sup> TRPNP Seminar (TRPNP 2021) is organized by TRPNP Steering Committee members: Ehime University, Kagawa University, and Kochi University of Japan, and Research Institute for Humanity and Nature (RIHN), and sponsored by Japan Society for the Promotion of Science (JSPS).

TRPNP 2018



Professor Masayuki Sakakibara gave opening speech at TRPNP 2019 Seminar.



Professor Masaaki Tokuda explained and discussed with Union Minister U Ohn Win, Ministry of Natural Resources and Environmental Conservation (MONREC) at Kagawa University's display booth in Nay Pyi Taw, Myanmar.





# Special Lecture



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pexel.com



# BCG Economy and Product Development

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**Abstract:** Moving forward, the Thai government is planning to implement the BCG (Bio-Circular-Green) Economic Model as its main national agenda. The BCG model exploits Thailand's strengths in biological diversity and cultural richness and employs technology and innovation to transform Thailand to a value-based and innovation-driven economy. Thailand's four strategic areas for the BCG model are based on her economic foundation and strengths namely, (1) food and agriculture; (2) medical and wellness; (3) energy, material, and biochemicals; and (4) tourism and creative economy. Thailand hopes to achieve comprehensive security in key areas of food, health, energy, employment and sustainable natural resources and environment.

**Keywords:** BCG; Food; Innovation.

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Category: **Environmental Preservation and Sustainable Development**  
**National Security for Food and Health**

# Oral Presentations



Ron Lach PEXEL  
pexel.com

# From Shrimp Shell Waste to Chitosan as Versatile Biomaterials for Food and Pharmaceutical Applications

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**Abstract:** Shrimp-shell waste is generated in a large volume from the increasing consumption of seafood and shrimp processing industries. It can result in waste collection and disposal problems. In this study, the shrimp-shell waste is further utilized to produce chitosan which exhibit unique biological and chemical properties including biocompatibility, non-toxicity, antitumor and antioxidant activities. Chitosan has been employed in the development of nanocarriers as polymeric coating materials to provide a steric barrier to prevent nanoparticle agglomeration and prolong pathological inflammation. Nanoencapsulation of curcumin into chitosan was studied to enhance bioavailability of bioactive compound curcumin. The curcumin incorporating with folate-chitosan nanoparticles was prepared by ionotropic gelation and carbodiimide reaction. The particle size and polydispersity index (PDI) were measured by Dynamic Light scattering (DLS). The encapsulation and loading efficiency of the resulting particles were analyzed and the antioxidant activity and phenolic content were also evaluated by DPPH scavenging assay and total phenolic content assay. The results indicated that encapsulation of curcumin using folate-chitosan nanoparticles could provide advantages for functional food applications.

**Keywords:** Shrimp-shell waste; Chitosan; Nanoparticles.

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Category: **Environmental Preservation and Sustainable Development**

# Tracking Community Infection Dynamics of COVID-19 by Monitoring SARS-CoV-2 RNA from Wastewater

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**Abstract:** Wastewater-based epidemiology was reported to be useful to monitor the COVID-19 infection dynamics in the community. However, in some countries, mainly unquantifiable data were collected due to low concentrations of the SARS-CoV-2 RNA in wastewater. How to get meaningful information in WBE in low prevalence area is still key challenge. Here we used the real-time RT-PCR (RT-qPCR) to monitor SARS-CoV-2 RNA in wastewater from October 2020 to February 2021 during the third wave of the COVID-19 outbreak in Japan. At first, we tested a pattern of positive and negative results in qPCR when initial oligo DNA including CDC-N1 target was 0.1 to 20 copies/reaction, and confirmed that positive counts obtained by qPCR of these samples show excellent concordance with the those expected from the Poisson distribution, i.e., the lower the copy number of oligo DNA, the lower the positive ratio of qPCR was. This result indicates that, by counting positive reactions in repeated qPCR, we could monitor the changing of the SARS-CoV-2 RNA level in wastewater even they are unquantifiable level. Then we applied the positive count method to wastewater. Viral RNA was below the limit of quantification for all wastewater samples. However, the positive ratio in wastewater showed significant correlations with number of clinically confirmed cases by the date of symptom onset in the community. Positive count method is thus useful to trace the COVID-19 dynamics in the low prevalence area.

**Keywords:** SARS-CoV-2; early warning; wastewater; qPCR; positive ratio.

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Category: **National Security for Food and Health**



# Flood Risk Management in Urban Drainage System Based on QPE by Weather Radars

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**Abstract:** Urban flooding following extreme weathers and heavy rainstorms is one of the most challenging problems in the world. Progress of global warming makes the problem more and more serious. We are planning the development of total management system for the decreasing of urban flood risks. The system is composed of flow monitoring in urban sewers and receiving streams, and real time quantitative precipitation estimation (QPE). The former is achieved by a series of pressure-type water level gauges, and the latter is measured by polarimetric radars. The test field was located in Kochi City of Shikoku Island, Japan. Although the sewer system in this area was designed with a rather high standard and was able to clear pluvial flooding for an hourly rainfall event of 77mm, the residents suffered from flood disasters in the past years. We are also trying to establish the relationship between QPE nowcast and the change of water levels in the drainage system. In this presentation, we will introduce the concept and outline of our management system and our initial results.

**Keywords:** Flood control; Sewer system; Weather radar.

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Category: **Prevention and Reduction of Natural Disasters**

# Ecological Risk from Antibiotics in Pig Farming and Its Mitigation During Pond Treatment in Thailand

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**Abstract:** The objective of this study is to investigate ecological risk posed by antibiotics contaminated in pig farm wastewater and their mitigation during pond treatment. Ecological risk of antibiotics to fish, daphnia, and green algae was evaluated for raw wastewater and effluent from final pond. Risk quotient (RQ) reflecting ecological risk of antibiotics to aquatic species were calculated using measured concentrations and predicted no-effect concentration, which was determined by dividing no-observed effect concentration value by assessment factor. The concentration of no-observed effect was estimated using chronic value generated from an ecological structure-activity relationship model. The risk was divided into three categories: high ( $RQ > 1$ ), medium ( $0.1 < RQ < 1$ ), and low ( $0.01 < RQ < 0.1$ ). Among all investigated antibiotics, doxycycline, tilmicosin, and amoxicillin were found at higher concentrations in wastewater (12-459.1  $\mu\text{g L}^{-1}$ ), whereas those predominant antibiotics were still remaining in pond water up to 79.5  $\mu\text{g L}^{-1}$ . At those observed concentrations, doxycycline in wastewater posed medium risk to the fish ( $RQ=0.47$ ) and high risk to daphnia ( $RQ=1.13$ ) whereas it provided insignificant risk to algae ( $RQ=0.0081$ ). Meanwhile, tilmicosin posed high risk to all aquatic organisms with RQ values of 2.04-3.46. The organisms had low risk to amoxicillin and tiamulin ( $RQ=0.016-0.08$ ) with exception of daphnia which had moderate risk to tiamulin ( $RQ=0.11$ ). After pond treatment, remaining tiamulin concentrations in the effluent posed medium ecological risk to all aquatic organisms ( $RQ=0.27-0.58$ ) whereas that of tilmicosin was also reduced to medium level ( $RQ=0.23-0.39$ ). The risks of amoxicillin and doxycycline was kept at no to medium levels ( $RQ=0.008-0.17$ ). The pond treatment of pig farm wastewater could deviate some ecological risks from residual antibiotics but the discharge of final pond effluent could still pose some risks to natural living organisms.

**Keywords:** Pig farm, residual antibiotics, pond treatment, ecological risk.

Category: **Improvement on Urban Environmental Problems**

# Water Demand Management for Industrial and Urban Areas in Eastern Economic Corridor (EEC) Zone in Thailand

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**Abstract:** Water demand for industrial and urban areas in EEC zone is rising more in the future when full development is achieved. At present, industrial, tourism, urban water demand in three provinces of EEC area has reached higher than 800 million cubic meter per year. For next 20 years, the water demand will be higher than 1,000 million cubic meter per year. Therefore, water shortage will occur if without new alternative water resources. The objective of this research is to manage water demand by water reduction, saving and wastewater reclamation for the EEC area. From the research investigation and data analysis for domestic, service and industrial sectors, the appropriate wastewater treatment and recycling for urban area can be suggested for 3 models as a large scale wastewater treatment with water recycling unit; a cluster wastewater treatment with water recycling unit for small-scale community; an individual on-site wastewater treatment and water recycling unit for office and commercial buildings. High potential of water demand management will be achieved for water saving of 600 million cubic meter per year in 2020 when water consumption can be reduced by 15% for industrial sector, 10% for service sector and 10% for agricultural sector together with urban wastewater recycling in the case of 7 large cities in EEC with large volume of wastewater (larger than 40,000 m<sup>3</sup>/day). Moreover, legal and economic measures are also important to support the water saving and wastewater reclamation policy for efficient water demand management in EEC zone.

**Keywords:** water demand management; EEC zone; water saving; wastewater reclamation; legal and economic measures.

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Category: **Improvement on Urban Environmental Problems**

# Evaluation of Persistent Organic Pollutants in fish of Tonle Sap Lake, Cambodia

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**Abstract:** Few studies have investigated the bioaccumulation of persistent organic pollutants (POPs) in fresh water fish of Tonle Sap lake, Cambodia. The bioavailable of POPs was studied in fish muscle collected from 4 regions around Tonle Sap Lake in Cambodia. The persistent organohalogen compounds including organochlorine pesticides (OCPs), polychlorinated biphenyls (PCBs) and polybrominated diphenyl ethers (PBDEs) were determined. The analytical procedure involved the application of organic solvents extraction followed by Florisil clean-up and gas chromatography with mass spectrometry detector (GC-MS) for identification and quantification. The preliminary results showed amounts of persistent organic pollutants (POPs) in fish muscle with predominance of pp'-DDT, PCBs and BCPS. The total concentrations are ranged from 0.00 to 3.70 ng/g for pp'-DDT, from 0.00 to 9.99 ng/g for PCBs and from 0.00 to 0.86 ng/g for BCPS. The mean concentrations of the detected compounds were below the permissible levels proposed by the FAO. Therefore, the present data suggests and motivates further chemical and biomonitoring studies in freshwater ecosystems of Cambodia Tonle Sap Lake.

**Keywords:** Persistent organic pollutants; Fish; Tonle Sap lake; Cambodia.

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Category: **Environmental Preservation and Sustainable Development**  
**National Security for Food and Health**



# Natural Disasters in the ASEAN Region: Approach for Prevention and Reduction Measures

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**Abstract:** Natural disasters are the global threats to sustainable nature, culture, and economic growth and development. The natural disasters in the Association of South East Asian Nations (ASEAN) region have historically impacted the society and economy of the countries in the region. South East Asia and Asia-Pacific oceanic region is a huge region where 60 % of people live within 60 km range from the coast. ASEAN is a political platform where ten countries are located within the Asia-Pacific oceanic region: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam, is geographically located in one of the most disasters prone region of the world. ASEAN region covers an area of 4.48 million sq km, and has a total 661.5 million inhabitants (2020) and they live within the region and fight against natural hazards and disasters. ASEAN region sits between several tectonic plates causing earthquake, volcanic eruptions and Tsunamis. The region is also located in between two great oceans namely Asia – Pacific and Indian oceans causing seasonal Typhoons and in some areas Tsunamis. The characters of natural disasters, which are the most common natural threats for the people of the ASEAN region and the East Asian States, are cyclones, tornados, earthquakes, thunderstorms, haze, forest fire, floods, landslides, Sea Level Rise (SLR), river bank and coastal erosion, salinization, and health hazard (COVID-19 Pandemic).

Global warming and climate change represent current threats for the region. Due to global warming and the effects of Sea Level Rise, the resulting vulnerability of coastal offshore, shoreline, and oceanic ecosystems are the additional factor that needs to be considered urgently. Asia and ASEAN region at relatively high risk from multiple hazards. The annual economic losses of Asia-Pacific regional riskscape are US \$ 675 billion, and loss comes from the impacts of the following natural hazards and disasters like Tsunami- 8%, Floods -8%, Tropical Cyclone 12.8%, Earthquake 13.6 %, Drought-60%. Earthquakes, Tropical Cyclones, Floods, Landslides, Forest fires, Volcanic eruptions, and Natural disasters in the region have caused slow economic growth, displacement, in many instances frequently, forcing people to migrate now and then.

Based on the present vulnerable situation, a comprehensive strategic partnership approach is needed between the ASEAN region and the geographically territorial members of the Asia-Pacific and Indian ocean like Japan, South Korea, China, India, Russia, USA, Australia, and New Zealand. The capacity building initiatives and the sharing of expertise and experiences among the member countries could prevent and reduce the vulnerability of natural disasters and ensure the health and life security and economic prosperity in the Asia-Pacific and the ASEAN region. This study aims to map the natural disaster effects in the region and develop a comprehensive preventive and reduction guideline for the people of the ASEAN region to sustainable livelihoods and secure everyday life from the effects of natural disasters in the region.

**Keywords:** Natural disasters; ASEAN; vulnerability; livelihoods; prevention; reduction; measures .

Category: **Prevention and Reduction of Natural Disasters**

# Development of Telemedicine Network System in Kagawa and Its Global Implementation

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**Abstract:** Kagawa university and Kagawa medical association have been developing telemedicine network from 2003, sponsored by Kagawa local government office. The system is called Kagawa Medical Information EXchange (K-MIX). The latest update was performed in 2021 March and enhancement of network functions has been done. One of main function enhancement is upload function from small medical institutions. Former K-MIX could only provide data sharing of electronic medical records running in flagship hospitals. The new K-MIX can share data from small hospitals, clinics, and laboratories. Moreover, secure mail, file sharing in the K-MIX members can be provided strictly.

Last few years, Kagawa university has been working for global implementation of telemedicine network based on K-MIX technology. For example, we provided telemedicine devices to hospitals in Thailand, which are Mobile Cardiotocogram (iCTG)" to monitor fetus heart rate and uterine contraction of the pregnant women. iCTGs have been used to communicate between pregnant women's house to obstetrician in hospital, iCTGs are also used to transfer the CTG information from ambulance to hospital via wireless communication of 2G, 3G and 4G Long Term Evolution. The device was evaluated to be effective in rural areas with few OB-GYN specialists. Especially, a reduction of the number of prenatal checkups could make the infection risk lower in COVID-19 situation.

**Keywords:** Telemedicine; Telemonitoring.

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Category: National Security for Food and Health

# Cardioprotective Effect of D-allulose in Prediabetes is Through Cardiac Mitochondrial Protection

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**Abstract:** Cardiac mitochondrial dysfunction is known to be associated with impaired cardiac contractile function in obese-insulin resistance or prediabetes. Consequently, targeting at improving cardiac mitochondrial function has been investigated as a potential intervention for cardioprotection. Although pharmacological interventions could provide benefits in combating diseases, they have their own limitations and side effects. With this regards, functional food that can exert similar benefits could be an alternate choice. Previous reports demonstrated that D-allulose exerted ability to improve insulin resistant condition. Nevertheless, its effects on the heart in a prediabetes model is unclear. Therefore, we investigated the effects of d-allulose on the heart of prediabetic rats induced by long-term high-fat diet consumption. In prediabetic rats, our results demonstrated that they had cardiac contractile dysfunction as indicated by decreased %left ventricular ejection fraction, and cardiac autonomic imbalance. Rats treated with D-allulose had reduced HOMA index and plasma insulin level. Cardiac contractile dysfunction and cardiac autonomic imbalance were also improved in prediabetic rats treated with D-allulose. These functional improvements were associated with an improved cardiac mitochondrial function. All of these findings indicated that D-allulose provided benefits on attenuating metabolic parameter impairments, and exerted cardioprotective effects in prediabetic rats.

**Keywords:** Prediabetes; obesity; heart; mitochondria; D-allulose.

Category: **National Security for Food and Health**

# Study on the Impact of the New Operation Rules on the Safety of Wonogiri Multipurpose Dam

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**Abstract:** Wonogiri Multipurpose Dam is experiencing problems due to sedimentation in the surrounding intake structure, so that the function to fulfill water demand for irrigation, industrial and hydropower purposes are disrupted. To overcome this problem is build a closure dike and new spillway that separates the reservoir into two storages, the main reservoir (MR) and sediment storage reservoir (SSR). **Objective:** to assess the safety of the Wonogiri Multipurpose Dam from the flood control point of view, use the new reservoir operation rules (Nippon Koei Co. Ltd., 2016). A simulation model of reservoir flood routing has been developed and applied using the new operation rules with inflow hydrograph of 60 years ( $Q_{60}$ ) and 500 years ( $Q_{500}$ ) return period as well as the PMF. Two flood control water levels (CWL) were used for obtaining the maximum reservoir water level, and the total outflow discharges. **Results simulation:** inflow  $Q_{60}$  and  $Q_{500}$  the reservoir water level until the fourth day cannot reach CWL, if there are heavy rains consecutively risk of dam overtopping. The maximum water level of SSR and MR for CWL +135.8 and +136.30 m exceeds the extra flood water level (EFWL), very risky to trigger the dam overtopping and the freeboard doesn't comply with the dam safety requirements. The maximum total outflow discharge for PMF inflow with both CWLs exceeds the expected flood control capacity, which is 1,360 m<sup>3</sup>/s. This study proposed to change the reservoir water level boundaries for the arrangement of the existing spillway gates of MR and new spillway gates of SSR so that the freeboard meets the requirements for all inflow hydrographs of the design flood. **New result:** although the reservoir water level in MR and SSR can be controlled not to exceed EFWL, the total outflow discharges for the inflow of PMF still exceeds 1,360 m<sup>3</sup>/s.

**Keywords:** Sedimentation; closure dike; control water level; freeboard; overtopping.

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Category: **Prevention and Reduction of Natural Disasters**



# Applications of LPWAN Technology in Slopes and Rivers for Disaster Mitigation

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**Abstract:** The increase in heavy rainfall events has contributed to the increase in floods and slope failures. These natural disasters can lead to a severe loss of human lives. Monitoring and early warning may be the most promising ways to reduce the damage caused by natural disasters. Low-power wide-area networks (LPWANs) are new and efficient techniques for establishing monitoring methods since a small amount of the data can be transmitted over great distances using batteries with a long lifespan. Many LPWAN technologies have arisen, such as long-range (LoRa), Sigfox, narrow-band (NB)-IoT. In this study, the tilt sensors and extensometers were installed at selected observation sites in order to monitor the slope movement. Furthermore, the measurement data have been transmitted using LPWANs (LoRa, Sigfox, NB-IoT) since 2018. In addition, one ultrasonic sensor has been installed to monitor the depth of river water level. Before the monitoring system is in full operation, the radio wave propagation tests have to be conducted in order to determine the proper locations for the gateway and sensors. The monitoring system was able to successfully collect the measurement data at each observation site. For example, at the Tachiyama site, a slope failure occurred due to extreme rainfall in July 2018, and this failure was captured by the system. Moreover, the slope movement in several locations at the Aruse site was also successfully observed during the heavy rainfall in July 2020. However, errors were still found in the measurement data for several reasons, such as electrical circuit problems, batteries problem, and temperature changes.

**Keywords:** Radio wave; LPWAN; monitoring; sensor.

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Category: **Prevention and Reduction of Natural Disasters**

# Thoron (Rn-220) Exhalation Rate from Soil Building Material into Room Air of Earthen Dwellings

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**Abstract:** Thoron (Rn-220) gas has been recognized as a potential health hazard for residents of traditional earthen dwellings that are constructed with compacted and dried clay-rich soil. Soil-derived building materials are major sources of radon isotopes Rn-220 and Rn-222 in indoor air. Changes in moisture content and density influencing the thoron exhalation rate from earthen materials into room air were studied in the laboratory with terra rossa from a village on the Dong Van Karst Plateau Geopark, Vietnam, where ethnic minorities construct traditional dwellings with unfired terra rossa walls and floors. Our results show that the thoron exhalation rate from mud surfaces depends on (i) the content of radioactive parental nuclides in mineral components; (ii) the moisture content of mud where ~5 to 10 weight % water maximizes the Rn-220 exhalation rate; and (iii) the density of dry mud as primarily controlled by internal macroscopic voids, fractures, and porosity. Additional time-series of Rn-220 exhalation data from an interior mud wall of a terra rossa-built house under different seasonal and weather conditions show that the temperature is influencing thoron exhalation via the water vapor pressure deficit in air and the associated amount of atmospheric moisture adsorbed onto indoor mud surfaces.

**Keywords:** thoron (Rn-220); earthen dwelling; exhalation rate; inhalation hazard; radioactivity; room air.

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Category: **Prevention and Reduction of Natural Disasters**

# The Potential of Indonesian Tuber and Traditional Food as Immunomodulatory Functional Foods

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**Abstract:** The prevalence of infectious diseases in the world, including Indonesia, has increased significantly. One of the factors that lead to death from infectious diseases is the weakness of the immune system. Therefore, studies on immunomodulatory substances need to be further investigated. Many studies have shown that active compounds present in plants have immunomodulatory properties. In Indonesia, there are many types of tubers and spices that contain active substances.

Porang tuber is one of the potential glucomannan sources in Indonesia. Glucomannan is more popularly known as healthy food due to high level fiber content. In the present study, porang possesses the immunostimulatory activity to enhance phagocytosis activity of macrophages and increased the production of IL-6 and TNF- $\alpha$  as well as their gene expression levels. Immunoblot analysis revealed that porang activates NF- $\kappa$ B and MAPK signaling. Our findings also indicated that porang activated macrophage through not only TLR4, but other receptors. Furthermore, examination by polymyxin B showed that cytokine production induced by porang was not due to endotoxin contamination. Overall findings suggested that porang has potential as immunostimulatory through the stimulation of macrophages.

In addition, rendang is one of Indonesian dishes, and famous for its deliciousness. More than 20 spices are used to make rendang, such as turmeric, coriander, candlenuts, red chilies, cardamom, star anise, cloves, asam kandis, etc. Based on the number of spices used in the rendang cooking process, it is suspected that the rendang seasoning has potential as a healthy food. The most commonly used traditional Indonesian food should be studied for its ingredients and immunomodulatory effects. However, more research is needed to prove its efficacy and safety.

**Keywords:** Porang tuber; spices; Immunomodulatory activity.

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Category: National Security for Food and Health

# Display Booths



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## Overview of Experiments in Rock Mechanics Laboratory

**Achmad Hafidz**

Ehime University, Japan.

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**Content:** In rock mechanics laboratory, there are several research topics related to deep geological disposal of high-level radioactive waste, slope movement monitoring system, soil improvement using bio-grout material, utilization of waste material, heavy metal removal, rockfall protection net, and sub-surface survey. In deep geological disposal topic, a simulated seawater flow-through experiment on fractured granite, permeability test using transient pulse method, and rock permeability simulation using COMSOL Multiphysics 5.4 have been conducted in order to ensure the long-term safety of deep geological disposal of high-level radioactive waste. In the slope movement monitoring system topic, new wireless technology, a low-power wide-area network (LPWAN), has been applied to transmit the measurement data from an observation site to a gateway with low battery consumption. In the soil improvement topic, soybean urease has been employed to increase soft soil strength since calcium carbonate precipitation will be formed between soil particles. In the utilization of waste material topic, paper sludge ash has been combined with other binder materials, such as fly ash, calcium sulfate, silica fume, and ordinary Portland cement, to develop a good construction material. In the heavy metal removal topic, calcium carbonate has been employed in order to reduce the concentration of  $Pb^{2+}$  and  $Zn^{2+}$  in heavy metal solutions. In the rockfall protection net topic, a full-scale experiment and simulation analysis have been conducted to investigate the performance of a new type of rockfall protection net. In the sub-surface survey topic, ground-penetrating radar has been employed to detect buried material below the ground surface.

**Keywords:** Experiment; monitoring; simulation; waste.

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Category: **Prevention and Reduction of Natural Disasters**

## Experiment to Purify Turbid Water with Sheet-shaped Kapok Fiber Using an Artificial Channel

**Kenji OKAZAKI**

Civil Engineering Research Institute for Cold Region, Public Works Research Institute

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**Content:** Turbid water may occur civil engineering projects in Japan. It is necessary to reduce the turbidity of the generated turbid water and drain it. The treatment of turbid water use flocculants and carbon dioxide gas, which is costly. Therefore, in order to propose a treatment system with less environmental impact, we conducted a purification experiment using plant fibers. In the experiment, sheet-shaped kapok fiber was laid in an artificial channel with a length of 30 m, and 500 liters of turbid water from tunnel construction site was flowed into it and circulated for 7 days. The turbidity of the circulated wastewater and the diurnal changes in PH and EC were investigated. As a result of the experiment, the turbidity became 1/10 or less after 1 day, which was below the wastewater standard value. Suspended solids were also trapped in the kapok fibers. The PH decreased from initial value of 11.5 to 8.3 after 7 days and became a value within the standard value for allows drainage.

**Keywords:** Turbid water; Kapok fiber; Civil engineering; Purification experiment; Artificial channel.

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Category: **Environmental Preservation and Sustainable Development**



# The Construct Methods of Steel Pipe Pile Bridge and Overseas Business Development

**Chen Li-Ting**

Kochi Marutaka Co., Ltd.

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**Content:** Since our founding, as a pioneer in the foundation industry, we are working on the development of construction technology to meet the world's needs on the frontlines. And also, we have been providing one-stop services for proposal, design, estimation, management and construction. Especially in the case of hard ground foundation works, we have the best machines which are top class in Japan. We introduce the large pile drivers from overseas and then improve them. As for working at various foundation works (soldier piles, well drilling, bridge construction, etc.), and MLIT semi-recommended SqC Pier Construction Method (gantry and pier construction method) of temporary pier and main bridge construction works, we have been very successful all across the country. Also, due to the increasing frequency of natural disasters, we have expanded into research and development in disaster prevention. Recently, the ratio of overseas construction has increased, and we also had been adopted by the JICA overseas development support project. In the future, overseas expansion will begin in earnest, and at the end of 2019, a monastery school will be completed in Myanmar with our funds. We also focus on human resource development to secure and invite new engineers to Japan. In the beginning of 2020, we plan to start foundation work at Mandalay Port in Myanmar.

**Keywords:** SqC Pier Construction Method (gantry and pier construction method); Monastery school in Myanmar; JICA project

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Category: **Prevention and Reduction of Natural Disasters**

## ASTRAEA Allulose – Functional Rare Sugar That Provides People's Wellness and Healthy Life

**Rikitaro Watanabe (Mr.) / Shigehiro Hayashi (Mr.)**

Matsutani Chemical Industry Co., Ltd.

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**Content:** Allulose is one of the rare sugars, a monosaccharide rarely exists in nature. Allulose is one of the most attractive rare sugar among others in terms of physical and physiological properties. It has very low caloric value (0.4 kcal/g) and its sweetness is 70% relative to regular sugar. It attenuates postprandial blood glucose levels if ingested together with carbohydrates. It also promotes fat oxidation. It is more than just a low calorie sugar which provides people's health. ASTRAEA is the brand name of allulose that Matsutani produces.

**Keywords:** Allulose; psicose; astraea; rare sugar; functional sugar; healthy sugar; fat oxidation.

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Category: **National Security for Food and Health**

## Perinatal telemedicine platform Melody i and Mobile Fetal Monitor iCTG

**Yhuko Ogata**

Melody International Ltd.

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**Content:** The global maternal mortality rate remains high and many of these deaths were preventable and occurred in developing countries. The perinatal mortality rate in developing countries is significantly higher than the global average of 17.7 deaths per 1,000 live births.

To solve these problems, we have developed Melody i, a communication platform for pregnant women and doctors. Melody i has the IoT devices called Fetal Monitor iCTG, Which has a fetal heart rate meter and a uterine contraction meter. If the mother and her baby have any concerns, they can immediately show a doctor via the internet, and also can be referred to a large hospital very smoothly. It can prevent baby's problems such as hypoxia, stillbirth and so on.

The core technology of the Fetal Monitor-iCTG is a medical device with IoT communication technology. It offers the same high-level performance as a conventional CTG.

The doctor diagnoses from the CTG graph as before. One of the big difference from the conventional CTG is the diagnosis can be made remotely. It is useful to management of high risk pregnant women and to avoid the risk of infection under infections like COVID-19.

In Thailand and Bhutan, we mainly use it for referrals. We will show you three types of perinatal eHealth made possible by fetal monitor iCTG. ① For pregnant women living in island and mountainous areas refer to the central hospital as soon as possible. ② For high-risk pregnancies and infection risks, Online medicine will be available. ③ Fetal monitoring in Shelters and emergency vehicles send to doctors real-time. As in these cases, you do not have to be in a hospital to use the Fetal Monitor iCTG. That because the device can come to the pregnant woman side and show her CTG data to you away from the hospital.

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Category: **National Security for Food and Health**

## A Recent Case of a Natural Disaster in Japan (Debris Flow and River Flooding Caused by Heavy Rain)

**Kazunari Kimura**

Naiba Co., Ltd.

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**Content:** Our company, Naiba Co., Ltd., is located in Shikoku, Japan and conducts various geological surveys. Japan has long been hit by many natural disasters (eg earthquakes, typhoons, landslides, volcanoes, etc.). Especially recently, natural disasters (for example, debris flow, river flooding, etc.) that cause enormous damage due to heavy rain occur almost every year. Our company has conducted on-site confirmations of some of these natural disasters. This time, at our booth, we will introduce some recent disaster cases in Japan.

**Keywords:** Japan; Natural disasters; Case report; Debris flow; River flooding.

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Category: **Prevention and Reduction of Natural Disasters**

# Green Technologies for Environmental Remediation in Vietnam: Some Case Studies from Laboratory to Pilot Scale

**Nguyen Thi Hoang Ha**

VNU University of Science

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**Content:** Green technologies for environmental remediation have attracted increasing attention worldwide. These studies aim to assess the potential of using some green technologies (phytoremediation, phytostabilization, using mining and agricultural wastes) for remediation of contaminated soil and water at different scales (laboratory and field trials). The results of these studies show prospecting application of these technologies as environment friendly, low cost and zero-waste approaches.

**Keywords:** Adsorption; agricultural wastes; green technology; mining waste; phytoremediation; phytostabilization.

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Category: **Environmental Preservation and Sustainable Development**

## Research Opportunities with the Universiti Brunei Darussalam

**Assoc. Prof. Dr. Basilios Tsikouras**

Universiti Brunei Darussalam

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**Content:** Universiti Brunei Darussalam (UBD) is the first comprehensive university in Brunei Darussalam. It was established in 1985, a year after Brunei Darussalam has achieved independence. It has grown from a teaching university with only 176 students in 1985 to the research university with 5,000 students today. We are classified in the top 1% universities in the world and we are ranked in both QS (250 in the world) and THE (350-400 in the world) rankings. Our researchers cover a broad spectrum of research areas including Sciences, Engineering, Social Sciences, Business & Economics and Education. Some of the research thrusts in UBD include, but not limited to, Natural Hazards, Environmental Sustainability, Biodiversity, Catalysis, Biosensors and Halal Food, Material Science, Communications and Intelligent Systems, Data Analytics, Smart Farming, Climate Change, and Precision Genomics. State-of-the-art facilities provide to our academic staff and students unique opportunities for research. We always strive to improve the research conditions and opportunities and to advance our achievements, led by our moto: *"Towards Human Excellence"*. Our young researchers and graduate students are mentored by and collaborate with renowned experts in their fields guided by the four core values of UBD: "people, expertise, relevance and leadership". UBD sponsors postdoctoral researchers with competitive funds awarded on a merit basis. Competitive scholarships are also offered to international students for their PhD studies and research. Our vision is "to make UBD a globally leading research University, led by ethical practices". UBD mission is to empower future-ready leaders through innovative education and enterprising research, driven by national relevance with global impact, and guided by the values of Malay Islamic Monarchy (MIB).

**Keywords:** Universiti Brunei Darussalam; Research; Graduate Studies; Scholarships.

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Category: **Prevention and Reduction of Natural Disasters**

**Improvement on Urban Environmental Problems**

**Environmental Preservation and Sustainable Development**

**National Security for Food and Health**

## Microwave Pyrolysis of Plastic Waste into Fuel

**Dr. Shaifulazuar Bin Rozali**

Universiti Malaya

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**Content:** The high demand for plastic has led to plastic waste accumulation, improper disposal and environmental pollution. Even though some of this waste is recycled, most ends up in landfills or flows down rivers into the oceans. In addition, recycling has a few drawbacks including the high costs of plastic separation process and water contamination. Therefore, researchers are now exploring better ways to solve the plastic waste management problem and convert it into useful products. This concept of waste-to-wealth is in line with the United Nations' Sustainable Development Goals strategies. In this study, an innovative approach namely as "microwave-metal assisted pyrolysis" is proposed to efficiently convert plastic waste into liquid fuel. Plastic waste will be mixed with metallic pieces and microwave absorber such as carbon during heating. Microwave pyrolysis can shorten heating time and increase cracking efficiency. The obtained fuel can be blended with pure diesel to reduce the portion of fossil fuel.

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Category: **Environmental Preservation and Sustainable Development**



# Thermoelectric Energy Harvester for Self-Powered Smart Window Application

**Faiz Salleh**

Universiti Malaya

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**Content:** The building energy consumption in developed countries is reported to consume about 40% of the total energy use and is more dominant in hot and humid regions, where the energy is mainly consumed to maintain the thermal comfort in buildings. Since it is known that window is the most energy inefficient building's components with high maintenance requirement, thus, by improving its thermal performance and function as an energy harvester from the ambient environment will be better solutions for reducing building electricity cost and lessen the greenhouse gas emission. The concept of self-powered smart window has recently been introduced by integration with solar cells and piezoelectric generators for effectively converting ambient photon and mechanical energy into electricity from the sun rays and raindrops. Therefore, in this study the possibility to integrate thermoelectric energy harvester with self-powered smart window is explored in order to improve its functionality as energy harvester and thermal insulation.

**Keywords:** Thermoelectric; Energy Harvester, Self-Powered Smart Window.

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Category: **Environmental Preservation and Sustainable Development**

# Study of Water Contact Angle on the Temperature and Productivity of Solar Still

Nursyahirah Mohd Shatar

Universiti Malaya

**Content:** Water security and safety for consumption and sanitation remain a challenge, especially with the dwindling freshwater resources. The desalination method as a means to produce freshwater has been garnering interest amongst researchers due to the abundance of seawater supply available. Solar still is a widely researched desalination method due to its simplicity and versatile design. However, passive single slope solar still has low freshwater productivity and efficiency. The low freshwater productivity is overcome by studying the parameters influencing the productivity rate of the conventional solar still design. Therefore, this work investigates the effect of cover materials with varying water contact angles on the temperature of the condensing cover to determine the driving factor in freshwater production of the solar still. A lab experimental investigation was done using acrylic (PMMA) and polycarbonate (PC) as the cover material for the solar still. The solar still was heated at a constant water temperature of 60 °C during which the cover temperature and freshwater output were observed for a duration of 150 minutes. The results indicated that the condensing cover temperature for PC is lower than PMMA with an average of 1.5°C. Furthermore, PC cover obtained a higher temperature difference between cover and saline water by 2°C than PMMA cover. Despite that, the freshwater productivity was seen to be affected more by the water contact angle of the cover material where the hourly yield obtained by PMMA and PC covers were 409.1 mL/m<sup>2</sup> and 355mL/m<sup>2</sup> respectively. Therefore, this highlights the importance of material contact angle on the freshwater production of the solar still.

**Keywords:** Desalination; single slope; solar distillation; solar still; water contact angle.

Category: **Environmental Preservation and Sustainable Development**

## Kennarey Seang\_University of Health Sciences

### Kennarey Seang

University of Health Sciences

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**Content:** The University of Health Sciences (Cambodia) offers many academic programs and trainings in healthcare profession and public health. The University is one of the oldest public universities in Cambodia offering medical education.

**Keywords:** Medicine, Pharmacy, Dentistry, Nursing and midwifery, Public Health.

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Category: **National Security for Food and Health**

## SRIREP Project, Research Institute for Humanity and Nature (RIHN)

**Myo Han Htun**

SRIREP Project, Research Institute for Humanity and Nature (RIHN)

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**Content:** Over the years, environmental contamination issues have been highlighted, and mercury pollution is now one of them. Furthermore, due to socioeconomic factors, there are several complicated and unsolvable problems involving mercury for the livelihood. As a result, it is difficult to solve. A group of scientists, researchers, and stakeholders from various disciplines in a project that has been conducting transdisciplinary approach research and practice of various studies in collaboration with various stakeholders to co-create sustainable regional innovation for reducing the risk of high-impact environmental pollution and poverty problem, as well as the wellbeing of ASGM (Artisanal and Small Scale Gold Mining) communities in Indonesia and Myanmar.

**Keywords:** ASGM (Artisanal and Small Scale Gold Mining); Mercury Pollution; Transdisciplinary Research and Practice; Sustainable Regional Innovation; Wellbeing.

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Category: **Prevention and Reduction of Natural Disasters**

**Improvement on Urban Environmental Problems**

**Environmental Preservation and Sustainable Development**

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