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2018 International Conference on Sustainable Environmental Technologies (ICSET 2018)

Mapúa University, Intramuros, Manila, Philippines
August 19-21, 2018

BOOK OF ABSTRACTS

2018 International Conference on Sustainable Environmental Technologies (ICSET 2018)

Mapúa University, Intramuros, Manila, Philippines
August 19-21, 2018

Co-organized by:
Mapúa University, Philippines
Chia Nan University of Pharmacy and Science, Taiwan
National Cheng Kung University, Taiwan

"Innovation and Technopreneurship for Sustainable Environment and Development"

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INTRODUCTION

The International Conference on Sustainable Environmental Technologies (ICSET) evolved from Asian Pacific Regional Conference (APRC), an outcome of the Environmental Quality Concern, Control, and Conservation (EQC3) International Program of Chia Nan University of Pharmacy and Science, Tainan, Taiwan. The EQC3 is composed of International Core Members from five various countries namely Taiwan, Philippines, Thailand, Vietnam, and South Korea. These universities are: Taiwan's Chia Nan University of Pharmacy and Science, National Kaohsiung Marine University, National Chung Hsing University, and I-Shou University; the Philippines' University of the Philippines Diliman and Mapúa University; Thailand's King Mongkut's University of Technology Thornburi; Vietnam's Hanoi University of Technology and Ho Chi Minh University of Technology; and] South Korea's Seoul National University.

Seoul National University first hosted ICSET in 2011. This hosting was followed by King Mongkut's University of Technology Thornburi in 2012 and by Mapúa University (then Mapúa Institute of Technology) in 2013. ICSET 2018 marked Mapúa University's second time to host the conference. In 2020, ICSET will be hosted by Indonesia's University of 17 Agustus 1945 Surabaya.

In the past, selected papers were recommended for publication to the Sustainable Environment Research (SER), a journal published by Chinese Institute of Environmental Engineering, Taiwan. These papers, before being published, underwent the review process carried out by SER editorial board.

ICSET 2018 introduced four new participating journals, in addition to SER. These are Taiwan Water Conservancy, Paddy and Water Environment, Environments, and Journal of Environmental Science and Management. This addition makes a total of five (5) participating journals to ICSET 2018. These scientific journals are indexed by SCOPUS and/or Web of Science Group. Prior to acceptance, submitted papers to ICSET 2018 were peer-reviewed by the conference technical committee members, and revision and resubmission were carried out by the concerned authors. This process improved the quality of papers produced by ICSET 2018.

Accepted papers to ICSET 2018 are recommended for publication to the aforementioned participating scientific journals and will undergo another round of review and editing by the respective journal's editorial board.

ICSET 2018 produced the 2018 ICSET Book of Abstracts with ISSN 2619-8339. Conference organizers envision that soon, ICSET proceedings would be indexed by an international indexing organization.

ICSET 2018 Secretariat
EQC3 International Core
August 2018
Manila, Philippines

2018 International Conference on Sustainable Environmental Technologies
Manila, Philippines
19 – 21 August 2018

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MESSAGE
20 August 2018
Manila City

REYNALDO B. VEA, PH.D.
Chairman, ICSET 2018
President and CEO
Mapúa University

We are delighted for the opportunity to host the 2018 International Conference on Sustainable Environmental Technologies (ICSET 2018) in our Intramuros campus.

In 2013, we also had the privilege to host ICSET, during which 48 papers from academia, research institutes and industries were presented. The theme then was "*Education and Training for the Uptake of the Sustainable Environmental Technologies: Enhancing Knowledge Base for Non-Toxic Environment and Poverty Alleviation*." This year's theme is "*Innovation and Technopreneurship for Sustainable Environment and Development*". We are hoping that 75 papers shall be published in the participating international journals.

Let us enjoy today's event with its presentation of new research findings, discussions of differing views, sharing of each other's experiences, creating partnerships, and establishing long term cooperation in the area of research, development, innovation, and technopreneurship.

Together, let us face the challenge of fostering sustainable development!

Welcome to ICSET 2018 and to Mapúa University!

MESSAGE
20 August 2018

MING-CHUN LU, PH.D.
Honorary Chair
Chia Nan University of Pharmacy and Science
Taiwan

In recent years, much progress in industries and agriculture were achieved. These developments and advances resulted in the deterioration of the environment as natural resources are continuously exploited. In response to this concern, the Asian Pacific Regional Conference (APRC) was organized in 2003 and became known as the International Conference on Sustainable Environmental Technologies (ICSET) in 2011.

On its 15th year, ICSET 2018 has the theme *"Innovation and Technopreneurship for Sustainable Environment and Development."* In previous ICSET conferences, environmental concerns such as water, solid and hazardous wastes, air, water and environmental pollution, and energy were addressed. This year's theme is timely and appropriate as researchers now need to innovate on the existing and developing technologies for a sustainable environment. In the process of innovating, researchers can convert the results of their work into business ventures.

It is my sincere hope that through the presentations and discussions, the participants will gain meaningful insights that will inspire and motivate them to pursue more collaborations, do more research, innovate, and take the big leap into business, thus, contributing to a sustainable environment for the succeeding generations.

I would like to express our gratitude to the President of Mapúa University, Dr. Reynaldo B. Vea for his invaluable support in hosting this conference. Special thanks go to Dr. Delia B. Senoro and her core organizing team for their effort to make this event a success. I also offer my sincere appreciation to all those who support ICSET 2018 especially the authors and presenters for sharing the result of their work.

MESSAGE
20 August 2018

TSAIR-FUH LIN, PH.D.
Conference Co-Chair
Director, Taiwan-Philippines Joint Water Quality
Research and Innovation Center
Distinguished Professor
National Cheng Kung University
Taiwan

On behalf of one of the co-organizers, National Cheng Kung University (NCKU), I would like to welcome all the participants to join the 2018 International Conference on Sustainable Environmental Technologies (ICSET 2018), held in Mapúa University, Manila, Philippines. This conference series, founded by Prof. Ming-Chun Lu of Chia-Nan University, Taiwan, has been organized for many years and has become an important annual event for the researchers and practitioners in environmental engineering and science areas in Philippines, Thailand, Vietnam, Indonesia, Taiwan, and a few Asian countries. It has served as and will continue to be an excellent platform for professors, regulators, engineers, managers, and students to share their ideas, new findings, and knowledge to other people. Therefore, this year, Taiwan-Philippines Joint Water Quality Research and Innovation Center, jointly funded by Taiwan Ministry of Science and Technology, Mapúa University, and NCKU, is very glad to have the opportunity to participate and support this important event. In this ICSET 2018 conference, Mapúa University, takes the lead to organize this conference and has spent tremendous effort to organize the conference. I would like to express my special thanks to President Reynaldo B. Vea, Executive Vice President Bonifacio T. Doma, Jr., Prof. Delia B. Senoro, and their team in Mapúa University for their contribution in hosting this excellent event. I would also like to thank you all for joining the conference. Please share your ideas, learn new knowledge, make more friends, and enjoy the hospitality in the conference.

MESSAGE
20 August 2018

DR. IR. RA RETNO HASTIJANTI, M.T
Conference Co-Chair
Chairman of UNTAG Delegates
University of 17 Agustus 1945
Surabaya, Indonesia

Greetings from UNTAG Surabaya

Dear friend, college, and distinguish guest,

It is an honor and a pleasure for us to be among all of you, our precious friend. In this precious opportunity, we would like to express our gratitude to Mapúa University, Manila, Republic of the Philippines, as the organizer of the ICSET 2018 event. This event is our pride event where we can share our knowledge and celebrate various academic forums that will take place in the next few days. We believe, through this event, we can develop our network and increase mutual benefits for all parties. Based on the open understanding and in line with the vision of our university, Untag Surabaya will always support various activities, which will be implemented in ICSET 2018 as well as upcoming activities.

Finally, we hope that this ICSET event can continue and remain successful in the coming years. We are optimistic that other academic forums, we can hold together, in the future. We also believe that these international events can develop into a binder for our relationships and a milestone for the development of future global cooperation.

MESSAGE
20 August 2018

BONIFACIO T. DOMA, JR., PH.D.
Conference Co-Chair
Executive Vice President for
Academic Affairs
Mapúa University
Manila, Philippines

The 2018 International Conference on Sustainable Environmental Technologies provides platforms for scientists, researchers, faculty, and students to discuss a wide array of technologies to help our economic activities sustainable with regard to upkeep of our environment. This year's theme, *"Innovation and Technopreneurship for Sustainable Environment and Development,"* focusses on discussing strategies to maintain the delicate balance of development through innovation and technopreneurship while maintaining biodiversity and environmental health. This task is never easy and straightforward, but our continuous efforts to improve systems and technologies will definitely make a difference in sustaining economic progress compatible with our environmental targets. I would like to greet all participants of this conference. May this event be an instrument for continuous sharing of information and dialogue, and for forming linkages and friendships. Mabuhay!

MESSAGE
20 August 2018

PROSPERO E. DE VERA III, PH.D
Office-in-Charge
Commission on Higher Education
Manila, Philippines

It gives me great pleasure to send my sincere message of support to the 2018 International Conference on Sustainable Environmental Technologies (ICSET 2018). Special mention to Mapúa University, the Philippine host university. Thank you Mapúa!

This is also to acknowledge the strong cooperation of Mapúa University with the National Cheng Kung University and Chia Nan University of Pharmacy and Science, both of Taiwan, and KTH Royal Institute of Technology, Stockholm, Sweden. This partnership delivering this kind of activity form a good example of embracing globalization in a scientific platform. The conduct of ICSET 2018 contributes to the fulfillment of the Philippines' commitments on sustainable development goals 2030 in the context of knowledge sharing. These commitments are: (1) partnership, (2) quality education, and (3) climate action. With the theme *"Innovation and Technopreneurship for Sustainable Environment and Development,"* ICSET 2018 contributes to the fulfillment of the following commitments: (1) industry, innovation, and infrastructure, (2) clean water and sanitation, (3) affordable and clean energy, (4) good health and well-being, and (5) responsible consumption and production.

Therefore, the Commission on Higher Education commits to support higher education institutions in the Philippines and its partners in its quest to share knowledge, discuss research outputs and its utilization, experts experiences and challenges, as well as provision of common good solution. In this way, we will move forward together!

My best wishes to the organizers and all participants!

THE PLENARY AND KEYNOTE SPEAKERS

Sustainable business opportunities using cellulose products other than wood – A domestic challenge using crops from the Philippines

Anders Hult, Ph.D.
Conference Plenary Speaker
KTH Royal Institute of Technology, School of Engineering Sciences in Chemistry, Biotechnology and Health, Department of Fiber and Polymer Technology, Stockholm, Sweden.

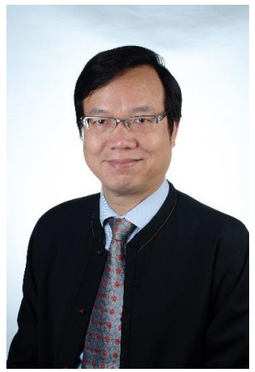
Development of the modern Sweden has to a large extent been made possible through utilization of our natural forests. Processing technologies have been developed and commercialization of wood products, paper and pulp has largely contributed to our present wealth. Since 2016, KTH has started a new collaboration with Mapúa University to study if these processing technologies can be used for domestic crops in the Philippines.

Aim of the project has been to investigate how domestic crops in the Philippines, such as seaweed and bamboo, can be utilized as raw material for new advanced materials using sustainable engineering techniques. In order to achieve this long-term goal, knowledge is shared through teaching and practical training where each university shares information about their respective fields.

Both seaweed and bamboo can be used as source for production of super strong nano fibrillated cellulose (NFC) fibers. Further, seaweed is also a source for functional chemicals such as amino acids and fatty acids (omega 3 fatty acids), which can be extracted from the seaweed. Philippines is today one of the largest producers of seaweed in the world. However, the crop is normally just dried and exported to South Korea and Japan. The added value from fibers and extractable doesn't stay in the country. One can foresee the possibility in the near future to set up mini bio refineries in close proximity to where seaweed is harvested. The refineries will have 3 product lines: fibers, amino acids, and fatty acids. If this is combined with energy from windmills, rainwater harvesting for, and reuse of wastewater from its operation then the whole production will be 100% green. Mapúa is very strong in alternative energy sources, marine plantations as well as growing bamboo and its extractable while KTH has a deep knowledge in fiber processing technology and extraction techniques.

Green engineering, sustainable environment, and development would significantly contribute to poverty reduction and a better life to the future generations. For the present generation, green and sustainable engineering produces new knowledge that lead to new processes and products which could have great economic value.

Oxidation Treatment of Cyanobacteria, Cyanotoxins and Taste and Odor Compounds in Drinking Water Systems



Tsair-Fuh Lin, Ph.D.
Conference Plenary Speaker
Distinguished Professor
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Cyanobacteria is an important group of microorganisms present in many lakes and reservoirs in the world. As many of them may produce harmful cyanotoxins and/or taste and odor compounds, excess growth of the microorganisms may pose additional risk to human and diminish the aesthetic value of the water. Therefore, treatment of cyanobacteria and their metabolites are important to safeguard the quality of drinking water.

Oxidation is an important process used in both water sources and treatment plants for the control of cyanobacteria and other water quality issues. In this presentation, the interactions of typical oxidants used in water treatment processes with harmful cyanobacteria and their metabolites, will be discussed and modelled. Oxidation experiments were conducted to characterize the impact of typical oxidants, used in water treatment plants and/or reservoirs, on cyanobacteria cells and/or metabolites. Models were developed to simulate the processes for cyanobacteria cells and metabolites. The models were able to successfully simulate/predict the removal of cyanobacterial cells and metabolites. The developed models provide a simple means to estimate the dose and contact time required when oxidants are used for the control of cyanotoxins and T&O compounds in water treatment plants and/or reservoirs.

Application of advanced oxidation processes for treatment of industrial wastewaters

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Fast growth in population and rapid technology developments in the industries result in large volume of wastewater that needs treatment. In the degradation of toxic wastewater, chemical oxidation can be used as a post treatment to oxidize non-biodegradable residues present in wastewater treated by biological processes. Each treatment technique has positive aspects and constraints in relation to applicability, efficiency, and cost. Advanced oxidation processes (AOPs) are favored for high efficiency and being eco-friendly, using the generated non-selective hydroxyl radicals (•OH) for oxidation. AOPs are herein divided into two categories: dark and light driven AOPs. Therefore, a quick introduction to the importance of wastewater treatment by AOPs to the environment is discussed, followed by the benefits and limitations of treatment techniques.

Among the AOPs, the Fenton process has been proven to be effective in treatment of recalcitrant organic compounds. One disadvantage, however, is the production of a large amount of sludge that needs further treatment and disposal. The production of sludge is reduced by the use of fluidized-bed Fenton (FBF) process where iron is crystallized onto the surface of the carriers in the reactor. This presentation gives an overview of the recent developments on the application of FBF process to the treatment of industrial wastewater from thin film transistor liquid crystal display manufacturing, the production of pharmaceuticals, textiles, phenol, phenol derivatives, refractory organics, petrochemicals, and other chemicals which shows the potential applicability of FBF technology to reduce the levels of recalcitrant organic contaminants in wastewater. The advantages of FBF process over other technologies that are based on Fenton oxidation in terms of performance, operating conditions, and factors affecting the removal efficiency are highlighted. Included also are the reaction kinetics and mechanisms involved and the carriers that were used. Finally, full-scale applications are presented.

Lessons Learned from International Scientific Journals Editor-in-Chief

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An Editor-in-Chief (EIC), or Editor, serves as the chair of a journal's editorial board. An EIC is appointed by the journal and is responsible for inviting editorial board members, organizing conferences, communicating with authors and editorial offices, conducting first evaluations of submissions, assigning editors or reviewers, as well as making decisions on submissions. An EIC might be a senior researcher with previous experience as a reviewer, editorial board member, and/or associate editor. An EIC is responsible for the overall quality of the journal and implements journal policy decisions while promoting the journal. To this end, the EIC is accountable for all aspects of the journal publication process such as achieving the journal's aims, ensuring academic quality, and overseeing the editorial board structure, special issues, and peer-review process.

In this presentation, I would like to share my experience as an EIC, associate editor, editor, and reviewer for international journals. Though each journal has various and slightly differing editorial processes, one goal remains common among all--the publication of high quality papers. Accordingly, I will discuss some examples of publication processes as well as the responsibilities of various editorial positions from the point of view of an EIC, and conclude with my suggestions and recommendations.

Determination of Carbon Stock and Sequestration Potential in Mangrove Rehabilitation: The Maynilad Case

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Maynilad, the biggest water and wastewater operators in the Philippines is continuously expanding its operations to meet its contractual obligations. This requires building new water/wastewater infrastructures and development of alternative sources of water. The same will be implemented using more sophisticated treatment process resulting in increased carbon footprint. Since 2010, its carbon footprint has been increasing annually. As of 2015, the company's verified carbon footprint (lSO 140064, (TUV Rhineland) is 0.0850 g CO_2/L water. With the growing interest in mitigating the impacts of climate change, mangrove conservation and rehabilitation programs have been implemented by various institutions. Mangrove forests are important ecosystems because they are known to be effective in storing carbon, reducing water pollution, hosting biodiversity, and protecting coastlines (Primavera et al, 2012).

In 2013, Maynilad launched its mangrove rehabilitation project as part of its "Plant for Life Program" in the coastal areas of Cavite, Philippines. The sites are in Noveleta (2.2 has), Cavite City (2.2 has), Bacoor City (2.2. has), Kawit (1 ha), and Rosario (1 ha). An estimated 87,000 mangrove propagules were planted by Maynilad and volunteers from its partner organizations covering a total of 8.6 hectares over the past four years (2013-2016). The program also includes watershed rehabilitation project which was started in 2006. This carbon stock calculation and sequestration study of Maynilad was conducted to gauge the success of the program in terms of the condition of the mangroves and its carbon stock and sequestration potential through allometric calculation methods. This will enable Maynilad to reduce its net greenhouse gases, GHG emission. The study shows that 21,287.16 tons of carbon is stocked or captured instead of being released to the atmosphere as CO_2, and 4,247.91 tons CO_2 is sequestered or absorbed from the atmosphere and used for mangrove plant growth instead of contributing to the global GHG. The program is proven to be beneficial because mangrove is 3-5 times more potent to sequester carbon than other forest types (Donato et.al., 2011), thereby offsetting the company's increasing CO_2 generation.

Moving forward, Maynilad intends to continue and expand its rehabilitation programs and pursue the assessments of the company's carbon sequestration initiative to be carbon neutral or ultimately carbon negative.

ABSTRACTS

International Conference on Sustainable Environmental Technologies (ICSET 2018)
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A Smart Irrigation and Paddy Water Level Control System on Safe Alternate Wetting and Drying Principle Using Wireless Sensor Network

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ABSTRACT

This paper aims to develop an automated irrigation system adopting the safe Alternate Wetting and Drying (AWD) and an irrigation monitoring system which can be accessed through the Internet. Safe AWD is an irrigation method where the rice paddy is alternately submerged and subsided, with the maximum irrigation water level being 150mm above the ground and critical level of 100mm below the ground. The proposed system automates irrigation by considering the field water level – current and required. It determines and manages the irrigation schedule depending on the sensor's gathered data and acts upon it. It commands the irrigation delivery gate to open or close the counter weight-designed water gate valve considering the smart schedule set by it. It was able to save about 20% of water usage within three weeks in a two-hectare area with four weirs compared to the traditional irrigation method. The results show that adopting the proposed system significantly increases land productivity and water use efficiency without affecting the quality and quantity of the rice crops produced.

Keywords: AWD, IoT, irrigation, rice paddy, soil water content, wireless sensor network

Acknowledgement(s)
This study is supported by the University Research and Development Services Office and the University Research and Extension Council of the Technological University of the Philippines. The University is highly acknowledged for the financial support. The authors would like to thank the National Irrigation Administration especially to Engr. Felix Robles, Engr. Eusebio Villamanto, and Mr. Abel Bucu for the support and assistance in the conduct of the study and to our colleagues and professors from the Electronics Engineering Department for the encouragement.

Paper Reference Code: ICSET18-16-03

Fluctuating Asymmetry in Whitegoby, *Glossogobius giuris* (Hamilton, 1822) as Indicator of Environmental Stress in the East Bay of Laguna Lake, Philippines

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ABSTRACT

Laguna Lake, the largest freshwater lake in the Philippines, has been threatened by fertilizer and pesticides runoff from agricultural land uses in the eastern bay. Glossogobius giuris, whitegoby, is among the native and economically important fishes of declining population in the lake. Fluctuating asymmetry (FA), the subtle random deviation between left and right sides of bilaterally symmetrical organism, is widely reported as potential early-warning tool in monitoring the health of aquatic ecosystems. The study investigated asymmetry in goby samples (n=118) from two predominantly agricultural sites in the eastern bay and from a reference (tank reared) site. Landmark-based geometric morphometrics via Symmetry and Asymmetry in Geometric Data and Procrustes Analysis of Variance revealed highly significant (P<0.01) levels of both directional and fluctuating asymmetries among populations and between sexes. Higher F values of FA however may imply that deviations from perfect symmetry could be attributed to environmental stress. Principal component analysis implied deformation for FA showed notable deformations and higher overall variation in populations from agricultural sites. Findings may indicate the contributory effects of environmental conditions associated with anthropogenic pressures on the developmental instability of goby populations.

Keywords: Environmental stress, fluctuating asymmetry, geometric morphometrics, Laguna Lake, Whitegoby

Acknowledgement(s)
This study is funded by Accelerated Science and Technology Human Resource Development Program – National Science Consortium (ASTHRDP-NSC) of the Department of Science and Technology – Science Education Institute (DOST-SEI), Philippines and benefited from Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA), and National Research Council of the Philippines (NRCP). Special thanks to the University of the Philippines Los Baños - Limnological Research Station (UPLB-LRS) and Department of Biological Sciences, Mindanao State University – Iligan Institute of Technology (MSU-IIT) for the assistance in the research conduct and data analyses.

Paper Reference Code: ICSET18-04-04

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Enhancing Agricultural Techniques in the Philippines: Comparative Evaluation of *Brassica rapa, Lactuca sativa,* and *Brassic integrifolia* using Image Processing in an IOT-Based Aquaponics with Temperature-Controlled Greenhouse

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ABSTRACT

Among the main concerns in inefficient agricultural methodology involves critical food safety from weather instability, environmental degradation caused by waste from conventional farming, wasteful energy usage, and climate change. To give response to these, the paper introduced the development of a self-sustainable smart aquaponics system in a temperature-controlled greenhouse with a monitoring and automatic correction system using an Android device through Internet of Things (IoT) and plant growth monitoring system through image processing using Raspberry Pi. The system involves the acquiring of real time data detected by the light intensity sensor, and air temperature and humidity sensor. It also includes the monitoring of the pH level, and temperature of the recirculating water of the system. If the acquired data is not within the threshold range, the correcting devices, namely grow lights, exhaust and inlet fans, evaporative cooler, aerator, and peristaltic buffer device were automatically triggered by the system to correct and achieve its normal status. The internet remote access includes the effective wireless transmission and reception of data report between the system and an Android unit with the Android application in real-time. The study focused on the evaluation of two experimental set-ups comparing the plant growth between the conventional soil-based farming and the smart aquaponics system using image processing. After data gathering, results showed that the smart aquaponics set-up successfully produced a yield better than the conventional farming set-up.

Keywords: Aquaponics, Android, IoT, image processing, smart farming, sustainability

Acknowledgement:
This study is supported by the University Research and Development Services Office and the University Research and Extension Council of the Technological University of the Philippines. The University is highly acknowledged for the financial support. The authors would like to thank the immensely thank the Pasay City Cooperative officers and staffs, principally to Engr. Rolando A. Londonio, for the commendable support and accommodation during the deployment of the project; an appreciation also to Mr. John N. Nadua, Mr. Ronnie C. Tangpuz, Jr. and Mr. Rene T. Magdaraog, for their valuable assistance and supervision in the project's creation and evaluation; and, lastly, to our colleagues and professors from the Electronics Engineering Department for the encouragement.

Paper Conference Code: ICSET18-06-06

Flood Inundation Modeling Using Hydrologic Engineering Center's River Analysis System: A Case Study in Pasig-Potrero River Draining from Mount Pinatubo to the Pampanga River Basin in the Philippines

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ABSTRACT

Through the conduct of one-dimensional steady-state flow analysis using HEC-RAS, inundation that is related to three storm scenarios of varying rainfall rates was characterized to compensate for the limited event-based flood risk data that is presently available for the Pasig-Potrero river, which drains from Mount Pinatubo to the Pampanga River Basin in Central Luzon. The climatological setting of the Philippines makes it an entryway for atmospheric disturbances originating from the east. Such meteorological events are often accompanied by concomitant hazards that amplify the devastation that is already associated to the calamitous surge occurrences. Flooding is among the phenomena connected to these so-called disturbances, and recurring floods are plights that necessitate proactive disaster risk planning and management. Based on the performed simulations, flooding was found to be especially extensive downstream, exposing low-lying areas to several meters deep of floodwaters, particularly Cabetican in the municipality of Bacolor. Inundation may have been governed by different interplaying factors, but within the context of HEC-RAS, flooding may have primarily been a function of river morphology. The simulations do not necessarily recreate the same inundation patterns that have manifested during the time the simulated events have occurred; however, by incorporating the same rainfall conditions that characterized the modeled meteorological scenarios, flood simulation was carried out given the present conditions of the river.

Keywords: One-dimensional steady-state flow analysis, HEC-RAS, Pasig-Potrero river

Acknowledgement:
A heartfelt praise to the university, the National Mapping and Resource Information Authority (NAMRIA), the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), the Bureau of Soils and Water Management (BSWM), and the Local Government Unit of Bacolor and Porac for their respective contributions in realizing the completion of the study. Gratitude is also extended to the United States Geological Survey (USGS) for making their datasets readily accessible to the public, and to Ms. Krizia Michelle D. Erodias and Mr. Randy J. Gardose for allowing the use of their fully-calibrated HEC-HMS model.

Paper Reference Code: ICSET18-10-07

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Integrated Web Based Information System with Short Message Service (SMS) gateway for Natural Disaster Preparations Case Study in Kediri Region, East Java Indonesia

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ABSTRACT

Geo graphics Information System (GIS) is a system that can be used to collecting, manipulating and analyzing information of geo graphics. This technology does not only function as a tool maker of digital maps, but capable of producing a system used for the planning, geographical data analysis and decision-making. The technology is much used in various fields between other: the field of social and cultural, the field of transportation, the field of land planning, the field of resources and the field of disaster. Based on geographical location and geological, Indonesian is one of a country often experienced disasters. There for needed a technology that could help in handling the disaster. One of the technology needed for the handling of disasters namely by utilizing GIS. This research implementation of GIS for mapping prone to disaster districts and cities areas Kediri web based. The process of making GIS using software PHP, database MySQL and Google Maps. Besides comprising mapping prone to disaster, system to be made it may help a quick reaction team for information disaster that was going on in an area, that a team quick reaction be able to come to the residing and do study data. By using with Global Positioning System (GPS) village officials (user who given the access) to send information disaster that was going on in the area, so that data it can be processed by admin to disaster mitigation.

Keywords: Geographic information system, Google maps, PHP, GPS, web

Paper Reference Code: ICSET18-06-09

Determinants of Tilapia Aquaculture Profitability in Nueva Vizcaya using Stochastic Frontier Analysis

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ABSTRACT

This paper describes the factors that determine aquaculture production in the province of Nueva Vizcaya. A cross sectional analysis of 202 fish farm operators from the 10 municipalities was conducted. Empirical analysis was initially subjected to an Ordinary Least Squares (OLS) regression analysis to determine the effects of variable inputs such as fingerling, labor, land and feeds on the dependent variable harvest. However, since OLS estimation procedure cannot provide estimates of producer-specific technical efficiency of the datasets, the analysis extends into identifying technical efficiency variables using stochastic production frontier to improve the model. This study incorporates social capital as an additional determinant of technical efficiency measured by social network and trust to the residents in the community. The results suggest that social capital using social network as proxy variable has an indirect but significant relationship to aquaculture harvest, which implies that an increase in social network decreases output of the farmer. On the other hand, harvest is significantly influenced by the "community trustworthiness" variable, another dimension of social capital. The findings show that the more the fish farmer distrusts the residents in the community in terms of lending money, the more he/she increases aquaculture harvest. For, the funds of the fish farm operators are not compromised if not lent to the residents in the community. A brief overview of the socio-economic profile of the fish farm operators and their profitability is also provided.

Keywords: Stochastic frontier, social capital, social network and technical efficiency

Acknowledgement:
I would like to acknowledge important individuals who have played significant roles that led to the realization and completion of this dissertation. Dr. Rosalina Palanca-Tan, my adviser, for untiringly instilling confidence in me and in sharing some of her precious time and expertise. Dr. Philip Arnold P. Tuaño, Dr. Victor Venida, Dr. Noel de Guzman, and Dr. Angel Encarnacion, my committee members, for graciously imparting constructive criticisms, inputs and guidance. Commission on Higher Education for the scholarship grant.

Paper Reference Code: ICSET18-05-10

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Evaluation of the Cyclic Stability of the Bimetal Oxides through Chemical Looping Combustion of the Philippine Coal

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ABSTRACT

Chemical looping combustion (CLC) can separate the CO_2 formed from combustion without incurring any energy penalties. In this study, two mixtures of bimetal oxides, 75Ni25Fe and 75Fe25Cu, were used in the CLC of Philippine coal under three hold temperatures: 700, 800, and 900 °C. The study focused on identifying the stability of the bimetal oxides after 10 cycles based on its oxygen carrying capacity and conversion. Based on 10 redox cycles, it was determined that the effects of temperature were dependent on the bimetal oxide. 75Fe25Cu performed optimally at 800°C, while 75Ni25Fe continued to degrade as cycling continued at 900°C. 75Ni25Fe was predicted to be viable for more cycles otherwise. A more drastic decrease in the number of viable cycles was observed for 75Ni25Fe as the temperature increased.

Keywords: Chemical looping combustion, oxygen carrying capacity, bimetal oxides, Philippine coal

Paper Reference Code: ICSET18-04-12

On the Assimilation of GNSS Precipitable Water Vapor (PWV) Measurements in Heavy to Torrential Rain Events in Davao City

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ABSTRACT

Precipitable water vapor (PWV) measurements derived from the datasets of a standalone GNSS receiver was conducted in Davao City, Philippines (7º4'N, 125º36'E) for the years 2013 to 2016. The primary goal of the study is to monitor the variability of the GNSS-PWV estimates during heavy to torrential rain events. Several papers have made case studies on precipitation and atmospheric water vapor and most studies have supported the existence of the positive correlation between PWV and rain. These studies implied that a better analysis of the distribution of water vapor is a key factor to better understand the initiation of precipitation and provide more accurate forecasts of such events. In the present study, time series plots were made to provide a better picture of the variability of PWV for each rain event. It can be observed that while moderate rain follows small variations in PWV, heavy to torrential rains usually follows a peak in PWV. A time lag of approximately 2-8 hours is observed between the two peaks. Intense to torrential rains would always be followed by a decrease of about 5-10 mm in PWV. In addition, a build-up of PWV is observed prior to intense to torrential rain. However, the maximum PWV value that precedes each rain event varies depending on the season and no cut-off value of PWV had been noted that predicts the occurrence of heavy to torrential rain events.

Keywords: GNSS-Precipitable Water Vapor (PWV), rain events, atmospheric water vapor

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The authors would like to acknowledge the data sources in this study: Space and Earth Geodetic Analysis Laboratory (SEGAL), University of Biera Interior, Portugal, PAGASA Davao Station, Manila Observatory (MO), as well as the valuable assistance provided by Fr. Francisco Glover, SJ and Fr. Daniel McNamara, SJ. The research work is also made possible through the corresponding author's DOST-SEI ASTHRDP-NSC scholarship grant.

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Simultaneous Treatment and Reuse of Textile Wastewater Following Ozonation Process

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ABSTRACT

This study presents the research work on textile wastewater originating from wash-off process post cotton reactive dyeing of cellulosic knitted fabrics. The objective was to find an innovative washing-off method for the removal of unfixed dyes with least amount water and energy consumption, without impairing fastness qualities. In this reference, Ozone gas was utilized for the very first time in the washing and rinsing of reactive dyeing to get required color fastness properties of reactive dyes. After fabric swatches were dyed in deep shades, 5% on weight of fibres (owf) using Ramazol Black B, Remazol Blue R, and Organge RR, C.I. Reactive Black 5, C.I. Reactive Blue 19, and C.I. Reactive Orange 7. Dyed fabrics underwent both conventional and new washing procedures to make comparison. The new washing method employed the use of ozone gas injected at the bottom of a column reactor using a fine gas diffuser. Both the fabric and coloured wastewater was subjected to ozone treatment. The new method was carried out at ambient temperature using a single fill of water without draining and refilling fresh water. Cotton samples rinsed and washed with new method were compared with those conventionally washed fabrics with respect to wash fastness, rubbing fastness, change in color, and total color difference (ΔE). All fastness properties and ending shade of colour of ozone washed samples were found to be equivalent to samples went through old conservative method of washing-off. The new investigated method exhibited both energy and water efficiencies.*

Keywords: Wastewater, ozone, AOP's, washing-off, reactive dye, fastness properties

Acknowledgement
We wish to thank Thies GmbH & Co.(Germany) for their support to implement this new method in the jet dyeing machine. The new method has been protected by international patents: WO/2008/138282; EP1990456; KR20080099824; JP2008280666; DE102007022265; CN101302722; BRPI0801267; US2009126124.

Paper Reference Code: ICSET18-01-14

An Initial Quantification of Embodied Energy of Economic and Socialized Housing Units in Davao City, Philippines

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ABSTRACT

This study aimed to quantify the embodied energy of economic and socialized housing units in Davao City, Philippines and listed down the construction materials that contributed significantly to the total embodied energy and at the same time correlated these materials to the embodied energy. Embodied energy coefficients of construction materials were sourced out from existing literatures since there were no available standards and studies conducted or published in the context of the Philippines. A bill of materials/quantities was prepared for each housing unit in order to compute the embodied energy. The research findings showed that an average of 9,477.74 MJ/m^2 of embodied energy was computed among the housing units. The results also showed that building materials such as cement, reinforcing bars (steel), gravel, and sand, have significant positive correlation with the embodied energy alongside the house unit floor area. The result further showed that the embodied energy measured per square meter (MJ/m^2) was higher compared to the existing and published studies conducted in Australia, Brazil, India, and Indonesia. Implications to housing delivery and energy efficiency were also pointed out for policy-making which could be adopted by the housing authority.

Keywords: Embodied energy, economic housing, socialized housing, Davao City, Philippines

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Suitability Analysis of the Proposed Landfill Site in Brgy. Balayhangin, Calauan, Laguna

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ABSTRACT

Landfill site developments are required to cope with the increasing waste generation due to the growing population. Maintaining measures for environmental and social protection require thorough analysis of the conditions to adequately predict the potential impacts and to determine the suitability of the site. Field surveys, Atomic Absorption Spectroscopy, Analytical Hierarchy Process, and analysis using Geographic Information System are used to determine the suitability of the landfill site in Barangay Balayhangin, Calauan, Laguna based on related literature and the Department of Environment and Natural Resources' Administrative Order No. 98-50. Reclassified maps and overlay analysis indicate that the site is suitable but requires further engineering modifications. The metal concentrations are inferred to be within acceptable limits, yet it requires further detailed studies for a more definite conclusion. Critical potential impacts to the water quality and geology and hydrogeology have been identified and predicted.

Keywords: Landfill, Laguna, geographic information system, site suitability, analytic hierarchy process

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Initial Nutrient Removal Performance of Constructed Wetlands Using Incineration Bottom Ash (IBA) as Alternative Substrates

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ABSTRACT

A feasibility study was carried out to investigate the usage of incineration bottom ash (IBA) as an alternative substrate of subsurface flow (SSF) constructed wetlands (CWs). Based on the experimental results, the averaged removal ratio of ammonia-nitrogen of SSF CWs filled with IBA was significantly improved from 14.1 % to 52.9 % when compared with that of the control system. Because of the metallic ions released by IBA, the averaged removal ratio of total phosphorous was also increased from 14.7 % to 40.4 %. The aquatic plant, whorled pennywort, well grew in both systems, showing the variations of pH and metallic irons released from IBA did not affected their growth and water purification. After proper washing and screened, the application of IBA as the substrate of SSF CWs was another alternative for their disposal.

Keywords: incineration bottom ash; subsurface flow constructed wetlands; ammonia-nitrogen; total phosphorous

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Earthquake and Flood Hazard Risks Assessment Using Monte Carlo Analytic Hierarchy Process (MCAHP)

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ABSTRACT

Disaster risks have to be carefully assessed so that measures may be introduced to avert potential danger to life and damage to property. In this study, we model the flood and earthquake risk for the central business district (CBD) of Makati City, which is located at the center of National Capital Region (NCR). To accomplish this, we identified important geological and meteorological hazard-related factors whose data are either easily available or may be collected through some automated process like the internet. We then surveyed academic experts in the field of Civil Engineering to gather their estimation of the importance of the identified factors, and then used the Analytic Hierarchy Process (AHP) to determine the consistency of the expert judgments as well as the relative weights of each factor. These factor weights from the AHP were applied to the gathered data, and Monte Carlo Simulation (MCS) was used to model situations that present uncertainty. Using such a weighted simulation analysis we accurately predict the probabilities on uncertain events such as extreme natural phenomena like typhoon or earthquake, make visible all possible outcomes of each decisions and assess the impact of risks to life and property.

Keywords: Analytic hierarchy process (AHP), Monte Carlo Simulation (MCS), geological and meteorological hazard

Acknowledgement:
The author/s would like to thank Dr. Juanzon and Engr. Juan my co-authors for giving me the opportunity to present this research paper.

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Neem *(Azadirachta Indica)* Raw Extracts as Potential Bio-based Coco Wood Preservatives in the Philippines

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ABSTRACT

The purpose of this study was to develop an organic wood preservative from the liquid extract of Neem tree (Azadirachta Indica). This product is potential in controlling the fast deterioration of coco wood as affected by water absorbency, tangential swelling, and vulnerability to termite attacks. The liquid extract was produced by simply crushing the fruits with seeds and leaves of Neem tree. Effectiveness as wood preservative was investigated for termite repellency, water absorption, and tangential swelling following ASTM (American Society for Testing and Materials) methods such as D-3345-74, D-4442-92, and D-4446-06, respectively. The study revealed that wood samples with Neem extracts have favourable effects in preserving coco wood. It was also observed that extract from Neem leaves and fruits with seeds has no significant difference in terms of effectiveness on wood preservation displayed and coco wood physical characterization. Majority of the results were commensurate to gear on an affirmative finding to conclude that the liquid extract from Neem can be used and further explored as an effective material for wood preservation.

Keywords: Coco wood, Neem extract, preservative, Philippines, resource utilization

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Synthesis and Characterization of Activated Carbon Derived from Bignay Seeds *(Antidesma bunius L.)* in Methylene Blue Removal: Parametric, Kinetic, and Isotherm Studies

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ABSTRACT

In this study, bignay seeds were utilized to synthesize granulated activated carbon and tested its effectivity through simulated mixture of methylene blue and water. It investigated the adsorption capacity of granulated activated carbon by the effect of contact time and concentration of the methylene blue solution. The raw bignay seeds were subjected to physical activation by oven drying at 120°C and carbonization of the bone dry seeds at 500°C for 30 minutes.The adsorption isotherm was analyzed through Langmuir, Freundlich, Temkin, and Dubinin-Radushkevich isotherm models and the data fitted with the Freundlich isotherm. The mean energy of the adsorption showed that the adsorption of Methylene Blue by Bignay Activated Carbon was physical adsorption implying that MB molecules were trapped in the pores of the AC. The maximum adsorption capacity was 1.596 mg/g. The rate of adsorption was used to determine if the process is physisorption or chemisorption using pseudo-first order and pseudo-second order adsorption kinetics. The data shows that the best fit model was pseudo-second order suggesting that the reaction depends on the concentration of both of the reactants. The alkyl functional groups of Bignay Activated Carbon were determined using FTIR analysis and the surface morphology and composition of the activated carbon were analyzed using SEM-EDX. The adsorption studies determined the maximum adsorption capacity of both powdered and granulated activated carbon. Hence, the experimental results showed the potential of bignay seeds to produce activated carbon.

Keywords: Activated carbon, adsorption, bignay, isotherm, physical activation

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Removal of CO from Kitchen Emissions Using a Fabricated Composite Corn Husk/Compost Biofilter

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ABSTRACT

Several deaths due to carbon monoxide (CO) poisoning in highly insulated homes occur each year. To provide solution to the problem, this study investigated the ability of a fabricated biofiltration unit for CO removal in kitchen emissions. Vermicompost was mixed with corn husk to produce media for a novel biofilter system utilized to control kitchen emissions. Benetech CO Meter GM8805 was used as a CO analyzer. Continuous smoke emission from charcoal was used as source of CO. Inlet gas flowrates for all trials were constant at 166.42 cfm (0.07854 m^3/s). The pH of the biofilter media ranged from 7-8. The temperatures of the inlet gas ranged from 30-31 C^o. The effective media composition of 70:30% by weight compost/corn husk was used. The effective bed height was 430 mm with a cross-sectional area of 20.27 cm^2. Characterization and the determination of the effect of exposure to CO of the media was made using Scanning Electron Microscopy. Cornhusk is a suitable biofilter media because of its desirable properties like high porosity. Possible deterioration was observed in the composite media after exposure to CO. The maximum CO Removal Efficiency was observed at the first minute of operation and decreased with time. Results shows that composite corn husk/compost as biofilter media has a competent ability in eliminating CO. Removal efficiencies for the first minute at high concentration and low concentration were 89.18% and 95.14% respectively. As time progressed removal efficiency dropped to a range of 40-80% at high concentrations. For low concentrations, removal efficiency remained high at 90-100%.

Keywords: Biofilter, corn husk, vermicompost, retention time, breakthrough point, destruction point

Acknowledgement:
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Analysis of Factors Influencing the Cost of Hospital Wastes Management in Surabaya, Indonesia

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ABSTRACT

Waste issues in general include the handling and waste management start from waste sources to land disposal. This needs technology selection and management of appropriate waste management. Waste cost management was achieved by selecting waste combustion technology using incinerator engine in order to minimize costs incurred by PHC (Port Health Care) Hospital Surabaya. There are many factors affecting the cost effectiveness of process hospital waste management in burned medical waste.

This research uses linear regression programming supported by SPSS computer program. Variables used in this research are (Y) = cost, (X1) = waste weight, (X2) = duration of burning time. This analysis uses several tests such as heteroskedasticity test, normal data of residual data test, validity test, and reliability test. The data are taken from secondary data obtained from CV.NOVALINDO, a third-party waste management company.

The result shows the most influential factors are the weight of wastes and combustion time in the effectiveness the cost of waste management in Hospital. These factors can explain the positive relationship simultaneously between the variable weight of waste (X1) and duration of combustion (X2) to the management cost of 89%. It shows that the longer the burning time, and the heavier the waste, the greater the cost of waste management required.

Keywords: Waste management hospital, waste weight, burning duration, linear regression

Paper Reference Code: ICSET18-05-27

Pleurotus djamor as a Potential Biosorbent for Copper (II)

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ABSTRACT

Biosorption is a low-cost alternative heavy metal removal technology which involves certain biomass to concentrate passively and bind metal contaminants. Pleurotus djamor, commonly known as pink oyster mushroom, is an edible fast-growing fungus and is thermophilic in nature. This study tested the biosorption potential of P. djamor for Copper (II). The factors including P. djamor biosorbent mass, pH level, temperature, contact time, and agitation speed were set constant for all the set-ups whereas the copper concentrations were varied. Upon the cultivation of the mushroom, preparation of Copper (II) solutions and assembling the biosorption set-ups, the biosorption process was done mainly through agitation process, as it induces the adherence of the adsorbate, Copper (II) to the biosorbent (P. djamor), followed by the heavy metal removal analysis aided by three isotherm models. Results revealed that the highest percentage of heavy metal removal of about 84% was found at the lowest concentration of Copper (II) particularly at 10 ppm. The final pH of the set-ups decreased as the concentration of copper (II) increased after the biosorption process. The Temkin isotherm model demonstrated the best-fitted model as it has the highest R^2 value of 0.9828 which implies that the designed biosorption system is physical adsorption and the biosorbate had formed a multi-layer on the surface of the biosorbent. The heat of biosorption of molecules in the subsequent layers decreases linearly rather than logarithmic in comparison to the principle of Freundlich isotherm model.

Keywords: Adsorption, biosorbate, biosorbent, biosorption, copper (II), Pleurotus djamor

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Geomorphology of Bucayao and Pangalaan Rivers, Oriental Mindoro, Philippines: Prediction and Delineation of Channel Migration Zone and its Implications on Floodplain Land Use

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ABSTRACT

Several studies about channel migration and riverbank erosion were undertaken in other countries such as United States of America, China, and India. However, in the Philippines, studies about fluvial geomorphology were limited, particularly for the geomorphologically-active Bucayao and Pangalaan Rivers in the City of Calapan, Oriental Mindoro. This research tried to answer the following questions: What are the geomorphic characteristics of Bucayao River and Pangalaan River which influenced the nature and extent of riverbank erosion and channel migration; and their implications on floodplain land use in Barangays Bucayao and Pangalaan, Calapan City, Northeastern Oriental Mindoro? The modified Bank Erosion Hazard Index of Newton & Drenten (2015) was employed to assess the bank erosion susceptibility along Bucayao and Pangalaan Rivers. Based on historical and planimetric observations, the Channel Migration Zone originally proposed by Rapp & Abbe (2003), was divided into low, moderate, and high migration potential areas. In the generation of the floodplain land use map, a conservative approach was adopted in the floodplain management of Barangays Bucayao and Pangalaan by overlay analyses and correlations between the channel migration zone, the existing land use map, and the road network map. As a non-structural countermeasure, three types of floodplain zones were suggested: (1) the blue zone, (2) the red or no-build zone, and (3) areas outside the blue and red zones. These zones denote the appropriate land use by considering the hazards related to channel migration.

Keywords: Fluvial geomorphology, meandering river, channel migration, bank erosion, land use

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A Triple Bottom-Line Approach of Analyzing the Qualitative Impact of Waterlily Handicrafts Production of Barangay Pandaras Residents, City of San Fernando, Pampanga

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ABSTRACT

The common water hyacinth is considered as a hindrance in the ecological system of a body of water to which it grows into. To mitigate these effects of its proliferation, Waterlily Handicrafts livelihood were introduced to communities where the plant is spreading. One of these communities is Brgy. Pandaras, where Fernandina Waterlily Handicrafts Association (FWHA) spearheaded the production of waterlily handicrafts in the community. Since its introduction to the community in 2009, an update on how it has helped the community is yet to be analyzed. The research was directed to identify indicators that related to the impact of waterlily handicrafts production on the environmental, social, and financial dimensions of the company, as well as how the residents see its environmental, social, and financial impact in the community. A triangulation of methods was performed and it was determined that harvesting stalks, drying and preparing the materials, and product preparation were the activities contributing to the triple bottom-line objectives of the production. Outcomes were generated from the activities and formed to a matrix of impacts (questionnaire) which was distributed to a sample size of 286 respondents from the community of Barangay Pandaras. Using mean rating analysis, respondents had a mean response equivalent to "slightly agree" to the impacts in general. "Less flood occurrences" and "no unpleasant smell" had the highest mean rating, translated as "agree" on said environmental impacts. The impact of waterlily handicrafts production was only slightly positively felt by the community due to limited demand and involvement of the community.

Keywords: Barangay Pandaras, environmental and social impact, waterlily handicrafts production

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Abaca Fiber (*Musa textilis Nee)* and Plastic Post-Consumer Wastes (A/PCW) as Potential Composite Board for Building Materials in the Philippines

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ABSTRACT

This paper presents a study on the utilization of flexible plastic post-consumer wastes combined with abaca (A/PCW) as potential composite board for building industry. The Manila hemp (abaca) has been considered as the source of strongest natural fiber in the world. On the other hand, Philippines has been cited as the 3rd highest contributor of plastic wastes in the ocean. Targeting to help contribute to solution on the current problems in plastic wastes and utilizing the abaca (hemp) of the Philippines. Hence, the aim of the study was to investigate the possibility of combining abaca with post-consumer (A/PCW) flexible plastic wastes to produce a composite board for building industry. The study further investigated the most appropriate formulation of the A/PCW based on its physical and mechanical properties. Three types of samples (A: PCW) with six specimen each type, e.g. {1} 50:50, {2} 50:40, and {3} 70:30 were prepared using the w:w ratio. Employing simple physical-mechanical process and polymer resin adhesive together with A/PCW resulted to a composite board. Sample 2 was the best performing sample based on the results of its physical and mechanical properties analyses. Further, the results of ANOVA with SPSS supported the experimental results.

Keywords: Abaca, composite board, flexible plastics, wastes utilization

Paper Reference Code: ICSET18-14-36

Watershed and Cave Stream Interconnectivity in Pahuan Cave in Bonliw, Torrijos, Marinduque, Philippines

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ABSTRACT

Marinduque is endowed with a lot of caves with underground streams harboring a variety of freshwater organisms including freshwater shrimps. However, these potential resources can be lost if the water quality of the cave streams are not maintained which are also dependent on the quality of the aboveground forest and watershed. This study aimed to characterize the aboveground forest cover in the vicinity of the cave, determine the siltation/sedimentation rate in the aboveground and cave streams, nutrient contents (ammonium, phosphate and sulfate) of the sediment and water, and organisms (freshwater shrimps and planktons) present in both streams.

Results of the assessment indicated that the aboveground stream and the cave stream in the Torrijos Watershed Forest Reserve are interconnected as shown by both streams having common organisms (both freshwater shrimps and planktons). Further, there seemed to be similar trend or correlation on the total suspended solids, sedimentation rates and amount of nutrients (in particular phosphates) between the two streams. Although organic matter and nutrients from the aboveground landscape are needed for the sustenance of organisms in the cave ecosystem (the abundance of which are dependent on the connectivity of the two water systems), excessive siltation/sedimentation can ultimately threaten the water quality of cave stream. With the forest in the watershed area characterized as denuded, the threat is evident. The protection of the watersheds and its landscape is imperative.

Keywords: Freshwater shrimps, cave stream, interconnectivity, nutrients, watershed, planktons

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This study was funded by the Commission on Higher Education – Faculty Development II (CHED-FDP II). The permits to study the areas were granted by the Department of Environment and Natural Resources and the Local Government Units of Brgy. Bonliw and Municipality of Torrijos. Prof. Roy Olsen D. de Leon of Silliman University technically supervised this study. Forester Efren L. De los Reyes and Mr. Ronald Atienza assisted in the fieldworks.

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The Disinfection Activity of Eco-Friendly Nano/Micro-Sized Material Synthesized by Waste Shells

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ABSTRACT

The yearly production of oyster shells are around 200,000 tons every year in Taiwan. Approximately 4 million tons waste shells are produced every year in the globe. Although oyster shells have various applications, these are still low efficient and cause to serious environmental problems. The alternatives for more efficient use of oyster shells has aroused public concern. Calcined oyster shells can be regarded as the innovated antibacterial agent. The various calcination temperatures (650 – 1050 °C) and calcination times (1 - 6 hr) were evaluated. The characteristics (specific surface area, particle size, zeta potential and scanning electron microscopy) of samples were analyzed by the. The disinfection kinetic model and the disinfection mechanism against Escherichia coli (E. coli) and Staphylococcus aureus (S. aureus) were also investigated. The results indicated that the smaller size of calcined oyster shell wouldn't increase the disinfection rate. Compared the effect of various calcination temperature. The disinfection rates against S. aureus (99.48%) in 1 hr were slight lower than E. coli (99.999%) with same calcination condition at 950°C for 1 hr. Further, increasing the calcination time to 6 hr. The disinfection rate against E. coli in 1 hr reached 99.999% with the temperature up to 850°C. As to the effect of various calcination time, the disinfection rate against E. coli in 1 hr reached 99.999% with the calcination temperature at 850°C up to 2 hr. With the innovation use of oyster shell as an antibacterial agent, this application of green technologies can improve the problem in aquaculture and provide the innovative.

Keywords: Disinfection rate, nano/micro-sized, waste shells

Paper Reference Code: ICSET18-08-39

Demeter's Eyes: Detection and Recognition of Witch's Broom Disease on Cassava using Extended Viola-Jones and Template Matching Algorithm for Disaster Risk Reduction

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ABSTRACT

Cassava Phytoplasma Disease (CPD) also known as Witch's broom disease is presently manifesting to some cassava fields, the disease is named after the broom-like leaf spread at the top of cassava plants. The study is about the design and development of the Demeter's Eyes. The Demeter's Eyes is a prototype that comprised of an embedded system through extended viola-jones and template matching algorithm. The study has three major components: (1) the building of the prototype device which will be attached on a drone to do the image processing in real-time; (2) the development of the embedded system which will be responsible in analyzing the real-footage captured by the camera; and (3) the evaluation of the Demeter's Eyes in terms of accuracy and speed to limited variety of cassava.

The proposed algorithm served as the framework mainly designed for detection and recognition of CPD cutting the time in the detection process by only analyzing those potential object of interest and set criteria to increase accuracy rate. This study will be very helpful for reducing the disaster risk for a cassava plantation. It will help identify what areas in the cassava plantation are infected with the disease and hence can be isolated immediately to avoid infecting others. The study involved custom cascade classifier model that comprises image acquisition, template selection, train cascade classifier, and real-time object detection and to recognize once validated. Hardware and software requirements for the Demeter's Eyes were identified to develop its prototype and embedded system. Accuracy and speed of detection and recognition were evaluated during the conduct of experimentation. The system showed that the proposed algorithm has remarkable results in terms of accuracy and speed.

Keywords: Cassava, witch's broom, image processing, Viola-Jones algorithm, disaster risk reduction

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Adsoprtion of Sulfamethoxazole Using Graphene Oxide and its Modifications

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ABSTRACT

Graphene oxide, a nontraditional compound obtained from the oxidation of graphite, was found to be a good alternative to conventional adsorbents like activated carbon and nanotubes for the removal of contaminants in wastewater. In the current work, the effect of oxidation degree and reduction of graphene oxide as well as the pH, temperature and contaminant concentration in the adsorption of SMX were investigated. Results show that the less oxidized graphene exhibit greater affinity towards SMX. With this finding the major adsorption mechanism can be concluded as pi-pi interactions which refers to noncovalent binding between aromatic groups. It was also found out that lowering the pH increased the adsorption capacity of all graphene oxide samples. Functional groups of SMX have neutral ion species at acidic pH and therefore has more affinity with graphene oxide. On the other hand, the sorption capacity decreased as the temperature is increased indicating that the process is exothermic and the adsorption is rather a physical phenomenon than chemical. For the adsorption isotherm, data fitted well with both Freundlich and Langmuir isotherms but better with the latter indicating monolayer adsorption. Overall it can be concluded with these findings that graphene oxide is an effective adsorbent for the removal of SMX in wastewater.

Keywords: Adsorption, graphene oxide, Hummers method, pi-pi interaction, wastewater treatment

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Framework Development for Untag Surabaya as Eco-Campus

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ABSTRACT

Sustainable issue is still trending topic in nowadays. This happens because of the appearance of global climate change phenomenon. One of best solution is making sustainable concept to be implemented in many aspect. Increasing environmental awareness is a must for human being in nowadays. University is one of community to be considered and take part to make better environment. In this research, a simple assessment will be taken through campus stakeholders. This is to know the level of achievement on-sustainable campus program of the university. An assessment using questionnaire was carried out and fulfilled randomly by respondents (stakeholders). Then, a framework of sustainable campus is developed. The output of this research is road map strategy which is deployed considering continuous improvement to achieve high level of sustainable campus. There is level sustainability enhancing after implementing developed framework, from 50% to be 87%. Roadmap strategy has been deployed to three periods 2012-2014, 2015-2017, 2018-2020 which have been considered by all stakeholders who engaged in the program. A future research opportunity about integrated modelling on LCC and LCA has emerged to complete the current research on eco-campus for sustainable development.

Keywords: Eco, environment, campus, roadmap, strategy, sustainable

Acknowledgement:
The author acknowledgement for the support who gives from Ministry of Higher Education Republic of Indonesia, stakeholder campus sort of Rector, Vice Rector, Dean, Lecturers and staff, Research Centre, students, society surround in Untag Surabaya. This acknowledgment also for Surabaya City Government, especially Dinas Lingkungan Hidup who give us the chance to join Eco Campus competition, and be the first winner of Eco Campus competition in 2018. It is such an honour.

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Ecological Footprint Accounting of Non-Biodegradable Wastes of Angeles City: The Anthropogenic Shift to Biodegradable Food Packaging Materials

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ABSTRACT

The study factored the two anthropogenic indicators on ecological footprint accounting (EFA) of non-biodegradable wastes of Angeles City; (1) the solid waste production rate that accounted for both the level of waste consumption and quality of habitat (2) and the city's population growth. The ecological footprint on municipal wastes generated per capita was based on the projected five-year collective final solid wastes of the entire city's population taken into consideration the horizontal trend rate of diverted wastes from recyclables and the city's target policy on quality improvement of waste characterization from non-biodegradable shifted to biodegradable.

The main objective of the study dwelled on the (1) municipal costs differential analysis on diverted wastes based on the trend projection of final solid waste ending in the Landfill (2) the quantified benefits on annual tipping fee savings plus the projected profit on recyclables. In addition, the study described the statistical inferences on the stakeholder's preference between biodegradable and non-biodegradable food packaging materials using mean rating and one-way ANOVA.

Keywords: Ecological footprint accounting, biodegradable, non-biodegradable, trend analysis, cost and benefit analysis

Acknowledgement:
I acknowledge the great help of CENRO-Region III for entrusting their valuable data for Waste Analysis Characterization Study. This research paper was funded by CHED-DILG for an amount of Php 50,000. I am also grateful to Holy Angel community. Laus deo Semper.

Paper Reference Code: ICSET18-14-45

Investigating the Effect of Urbanization on Weather Using the Weather Research and Forecasting (WRF) Model: A Case of Metro Manila, Philippines

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ABSTRACT

The effect of urbanization of Metro Manila particularly to the amount of heat flux, rainfall and temperature of selected urban and rural areas was investigated using the Weather Research and Forecasting Version 3.4.1 (WRFV3.4.1) model. The NCEP FNL grib 1 data from Year 2000 to 2010 were used as input in the model for meteorological data. The Mann-Kendall trend test (M-K test) was utilized to verify the significance of the trends while the Sen's slope estimator quantified the measured trends.

Results showed that, on the average, the heat flux of Metro Manila is about $1.5x10^8$ Jm^{-2} higher than in selected areas outside Metro Manila. The occurrence of urban heat island (UHI) effect was detected in Metro Manila by comparing the difference in the minimum temperature and maximum temperature. For the selected urban and rural areas, the minimum and maximum temperature differences (relative to Metro Manila) are around 0.4°C to 2.4°C and 0.83°C to 2.3°C, respectively. Metro Manila recorded 11-year higher average values of rainfall during the summer season (8% to 64%) rainy season (15% to 305%) and transition season (8% to 232%) when compared with selected areas from 25 km up to 100 km from Manila. These results show that the urbanization of Metro Manila affects its weather specifically heat flux, temperature and rainfall.

Keywords: WRF, urbanization, heat flux, rainfall, temperature, Mann-Kendall test

Acknowledgement:
The researchers would like to acknowledge the support of the Department of Science and Technology Science Education Institute (DOST-SEI), the Commission on Higher Education (CHED), the DLSU Science Foundation and the Technological University of the Philippines (TUP) for the study grants and research grants.

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Soil Macrofauna Communities at the Bamboo Forest in Surabaya, Indonesia

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ABSTRACT

Soil macrofauna must be better understood in order that we can take advantage of their full potential for the restoration of ecosystems. In this study, we conducted study of soil macrofauna in the Bamboo Forest Park Surabaya which has been used as a landfill and is now managed as a public park. The goal is to compare the soil macrofauna living on and in the ground in three different managed areas: bamboo forests, flower gardens and unmanaged areas to investigate how the management plan might promote soil macrofauna communities which are in turn play important roles in ecosystem restoration. Soil macrofauna were collected in five randomly selected plots of sampling with 50 x 50 square centimeters to a depth at 10 cm in each area. The sampling was performed once a week for 3 weeks and then the soil macrofauna were counted and identified to the order level (or a lower classification level, if possible) for calculating the biodiversity index. In total, we found 1,209 of soil macrofauna in the study areas. They can be divided into 3 phyla, 7 classes, 17 orders and 46 species. The highest diversity of macrofauna species is flower gardens, followed by unmanaged areas and bamboo gardens.

Keywords: Soil macrofauna, bamboo forest, flower garden, unmanaged area, biodiversity index, landfill

Paper Reference Code: ICSET18-11-47

Carbon Dioxide Analysis of Taman Flora Park, Surabaya, Indonesia

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ABSTRACT

In this research, we studied on carbon dioxide sequestration in aboveground biomass of Flora Park Surabaya. The goal is to redesign the plants composition of the park so it can be reduce the carbon sequestration of biomass. The samples are 20 plots which have size 10 x 10 square meters and the number of transportation around Taman Flora Surabaya to compare carbon emission with carbon stock in trees in the garden. Aboveground biomass was estimated by using allometric equation and aboveground carbon stock was calculated by multiplying the 0.47 conversion factor to the estimated aboveground biomass. Carbon dioxide emissions of transportation was calculated by using CO_2 emission factor from EEA (2014(. The results showed 81 trees of 21 Species belonging to 12 Families in Taman Flora Surabaya. The highest number is Angsana (Pterocarpus indicus Willd.), following by Flamboyan (Delonix regia), and Trembesi (Samanea saman), respectively. The total aboveground biomass is 1,658.031 tonne/ha. The total carbon sequestration of biomass in Taman Flora Surabaya is 779.275 tonne C/ha. The total CO_2 emissions of transportation is 4.77 tonne/day.

Keywords: Carbon sequestration, aboveground biomass, CO_2 emissions, Taman Flora Surabaya, Indonesia

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Strength Analysis of Glass Fiber-Reinforced Compressed Earth Block (GFRCEB)

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ABSTRACT

Concrete masonry buildings have been the focus of the Philippine construction industry. However, the development of other existing building materials with technology are still in demand. Most of them aim to create a stronger and more serviceable building materials that will cater to the demand of the public. This paper aims to develop a reinforced compressed earth block, with the use of glass fiber to stand against the mechanical properties of a concrete hollow block. The process involves the development of a proportionate mix for the 18 samples of compressed earth blocks and reinforcing them with glass fiber. Unreinforced compressed earth block was also produced to study and validate the effect of the glass fiber. An improvised pressing machine was used to form the compressed earth blocks. Concrete hollow blocks were purchased and then filled with a mixture of cement, sand, and water. Compressive and flexural strength tests were conducted at an accredited laboratory that conforms to the codes C67 and C140 of the American Standards for Testing Materials (ASTM). Results of the compressive and flexural strength test and cost were then compared between glass fiber-reinforced compressed earth block and concrete hollow blocks. The results of this study highlighted general trends in the mechanical properties of compressed earth blocks. These endeavours are important to ensure that compressed earth block technology is recognized in the world of building materials and be considered a reliable option for providing low-cost housing.

Keywords: Compressed earth block, glass fiber, compressive strength, flexural strength, concrete hollow block

Paper Reference Code: ICSET18-14-50

Rain – Induced Landslide Susceptibility Mapping of General Nakar in Quezon Province Using Stability Index Mapping (SINMAP)

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ABSTRACT

Rain – induced landslides as well as seismic – triggered landslides in the Philippines is inevitable due to the country's geologic and geographic setting. These landslides threaten people and causes vast property destructions. The municipality of General Nakar in Quezon Province which is situated on the eastern flank of the southern Sierra Madre characterized by narrow and steep peaks is a landslide prone area. The non – availability of geohazard maps in the area providing quantitative, and deterministic information for engineering project designs, and engineering works presents an opportunity to generate a rain – induced landslide susceptibility map. The Stability Index Mapping (SINMAP) technique was adapted to create the landslide susceptibility map of the study area. Calibration parameters necessary in this study were derived through laboratory tests such as direct shear test as well as observations that best fitted the field conditions. The utilization of SINMAP model was significant as it predicted how much the area is susceptible to landslides and identified what are the potentially unstable and landslide prone areas. Through the analytical results, 17.68% of the total study area is Low Susceptible Zones, 28.98% of the total study area is Moderate Susceptible Zones, and 53.34% of the total study area is High Susceptible Zones. The accuracy of the SINMAP results in this study is high since the study has a DP value of 97.46% and a MF of 0.026. The High Susceptible Zones are areas that have steep to very steep slopes, Moderate Susceptible Zones have moderate slopes, and Low Susceptible Zones are areas that are near a river channel, and slopes that are relatively flat. Engineering measures can be applied for the mitigation of slopes, and the results from the laboratory testing serves as a basic information for detailed designing. A coalesce study with a different approach on landslide susceptibility mapping of the same area can be made to have a more definite recognition on the landslide susceptible zones.

Keywords: Landslide susceptibility mapping; stability index mapping (SINMAP); General Nakar, Quezon Province

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An Overview of Vertical Air Sampling Technologies for Ambient Volatile Organic Compound Monitoring to Resolve Air Quality Concern

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ABSTRACT

Investigation of vertical volatile organic compound (VOC) profiles has been conducted by towers, tethered balloons, airships, and aircrafts in the past decade. The sampling height and site are major limitations for the tower-based measurements. The tethered balloons and airships seemed to improve the sampling altitude but they require large space and could only operate with slow speed and short-flight distances. The aircrafts showed greater versatility and could sample up to 12 km in height. However, their main disadvantages are contaminant emission potential and high risk when flying at low altitudes, where contain important information for air quality research. Small unmanned aerial vehicle (UAV) equipped with canister sampling technique and different sensors have recently known a realizable alternative to the above-mentioned techniques because of their operational flexibility, lightweight, small space requirement and acquiring capacity of high resolution remote sensing data. The vertical VOC profiles up to 1000 m in height had been investigated, and had successfully demonstrated the need and the ability to characterize vertical variations of ambient VOCs. However, some challenges need to be concerned, namely payload capacity, flight durability as well as dimensions, weight, sensitivity and accuracy of attached sensors. Once UAVs are applied worldwide, regulations and policy, which differ between countries, will become a more important challenge.

Keywords: Unmanned aerial vehicle (UAV), tower-based measurement, tethered balloon, airship, aircraft, vertical volatile organic compound.

Paper Reference Code: ICSET18-03-53

Comparative Analysis of Compressive Strength of Concrete with and without Capping Compound (Gypsum)

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ABSTRACT

This paper aims to develop a correlation between capped and uncapped concrete cylinder tested. Concrete is the most widely used material for construction mainly because of its properties and characteristics that engineers look for. One of the best properties of concrete is its compressive strength; it is most commonly used by engineers to test the concrete to be able to design buildings and structures. It can be measured by breaking cylindrical concrete specimens in a compressive-test machine. The ends of the cylinder is important as ends of the concrete is the location where axial loading during material tests are carried out by the concrete. This research determines which capping materials maximized the compressive strength of concrete. In this study, eighteen (18) concrete specimens were examined and underwent compressive strength test. The samples were split into two (2) groups; the first group are capped concrete specimens while the other group were uncapped concrete specimens. Gypsum plaster were used as capping material employing the ASTM C39/C39M. Results showed that the difference of the compressive strengths of the capped and uncapped concrete cylinders is not significant. The capped and uncapped concrete cylinder samples had average compressive strength of 23.15 and 22.74 Mpa, respectively.

Keywords: Concrete, compressive strength, capping, gypsum plaster

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Quantitative Detection of Cyanobacteria (blue green algae) with Toxigenic and Odor Producing Genes in Laguna Lake, Philippines

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ABSTRACT

This paper presents the quantitative assessment of water quality focusing on the harmful blue green algae and the result of the first ever detection of 2–methylisoborneol (2-MIB) in Laguna Lake, Philippines. Peculiar taste and odor were experienced by nearby communities which received treated water from the lake. Laguna Lake is the biggest inland water in the Philippines and a water resource for domestic use. The average depth is 2.5 meters with 20 meters as the deepest section near the northern part of the lake. Presence of cyanobacteria (popularly known as blue-green algae) is one of the challenges in the lake's water quality. Collection of secondary qualitative data for the period of 2012 – 2016 combined with the quantitative detection and analysis of primary data in 2016 and 2018 were carried out for this specific study. Grab sampling while on board a boat was carried out using Ekman and stainless water sampler for sediments and water column, respectively. Using real time quantitative polymerase chain reaction (qPCR), enzyme-linked immunosorbent assay (ELISA), and gas chromatography – mass spectrometry with head space solid-phase microextraction (GC-MS-HS-SPME), several species of harmful cyanobacteria were detected at various stations in the lake. Results of qualitative assessment showed the dominance of microcystis; whereas, the quantitative analysis uncovered the abundance of toxigenic cyanobacteria species, concentration of toxins (microcystins and cylindrospermopsins), and the number of gene copies that produced taste and odor problem in water. The cyanotoxins caused kidney and liver problem to human. Quantitative analysis of the harmful blue-green algae in the lake provide additional understanding of the lake water quality. This information could aid in making remediation strategy, appropriate water treatment system, research direction, as well as developmental cooperation with capable and concerned institutions or agencies inside and outside the country. Also, the information as a result of the detection technology used in this study would provide the regulatory agency to develop mitigation measures as well as policy enhancement to conserve the lake.

Keywords: 2-methyisoborneol, blue green algae, cell-bound, taste and odor

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Paperless Smart Classroom Attendance System using Fingerprint Biometric Technology with SMS Notification through Rapid Application Development Tool

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ABSTRACT

As people's demand and lifestyle change, the demand for advancing the type of technology used is high. Thus, the authors came up with the idea of developing a system entitled "Paperless Smart Classroom Attendance System using Fingerprint Biometric Technology with SMS Notification through Rapid Application Development Tool."

The system is a real time monitoring of student attendance with SMS notifications to parents or guardians. The SMS serves as a notification is the student really went to his or her classes. The system was developed using the Rapid Application Development approach and had used VB.NET as the frontend and SQL on the backend. Upon registering a student record, a text confirming the registration in the system was sent in the parent or guardian's contact number. Upon entering the classroom, the system sends a real-time report of the IN and OUT of the student. The system is also used to tighten the security upon entering the classroom because the system would invalidate unenrolled fingerprints and hence will invalidate the attendance of the unregistered students. The system also generates attendance logs for future use.

The system has undergone methods and procedures as well as several tests in order to obtain the desired outputs. Through this, the developed system showed that it its functions served its purposes most especially for a system that is paperless to help save the environment. At the end of study, the system was able to provide an accurate, reliable, convenient, timely and with less cost paperless process.

Keywords: Paperless, fingerprint biometric, SMS, attendance system, rapid application development

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Biogas Production Using Anaerobic Digestion of Vegetable Wastes Prevalent in Cagayan de Oro Markets Mixed with Various Animal Wastes

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ABSTRACT

Cagayan de Oro City is a highly urbanized city that serves as the central hub and business center for Northern Mindanao (Region 10) in the southern part of the Philippines. Like any fast-growing city, it generates tons of solid wastes including vegetable wastes from its five public markets. They are regularly dumped to the new landfill and present several problems to the environment and populace. They produce methane, a greenhouse gas which is more potent than carbon dioxide. They also contaminate the soil and waterways that eventually lead to diseases to both humans and animals. Instead of directly dumping to the landfill these wastes could be diverted and converted to renewable energy (biogas).

Fifteen types of vegetable wastes prevalent in Cagayan de Oro markets were anaerobically digested with different animal wastes at ambient conditions for 40 days to compare the biomethane potential of each mixture. Cow manure, pig manure and cow dung were used as inoculums in a 1L single batch digester. Methane concentration and yield for treated vegetable waste-cow manure mixture were 51.3% and 0.258 l/g VS, respectively; and 48.7% and 0.295 l/g VS for treated vegetable waste-pig manure mixture.

Keywords: Anaerobic digestion, vegetable wastes, animal wastes, biogas, methane

Paper Reference Code: ICSET18-08-57

Ultrasound-Microwave Assisted Extraction of Andrographolide from Sinta (*Andrographis paniculata*) with Bioactivity Assessment

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ABSTRACT

Andrographolide is the metabolite of Andrographis paniculata (AP) documented to have anti-inflammatory, antioxidant, anti-dengue, anti-tumor, and anti-tuberculosis properties. Studies have shown the effectiveness of extracting Andrographolide using microwave and ultrasound alone. Ultrasound-Assisted Extraction (UAE) proceeds at non-thermal conditions which is desirable for Andrographolide extraction since it is heat sensitive. Microwave-Assisted Extraction (MAE) allows an increased extract yield at a very short extraction time. This research aims to determine the effect of combining ultrasound and microwave assisted extraction in the yield concentration of Andrographolide extract and its bioactivity assessment. For the non-conventional extraction methods, the controlled parameters were the solid to solvent ratio of 8 grams dried AP to 120 mL 50% ethanol, while varied parameters considered were: sonication time of 5, 10, and 15 min for UAE, irradiation time of 5, 10, and 20 min and microwave power of 120 W, 280 W, and 420 W for MAE, and combination of all three for Ultrasound-Microwave-Assisted Extraction (UMAE). Quantification of Andrographolide in the extract was measured using High Performance Liquid Chromatography with UV detector at the average retention time of 0.62 min. Results showed that UMAE obtained the highest concentration yield in the extraction of Andrographolide at a sonication time of 10 min and an irradiation time also of 10 min. For the cytotoxic activity of the extract from UMAE, lethal concentration 50 was obtained at 76.016 mg·L^{-1} concentration. Furthermore, it was of intermediate susceptibility to the bacteria Escherichia coli but it is resistant for both Bacillus clausii and klebsiella sp.

Keywords: Andrographolide, ultrasound-microwave-assisted extraction (UMAE), bioactivity assessment

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Treatment of Soil Washing Wastewater via Adsorptive Removal of Lead and Zinc Using Graphene Oxide

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ABSTRACT

In the present work, graphene oxide (GO) was synthesized via modified Hummer's method and utilized for the treatment of soil washing wastewater via adsorption of heavy metals. The soil washing wastewater is characterized by the presence of Pb(II) and Zn(II) with initial concentration of 220.9 and 2.60 mg/L, respectively. Characterization analysis was performed using X-ray diffraction, Fourier transform infrared spectroscopy and Brunauer-Emmett-Teller analysis. The effect of operating conditions such as adsorbent mass and contact time on the removal efficiency and adsorption capacity was investigated. Under the following operating conditions of 25°C, 4 h and 1.0 g GO, the maximum removal efficiency of 49.73% and 88.85% were attained for Pb(II) and Zn(II), respectively. Based on the high coefficient of determination values ($0.8683 \geq R^2 \geq 0.8958$), equilibrium data agreed well with Freundlich isotherm with maximum adsorption capacity of 19.48 and 13.97 mg/g for Pb(II) and Zn(II), respectively. This implies that adsorption occurs on binding sites of GO with heterogeneous energy levels. Kinetic studies revealed that pseudo-second order equation fitted well with the experimental data ($R^2 \geq 0.9996$), which indicate that chemisorption is the rate-determining step of the adsorption system. Regeneration studies revealed that 0.1 M HNO_3 can attain desorption efficiency of 91.56% and 87.25% for Pb(II) and Zn(II). Results have shown the possibility of GO as a potential adsorbent material in the treatment of soil washing wastewater.

Keywords: Graphene oxide, kinetics, lead, soil washing wastewater, XRD, zinc

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Journey to 150 MLD: Improvements in the Maintenance, Management, Operations, Process, and Safety Aspects in Putatan Water Treatment Plant 1

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ABSTRACT

The Putatan Water Treatment Plant 1 (PWTP 1) is one of the important alternative potable water sources in the West Concessionaire Zone of Metro Manila. Due to issues such as raw water quality, PWTP 1 has not been able to produce according to its nameplate capacity in the years 2015 and 2016. However, the plant was successful in meeting and exceeding its design capacity of 150 million liters per day (MLD) in the second half of 2017. This has been due to improvements in five general areas: (1) inculcation of safety practices, such as the Near Miss reporting and the Take 5 self-evaluation, (2) reforming the organizational hierarchy, such as the addition of the control room operator in order to permit the shift officer to oversee the whole plant, (3) improvements in each of the process streams, such as developing the preoxidation system and controlling the flow of the raw water feed better, (4) changes in the maintenance schedule, by anticipating low water demand for maintenance opportunities, and (5) modifications in the operational philosophies, especially in using and in cleaning the ultrafiltration systems. The vitality with which these improvements were done will be reflected in addressing the new issues that may come, as well as in the management of the upcoming second water treatment plant in the area, which will have the same source of water.

Keywords: Water security, potable water treatment, biological aerated filters, ultrafiltration

Acknowledgement:
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Evaluation of the WRF/Chem v. 3.6.1 on the Reanalysis of Criteria Pollutants over Metro Manila

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ABSTRACT

Metro Manila, Philippines and other urban areas reached internationally known unacceptable levels of pollution; where about 80% can be attributed to vehicular emissions. The WRF/Chem V. 3.6.1 was used in the reanalysis of pollutant concentrations for the year 2013. Initial results from the planetary boundary layer study suggested that the Yonsei University scheme provides a good estimate of the atmosphere's condition; hence this setting was used for the succeeding simulations. 2-meter temperature was simulated well except for Sangley Point, where the land coverage was not properly resolved by the model. Sea level pressure for all sites returned high correlations showing that modeled values are in phase with the observed time series. Wind speed values did not correlate well with the observed values and were all overestimated. This was seen to be explained by the model's incapability to detect the urban canopy over Metro Manila. Pollutant concentrations were overestimated. The pollutant time series suggests that the model overestimates concentration values for PM_{10}, $PM_{2.5}$, and SO_2, while underestimating NO_2 and O_3 values. Furthermore, through a student's t-test, the model appears to also capture a significant difference in daytime and nighttime concentrations.

Keywords: Mesoscale modeling, WRF/Chem, Metro Manila, pollutant concentrations

Acknowledgement:
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Production of Elastomeric Material Using Water Hyacinth (*Eichhornia crassipes*) Cellulose Fibers via Chemical Cross-Linking and Radiation-Induced Polymerization

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ABSTRACT

This research aims to produce an elastomeric material using water hyacinth cellulose fibers. Cellulose is already a well-known reinforcer and filler for natural rubber latex that is usually performed through mixing and then drying. Gamma radiation polymerization was introduced in this study and treated cellulose fibers were used. Cellulose fibers were isolated through water retting, bleaching and hydrolysis. Chemical cross-linking with formaldehyde, swelling treatment with different concentrations of $ZnCl_{2(aq)}$ solution and radiation–induced polymerization with centrifuged latex having a composition of 0, 3 and 5 phr's along with the treated cellulose were the processes that followed to make the elastomeric material. Mechanical properties of the irradiated samples were tested according to ASTM D412. FTIR spectroscopy analysis achieved wavelengths of 3342.78 cm^{-1} and 2920.51 cm^{-1} indicating a successful isolation of cellulose fibers. Degree of solubility and gel percent revealed a successful chemical cross-linking of cellulose fibers and it determined that the ideal concentration for the swelling agent is 40%. A significant effect on the tensile strength in relation to the phr (parts per hundred resin) and irradiation dose were observed at 0.4 MPa at 10 kGy (kilogray – absorption of energy per mass of matter) improved to 1.23 MPa at 15 kGy. A significant effect on the ultimate elongation in relation to irradiation dose was recognized where, at best, 3 phr had 479% at 10 kGy that increased to 787% at 15 kGy. Enhancement of the property of natural rubber latex polymer was achieved and produced a potential green rubber material alternative.

Keywords: Water hyacinth, FTIR spectroscopy, cross-linking, swelling, Gamma radiation, mechanical properties

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Design and Performance Evaluation of an Amphibious Water Transport Unit for Relief Operations Application

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ABSTRACT

This paper presents water transport unit that answers the problem of water transportation when times of calamities happened in Brgy. Sinalhan, a coastal barangay located within Laguna de Bay. This water transport unit enables the beneficiary to have a way of transporting water may it be in a flooded or areas without flood. Due to the amphibious features of the unit, transportation through any terrain and weather condition will now be possible. Material selection for the unit was done using the weighted properties method. It was observed that the water transport has total water capacity of 126.78kg including the mass of the operator. The mechanical efficiency is 75.8%. It is determined that the transport time to traverse land and water has been reduced at least 50% by using the water transport unit. Using statistical analysis via two tailed t-test, it is concluded that the using the water transport unit the time of transporting water to the site has improved.

Keywords: Water transport, transport unit, amphibious, relief operation

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Genotoxicity of Fine ($PM_{2.5}$) and Ultra-Fine ($PM_{1.0}$) Roadside Air Particulates on Young Adult Peripheral Blood Lymphocytes in Manila, Philippines

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ABSTRACT

Urban air quality is increasingly being studied as a fraction of the world's population are now living in megacities. In this study, particulate matter (PM) along Taft Avenue, Manila, Philippines, is investigated in terms of its ability to induce genetic damage on human peripheral blood lymphocytes (PBL). Size-segregated roadside air samples were obtained from 2015-2016 near the gate of a university and analyzed using in vitro micronucleus and cytokinesis-block proliferation tests. While cellular proliferation was unaffected by 0-100 µg/mL of $PM_{1.0}$ and $PM_{2.5}$, PBL cells treated with $PM_{2.5}$ displayed significantly higher micronucleus count ($p=0.02$) compared to the cells treated with $PM_{1.0}$ at a confidence level of 95%. Atomic Absorption Spectroscopy revealed higher amounts of Cd, Ca, Pb, K, Na, and Zn in $PM_{2.5}$. Our results indicate the differences in the composition and genotoxicity of the two size fractions of air particulates which are associated with varying health consequences.

Keywords: Particulate matter, genotoxicity, peripheral blood lymphocytes, atomic absorption spectroscopy, In-vitro micronucleus test, air quality

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Determining the Tidal Parameters and the Peak Month for Tidal Energy Harvesting in Verde Island Passage for the Year 2017

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ABSTRACT

Greenhouse gas emissions from fossil fuels cause adverse effect in the environment in the form of climate change. The Philippines, a country in Southeast Asia, is heavily reliant on the import of fossil fuels as its main source of energy. In order to both reduce the high cost of electricity in the country and mitigate climate change, the utilization of clean and sustainable energy or in other words, renewable energy, is heavily encouraged. The Philippines has abundant natural renewable energy resources. This study focuses on one aspect of renewable energy which is the tidal energy, particularly, the kinetic energy from the tidal streams. There are various criterions in choosing locations suitable for tidal energy harvesting, and the Philippines, being an archipelago, have several areas with favorable tidal conditions; among them, is the Verde Island passage which has been chosen by the researchers as the area of the study. The objective of this study is to perform a tidal energy resource assessment on six points in Verde Island passage. The tidal parameters such as tidal heights, tidal ranges, and tidal currents, of six representative points within Verde Island passage, were determined through numerical modelling using Delft3D. A decision matrix was used to determine the peak month for tidal energy harvesting, for the year 2017 and a one-month energy density map was created.

Keywords: Renewable energy, tidal energy, resource assessment, numerical modelling

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Estimation of PM2.5 in Indonesia Using Chemical Transport Model

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ABSTRACT

This paper presents simulation results of the distribution of PM2.5 concentration in Indonesia using chemical transport model, GEOS-CHEM. The resolution taken is 4x5 using meteorological data from geos-fp. Simulation results show that Java region is the region with the largest amount of PM2.5. In a more detailed view, the Jakarta area is the area with the largest PM2.5 number. Java has the highest concentration of PM2.5 due to the abundance of transportation and industry in Java, which is the source of PM2.5, compared to other regions in Indonesia. Furthermore, meteorological conditions also play a role in the large quantity of pollutants in the Java and Sumatera region. In February, a monsoonal breeze led from the west to the coast. Therefore, although the source of the pollutant comes from the region of Sumatera, the direction of monsoon wind will transport the pollutants to the Java region. In addition, there are rows of mountains in the southern regions of Java that cause blocking effect, which prevents air masses from going to Indian Ocean. Pollutants and other air masses will be settle in Java, and thus the PM2.5 concentration in the Java region increase and were most abundant.

Keywords: Air pollutant, chemical transport model, meteorology, monsoonal wind, PM2.5

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Development of Nanocomposite Polysulfone-Nanoclay Membrane with Enhanced Hydrophilicity

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ABSTRACT

This research study involves the development of membranes with local raw materials to suit water and wastewater treatment applications. Indigenous montmorillonite clay was synthesized with dialkyl dimethyl ammonium chloride to modify its surface properties to be used as a functional additive in a polymeric membrane. Polysulfone (PSf) pellets were dissolved in N-methyl pyrrolidone (NMP) and the organo-modified montmorillonite clay (OMMT) additive was incorporated to form the casting solution. OMMT or nanoclay was incorporated in PSf at varying concentration ranging from 0.25 wt% up to 1.00 wt%. The casting solutions were vacuum mixed and degassed using a planetary mixer then casted using an automatic casting machine to produce flat sheet membranes. The developed membranes were characterized using Atomic Force Microscopy (AFM), X-Ray Diffractometer (XRD), Scanning Electron Microscope (SEM), and Contact Angle Meter. The morphology of the nanocomposite membranes showed three distinct layers: a dense skin layer, a porous finger-like layer, and a layer with sponge-like structures. The surface roughness of the membranes was characterized using the non-contact mode of the AFM, and the results showed that the surface roughness increased as a function of increased OMMT concentration. Moreover, the contact angle of the nanocomposite membrane decreased at a magnitude of 18% with the addition of 1.00 wt%. The exfoliation of OMMT platelet structures that occurred within the PSf matrix at 1.0 wt% clay loading showed changes on the surface properties such as improved surface roughness and more porous morphological structure resulted to a lower surface tension. The enhancement of hydrophilicity has an impact on the properties like permeate flux and fouling of the membrane. These results play an important role in the functional performance of the polymeric membrane particularly on the use of synthesized nanoclay functional additives.

Keywords: Nanoclay, polymeric membrane, surface properties, hydrophilicity

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A Survey on the Tidal Power Capability of Salomague Strait, Marinduque Island, Philippines

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ABSTRACT

The study focused on determining the tidal power potential of the area bounded by the Salomague Strait and the boundary of Sta Cruz and Torrijos, Marinduque. The area of the location was calculated to be approximately 6,773,165 m^2 and the computed average tidal range to be used is 1.01 m for the year 2017 to 2021. The cross-sectional areas of the water entrance for Northern part and Southern part are 6431.9 m^2 and 6216.9 m^2 respectively. The areas of the barrages with assumed 1 meter additional heights from the highest water level are 7431.9 m^2 for the northern coast and 7016.9 m^2 barrage area for the southern coast. Using a simple pool tidal system, the monthly predicted power generated ranged between 1.33 MW and 1.82 MW, with yearly average of 1.55 MW. For an assumed 30% power conversion efficiency it is reduced to 466 kW which still can be changed depending on the turbine that will be used. The predicted monthly power generated followed the trend of monthly tidal range where it is expected to peak during solstices with minimum generated is anticipated during equinoctial months. The site has a Gibrat ratio of 0.0017 far lesser than that of La Rance's with a ratio of 0.36 which indicated the site's potential and economic feasibility.

Keywords: Tidal power, Marinduque Island, Gibrat ratio

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Phytoplankton Community in Relation to Physico-Chemical Characteristics in Iponan River, Philippines

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ABSTRACT

Phytoplankton composition, abundance, and their relationship with the physico-chemical parameters in Iponan River, Cagayan de Oro City, Philippines were determined in this study. Monthly samplings of phytoplankton using 20-micron plankton net were carried out from June to October 2016 at three sampling sites. A total of 68 phytoplankton taxa belonging to five major groups; Bacillariophyta, Chlorophyceae, Cyanophyta, Euglenoidea and Zygnematophyta were identified. The diatom was the most abundant (53%); followed by the blue-green algae (29%), green algae (14%), euglenoid (5%) and Zygnematophyceae (1%). Trichodesmium iwanoffianum and Anabaena planktonica were the most dominant species. Taglimao was found to have the highest phytoplankton diversity index (3.094) compared to San Simon (2.924) and Iponan (2.881). Physico-chemical variables; water temperature, conductivity, dissolved oxygen, salinity, nitrates, and phosphates were within the permissible limits. The mean turbidity (79.8 ntu) is remarkedly high while the TSS (108-160 mg/L) was exceeded the standard limit of DENR-EMB for "Class A" type inland waters. The occurrence of highly pollution tolerant species; Navicula sp., Nitzschia palea, Synedra ulna, Gomphonema parvulum, Euglena sp., Fragilaria sp. and Anabaena planktonica throughout the study indicates alarming input of pollution. Results on CCA suggest that most phytoplankton species identified were mostly associated to nitrates, TSS, temperature, turbidity, salinity and flow velocity. This study will be very useful as it will serve as baseline information in monitoring the water quality of Iponan River.

Keywords: Phytoplankton, community structure, physico-chemical parameters, Iponan River

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Investigation of Nata-de-Coco as Membrane for Forward Osmosis Application for Desalination

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ABSTRACT

A Forward Osmosis (FO) membrane was fabricated using a locally available material nata de coco (NDC) to form a bacterial cellulose (BC) film. Sodium alginate was used to form composites with the BC film. Two concentrations (10 % and 15 %) of cross-linking agent, $CaCl_2$, were compared in terms of its performance as a FO membrane for application in desalination. Two draw salts were compared as draw solution: 2M sucrose and 2.0 M $MgCl_2$. The performance of the fabricated NDC-FO membrane was investigated in terms of the water flux, salt flux and percent salt rejection in a laboratory-scale FO system. The 15% $CaCl_2$ solution was observed to give high water flux, low salt flux, and high salt rejection compared to the 10% $CaCl_2$. The 15% $CaCl_2$ solution produced a more tensile membrane compared to 10% $CaCl_2$. The former endures pressure at the suction points of the FO module while the latter breaks after some time of operation. The NDC-FO membrane has an average contact angle of 14.13º with an average thickness of 0.159 mm. The 2.0 M $MgCl_2$ performs better than sucrose as a draw solution. The commercial Cellulose Tri-Acetate (CTA) FO membrane was used to benchmark the performance of NDC-FO membrane. The latter produces a water flux of 4.01 LMH with 88.39% salt rejection, which is comparable to the water flux of CTA with 7.97 LMH and 100% salt rejection. Results showed the potential of nata de coco as raw material for FO membrane.

Keywords: Forward osmosis, desalination, nata-de-coco

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Carbonyl Compounds in Cooking Fume Emissions from Night Market in Southern Taiwan

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ABSTRACT

In night markets, cooking generates a large amount of cooking fumes. Cooking fumes are an important source of carbonyl compound emissions. Exposure to these fumes is associated with adverse respiratory health effects. Four carbonyl compounds namely formaldehyde, acetaldehyde, propanaldehyde, and acetaldehyde were sampled and quantified in the cooking fumes produced from grilling and stir-frying of food samples in Pingtung city night market. Grilled chicken steak with sauce had the highest total carbonyl concentration of 1840.71 ppb. The total carbonyl concentration for the other samples ranged from 783.72 to 1294.88 ppb. Grilling, meat dishes, and food samples added with sauce were found to have higher carbonyl concentrations. Among the carbonyls, formaldehyde contributed a large portion to cooking fume emissions. Generally, low carbon-containing species (C1-C4), e.g, formaldehyde, acetaldehyde, propanaldehyde and crotonaldehyde, were abundant in CFs generated from different food samples in night market. In conclusion, the significant findings of our study showed that grilled chicken steak with sauce generated the highest total carbonyl concentrations and formaldehyde was the most dominant carbonyl specie in all food samples. Although a limited number of food samples were tested in this study, therefore resulting in large uncertainties, the high total carbonyl concentrations still suggest that cooking fumes in night markets could be an important source of air pollutants. Future studies should focus on a more improved emission measurement to obtain a more accurate quantification of the pollutants. Future works should also consider the effect meteorological factors on pollutant concentration.

Keywords: Cooking fumes, carbonyl compounds, formaldehyde, air pollutants, night market

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Health Effects and *In Vitro* Toxicity of Ambient TSP and $PM_{2.5}$ in Elementary Schools in Southern Taiwan

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ABSTRACT

Recently, total suspended particulate (TSP) and particulate matter 2.5 (PM2.5) have been included as air quality indicators in the global Pollutant Standards Index (PSI). There is a growing public concern because human exposure to high concentrations of these pollutants may cause adverse health effects. There are fifteen continuous outdoor dust and particle monitors stationed in Southern Taiwan. However, those data only express the air quality within a wide range. Therefore, the aim of this study was to investigate the health effects and in vitro toxicity of ambient TSP and PM2.5. Sampling of ambient TSP and PM2.5 were carried out in 2 southern Taiwan elementary schools. After sampling, TSP and PM2.5 were extracted using Soxhlet extraction method. Following extraction, ATP bioassay was used to test the pollutants' cytotoxicity in T47D-KBluc, A549, and H4IIE cells. TSP and PM2.5 showed no toxic effects in all cells. Notably, very low AhR activity was also determined in the paired PM2.5 and TSP samples at concentrations of 0.482, 0.756, 0.016, and 0.008 pg BEQ m^{-3}, respectively. PM2.5 had a higher AhR response as compared to TSP. Although PM2.5 and TSP both activated the AhR pathway, their levels are still considerably low. Our results indicated no cytotoxicity effects of TSP and PM2.5, which may be due to no significant sources of contamination in the sampling areas. Additionally, an association between ambient TSP and PM2.5 and cardiovascular and respiratory diseases was shown. In vitro effects of TSP and PM2.5 are encouraged to be studied further in future studies.

Keywords: Cytotoxicity, PM2.5, total suspended particulate, elementary schools, AhR activity

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The Effect of Laminating Epoxy to the Tensile Strength of Unidirectional Carbon Fiber

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ABSTRACT

Carbon fiber has been widely used in the construction industry in the Philippines. Combining unidirectional carbon fiber with laminating epoxy resin produces a new material that can withstand a greater amount of stress. The researchers used a unidirectional carbon fiber, which is coated with laminating epoxy resin, to enhance its capability of resisting tensile forces. Unidirectional carbon fiber is a kind of carbon fortification that is non-woven and includes all strands running in the same direction. In the other hand, laminating epoxy resin is intended to offer the most elevated quality for a room temperature epoxy. It is regularly utilized for creating high quality parts which is in demand on construction applications. The study aims to enhance the carbon fiber strands with laminating epoxy resin applied evenly on the surface. The researchers focused on effect by having different the amount of coating that will make the carbon fiber more economical to use. The strength of the carbon fiber itself is 682.88 MPa. The maximum strength resulted in 1126.13 MPa, coated twice with laminating epoxy resin. Given its lightweight characteristic, the epoxy somehow increased the strength of the carbon fiber. This study can be innovated by performing experiments on structural materials reinforced with epoxy resin coated on carbon fiber.

Keywords: Carbon fiber, resin, carbon-fiber reinforced polymer

Paper Reference Code: ICSET18-14-83

Developing Agricultural Damage Simulation in the Impact of Typhoon Based on the Basic Landforms of the Farming Sectors in Laguna

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ABSTRACT

Philippines suffer a great loss from typhoon damages and tons of natural disasters that has negative impacts on the environment. Typhoon and flash flood will reduce farm productivity by damaging farm inputs and destroying establishment and infrastructure and prevent an increasing in farm planting, these results in the worse condition in output and productivity which will possibly harm by the country's food security, economic losses, and income. One of the major reasons for this is allocation of fund, the lack of knowledge and preparation of a citizens and officials in agricultural damages and disaster prevention. This concept paper focuses on giving knowledge and awareness by simulating the damage of the typhoon in the Agricultural sector to help the community and officials to visualize and know the risks and damages of typhoon on the Agricultural when calamity occurs as well as to view the damages on agriculture with interactive 3D simulation environment. The proposed system can be develop using Simulation Methodology which composes of several phases to achieved the agricultural disaster simulation with the integration of Monte Carlo Algorithm, it can be used to apply the parameters from PAGASA's storm warning signals for simulation and typhoon parameters. The need for the development of this system must be develop and implement for the benefits of the farmers, agricultural sector, the people, and to the environment to prevent possible damages and mitigate larger amount of losses in economic and agriculture.

Keywords: Simulation, agriculture damages, natural disaster, agriculture sectors, crops

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CIRCLO: Android-Based Aquaponics Monitoring Mobile Application

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ABSTRACT

Adapting technology in sustainable environmental concerns has been made possible through the emerging power of Internet-of-Things or IoT. IoT is the interconnection of objects through wireless sensor networks where embedded devices and appliances are connected via the Internet. A number of IoT projects were applied in the field of agriculture, food processing, manufacturing industries, animal and livestock tracking, health monitoring, weather related studies, education, marketing and many others. This paper focuses on the development of Android-based mobile application for indoor aquaponics. Aquaponics proved its increasing economic efficiency and sustainability in the field of indoor fish farming. With the addition of IoT in aquaponics system, this study implements a closed loop triangulation system to address the need of commercial implementation in urban living and keep adept with the use of technology in this era. Based on the user acceptance testing conducted by urban farmers, private families and IoT entrepreneurs, all given requirements included on the mobile application and the Arduino controller were met. Creation of indoor aquaponics and employment of microcontrollers were carried out to constantly monitor the aquaponics parameters. A programmable sensor was utilized and suite to process data like temperature and lighting and present it to the end-user through a mobile app for automatic and remote adjustment. Aside from Arduino hardware testing, functionality and compatibility testing in the Android mobile app was performed to fully harness its advantage for user interaction. As a result of all passed testing, that entails both hardware and software components, the entire aquaponics system is working properly as monitored by the designed mobile application which made this study attained its expected result.

Keywords: Aquaponics, Android, mobile application, IoT, sensor, microcontroller

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Land Use/Cover Change Detection and Urban Sprawl Analysis in the Buffer Zone of Mount Makiling Forest Reserve, Philippines

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ABSTRACT

Ecologically Valuable Areas play an important role in providing ecosystem services but human activities such as land conversion and urban sprawl pose pressures and threats to these areas. This study assessed the urban sprawl in the Mt. Makiling Forest Reserve Buffer Zone from 1992 to 2015 using Remote Sensing and Geographic Information System. The different land use land cover in the area were determined first using Landsat images from 1992 to 2015 through a supervised classification approach. An overall accuracy of the supervised classification of 2015 imagery was 93.55% based on Google Earth. Results showed that the land cover within the Mt. Makiling Forest Reserve buffer zone has changed from 1992 to 2015 with built-up areas increasing by as much as 1.57% despite Proclamation 1257 s.1998 which regulates human activities in the zone. Based on the Shannon entropy analysis the land development in the Mt. Makiling Forest Reserve buffer zone tends to be dispersed with entropy values of 1.29 (1992), 1.47 (2002), and 1.46 (2015), and sprawling having entropy values greater than the threshold value of 1.09. However, when the magnitude of change of urban sprawl in the buffer zone from 2002 to 2015 was calculated, a decrease in the entropy value was observed which implies a compacting pattern as the human settlement in the buffer zone increases over time. Proclamation 1257 s.1998 needs to be strengthened to protect Mt. Makiling Forest Reserve and its buffer zone from further encroachment and pressure. Moreover, remote sensing and Geographic Information System prove to be useful tools in assessing urban sprawl in ecologically valuable areas like Mt. Makiling Forest Reserve.

Keywords: Ecologically valuable areas, buffer zone, Mount Makiling Forest Reserve (MMFR), urban sprawl, remote sensing and GIS

Acknowledgement:
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A Review of Current Development of Cellulose Nanofibrils (CNF) and Cellulose Nanocrystals (CNC) as Functional Membrane with Special Attention to Water Purification

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ABSTRACT

This paper review manifests cellulose nanofibrils (CNFs) and cellulose nanocrystals (CNCs) beneficial role, including high aspect ratio, high surface area, high crystallinity, and high mechanical properties. It also elaborates additional components in membrane materials and the approaches of its use as membrane material for water purification. CNF and CNC have been studied extensively during the past decades as membrane materials due to its inherent abundance, renewability, sustainability and unique properties. The overview of CNF and CNC based membrane performances (flux and adsorption capacities) is also highlighted in this review to give a better understanding of the behavior of these cellulose nanomaterials as membranes. The different challenges of using CNFs and CNCs and the needs for improvements for the future development of membrane materials with CNF and CNC are discussed.

Keywords: Cellulose, nanocrystals, nanofibrils, nanomaterials, membrane, water purification

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Removal of Heavy Metals and Organic Pollutants from Payatas Sanitary Landfill Leachates Using Raw and Modified Zeolites from Pangasinan, Philippines

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ABSTRACT

The Payatas dumpsite served as the main dumpsite in Metro Manila since 1973 until it was converted to a controlled dump in 2003, later called as Payatas Sanitary Landfill, and eventually stopped operations in 2010. Because of the huge amount of solid wastes that it received for the past decades, it is very likely that hazardous substances have accumulated in the liquid runoff called leachates, which may pose threat to human health and to the environment. This is of special concern since the Payatas Sanitary Landfill is located near the La Mesa Watershed, which is one of the city's water reservoirs. This study identified the some of the pollutants present in the leachate and evaluated the effectiveness of using raw and modified zeolites for the removal of the pollutants through ion-exchange and adsorption processes. A sample of the Payatas landfill leachate was characterized using the chemical oxygen demand (COD) test, atomic absorption spectrophotometry (AAS), X-ray fluorescence spectrometry (XRF) and ion chromatography (IC). Leachate quality parameters such as pH, conductivity and dissolved oxygen were also measured. Raw zeolite was modified using 50mmol/L hexadecyltrimethylammonium (HDTMA) bromide and characterization was done through X-ray diffraction (XRD) analysis, Fourier-transform infrared (FTIR) spectroscopy and scanning electron microscopy (SEM). Leachate was passed through the columns with the raw and modified zeolites and analyzed for COD and selected anionic and cationic compounds.

Keywords: Adsorption, leachate, Payatas landfill, zeolites, surfactant-modified zeolites

Acknowledgement:
The authors would like to thank the Department of Science and Technology for the financial support in conducting the study.

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Modelling Land Use and Land Cover Dynamics using Multi-Temporal Satellite Images of Bacolod, Lanao Del Norte

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ABSTRACT

Landsat data offer a unique record of the land surface and its modification over time. Landsat data have demonstrated capabilities for mapping and monitoring of land cover and land surface biophysical and geophysical properties and potential utility for terrestrial assimilation and biogeochemical cycling and land use forecasting applications. The growing population and high demands of agricultural products and raw materials resulted in increased land consumption causing modifications and alterations of its land use and land cover without any detailed and comprehensive attempt to evaluate this status as it changes over time. It is necessary for a study such as this to be carried out to avoid the associated problems of a growing municipality which will possibly become a city in the near future due to industrialization. This study aims to detect and determine land use and land cover changes in the Municipality of Bacolod, Lanao del Norte using LandSat data obtained from 1989, 2001, and 2016 using ENVI software and generate a land use map projection for 2031 through spatial analysis using ArcGIS and IDRISI Land Use Modeler software.

Keywords: Landsat, land use land cover, remote sensing

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Simultaneous Power Generation and Degradation of Methyl Orange in Dual-Chamber MFCs Using Meat Processing Wastewater Inoculated with Active Soil Microbes

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ABSTRACT

Microbial fuel cells are bioelectrochemical devices that use exoelectrogenic bacteria as biocatalysts to oxidize a variety of substrates while simultaneously generating electricity. Studies on microbial fuel cells or MFCs have shown great potential for simultaneous bioenergy generation and wastewater treatment using different electrode materials, microorganisms, and substrates under different operating conditions. The study aimed to investigate the performance of a consortium of active soil microbes containing lactic acid bacteria, Saccharomyces, Rhizobium, Rhodopseudomonas, Rhodobacter, Actinomycetes, and fungi in decolorizing methyl orange, a type of azo dye, in dual-chambered microbial fuel cells using meat processing wastewater as substrate while simultaneously producing bioelectricity. The performances of the MFCs using carbon fiber brush and titanium mesh electrodes were compared in terms of power generation and azo dye degradation. The results showed that using titanium mesh, the open circuit voltage and the power density in close-circuit condition were 1.005 V and 1.223 Wm^{-2} while using carbon fiber brushes, values were 0.992 V and 0.338 Wm^{-2}. Results also revealed that the MFC system with carbon fiber brush electrodes is more effective in decolorizing methyl orange, achieving up to 78 percent removal. In 10 hours of continuous operation, the concentration of methyl orange was reduced from 0.1 mM to 0.022 mM.

Keywords: Bioenergy, azo dye, methyl orange degradation, carbon fiber brush, bioelectrochemical system

Acknowledgement:
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The Transport and Fate of Chlorinated Compounds in Houjing River, Taiwan: An Information Potential for Philippines Inland Water Treatment

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ABSTRACT

Detection of targeted dechlorinating population and monitoring of geochemical, and hydrodynamics factors to investigate the occurrence of chlorinated compounds transformation and transport in Houjing River were carried out. Quantitative real-time PCR was used to evaluate the biodegrading potential of organohalide respiring bacteria (OHRB) based on DNA biomarkers. 16S rRNA genes divulged the abundance and spatial distribution of the targeted dechlorinator biomarker. Chlorinated compounds pathway convergence from parent to daughter compounds with targeted OHRB's interference were identified. Geochemical conditions showed that reducing redox conditions of the river downstream side indicates a favorable condition for reductive dechlorination. While the hydrodynamic factor also affects the transport and fate of these compounds. Philippines and Southern Taiwan have relative ambient temperatures. Thus, the detection and monitoring system in this study can be adopted for the rehabilitation and restoration of Pasig River and Laguna Lake to further improve its water quality.

Keywords: Houjing River; organohalide-respiring bacteria; SybrGreen-qPCR quantification

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This study was supported by Mapua University in Philippines; the Global Water Quality Research Center of Department of Environmental Engineering of National Cheng Kung University and the Centre of Environmental Analysis Service of the Department of Marine Environmental Engineering of National Kaohsiung Marine University in Taiwan. The authors also gratefully acknowledge the financial support from the Engineering Research and Development for Technology (ERDT) of the Department of Science and Technology (DOST) for the scholarship assistance to Donamel M. Saiyari, a PhD student in environmental engineering under a sandwich program of Mapúa University and National Cheng Kung University.

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Projection of the Operation Life Years of Ambuklao Dam Due to Siltation Using Hydrologic Engineering Center's River Analysis System

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ABSTRACT

The capacity of the Ambuklao Dam is decreasing over time due to continuous siltation in the area as shown by the bathymetric data gathered each year. This has been one of the major problems that the dam operators are facing right now because their operation is very dependent to the volume of water that the reservoir can have. The accumulation of sediments in the dam were predicted using the Hydrologic Engineering Center's River Analysis System (HEC-RAS). The combination of MPM-Toffaletti were used for the sediment transport function while Copeland Mixing Method for the sorting and armouring method and Report 12 for the fall velocity which are all very important in sediment analysis. Bathymetric data was used to calibrate the results from the HEC-RAS for the validity of model, then it was projected from the year 2011 up to the year 2060. Using the calculatedminimum requirement for power generation in hydro powerplant which is 42.42MCM, the expected date for the failure of the reservoir will be on August 2056 if nothing is done. It is expected that the reservoir will no longer produce hydroelectric power because it reaches its minimum volume for producing electricity.

Keywords: Capacity, sediments, bathymetric, volume

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Downstream Risk Analysis of Magat Dam Breach Using Geographic Information System and HEC-RAS

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ABSTRACT

Dam construction truly marked the civilization of humanity. There are wide range ofbenefits from dams, nevertheless it coexist with the tragic consequences of tragedies such as breaching. Over the last decades, there has been a significant increase on dam failures because an unusual and more severe rainfall intensity was experienced by a dam not designed to carry that much volume. It is therefore a necessity to predict a peak discharge as well as the warning time at a given location so that the downstream area residents can be given early warnings, this must be done in order to mitigate the possible damages that can be caused by a dam collapse. To achieve this, latest technology involving geographical information system and computer modeling software were used in the simulation of the hypothetical failure of Magat Dam, one of the largest dams in the Philippines built 36 years ago. Through the materials produced in this study such as flood hazard and risk maps, effective and more reliable emergency plans and early warning system design were derived. In this study, it was found out that the existence of Maris Dam, around5 kilometers from Magat Dam, impeded most of the flood. This largely increased the time for evacuation of the downstream area residents, thus decreasing the risk.

Keywords: Magat Dam, dam breach, risk assessment, flood risk map

Paper Reference Code: ICSET18-15-96

Non-Revenue Water (NRW) Reduction Methodology in Calamba City, Laguna, Philippines: Comparative Analysis of Three Water Distribution Models Using WaterGEMS

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ABSTRACT

Low system pressure and intermittent water supply with high percentage of non-revenue water (NRW) is the current scenario of water system in the Southville 6, Brgy. Kay-Anlog, Calamba City, Laguna, Philippines. Being a relocation site for informal settlers in Laguna, Philippines, there is a growing demand in water which the existing water system could not cater. The main objective of this study is to develop a water distribution system that could increase the service quality of the utility in the area through comparative analysis of methods that would address the problem in water loss and irregular water supply in the area. In this regard, this paper compared three (3) hydraulic network models to evaluate the existing condition of the system and to identify engineering approaches to improve the system's level of service in terms of low non-revenue water and adequate system pressures in analysis of network design with the aid of WaterGEMS. The first method in improving water system is through replacement of pipe, the second is adding water source and the third is adding water source and implementing district metering areas (DMA). With the average system pressure of 28.10 psi and NRW lowered by 8.63%, the simulated hydraulic model with additional source and implemented DMAs is the water distribution system suited in the area of study.

Keywords: Hydraulic network model, water distribution system, non-revenue water, intermittent water supply, district metering areas

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An Approach Algorithm to Spatial Estimation of Exposures of Ambient Air Pollution in Indonesia

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ABSTRACT

Ambient air pollution especially fine particulate matter (e.g. $PM_{2.5}$ or PM_{10}) has been established as a key driver of global health. The Government of Indonesia (GOI) only monitored the particulate matter through ground monitoring without any support of pollutant emission dispersion prediction and not integrated into a holistic system for pollutant exposure. Therefore, there is an urgent need to develop spatial estimation of air pollution data deduction method and an exposure estimation method that cover a large area especially over cities and industrial area, also wildfires affected area. The method's algorithm will also extend for data assimilation of the scarce observation data with reliable secondary data to develop spatial data that could estimate the total population that have been exposed to the air pollution. Set within a Bayesian hierarchical framework, this data integration model for air quality estimates exposures, together with associated measures of uncertainty, at high geographical resolution by utilizing information from multiple sources and addresses many of the issues that were encountered with previous approaches. Further, this algorithm will the part of the integrated air quality early warning system for risk of air pollution exposure. This algorithm allowing information on scarce air quality data to be drawn from a wide variety of sources, each potentially measured at different resolutions, with different error structures and with different levels of uncertainty. This work presents an important step forwards in large-scale air quality data integration in Indonesia.

Keywords: Air pollution, data assimilation, environmental health effects, exposure of air pollution, spatial modelling

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Monitoring of Cyanotoxin and Odorant-Producing Cyanobacteria in Drinking Water Reservoirs Using Real-Time PCR

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ABSTRACT

Cyanobacteria are present in many important drinking-water sources in Taiwan and many other countries, and some of them may produce cyanotoxins and odorants as secondary metabolites, such as microcystins (MCs), cylindrospermopsin (CYN), and 2-methylisoborneol (2-MIB). Drinking water contaminated with cyanotoxins and odorants may affect public health and consumers' perception to public water supply. Therefore, it is very important to understand the presence of cyanotoxins and odorants in water supplies.

Currently, when water utilities are faced with cyanobacteria problems in the source water, the standard procedures to confirm the risk associated with cyanotoxins and odorants include sample collection and transportation to the central laboratory, laboratory analysis, and data reporting. As the whole procedures usually need more than 24 hours, the contaminated water may have entered into public water supplies before the analytical results were obtained. Therefore, a method able to quickly measure the potential risk of cyanobacteria associated toxins and odorants would be very usefully for water utilities to justify the quality and risk of their drinking water.

This study aimed to establish a monitoring platform to quickly determine the risk of cyanobacteria associated toxins and odorants in drinking water reservoir based on the detection of cyanotoxin and odorant-producing cyanobacterial genes. In this study, samples were collected from 29 reservoirs in Taiwan, mostly near the water intakes of associated water treatment plants. A real-time PCR was used to quantify the cyanotoxin- and odorant-producing cyanobacterial genes, while an enzyme-linked immunosorbent assay (ELISA) and a solid-phase microextraction concentration followed by a gas chromatograph-mass selective detector were employed to measure cyanotoxins and odorants produced by cyanobacteria, respectively. In addition, the samples were also enumerated for cyanobacteria cells using microscopy. Both the real-time PCR and ELISA methods were conducted on-site near the sampling locations of the reservoirs.

This qPCR and ELISA-based methods have been successfully applied in the on-site monitoring of cyanotoxins and their producers in 29 drinking-water sources in Taiwan. After sample collections, the analytical results were obtained within 2 hours and reports were provided to the managers of water utilities. This on-site analytical approach has been shown to be a good tool for the determination of the potential risk of cyanotoxins and odorants in drinking water sources.

Keywords: Real-time PCR, microcystins, cylindrospermopsin, 2-Methylisoborneol, enzyme-linked immunosorbent assay (ELISA)

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Using HPSEC and F-EEM Analysis to Identify of Organic Characteristic in Drinking Water Distribution System

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ABSTRACT

While organic to be present at different stages of a drinking water system, the characteristic in such systems are poorly understood. The object of this research focuses on the identification of organic characteristic in drinking water distribution system. The treatment and distribution processes, which was from Lu-Jhu (LJ) Water Treatment Plant, was collected and studied. The purpose is to look into the effect of different treatment and distribution processes on the various organic characteristic by HPSEC and F-EEM. The results show that organic characteristic in the source water were dominated by humic substance. Based on the results from HPSEC-UV254 and F-EEM, these can be explained by the higher removal efficiency for humic substance from coagulation, chlorine addition, and distribution. As distribution system. From the distribution system, bioreaction was found by HPSEC-UVD210 and F-EEM analysis that even chlorine remain in the drinking water distribution system.

Keywords: Water distribution system, NOM, EEFM, HPSEC

Paper Reference Code: ICSET18-04-100

Biological Pre-Treatment of River Water Slightly Contaminated by Ammonia for Use as a Drinking Water Source

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ABSTRACT

Public water supply in south Taiwan strongly relied on a major surface water source, Kaoping River. However, water quality and quantity of the river was influenced by extremely high turbidity, in many cases up to 20,000 NTU, in rainy seasons, and low flow in dry seasons, posing a high risk to public water supplies in the area. To secure water supply during the episodes relevant to high turbidity and low flow conditions, an alternative source water, Dong-Gan (DG) River, with stable surface flow and low turbidity, was proposed to be used. Because DG river is polluted by the wastewater from swine farms, ammonia in the river is relatively high and therefore need to be treated.

A 2 m^3 pilot-scale biological pre-treatment process was applied in this study to examine the capability and efficiency of ammonia removal in the contaminated river water. The biological pre-treatment process applied porous polyurethanes carriers (BioNET) for microorganisms, including heterotrophs and nitrifiers, to grow on and retain in the bioreactor. Three different hydraulic retention times (HRTs), 1.33, 0.81, and 0.5 hours, were examined in this study. Ammonia monooxygenase subunit A (amoA) gene of ammonia oxidizing archaea and bacteria (AOA and AOB) and 16S rRNA gene of total bacteria were quantified using real time quantification polymerase chain reaction (qPCR).

Contaminated river water was directly used as raw water for the BioNET process. The ammonia concentration in the river water increased from below 1 mgN/L (August/September) to 8-9 mgN/L (April/May). Under HRT 0.5 hours, average ammonia removal efficiency and rate could reach 84% and 0.42 kg-N/m^3/day, respectively. The quantification results showed that AOB abundance was 2-3 orders of magnitude higher than that of AOA. The ratio of AOB over total bacteria was varied within 0.1% to 8.6%. Besides, AOB abundance higher than 1.5×10^8 copy/BioNET provides nitrification removal efficiency more than 70%. Furthermore, after applying recycle of the effluent, total inorganic nitrogen loss was observed, indicating the occurrence of denitrification and the potential of total nitrogen removal in the BioNET process. Our results suggested promising strategy of removing ammonia from slightly polluted river water using BioNET.

Keywords: Biological pre-treatment, nitrification, denitrification

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Biological Treatment of DMSO-Containing Wastewater from Semiconductor Industry Under Aerobic and Methanogenic Conditions

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ABSTRACT

DMSO is a sulfur-containing organic solvent and recently is used in many different industries, especially in semiconductor and TFT-LCD industries, due to its high dissolved but relatively less toxic properties. Although DMSO carries good properties as a solvent, its impact on the environment is still a concern. There are different methods proposed for treating DMSO-containing wastewater, including physiochemical and biological ones. UV/H2O2 and ozone-based processes have been evaluated for DMSO-containing wastewater treatment, but the cost of these physiochemical methods is a great concern when applied to full-scale processes. The biological treatment of DMSO is usually considered less efficient because conventional aerobic process may not achieve good removal efficiency. Therefore, some studies suggested using a combination of advanced oxidation such as UV/H_2O_2 or Fenton process followed by a biological process in order to enhance the efficiency of DMSO degradation. The cost of these methods, however, is still high compared to using biological method alone.

This study evaluated biological treatment of dimethyl sulfoxide (DMSO)-containing wastewater from semiconductor industry under aerobic and methanogenic conditions. Using an aerobic membrane bioreactor (MBR) treating DMSO-containing wastewater, influent DMSO concentration as higher as 1500 mg/L did not inhibit DMSO degradation efficiency (Fig. 1). Experimental results of aerobic batch tests indicated that aerobic MBR sludge was able to convert 2500 mg/L of DMSO to sulfate, despite that small amount of dimethyl sulfide (DMS) was observed during aerobic degradation. Fig. 2 summarizes specific DMSO degradation rate at different initial substrate-to-biomass (S/X) ratios obtained from aerobic batch tests and it seemed to follow the Haldane-type kinetics. The results suggested that a higher specific DMSO degradation rate maybe attained at initial S/X around 0.15. Microbial community of the aerobic MBR was investigated using next generation sequencing technique by illumina Miseq platform [1] as shown in Fig. 3. As influent DMSO concentration increased, Proteobacteria decreased from 88.2% to 26% from Day 30 to Day 79, while Bacteroidetes, Parcubacteria, Saccharibacteria increased from 6.4% to 44.8%, 0.2% to 13%, and 1% to 6.4%, respectively. Within the Bacteroidetes class, Flavobacterium and Laribacter genus significantly increased from less than 0.05% to 26.8% and 13.4%, respectively, as influent DMSO concentration increased. Chitinophaga genus, in the same family with Laribacter genus, was reported to be dominated in biofilter treating DMS [2]. Flavobacterium spp. was reported to oxidize dimethylsulfide to produce biomass [3]. Hyphomicrobium and Thiobacillus, which are known as DMS degrader [2,4], presented about 2% at Day 13 but decreased to 0.1% and 0.8%, respectively, at Day 79. The results of real-time PCR targeting on Hyphomicrobium sp. and Thiobacillus sp. also indicated that abundance of Hyphomicrobium sp. and Thiobacillus sp., potential DMSO and DMS-degrading mircroorganisms, decreased at higher DMSO conditions.

Under methanogenic conditions, in general, a higher initial substrate-to-biomass (S/X) ratio seemed to inhibit specific DMSO degradation rate (Fig. 4), especially at DMSO concentrations higher than 3000 mg/L. However, the severity of inhibition seemed to depend on methanogenic community structures and their abundance presented in the examined sludges. It was also found that DMS accumulated during methanogenic DMSO degradation. Based on the results of terminal restriction fragment length polymorphism (TRFLP) analysis targeting on mcrA functional gene [5], microbial community of methanogens responsible for DMS degradation, including Methanomethylovorans, Methanosarcina, and Methanolobus zinderi, was important for converting DMS to H_2S [5]. Using a pilot-scale anaerobic fluidized bed membrane bioreactor (AFMBR) treating DMSO-containing wastewater, DMSO, COD, and TOC removal achieved 100%, 95% and 94%, respectively (Fig. 5). Gas composition produced from DMSO-containing wastewater included CH4: 35%, CO2: 57%, H2S: 7%, and DMS: 1%, indicating a complete DMSO conversion by methanogens can be achieved in the AFMBR. According to batch experiments using attached microorganisms on GAC and suspended sludge for DMSO degradation (Fig. 6), both microorganisms on GAC and suspended sludge were able to degrade DMSO and produce methane. It was calculated that attached microorganisms on GAC and suspended sludge contributed about 43% and 57% for DMSO degradation in the AFMBR. However, during DMSO degradation the attached microorganisms on GAC produced much less DMS and more methane than suspended sludge as indicated in the batch tests (Fig. 6). Based on the results of TRFLP analysis targeting on mcrA functional gene, Methanomethylovorans was dominant in samples taken from GAC and suspended sludge after 54 days of operation, indicating its importance for DMSO degradation in the AFMBR (Fig. 7).

Keywords: Aerobic and methanogenic, biological, DMSO, wastewater, semi-conductor

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Bioremediation Efficiency Analysis by Dehalococcoides Reductive Dehalogenase Genes in a Real TCE-Contaminated Site

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ABSTRACT

Chlorinated solvents have threatened to groundwater quality somewhere in Taiwan. Trichloroethylene (TCE) is one of the most ubiquitous halogenated organic compounds of great concerns due to their carcinogens. Bioremediation approach has been recognized as an efficient approach for aquifers contaminated by the chlorinated volatile organic compounds (Cl-VOC). Degradation of TCE was correlated with the existence of Dehalococcoides sp. (Dhc) that contributed to chlorinated ethene detoxification. Compositions of metabolically active bacterial communities at an in situ Cl-VOC-contaminated sites was monitored along with a biostimulation approach. Quantitative PCR (qPCR) was applied to examine the complexity of the indigenous microbial communities and to identify biomarker genes including tceA and vcrA . Species diversity and evenness was evaluated by terminal restriction fragment length polymorphism (T-RFLP). In conclusion, the correlation between TCE degradation and the associated Dhc/biomarker genes was found evident. Adequate TCE degradation rates among the five wells were achieved when the injected substrate levels were appropriate, the adequately anaerobic environment was formed, and Dhc activity and associated biomarker genes grew up to the significant level (10^8 copies/L for Dhc and 10^7 – 10^9 cells/L for tceA). The worst degradation was observed in the well that the least concentration of tceA was detected, and a community lacking of dynamic were evident in the T-RFLP profiles. This study confirms the usefulness of molecular tools including qPCR, biomarker genes, and T-RFLP to monitor the dechlorinating microbes. Quantitative information about the Dhc and biomarker genes were available and help to explain the TCE remediation mechanisms.

Keywords: qPCR, biomarker, TCE contamination, Dehalococcoides sp., T-RFLP

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Environmental Hazards Contributory to the Local Vulnerability Indices of the Philippines

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ABSTRACT

This paper presents the identified environmental hazards which contribute to the Philippines vulnerability to disaster. Susceptibility determination and vulnerability index estimation were based on the empirical and community based monitoring system data assessment anchored in a vulnerability platform with three pillars as limiting/influencing factors. These influencing factors are 'exposure, sensitivity, and resiliency." The focus area of study is Marinduque island of the Philippines with an area of 952.6 sq. km. This island with six municipalities, 218 barangays with mean population density of 250 sq. km has been reported as among the top 10 provinces of the country susceptible to natural disasters. The determination of environmental hazards in the Philippines and specific to Marinduque island as influencing factors (potential indicators) is useful in the development of a local vulnerability index which is potential for the adoption by neighboring islands with similar environmental risks.

Keywords: Environmental hazards, community-based, vulnerability index, Philippines

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A Review of the Philippines Vulnerability to Hydrologic Related Disaster and Climate Change

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ABSTRACT

Study on vulnerability assessments, indexing and mapping has become popular and important as natural disasters keep on adversely affecting the people around the globe. Hence, this paper presents a review of the Philippines vulnerability to hydrologic related disasters and climate change effects. Data on 'El Nino" "La Nina", and historical flood events were collected from various government agencies. Reviews on the disasters in the country and the numerical assignments on unequal weights for the development of vulnerability index were carried out. Hence, this paper illustrates the summary of relevant and available data, and scenario of existing and past studies on disaster vulnerability focusing in the Philippines, and indexing methodology of areas with similar enviro-social factors.. This paper provides baseline data on environmental hazards by hydrologic related disasters and its adverse impacts that are linked with climate change effects in the Philippines. Also, this paper illustrates new research areas/ directions beneficial to researchers and funding agencies.

Keywords: Climate change, hydrologic events, vulnerability indexing technique

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