2019 7th International Conference on Environment Pollution and Prevention (ICEPP 2019)

December 18-20

Melbourne, Australia

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Conference Venue

Mantra Bell City

Add: 215 Bell Street，Preston, Victoria, 3072, Melbourne

Tel: +61 3 9485 0382 / Email: annabelle.almer@mantra.com.au / website: http://www.bellcity.com.au/

Hotel Introduction:

Mantra Bell City offers premium accommodation in Melbourne's vibrant inner North. Just 20 minutes from Melbourne Airport and the CBD the Bell City complex offers prime location for corporate travelers and guests wishing to explore Melbourne and its surrounds at leisure.

Home to two restaurants and a café, resort-style facilities including an outdoor pool; 24hour gym and sauna, Mantra Bell City is the perfect destination.

When you’re travelling on a budget, Break Free Bell City offers a relaxing stay at a price you can't resist. The comfortable hotel rooms are suitable for both short and long-term stays, offering everything you need during your time in Melbourne.

The organizer doesn’t provide accommodation, and we suggest you make an early reservation.

For the personal and property safety of the participants, please pay attention to notes below:

1-Please take care of your belongings all the time in case of any loss.

2-Participants are required to wear the conference representative card near the conference venue in the hotel, please do not lend the representative card to the irrelevant people and not "carry" irrelevant people into the venue.

3-The organizer is not responsible for the loss of participants.

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Session Chair: Prof. Jai-Young Lee

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Session 3

Topic: Air Pollution and Water Pollution
Session Chair: Prof. R. J. (Dick) Haynes

Session 4

Topic: Environment and Sustainable Development
Session Chair: Dr. Angela T. Ragusa

2019 Melbourne Conference Introductions

Welcome to HKCBEES 2019 conference in Melbourne, Australia. The objective of the Melbourne conference is to provide a platform for researchers, engineers, academicians as well as industrial professionals from all over the world to present their research results and development activities in the field of Environment Pollution and Prevention.

2019 7th International Conference on Environment Pollution and Prevention (ICEPP 2019)

Papers will be published in the following conference proceeding:

E3S Web of Conferences (Open Access proceedings in Environment, Energy and Earth Sciences), which is indexed by Ei Compendex, Scopus, Google Scholar, CAS, DOAJ, CPCI (Web of Science), EBSCO, ProQuest.

Conference website and email: http://icepp.org/index.html; icepp@cbees.net

Presentation Instructions

Instructions for Oral Presentations

Devices Provided by the Conference Organizer:

Laptop Computer (MS Windows Operating System with MS PowerPoint and Adobe Acrobat Reader)
Digital Projectors and Screen
Laser Sticks

Materials Provided by the Presenters:

PowerPoint or PDF Files (Files should be copied to the Conference laptop at the beginning of each Session.)

Duration of each Presentation (Tentatively):

Keynote Speech: about **40** Minutes of Presentation and **5** Minutes of Question and Answer
Invited Speech: about **25** Minutes of Presentation and **5** Minutes of Question and Answer
Regular Oral Presentation: about **12** Minutes of Presentation and **3** Minutes of Question and Answer

Instructions for Poster Presentation

Materials Provided by the Conference Organizer:

The place to put poster

Materials Provided by the Presenters:

Home-made Posters
Maximum poster size is A1 (841mm high and 594mm wide)
Poster must be in the "Portrait" orientation not "Landscape"
Load Capacity: Holds up to 0.5 kg

During your poster presentation, the author should stand by your poster to explain and answer the questions from the attendee. The time duration will be around three minutes.

Best Presentation Award

One Best Presentation will be selected from each presentation session, and the Certificate for Best Presentation will be awarded at the end of each session on December 19, 2019.

Dress code

Please wear formal clothes or national representative of clothing.

Brief Schedule for Conference

Day 1

December 18, 2019 (Wednesday) 10:00~17:00

Venue: Mantra Bell City (Lobby)

(Add：215 Bell Street，Preston, Victoria, 3072, Melbourne)

Participants Onsite Registration & Conference Materials Collection

Day 2

December 19, 2019 (Thursday) 9:00~18:30

Arrival Registration, Keynote Speech, Invited Speech, Conference Presentation

Morning Conference **Venue: Vienna Room**

Opening Remarks 9:00~9:05

Prof. R. J. (Dick) Haynes
The University of Queensland, St Lucia, Queensland

Keynote Speech I 9:05~9:50
Topic: "Constructed Wetlands Technology as an Aid to Remove Metal/Metalloid Pollutants from Wastewater Streams"
Prof. R. J. (Dick) Haynes
The University of Queensland, St Lucia, Queensland

Keynote Speech II 9:50~10:35
Topic: "Progress on Developing Small Scale Biogas Electric Generation for Developing World"
Prof. Tjokorda Gde Tirta Nindhia
Udayana University, Indonesia

Coffee Break & Group Photo Taking 10:35~11:00

Invited Speech I 11:00~11:30
Topic: "Carbon Footprint of an EUR-sized Wooden and a Plastic Pallet"
Dr. Ivan Deviatkin
Lappeenranta-Lahti University of Technology LUT, Finland

Invited Speech II 11:30~12:00
Topic: "Awareness that Coal-Powered Energy is Environmentally Degrading Insignificantly Affects its Consumption"
Dr. Angela T. Ragusa
Charles Sturt University, Australia

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Tips: Please arrive at the conference to upload or copy PPT into the laptop room 10 minutes before the session begins.

Note: (1) The registration can also be done at any time during the conference.

(2) The organizer doesn’t provide accommodation, and we suggest you make an early reservation.

(3) One Best Presentation will be selected from each presentation session, and the Certificate for Best Presentation will be awarded at the end of each session on December 19, 2019.

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Keynote Speaker Introductions

Keynote Speaker I

9:05~9:50

Prof. R. J. (Dick) Haynes
The University of Queensland, St Lucia, Queensland

Professor R. J. (Dick) Haynes works in the areas of soil and environmental science. His present research interests are in the use and recycling of industrial, agricultural and municipal wastes and minimising their effects on the environment. He has extensive experience having worked as both an applied research scientist and as a university professor and has worked in New Zealand, South Africa and Australia. He has published over 170 original research papers in international journals, over 20 review papers in international volumes as well as many conference and extension papers and contract reports. He has been an invited keynote speaker at 7 international conferences and has served on the editorial board of 4 international research journals. He has acted as principal supervisor and co-supervisor of PhD, MSc and honours students in both South Africa and Australia. Professor Haynes has carried out research in commercial horticultural, pastoral, arable and forestry production as well as in small-holder semi subsistence agriculture. He has also worked on bioremediation of soils contaminated with organic pollutants, rehabilitation of mined sites, application of organic and inorganic wastes to soils and the effects of heavy metal contaminants on soil processes. His research has been mainly in the areas of applied soil chemistry and soil microbiology/biology with links to soil physical properties and to pollution of air and water. He has specialised in working on applied problems and maintains strong links with industry. Major areas of research have included the role of grazing animals in the fertility of pastoral soils, N cycling and gaseous and leaching losses from arable and pastoral systems, soil quality and soil degradation under agricultural land use, effects of soil contaminants on soil processes, rehabilitation and remediation of contaminated, degraded and mined sites and use of wastes as soil amendments.

Topic: "Constructed Wetlands Technology as an Aid to Remove Metal/Metalloid Pollutants from Wastewater Streams"

***Abstract*—**The advantages of lower operational and maintenance costs have resulted in the use of constructed wetlands for wastewater treatment increasing rapidly throughout the world. The three main types of constructed wetland are surface flow, horizontal subsurface flow and vertical subsurface flow. Often hybrid systems are used. The removal of nitrogen and organics by such systems has gained substantial attention in recent years. Nonetheless, constructed wetlands can also be used to remove inorganic pollutants from wastewater. Inorganic contaminants (e.g. phosphate, metals and metalloids) are removed by a combination of mechanisms including precipitation reactions prevalent under anaerobic and/or aerobic conditions and specific adsorption reactions onto the surfaces of the filter medium. In addition, precipitation of Fe and Al initially present in the wastewater stream can result in formation of new, highly active, hydroxyl-Al and Fe adsorption surfaces which can coat the

surfaces of the filter medium. Waste-based adsorbent materials such as blast furnace slag and Fe and Al oxide ores can be used in the filter medium of the wetland or as add-on reactive filters in order to increase the effectiveness with which inorganic contaminants are removed. Although plant uptake of pollutants is often small, the presence of growing plants in a wetland promotes removal of pollutants by a variety of mechanisms including the filtering effect of roots, rhizodeposition of organic matter, transport of O_2 to the rhizosphere and moderation of rhizosphere pH. While organic pollutants are biodegraded and removed from the wastewater stream, phosphate and metals remain sequestered within the wetland. The reversibility of the sequestering reactions therefore needs to be carefully considered since the ultimate fate of metals is an important consideration. Constructed wetlands are now a widely accepted green technology for wastewater treatment and improved removal efficiencies will come from a greater understanding of the interacting processes involved.

Keynote Speaker II

9:50~10:35

Prof. Tjokorda Gde Tirta Nindhia

Udayana University, Indonesia

Prof. Tjokorda Gde Tirta Nindhia received Doctor Degree from Gadjah Mada University (UGM) Yogyakarta, Indonesia on August 2003, with major field of study was Material Engineering. He participated in various international research collaborations such as with Muroran Institute of Technology Japan (2004), Toyohashi University of Technology Japan (2006), Leoben Mining University Austria (2008-2009), Technical University of Vienna Austria (2010), Institute Chemical technology of Prague Czech Republic (2012-now) and very recently with Michigan State University (MSU) and University of Hawaii in the USA under Fulbright Scholarship. His current job is as Full Professor in the field of Material Engineering at Engineering Faculty, Udayana University, Jimbaran, Bali, Indonesia. His research interest covers subjects such as, Biomedical Engineering, biosensor, biomaterial, waste recycle, failure analyses, advance ceramic, metallurgy, composite, renewable energy, and environmental friendly manufacturing.

Topic: "Progress on Developing Small Scale Biogas Electric Generation for Developing World"

***Abstract*—**Anaerobic digester is solution for processing organic waste with providing useful side product such as biogas and fertilizer. anaerobic digestion has in recent years received attention among governments in a number of countries. A lot of biogas plant were built with incentive from the government that make biogas available abundantly. Biogas can be used as a fuel of internal combustion engine. The engine can be used to run electric generator and providing electricity. It is available in the market biogas electric generator wit big size to serve big biogas plant with certainly expensive since the engine should be design specifically for biogas combustion Engine. Small size biogas engine are not available in the market due to complexity arrangement in the biogas plant. This report is provided with successful design of small size biogas electric generator that suitable for small size biogas plant. The engine can be made from 4 stoke engine or 2 stroke engine or more even can also by converting small diesel engine to be fueled with biogas. The technologies that are over in these work is not base on dual

fuel of biogas and petroleum, but concentrate for flexible fuel, that is mean the engine is can be operated with biogas or if biogas not available the engine can be run with petroleum or LPG gas separately. By this technology, small biogas electric generator can be provided from around 1000 Watt up to 10000 watt.

Coffee Break and Group Photo Taking 10:35~11:00

Invited Speaker I

11:00~11:30

Dr. Ivan Deviatkin
Lappeenranta-Lahti University of Technology LUT, Finland

Dr Deviatkin currently acts as a postdoctoral researcher at LUT University, Finland. He completed his doctoral degree in November 2017 on the topic of the environmental sustainability of waste management systems with the focus on pretreatment using multiple wastes as case-studies. During his doctoral studies, he has participated in several projects studying the impacts of managing deinking sludge, sewage sludge, sewage sludge ash, municipal solid waste, thermal residues, and waste incineration bottom ash. After finishing his doctoral degree, he was conducting research at Technical Research Center of Finland VTT during 2018 where he has been involved in projects related to pyrolysis of plastic waste and assessment of environmental impacts of li-ion batteries, among other projects. His present research interests explore environmental sustainability of waste management. Particularly, he studies the impacts of producing composites from construction and demolition waste, the impacts of recovering nitrogen during thermal drying of sewage sludge and other organic residues. Deviatkin has published over 15 scientific articles. The research projects to be launched during this year assess the sustainability of flexible electronics and optics, as well as waste management in Russia.

Topic: "Carbon Footprint of an EUR-sized Wooden and a Plastic Pallet"

***Abstract*—**Pallets are an essential element of existing logistics worldwide. Pallets are simple in structure, yet they can be made of different materials, in varying dimensions, and be marketed via alternative management systems. This paper examines a carbon footprint, an indicator of impact on climate change, of a widely used EUR-size (1200 mm x 800 mm) pallet made of wood or plastic using the data from previously published literature. The study is geographically representative of Finland, while time and technological representativeness depend on the studies reviewed. On average, the production of a wooden pallet, i.e. cradle-to-gate, has a partial carbon footprint of 5.0 kg CO_2-eq. and of -34 kg CO_2-eq. if accounting for carbon sequestration in wood. Manufacturing of a virgin plastic pallet releases 62 kg CO_2-eq. Given the functional unit of 1000 customer trips and service life of 20 times for a wooden pallet and 66 times for a plastic pallet, the cradle-to-grave impacts of the wooden and the plastic pallets are 17 kg CO_2-eq. and 1790 kg CO_2-eq., respectively when the pallets are incinerated at the end-of-life, or 0.34 kg CO_2-eq. per one wooden pallet and 120 kg CO_2-eq. per one plastic pallet.

Invited Speaker II

11:30~12:00

Dr. Angela T. Ragusa
Charles Sturt University, Australia

Dr. Angela T. Ragusa is an environmental sociologist at Charles Sturt University in Albury, NSW, Australia. Angela has a PhD and Master Degree in Sociology and second Master's Degree in Science & Technology Studies from Virginia Polytechnic Institute and State University in Blacksburg, Virginia in the United States. Her Bachelor's Degree is in Psychology from St. Francis College, Brooklyn, New York. She is Editor-in-Chief for Rural Society: Journal of global research into rural social problems for sustainable communities, a role held for over a decade and has published 3 books and >80 academic publications. Recent research projects include identifying what prompts individuals and communities to engage in pro-environmental behaviours (air, land, & water pollution), factors affecting health and environmental literacy/knowledge, and how media and sociocultural norms affect socioeconomic priorities and beliefs (ie, biodiversity and nonhuman species' extinction).

Topic: "Awareness that Coal-Powered Energy is Environmentally Degrading Insignificantly Affects its Consumption"

***Abstract*—**This paper contributes findings from a social survey conducted to examine individual awareness of coal's non-renewability, environmental issues, and home energy behaviours. The sample exhibited high (86%) awareness of coal's non-renewability and 74% self-identified energy issues as key environmental problems affecting their lives. Government presumptions that education campaigns are needed to increase Australian public awareness of carbon emissions and may induce pro-environmental energy behaviours are questioned. Energy issue awareness failed to significantly affect 4 home energy behaviours (choosing A/C settings, type of home temperature control, turning lights off in unoccupied rooms, turning appliances off standby) for 'environmental sustainability' reasons. Findings support international research documenting disparity between individual awareness of environmental issues and pro-environmental actions for such issues. Consistent with prior research, age was the most significant factor affecting pro-environmental energy behaviours. Older individuals were most likely to consider environmental sustainability for home temperature and A/C settings. Education, age, and energy issue awareness did not significantly affect 'low stakes' consumption behaviours (appliances or lights) for environmental reasons. In locations with non-renewable energy, policy and education initiatives improving knowledge that aggregated carbon consumption from seemingly minor individual behaviours may reduce environmental degradation may make 'unnecessary' energy consumption less culturally normative or acceptable.

Session 1

Tips: The schedule for each presentation is for reference only. In order not to miss your presentation, we strongly suggest that you attend the whole session.

Afternoon, December 19, 2019 (Thursday)

Time: 13:30~15:45

Venue: Vienna Room

9 presentations-Topic: "Energy Saving and Emission Reduction"

Session Chair: Dr. Ivan Deviatkin

M0005 (Session 1) Presentation 1 (13:30~13:45)

Low Carbon Behaviours In Office Buildings and Its Activation Attributes - A Systematic Review

Nor Kalsum Mohd Isa, Mohd Suhail Ahmad Sahimi, Mohd Yazid Mohd Yunos, Mohd Hairy Ibrahim
Universiti Pendidikan Sultan Idris, Tanjong Malim, Perak Malaysia

Abstract—The operational carbon emission from buildings are well known to be one of the prominent contributor to Greenhouse gasses (GHG). One of the solution to reduce operational carbon emissions of buildings is to have occupants with low carbon behaviour (LCB). However, numbers of initiatives and researches to lower the building's carbon emission are mostly focused on occupants' behaviour of residential buildings rather than in office buildings. The aim of this paper is to systematically review the available research on behaviours that could be adopted or adapted as low carbon behaviour in office buildings and to identify the behaviour's activation factors by relating it to Norm Activation Model Theory (NAM). Literatures related to the research are carefully selected according to low carbon behaviour related keywords. The review results are then categorized by authorship, carbon term used, research locations, categories of respondents, behaviour change and activation theory used, research methods, data analysis and research findings. A proposed NAM LCB theoretical framework were proposed highlighting the factors antecedent one's personal norm, intention and attitude toward a holistic LCB framework.

M0041 (Session 1) Presentation 2 (13:45~14:00)

Decarbonizing Warehousing Activities through Digitalization and Automatization with WMS Integration for Sustainability Supporting Operations

Daria Minashkina, and Ari Happonen
LUT University, Lappeenranta, Finland

Abstract—The current strong outsourcing trend dictates that the efficiency of outsourced warehousing is a big contributing impact factor for the carbon footprint from supply chains. A

good warehouse management system boosts warehousing eco-friendliest by reducing space waste and unnecessary number of material movements, to ensure continuous fast materials flow and to keep the heating and cooling costs to a minimum. All this may happen on some lengths inside the traditional manual warehousing scenes, but in fact, if the highest level of efficiency is wanted/needed, the operator shall need to automate, digitalize and robotize their operations. In this publication, authors shall present an example of automation in the warehousing context, where the warehouse operator is capable of turning around an order line as an outgoing packet even in high peak load times under 3h time period. This sort of efficiency means less needed storage space as items stay less time in the warehouse and such automatization also gives the 3PLs possibility to store materials in high rising automated systems like automated storage and retrieval systems to optimize their space usage. All combined, the future warehouse operations can make a positive impact on efforts to reduce overall CO_2 emissions made by supply chains.

M5010 (Session 1) Presentation 3 (14:00~14:15)

Siliceous Foam Material and its Application in Post-Combustion Carbon Capture for Ngcc Plants: Effects of Aging Conditions

Meng Yang, Yan Yuxin, Jiang Peng, Wu Xinyun, Sun Cheng-gong, Wu Tao, Pang Cheng Heng
The University of Nottingham Ningbo China, Ningbo, China

Abstract—In an effort to reduce the overall energy penalty and capital expenditure associated with carbon capture technologies, a variety of porous solid adsorbents were developed. The limitations of solid sorbent in large-scale process are related to its CO2 uptake, physicochemical stability, lifecycle, regenerability and operation condition. In this paper, siliceous foam materials were synthesized via a modified microemulsion templating method and functionalized with polyethylenimine (PEI). The physical characteristics of synthesized silica adsorbents under different aging conditions were analysed via BET and SEM. CO2 uptake was evaluated by thermogravimetric analyser (TGA). The results show that CO2 uptake is desirable under low CO2 partial pressure and is predictable with multiple linear regression (MLR) model in the range of examined materials.

M0055 (Session 1) Presentation 4 (14:15~14:30)

Technologies for Reducing Emissions and Costs in Combined Heat and Power Production

Harri Auvinen, Ulla Santti, and **Ari Happonen**
LUT University, Lappeenranta, Finland

Abstract—According Finnish Energy association, in Finland roughly three-quarters of district heat production is based on combined heat and power (CHP) generation. Correspondingly, one-third of electricity is generated using CHP. In Finland, the market share of CHP derived electricity is significant, and therefore used technologies and fuels should be carefully chosen in terms of costs and emissions. In this paper we consider a case of Kuopio, which is the 9th biggest city in Finland. In the past few years, the total usage of fossil fuels has been decreasing and the use of renewable fuels has correspondingly been increasing. The amount of electricity produced with peat has gradually decreased during the last 15 years. The common explaining factor for these trends is the political will and national and municipal

level shared common aim to reduce greenhouse gases and emissions. Furthermore, there are new technical innovations available, such as flue gas scrubber and district cooling system, which has been proven to be significant tools to reduce emission and at the same time investments into these innovations have been shown to save energy and money, meaning being greener has been also financially lucrative decision for these sustainability enhancing technology investors.

M5014 (Session 1) Presentation 5 (14:30~14:45)

Environmental Benefits of Incorporating Palm Oil Fuel Ash in Cement Concrete and Cement Mortar

Gul Ahmed Jokhio, H M Hamada, A M Humada, Y Gul and Abid Abu-Tair
The British University in Dubai, United Arab Emirates

Abstract—Palm oil fuel ash (POFA) is a by-product waste material from palm oil with many economic and environmental benefits. A lack of enough information on the advantages of POFA in the concrete production in various proportions was the main cause to carry out this work. This paper shows advantages of POFA as a partial replacement of cement in concrete production, especially cement mortar. The data collection has been done from the literature review related to the use of POFA as partial cement replacement in the production of cement concrete and mortar. Therefore, this paper can potentially become a guide for researchers and manufacturers to use POFA in various proportions to replace the ordinary Portland cement (OPC) in cement concrete and mortar. The positive and negative impact resulting from this material has been discussed carefully. This study recommends that researchers and academics should perform more experimental works in order to illustrate the desired benefits from POFA as cement replacement, thus mitigate the adverse environmental impacts of cement.

M0053 (Session 1) Presentation 6 (14:45~15:00)

Reduction of Greenhouse Gas Emissions by Establishing an EIP Model - Based on the Recycling of Waste-plated Plastics -

Young Woon Kim, So Young Park, Yong Woo Hwang, Sung Ryun Choi, and Yong Ho Kang
Inha University, Incheon, Republic of Korea

Abstract—Domestic waste-plated plastics cannot be recycled in Korea, therefore they are exported to overseas such as China and Southeast Asia. In order to solve this problem, the recycling technology of waste-plated plastics is necessary. Also it is necessary to calculate the recycling aspect of waste-plated plastics. This study is aimed to develop the recycling technology of waste-plated plastics which consist of acrylonitrile butadiene styrene (ABS) and copper (Cu) and to evaluate the reduction of greenhouse gas (GHG) emissions by establishing an eco-industrial park (EIP) model based on the recycling technology.

The recycling process consists of etching, separation of plastics, and recovery of metal. Mostly the recycling technology for waste-plated plastics operates each process. The developed technology has integrated all processes. After recovering metals and ABS, those are used as raw materials of chemicals in other companies.

In order to calculate the GHG emissions in terms of the environment aspect as a recycling effect, this study used the life cycle assessment (LCA) as an evaluation methodology. This study calculated the reduction quantities of GHG emissions between the previous waste

disposal which is exported waste-plated plastics overseas and recycling on the EIP model. Usually, after exported waste plated plastics, it is necessary to use the new materials.
ABS recycled 249 tons per year in Korea by establishing the EIP model based on the recycling of waste-plated plastics. GHG emissions in the previous waste disposal using LCA was 14,474 tons of CO_2 eq./year and 3,192 tons CO_2 eq./year by recycling of waste-plated plastics. Therefore, GHG emissions of 11,282 tons CO_2 eq./year were reduced by recycling of waste-plated plastics.
As a result, this positive effect is that we can build a resource circulation network by commercializing waste-plated plastic resources. Resource acquisition due to the recovery of waste-plated plastics may increase competitiveness and inhibit waste generation.

M1033 (Session 1) Presentation 7 (15:00~15:15)

Promoting Natural Fiber from Bark of *Hibiscus Tiliaceus* as Rope to Reduce Marine Pollution from Microplastic Fiber Yield from Synthetic Rope

I Wayan Surata, **Tjokorda Gde Tirta Nindhia**, Dwiki Marsetio Widagdo
Udayana University, Jimbaran, Indonesia

Abstract—Synthetic ropes are popular for application in marine boat as docking, anchor, tow, and sailing. The advantages of synthetic ropes are waterproof, strong and durable, can be designed for sinks or floats and able to stretches. Synthetic ropes are stronger, more resistant to rotting than ropes created from natural fibers. Synthetic rope also possess certain disadvantages of slipperiness, and can be damaged more easily by UV light. Synthetic ropes is recognizes as a source of microplastic fiber pollutant in marine area. In this work a bark of *Hibiscus tiliaceus* three is introduced as candidate source of natural fiber for rope to reduce number of microplastic fiber pollutant from synthetic rope. The bark was taken from a trunk with diameter around 20 cm. The bark was immersed in water for 7 days and subsequently was soaked in 5% NaOH solution for 2 hours. Fiber obtained then was dried. It was prepared 7 valid single fiber samples. The average of tensile strength of single fiber obtained by using this method is found around 44.604 MPa. The average of Modulus elasticity E is found 365.864 MPa. The failure strain is found 11.6 %.

M0037 (Session 1) Presentation 8 (15:15~15:30)

Further Assessment of Heavy Metals of RDF for Thermochemical Conversation

Ismail Babatunde Adefeso, Daniel Ikhu-Omoregbe, and Yusuf M. Isa
Cape Peninsula University Technology, Cape Town Campus, South Africa

Abstract—Thermochemical applications towards low energy pre-treated municipal solid waste are continuously growing context contemporary technology. The quality of energy resource from municipal solid wastes (MSW) needs an improved analysis to enhance her choice of energy exploitation and environmental assessment of fly and bottom ashes associated with the thermochemical conversion. The MSW were collected from Solid Waste Disposal facilities (SWDF) in Cape Town to investigate heavy metals distributions municipal solid waste obtained from SWDF. The municipal solid wastes were pre-treated to improve the quality of MSW. The 7700 Series quadrupole ICP-MS solution method was used to determined concentrations and distributions of some heavy metals from SWDF in Cape Town. This study assesses and quantifies distributions of heavy metal in solid municipal solid waste

in city of Cape Town. The accumulation of high concentrations of heavy metals in bottom ash residue from thermochemical conversion could be a good remedy for heavy metals control. The heavy metals (especially Pb, Zn and Hg) emissions were technically monitored and controlled from escaping to urban air-sheds atmosphere and prevent from their consequential secondary environmental and health implication.

M5008 (Session 1) Presentation 9 (15:30~15:45)

Case Study of Industrial Green Development on The Perspective of Ecological Civilization in China

Dan Liu and Li Liu
Anshan Normal University, Anshan, China

Abstract—With the increasing concern of ecological crisis and sustainable development, the issue of green development has aroused widespread focus in the academic and practical domain. Green development and ecological civilization are especially important to developing country, which interact and both are the basis of sustainable development. This paper analyzed the present background, status, importance and problem about green development in China and shared a case study of the practice in Green Development in Anshan, as well as proposed specific tactics to promote realization of goal of green development and ecological civilization on the two main direction from the perspective of ecological civilization, which enriches the theory of green development and ecological civilization and guides the practical implication and implement of industry transformation.

Session 2

Tips: The schedule for each presentation is for reference only. In order not to miss your presentation, we strongly suggest that you attend the whole session.

Afternoon, December 19, 2019 (Thursday)

Time: 13:30~15:45

Venue: Beijing Room

9 presentations-Topic: "Water Resources and Environmental Technology"

Session Chair: Prof. Jai-Young Lee

M5003 (Session 2) Presentation 1 (13:30~13:45)

Risk Assessment of Water Environment in Beijing, China

Haijiao Yu, Bo Li, Zihan Yang, Xiaodi Zhang, Xiaoli Tai and Wenting Zhang
Beijing Normal University, Beijing, China

Abstract—Risk assessment of water environment safety is an essential challenge for a city's existence and sustainability. In this study, a risk assessment methodology was developed by selecting a consistent set of indicators based on the conceptual DPSIR framework. The

proposed evaluation index system was applied from 2008 to 2017 through a case study of Beijing, the capital of China and a megacity with severe contradictions between the activity of human being and water resources. Twenty indicators, addressing water resource system, economy, and society, were selected in terms of driving forces, pressure, state, impact and response. The principal component analysis was used to remove redundant factors, the entropy method was applied to determine the weights of the indexes. Results found that the safety level of water environment in Beijing rose from risk state to good state. It's indicated from the results that water environment can meet the basic need of the city, however, essential measures should also be taken to achieve water sustainability in the long run. The evaluation results of this study present references when making water management policies and the proposed methodology can help develop consistent tools for risk assessment.

M1008 (Session 2) Presentation 2 (13:45~14:00)

Dual Porosity Modelling of Groundwater Flow in Fractured Aquifers

Husam Baalousha, Damien Jacob, Philippe Ackerer
Hamad Bin Khalifa University (HBKU), Doha, Qatar

Abstract—Two approaches are often used to simulate groundwater flow in fractured aquifers: The discrete fractured network (DFN) and the dual porosity model (DPM). In the first approach, fractured are explicitly presented in the model. The aim of this study is to develop a dual porosity model for the flow in fractured media, and to compare the results with the discrete fractures network model.

The dual porosity model considers two flow equations; one for flow in the fractures, and the second is for the flow in the matrix, with an exchange between the two flow systems. The flow in the fracture is described by the 1-D explicit bond and the flow in the matrix block is described by the 2-D mesh. An exchange term links fractures and matrix. This exchange term was obtained and validated using flow experiment.

The developed dual porosity model was compared to the discrete fracture network model (DFN). Three different configurations of fractured were considered: high density, low density, and very low density fractured media.

Results show a good match between the DPM and the DFN models. The exchange term was found more important for the results than the fractures density.

M3005 (Session 2) Presentation 3 (14:00~14:15)

Socio-economic Impact of Land-use/cover change in a Himalayan wetland: A case study of Pong Dam Lake, Kangra, Himachal Pradesh

Maansi Malik, S.C. Rai
University of Delhi, Delhi, India

Abstract—Population growth, urbanization, and changing land use/cover practices are responsible for the loss of ecosystem services of wetlands around the world. The present study investigated wetland degradation that occurred in the Western Himalaya, Himachal Pradesh, India. The land use/cover change maps between 2001 and 2016 derived from remotely sensed imagery showed that the Pong Dam wetland is severely affected due to anthropogenic pressure posing risks of habitat destruction within its catchment area. The agriculture area has considerably increased in the area between 2001 and 2016. It indicates the rapid conversion of

unused or scrub land for agriculture purpose in the area. The rate of sedimentation in the wetland is very high and is likely to increase in the near future due to large-scale unregulated development in the area. To reduce further destruction in this wetland, agricultural practices should be minimized in the area, and agroforestry practices should be encouraged to maintain the health and ecology of the wetland.

M0020 (Session 2) Presentation 4 (14:15~14:30)

Gravity-fed Column Configuration for Acid Mine Drainage Experiment

Fitsum H. Solomon, Stephen O. Ekolu and Innocent Musonda
University of Johannesburg, Auckland Park, South Africa

Abstract—The aim of this study was to develop a gravity feed column set-up and to set the flow parameters based on experimentally measured flow rates and pressure drops. Prior to the present study the authors used a column set-up in which acid mine drainage was pumped through pervious concrete filled columns, using electrical peristaltic fish pond pumps. The gravity feed set-up in the present study was designed to overcome the need to rely on electrical power supply. The study describes the design set-up of four gravity columns. The design requirements comprised determination of appropriate column sizes, pressure heads and hydraulic gradients required to produce a low flow rate of about 1 mL/min at outlets of the columns filled with pervious concrete media. Of special interest is the hydraulic gradient being responsible for continuous flow in each column. Following completion of the design set-up, continuous flow rates of 0.60 to 0.80 mL/min were attained with a Reynolds number of about 4.0 in the columns filled with pervious concrete. Further research is in progress involving employment of the gravity-feed system for acid mine drainage treatment investigations.

M0016 (Session 2) Presentation 5 (14:30~14:45)

Simultaneous Removal of Nitrogen and Sulfur Oxides using the NAClO2/NAOH Composite Absorbent via Ultrasonic Atomization

Shuang Lin, Wei Liu and Dongyao Xu
China University of Mining & Technology (Beijing), Beijing, China

Abstract—In this study, $NaClO_2$ was used as an oxidant and mixed with NaOH to prepare a sodium-based composite absorbent. Simultaneous desulfurization and denitrification experiments were conducted in an ultrasonic atomization reactor and the effects of experimental parameters including pH value, $NaClO_2$ concentration, initial concentration of NO, reaction temperature, the addition of SO_2 and the utilization of ultrasonic atomization on desulfurization and denitrification efficiencies were investigated. Under the circumstance of the pH of 10, oxygen content of 8%, reaction temperature of 55^{o}C, and NO concentration of 500 mg/m3, SO_2 concentration of 1400 mg/m3, 69.38% of NO and 99.95% of SO_2 can be removed using the composite absorbent composed of 0.02 mol/L $NaClO_2$ and 0.1mmol/L NaOH. Ultrasonic atomization increased the denitrification rate by 10.6%.

M1005 (Session 2) Presentation 6 (14:45~15:00)

Development of Novel 2D Nanoplasmonic Materials for Light-Driven Environmental Remediation Applications

Vinh Q Dang
The University of Adelaide, Adelaide, Australia

Abstract—Photochemical reactions – light-driven chemical processes – are a sustainable alternative to conventional environmental remediation approaches based on chemical and thermal treatments. However, current photocatalysis technology faces challenges for practical applications: 1) the benchmark system based on semiconductor titanium dioxide (TiO_2) absorbs predominantly UV light (only 5% of the solar spectrum) and 2) most of systems are in nanoparticulate forms. The first challenge implies that photocatalyst materials cannot harness energy from high irradiance regions – visible and NIR light – of the solar spectrum. The second limitation is that nanoparticulate systems are an environmental threat due to the unknown fate of nanoparticles in the environment. These technical constraints hinder current photocatalysts from being a sustainable long-term solution. At the nanoscale, every photon is critical since more photons generate extra electron/hole (e-/h+) pairs, which are employed to accelerate photocatalytic reactions. As such, rational nano-structural and chemical designs of semiconductor materials can enable the efficient management of photons for high-performance photocatalytic processes. Despite outstanding advances in photocatalysis, there remains fundamental and applied questions concerning the design and engineering of semiconductor materials that can utilise sunlight efficiently. Of all existing alternatives, nanoplasmonic materials are a promising candidate due to their intrinsic photonic nature. Nanoplasmonic materials can be engineered to harness solar energy via optical entrapment so energy can be efficiently used for lightdriven environmental remediation processes.

M1002 (Session 2) Presentation 7 (15:00~15:15)

Assessing the Effectiveness of Hyparrhenia Hirta in the Rehabilitation of the Ecosystem of a Gold Mine Dump

G U Okereafor, M E Makhatha, L Mekuto, and V Mavumengwana
University of Johannesburg, South Africa

Abstract—The mining of gold is associated with several environmental challenges such as acid mine drainage, release of toxic metals which are associated to tailing sediments and have adversely impacted human health and the ecosystem. With increasing global population that is faced with limited land resources for agricultural activities, there is need for land restoration through effective rehabilitation of contaminated soils. The introduction of Hyparrhenia hirta, an indigenous grass specie as a phytoremediation technique for in situ rehabilitation of degraded soil is not only an economically viable approach but also environmentally friendly. Hyparrhenia hirta being a tufted and wiry perennial grass that is invasive with deep root system often aid in stabilizing the ecosystem owing to their self-fertile and drought resistant potentials that support that prevalence in harsh conditions at mine dump sites. In this study, mine tailings at Gold One Mine, Ekuhurleni, South Africa were assessed for heavy metal contents at the same time analysing the uptake of such heavy metals by Hyparrhenia hirta grass specie. The total metal mean concentrations was high (4023.67 mg/kg) for Hyparrhenia hirta which absorbed more of the following mean metal concentrations: 46.10 mg/kg for Cu; 40.08 mg/kg for Zn; 859.12 mg/kg for Pb; 618.26 mg/kg for Cr; 151.70 mg/kg for Co and 2308.41 mg/kg for Ni. The tailings were strongly acidic with a pH range of 3.86 – 4.34. These heavy metals despite the acidic environments were successfully absorbed by Hyparrhenia

hirta grass specie. Along these lines Hyparrhenia hirta was discovered reasonable for re-vegetation of mine tailings dump as it has the capacity to hold together tailings sediments against wind and water erosion.

M5020 (Session 2) Presentation 8 (15:15~15:30)

Prediction of Capital Cost of RO Based Desalination Plants Using Machine Learning Approach

Mohamed Ibrahim Kizhisseri, Mohamad Mostafa Mohamed and Mohamed A Hamouda
United Arab Emirates University, Al Ain, UAE

Abstract—This paper presents a neural network tool for predicting the capital cost of desalination plants based on reverse osmosis technology. A multi-layer feedforward neural network with back propagation learning method is used to model the project cost of RO plants. The model is developed using the data sets of 1806 RO plants of capacity at least 1000 m3/day, which involved training, testing and validation. The model used six inputs that included both categorical and numerical data elements, namely: plant location, plant capacity, project award year, raw water salinity, plant types (dual purpose/standalone), and project financing type. The output is the project cost of the RO plants planned. This prediction model can be used by governments, investors or other stakeholders in desalination industry to make a reasonable estimate of investment costs of coming RO plant projects.

M0015 (Session 2) Presentation 9 (15:30~15:45)

Microporous Zeolite@Vertically Aligned Mg−Al Layered Double Hydroxide Core@Shell Structures with Improved Hydrophobicity and Toluene Adsorption Capacity under Wet Conditions

Renna Li and Qiang Wang
Beijing Forestry University, Beijing, China

Abstract—Zeolites have been recognized as one type of the most promising adsorbents for capturing volatile organic compounds (VOCs, e.g., toluene), but their performance suffers severely from water vapor under wet conditions. In this contribution, we demonstrated that the hydrophobicity of microporous zeolites can be significantly improved by coating vertically aligned LDH nanoplatelets when the contact angle is increased from 16.5−20.1° to 44.4−64.2°. The toluene adsorption capacity of such synthesized zeolite@LDH core@shell composites in wet conditions can thus be largely enhanced when the breakthrough time is increased from 6.4−10.8 to 20.1−27.5 min.

Coffee Break 15:45~16:00

Poster Session

Tips: The schedule for each presentation is for reference only. In order not to miss your presentation, we strongly suggest that you attend the whole session.

Afternoon, December 19, 2019 (Thursday)

Time: 16:00~16:30

Venue: Vienna Room

9 presentations-Topic: "Resource and Environmental Science"

Session Chair: Prof. Tjokorda Gde Tirta Nindhia

M0010 Poster 1

The Adsorption of Oxyation and Forming Heavy Metals using Nano Scale Fe-Mn Oxide: Part 1. Preparation and Characteristics of Nanomaterials

Seungjin Oh, Minah Oh, Jinman Chang, Jae-Seop Lee, Jai-Young Lee
University of Seoul, Seoul, South Korea

Abstract—Synthetic nanomaterials are currently being applied to a variety of fields such as medical diagnostics, therapy, structural materials, and environmental application. As this kind of active research progresses, its application range is getting wider. Nanomaterials have a large surface area per mass and thus are more reactive than ordinary large particles. In the environmental field, various researches are underway such as water treatment, wastewater treatment, indoor and outdoor air purification, soil and groundwater contamination adsorption. Particularly, it is expected to develop an in-situ purification method for use in sites that are difficult to excavate by using adsorption reaction of nanomaterials and pollutants in soil by a method used for purification of soil and groundwater contamination. Fe-oxide is known to have effect on the adsorption of arsenic and heavy metals. Especially, nano-sized Fe-oxide shows 5~10 % better adsorption capacity than general-sized fe-oxide. The manganese oxide has high toxicity, solubility and mobility. Therefore, treatment efficiency can be improved because it effectively oxidizes trivalent arsenic and heavy metals having weak adsorption strength. In this study, we investigate the chemical and mineralogical characteristics of nanomaterials related to organic stabilization and possibility of using nanomaterials stabilizer in future. As a method of characterization, fine particle surface characteristics and EDS were observed using TEM-EDS(Transmission electron microscopes and energy dispersion spectrometer), mineralogical analysis using XRD(X-Ray Diffractometry), XRF(X-Ray Fluorescence), the specific surface area(BET) analysis and the chemical functional analysis were performed by Fourier-transform infrared spectroscopy(FT-IR) analysis.
As a result, $MnFe_2O_4$ as a main mineral was analyzed for each nano iron - manganese oxide before and after the organic material reforming. The chemical composition of MnO and Fe_2O_3 was about 99% or more before organic modification. After the organic modification, MnO and Fe_2O_3 were found to be 87% or more. The specific surface area was 142.20 m^2/g before

organic modification and 114.42 m^2/g after organic modification, and the average pore size was found to be 22 nm before organic modification and 52 nm after organic modification. The average porosity before organic modification was 0.006 cm^3/g and the average particle size was 20 nm. The average porosity after organic modification was 0.0009 cm^3/g and the average particle size was 52 nm. TEM-EDS are main characteristics of $MnFe_2O_4$ compounds such as before and after modification of existing organic materials were identified, and EDS results showed peaks based on Fe and Mn. FT-IR was found that a doped peak was observed in the region of 1,650 Cm^{-1} when the organic material was reformed, indicating that the C═C bond of the carboxyl system or the C═O bond of the amide system existed.

M0033 Poster 2

Evaluation of Companies Providing Environmental Services in Southern Brazil

Marise Keller Santos
Science and Technology Rio Grande do Sul Campus Viamão, PortoAlegre, Brazil

Abstract—The environmental services evaluation model was developed and applied to meet the needs of the management programs of a group of 20 metal-mechanical waste generation companies in the state of Rio Grande do Sul, Brazil. The objective was to work together to standardize and apply an assessment to their environmental service providers, enabling performance benchmark and the implementation of continuous improvement in the quality of environmental services provided. The model uses the quality house (HOQ) of the Quality Function Deployment (QFD) tool. This tool helps to systematize the identification and prioritization of waste generator requirements. The requirements identified were the management systems employed by the Environmental Service Provider for their solid waste, waste water and emissions treatment, quality, health and safety, business routines, environmental legislation, technology and innovation and entrepreneurship. Indicators were also identified for each management system, totaling 61 indicators. In this way, successive applications of the proposed model can contribute to the development of environmental service providers, as well as to the improvement of the relationship between waste generators and companies that provide services for the disposal of this waste. The results of the present study also indicate the potential for consolidation of shared responsibility roles in environmental management and a contribution to the local consolidation of the circular economy. Other results from the application may confirm the current situation of the local environmental services sector, such as the lack of tax incentives, studies for more standardized and effective licensing and enforcement actions by environmental authorities, standardization of waste quality, financing lines. specific to the sector, greater support from the academic sector.

M0011 Poster 3

The Adsorption of Oxyanion Forming Heavy Metals using Nano Scale Fe-Mn Oxide: Part 2. The Evaluation of Adsorption Performance

Minah Oh, Seungjin Oh, Jinman Chang, Jae-Soep Lee, Jai-Young Lee
University of Seoul, Seoul, South Korea

Abstract—The nano scale Fe-Mn binary oxide were synthesized with chemical precipitation and then stabilized using organic stabilizer as starch or carboxy methyl cellulose (CMC). The

nanoparticles were also characterized and tested with respect to adsorption of arsenate and chromate from groundwater. While stabilized nanoparticles showed rapid sorption kinetics, CMC stabilized Fe-Mn oxide offered the greatest capacity for arsenate and chromate. The adsorption reached equilibrium in 10 hours and CMC stabilized Fe-Mn oxide nanoparticles were adsorbed about 74.61% of arsenate and 41.30% of chromate. The equilibrium maximum capacity with Freundlich model was determined to be 98 mg/g of arsenate and 77 mg/g of chromate with CMC stabilized Fe-Mn nanoparticles, respectively. The high uptakes of arsenate and chromate were observed over the typical groundwater pH range 5-8. This study will continue to apply to the heavy metal contaminated soil and groundwater, and be expected to be a potential in-situ technology to remediate.

M5021 Poster 4

Verification of Euler type II reference hyetograph for modeling the sewage systems in Wroclaw (Poland)

Katarzyna Wartalsk, Bartosz Kaźmierczak, Monika Nowakowska, Andrzej Kotowski
Wroclaw University of Science and Technology, Wroclaw, Poland

Abstract—The aim of the research was the verification of Euler type II model rainfall used so far in modeling storm water drainage operation in Poland. Rainfall data from measurement stations in Wroclaw were used. For further analysis, rainfalls were selected on the basis of exceedance frequencies. Rainfalls were grouped with the use of cluster analysis: Ward and k-means methods. Especially the k-means method has proven to be useful for selecting precipitation in terms of hyetographs' shapes. On the basis of clustering results, 51 precipitation were selected for verification of Euler type II standard. The statistical analysis of hyetographs shapes similarity was based on 6 parameters defined in the paper. The comparative analysis revealed that, despite some discrepancies, Euler type II model rainfall is suitable for the description of rainfall in tested station.

M5012 Poster 5

Multi-variate Statistical Data Analysis for Detecting Leaks in Water Pipe Networks

Suwan Park and Jae Hong Ha
Pusan National University, Busan, South Korea

Abstract—As one of the areas of smart water management technology, studies on the development of techniques for estimating the leakage in water pipe networks such as the artificial neural network and statistical data analysis technique had been developed. Contrary to the previous methods the principal component analysis (PCA) technique, which is one of the statistical multi-variate data analysis techniques, does not need to train an artificial neural network and can still be applied to data sets that have missing values. In this study, the PCA technique was applied to the flow data observed in a water supply network and the relationship between the detected statistical outliers and the maintenance records related to leakage of the water supply pipelines was evaluated. Based on the results of the analysis the applicability of the principal component analysis to the early detection of leakage of water pipe network was analysed. A method to improve the efficiency of detecting the outliers of the PCA model was also developed that uses a portion of flow data among the hourly flow data rather than the whole 24-hour flow data. Using the developed Matlab computer program the

'effective outlier detection rates' (EODRs) were calculated for the hourly flow data inside all of the possible time windows in a day which were generated for all possible combinations of 'center times' and 'time ranges'. An EODR was calculated using the flow data in each time window. The best time window(BTW) which has the highest EODR(maximum EODR, M-EODR) was obtained for each district metered area (DMA) using the developed algorithm. It was considered that if the BTWs does not change much in a recent period, say for 6 months, the calculated M-EODR may be used to determine whether pre-emptive leak detection work is performed for a DMA. The technique developed in this study may be used by a manager of a water pipe network to confirm whether the flow data of the previous day at present analysis time is calculated as the outliers by performing the developed PCA algorithm. Occurrence of the outliers and the calculated values of the M-EODRs may assist the manager of a water pipe network in deciding whether to conduct a leakage test for a suspected leak zone in a DMA.

M5005 Poster 6

Factors Important to the Current Distribution and Conservation of Threatened Shorea Robusta Forest

Sharmin Shishir
University of Toyama, Gofuku, Toyama, Japan

Abstract—Detecting the determinants of spatio-temporal distribution of species is prerequisite for ecological conservation and restoration. Maximum entropy (Maxent)-type species distribution modeling was applied to investigate the present and future potential distributions of an endangered canopy-tree, Shorea robusta C. F. Gaertn. (Dipterocarpaceae), under urbanization in Purbachal, Bangladesh. The model was constructed by 165 location records that cover the entire extent range of S. robusta. Eight environmental variables related to climate, geography, and soil were included in the models. Two scenarios proposed by IPCC (representative concentration pathways, RCP) were used to predict the altered S. robusta distribution due to climate change (RCP4.5 and RCP8.5). The accuracy of predicted distributions was supported sufficiently by the binomial test of omission ($P \approx 0.00$) and area under the curve analysis (AUC > 0.97). The distributions were mostly determined by precipitation and soil nitrogen because being a canopy tree S. robusta requires high precipitation and soil nitrogen. Maxent predicts that the suitable areas for S. robusta forest decline to 86.5% from total area by 2100 in the climate change scenario of RCP8.5. Maxent results showed that precipitation and soil nitrogen are important predictors to the distribution and conservation of S. robusta forests.

M3007 Poster 7

Historical Variability and Trends Wind Speed, Sunshine Duration and Ambient Temperature from the Perspective of Renewable Energy in Poland

Fausto Canales, Piotr Jadwiszczak, Jakub Jurasz, Marcin Wdowikowski, **Bartosz Kaźmierczak**
Wroclaw University of Science and Technology, Wroclaw, Poland

Abstract—The installed capacity of renewable energy sources in the Polish power system is increasing. Owning to their intrinsic nature of a significant temporal and spatial variability observed on a short and long-term time scales their integration to the power system is a

challenging task. The variability on time scales from seconds to days and the seasonal (intrannual) is well described and different measures are commonly applied in power systems to overcome them. However, the variability on long-term scale is often neglected, as direct effects are not often clearly visible. Therefore, the analysis in this paper aimed at covering this issue by scrutinizing the trends of observed ambient temperature, sunshine duration and wind speed for 19 cities in Poland. From a statistical point of view, relevant upward trends have been observed for temperature and sunshine duration for all cities considered. Whereas for the wind speeds a contrary trend was observed for a majority of locations. We claim that the long-term increasing trend of air temperatures and sunshine duration, along with a simultaneous decrease in wind speed shapes the new RES working conditions. Furthermore, it is also accepted that potential change in meteorological conditions will influence the energy demand profiles, energy mix and coherence as well as conditions of energy generation by RES.

M1030 Poster 8

Environmental Value Assessment in Recycling of Waste Electric Vehicles Battery

Yong Woo Hwang, Ji Hyung Park, Young Woon Kim, Hong Yun Kang, Sung Ryun Choi
Inha University, Incheon, Republic of Korea

Abstract—As an increasing electric vehicle (EV) supply and replacement demand, the occurrence of the waste battery will increase. Lithium batteries in EVs are necessary for systematic management and can be recycled as energy storage system (ESS), etc. However, detailed procedures, regulations or infrastructures for commercial purposes are not configured yet. This study is aimed to assess the environmental value in the recycling the waste EVs battery in Korea.

Firstly, we analyzed the status of domestic system, policy, and overseas business model on the waste EVs battery and as well as ESS equipment in Korea. Then, we performed a cost-benefit analysis (B/C) based on the business model scenario of waste battery second use (B2U). Benefit for recycling waste EVs battery was considered ESS sales benefit and the avoidance benefit of final disposal. Cost for recycling waste EVs battery was considered removal cost, transportation cost, residual life diagnosis cost, battery purchase cost after use, manufacturing cost, and R&D cost.

Consequently, after conducting B/C analysis, a B/C ratio showed a maximum 2.9 to lowest 0.4. In this process, the battery residual life was analyzed as an important factor. On the present technology, if we invest in R&D on measuring the battery residual life, we will get the greatest benefit against the cost. And also the data showed that recycling of waste EVs battery based on B2U product is more efficient.

M0036 Poster 9

Bioaccumulation and Health Risk Assessment of Severe Metal Pollution of Street Dust from Various Urban Regions in Baghdad, Iraq

Salwan Ali Abed, Safaa A Kadhum, Salam Hussein Ewaid, and Nadhir Al-Ansari
University of Al-Qadisiyah, Iraq

Abstract—This study sought to define the metals bioaccumulation from street dust in Baghdad, Iraq for the first time. The samples were collected that research the levels, sources,

and health hazard model Cd, Cr, Zn and Cu. The geo accumulation Index (Igeo) found that the contamination level for Cd was moderately to strongly polluted in Karada, Jihad and Kinidi streets. Hence, it is important to measure the level of cadmium in the local environment. The relative bioaccumulation of chromium was high in Jadriyah Street (87.2%). The PCA showed two major sources of these minerals in Baghdad road dust that Cd, Zn are likely to originate from tire wear, brake wear and vehicular emissions as well as the fact that Cr and Cu originate from metal-processing industries. Assessing hazard to human health utilized measure population show suggested both non-carcinogenic and carcinogenic hazards minerals Baghdad road dust harmless to human environment.

Session 3

Tips: The schedule for each presentation is for reference only. In order not to miss your presentation, we strongly suggest that you attend the whole session.

Afternoon, December 19, 2019 (Thursday)

Time: 16:30~18:30

Venue: Vienna Room

8 presentations-Topic: "Air Pollution and Water Pollution"

Session Chair: Prof. R. J. (Dick) Haynes

M0014 (Session 3) Presentation 1 (16:30~16:45)

Cruising for Better Air Quality: Australian Clean Air Submissions, Issues, and Recommendations

Angela T. Ragusa, and **Andrea Crampton**
Charles Sturt University, Albury, NSW, Australia

Abstract—Clean air remains an elusive and inequitable human right. Air pollution unnecessarily increases morbidity, mortality rates, and environmental degradation globally. This paper presents results from a content analysis of all (n=133) submissions to the 2019 New South Wales Government call for public feedback to its 'Clean Air' issues and action priorities. Findings show stakeholder agreement that air pollution's regulation and measurement are problematic. Issue framing divulged stakeholder agendas, particularly for shipping industries, highlighted inconsistencies in government and industry regulations, and revealed mistrust and issue partiality. Science literacy, proximity to pollution source, socioeconomic status, and pollution visibility affected issue descriptions and recommendations. Cruise ships in Sydney Harbour received disproportionately high focus relative to their contribution to the shipping industry's contribution to local air pollution. Government and health body submissions proposed public education, awareness raising, and personal action as key steps to avoid emission exposure. We argue such 'deficit theory' approaches are inadequate in light of international research evidencing pollution visibility and personal perception poorly reflect scientific air quality measures. To surpass Australian

NIMBY approaches to air pollution, we propose adopting European international legislative reform to equitably enforce clean air 'rights' and actions across industries, governments, and communities, irrespective of stakeholder priorities.

M5007 (Session 3) Presentation 2 (16:45~17:00)

Investigation of Mean Monthly Maximum Temperature of Thailand Using Mapping Analysis Method: A Case Study of Summer 1987 To 2019

N Phumkokrux and **SOMKAMON Rukveratham**
Ramkhamheang University, Bangkok, Thailand

Abstract—This study aims to study the distribution of air temperature characteristics and to analyse the trend of mean monthly maximum temperature changed in summer of Thailand from 1987 to 2019. The study was performed by gathering the temperature data from 83 meteorological stations around Thailand. The study focused on the months February to May in the years 1987 to 2019. Then, distribution of air temperature characteristics maps and graph of each month in each year are created to analyse the distribution and trend of mean monthly maximum temperature over the past 33 years. The results showed that, for every year, the mean monthly maximum temperature increased from February to April and decreased in May. Moreover, the maps presented that the air temperature in the western of Thailand was higher than the eastern of Thailand. Furthermore, the temperature trend illustrated that the mean monthly maximum temperature of all months in summer was increasing, especially May. Totally, the trend of the air temperature in summer (February to May) was rising by 0.0087 °C per year. The result of this study might indicate the signal of climate change and global warming in Thailand.

M0057 (Session 3) Presentation 3 (17:00~17:15)

Intestinal Helminth Parasites of the Siganid Fish as a Sentinel for Heavy-Metal Pollution in the Red Sea

Mohammad Saleh Alafif
King Abdulaziz University, Jeddah, Saudi Arabia

Abstract—The rate of heavy metal pollution in an aquatic ecosystem and its effect on aquatic fauna wellbeing is on the increase. Heavy metals (Cu, Mn, Zn, Pb and Ni) concentrations were determine in fish samples and their helminth parasites collected from two major sites in Red Sea. The study quantified the heavy metals concentrations in the siganid fish tissues (liver, gills, intestines, and muscles) and their endohelminths parasites Nematoda; Procamallanus elatensis and Acanthocephala; Sclerocollum saudii to assess their suitability as biomonitors. A total of 52 fish were sampled from the study region, and their gut removed. The fish were examine for presence of endoparasites and the infrapopulation of the parasites were determined. The different fish tissues were examined for heavy metal accumulation. The quantification of the various metals was determined after sample digestion using the 'inductively coupled plasma atomic emission spectrometry (ICP/AES). A significant variation was found at ($P<0.05$) in heavy metals concentrations of fish tissues and their helminth parasites. Al-Khumrah region had significantly higher heavy metal content in fish organs and parasites compared to the Masturah. The liver Cu levels were the highest in Al-Khumrah (190.44±53.24 mg/kg) and Masturah (210.86±67.12 mg/kg). The nematode Mn

concentrations were the highest in Al-Khumrah (122.4±16.78 µg/l) and Masturah (91.17±10.295 µg/l). There was no significant relationship between heavy metal concentration in intestine of infected fish samples and their parasites infrapopulation. The siganid fish tissues and their endohelminth parasites accumulate heavy metals and are promising biomonitors of pollution at the Red Sea Coast. Repetitive monitoring of this aquatic environment should be put into practice to track subsequent changes due to environmental pollutants.

M1021 (Session 3) Presentation 4 (17:15~17:30)

Leachate Characterization and its Impact on Groundwater near Municipal Solid Waste Landfill Site of New Delhi

Priyanka Kumari, Amarjeet Kaur, N. C. Gupta
Guru Gobind Singh Indraprastha University, New Delhi, India

Abstract—The unscientific municipal solid waste (MSW) landfill sites produce leachate, loaded with different toxic components which gradually infiltrate and contaminate the nearby groundwater posing significant impacts on the human health and the environment. In view of the above, this study aims to discuss the characteristics of leachate produced from the Ghazipur landfill site, Delhi, India and its impacts on groundwater system. The leachate and groundwater samples were collected and analyzed to estimate its pollution potential. The results depicted the high concentrations of various physicochemical parameters like pH, TDS, Cl^-, Na^+, K^+, $NO3^-$, F^- and $PO43^-$ as well as heavy metals (Pb, Cu, Cr, Cd, Ni and Zn). The ratio of BOD/COD of landfill leachates was found high (0.40 to 0.44) which indicates high biodegradability under the anaerobic phase of landfill. The water quality index (WQI) showed that the groundwater samples lies within one km buffer area are more polluted as compare to the far samples. It clearly indicates that leachate is a point source of contamination. Thus, there is essential need of proper leachate management and treatment prior to its discharge to ensure the least adverse environmental impact.

M5018 (Session 3) Presentation 5 (17:30~17:45)

Detection of Waterborne Bacteria Using Adaptive Neuro-Fuzzy Inference System

Farhan Mohammad Khan, **Smriti Sridhar**, Rajiv Gupta
University of Virginia, Charlottesville, USA

Abstract—The detection of waterborne bacteria is crucial to prevent health risks. Current research uses soft computing techniques based on Artificial Neural Networks (ANN) for the detection of bacterial pollution in water. The limitation of only relying on sensor-based water quality analysis for detection can be prone to human errors. Hence, there is a need to automate the process of real-time bacterial monitoring for minimizing the error, as mentioned above. To address this issue, we implement an automated process of water-borne bacterial detection using a hybrid technique called Adaptive Neuro-fuzzy Inference System (ANFIS), that integrates the advantage of learning in an ANN and a set of fuzzy if-then rules with appropriate membership functions. The experimental data as the input to the ANFIS model is obtained from the open-sourced dataset of government of India data platform, having 1992 experimental laboratory results from the years 2003-2014. We have included the following water quality parameters: Temperature, Dissolved Oxygen (DO), pH, Electrical conductivity,

Biochemical oxygen demand (BOD) as the significant factors in the detection and existence of bacteria. The membership function changes automatically with every iteration during training of the system. The goal of the study is to compare the results obtained from the three membership functions of ANFIS- Triangle, Trapezoidal, and Bell-shaped with 35 = 243 fuzzy set rules. The results show that ANFIS with generalized bell-shaped membership function is best with its average error 0.00619 at epoch 100.

M1020 (Session 3) Presentation 6 (17:45~18:00)

An Overview of Constructed Wetland Systems Vegetated with Different Macrophytes for the Treatment of Textile Wastewater

Neha Tiwari, Amarjeet Kaur, S.K. Singh
Guru Gobind Singh Indraprastha University, New Delhi, India

Abstract—The release of textile dye wastewater into streams has been long proved to be toxic and carcinogenic for aquatic flora and fauna. The ongoing approaches used for treatment of textile wastewater have technical and economic restrictions such that they are costly, produce large amount of sludge and contains waste products of dye solubilization. Hence, an advanced technology i.e. Constructed Wetlands have proved to be more efficient in terms of time and cost. This paper deals with the use of these Constructed Wetlands for the treatment of two azo dyes (Amaranth) and (Direct blue 15) by using gravel as a substrate and different emergent macrophytes. The PVC cylindrical pipes of (24×8) height and diameter were used for the system set up. The experimental set up was consisted of one unplanted control system and other three systems planted with Typha latifolia, Colocasia esculenta and Cyperus papyrus. The synthetic dye wastewater of 10 mg/l concentration was prepared on laboratory scale. The dye wastewater was given to the systems for different hydraulic retention time (24h and 96h). The results show that the removal percentage of TSS, COD, Phosphate, Nitrate, hardness, chloride and alkalinity by unplanted control system was 68%, 72%, 74%, 70%, 65%, 69% and 74%. On the other hand, the percentage removal of TSS and COD by system planted with T. latifolia has shown maximum removal of 75% and 78% to that of C. papyrus and C. esculenta which has the removal rate for TSS- 70% & 58% and COD- 66% & 60%. The removal of phosphate, nitrate, hardness, chloride and alkalinity by system planted with Typha- 72%, 69%, 74%, 76% & 73% where as by Cyperus-68%, 66%, 70%, 72% & 71% and Colocasia- 64%, 59%, 61%, 65%, & 63%. The wetland system planted with Typha latifolia has proved to be much more efficient in case of increased hydraulic retention time.

M0017 (Session 3) Presentation 7 (18:00~18:15)

Chlorella Vulgaris Enhance the Photodegradation of Chlortetracycline in Aqueous Solution via Extracellular Organic Matters (EOMs): Role of Triplet State EOMs

Yajun Tian, Li Feng, Liqiu Zhang, Yongze Liu
Beijing Forestry University, Beijing, China

Abstract—Algae which are ubiquitous in typical surface water environment (e.g., lakes, ponds, wetlands) may play an important role in sunlight-driven phototransformation of compounds. This study was to investigate the role of algae (*Chlorella Vulgaris*) in chlortetracycline (CTC) photolysis and explore the photosensitive mechanism. The algae were found to significantly accelerate the photodegradation rate of CTC and extracellular organic

matters (EOMs) were confirmed to be the major active substances. Triplet state EOMs (^{3}EOMs*) were verified to be the dominant reactive species with > 93% contribution to the indirect photodegradation rate, while • OH and $^1O_2$ contributed minor (< 7%). The second order rate constant of ^{3}EOMs* with CTC was further calculated to be 3.17×10^9 $M^{-1}s^{-1}$. ^{3}EOMs* were found to react with CTC mainly via electron transfer, on basis of susceptible reaction of ^{3}EOMs* with the hydroxyl and amidogen groups in CTC. In addition, the energy transfer of ^{3}EOMs* to CTC was possible according to the higher energy of ^{3}EOMs* than that of triplet CTC.

M0022 (Session 3) Presentation 8 (18:15~18:30)

Impact of Activated Sludge Bulking and Foaming on the Quality of Kuwait's Irrigation Water

Abdallah Abusam, Andrzej Mydlarczyk, Fadila Al-Salamain, and Moh Ahmed
Kuwait Institute for Scientific Research, Kuwait

Abstract—Treated municipal wastewater produced in Kuwait is used mainly in agricultural and landscape irrigations. However, there are strong doubts that severe sludge bulking and foaming problems, particularly during winter seasons, may render this water unsuitable for irrigation purposes. To assess the impact of these problems on the quality of irrigation water in Kuwait, samples of secondary and tertiary effluents and sludge-mixed liquor were collected weekly from two wastewater treatment plants for nine months. Routine wastewater quality parameters were then determined for the collected influent and effluent samples. Further, dominant filamentous bacteria in the sludge-mixed liquor samples collected from the aeration tanks were also identified and quantified using a molecular method called Vermicon Identification Technology (VIT). Obtained results of the effluents' qualities were then statistically analyzed and compared to Kuwait's irrigation water standards. Statistical results indicated that secondary effluents were greatly impacted by sludge bulking and foaming problems, while tertiary effluents were slightly affected. This finding highlights the importance of having tertiary treatment units in plants to encounter sludge bulking and foaming problems.

Session 4

Tips: The schedule for each presentation is for reference only. In order not to miss your presentation, we strongly suggest that you attend the whole session.

Afternoon, December 19, 2019 (Thursday)

Time: 16:30~18:30

Venue: Beijing Room

8 presentations-Topic: "Environment and Sustainable Development"

Session Chair: Dr. Angela T. Ragusa

M5006 (Session 4) Presentation 1 (16:30~16:45)

Development of GIS and Database Program on Website for Concerned Government Office for Environmental Management under PES and BioCarbon Concepts

Nutthakarn Phumkokrux, Somkid Phumkokrux, Komsan Kiriwongwattana, Supharerk O-In, Akirat Abdulkade, Preeyaporn Muenratch, and Arisa Jirasirichote
Silpakorn University, Nakhon Pathom, Thailand

Abstract—This study aims to develop GIS and database program for ecosystem services management, environmental management and policy planning for natural conservation in the representative areas under the Integrated Community-based Forest and Catchment Management through an Ecosystem Services Approach project (CBFCM) by using Payment for Ecosystem Services (PES) and Biological storage of carbon (BioCarbon) concepts. At first, the concerned data were collected by brainstorming of the needs of GIS and database program with staffs from 4 pilot areas in Thailand: Mae Sa watershed area in Chiang Mai, Lam Sae Bai River Basin in Ubon Ratchathani, Tha Chin watershed area in Samut Sakhon and Phangan River Basin in Surat Thani. Then, the situations and variables which affect to natural resources were analysed. Secondly, GIS and database program were designed and developed. However, the program can be divided into 3 sub-programs for different proposes which are; (1) to enhance coordinated and follow-up performance of change of PES and Bio-carbon concept, (2) to increase communication and training for delegate areas to understand about PES and BioCarbon concept and (3) to collect and manage data and information for representative areas.

M5013 (Session 4) Presentation 2 (16:45~17:00)

Transformation of Flood Risk Management with Evolutionary Resilience

Herath Mudhiyanselage Malani and NTS Wijesekera
University of Moratuwa, Colombo, Sri Lanka

Abstract—The occurrence of flood disasters has become a vicious problem in many urban regions. Operationalization of flood resilience has become a significant concern with the increase of urban development and climate change. The objective of this paper is at first to analyze how flood resilience has been framed over the past period of time. Second, this paper has focused to identify the practical difficulties related to the available flood risk assessment and management frameworks for operationalization of flood resilience. The results show that the flood risk and resilience has been framed differently throughout the time, in diverse perspectives but still remains as contested concepts. Evolutionary resilience has been reframed the flood risk management system as an integrated and adaptive system with the recognition of the uncertainties due to the dynamics of socio-spatial interdependencies of flood risk. Therefore, the integration and the adaptive capacity of spatial planning has become a crucial aspect for operationalizing flood resilience which is governed through the knowledge base of the dominant discourses of stakeholders and the way of power and the resource exercised in the context.

M3006 (Session 4) Presentation 3 (17:00~17:15)

Contribution to the Environmental Sustainability by Improving the Walking Behavior through

Neighborhoods Design with Special Reference to Developing Countries

Yasmeen Gul, Zahid Sultan, Gul Ahmed Jokhio
Alghurair University, Dubai

Abstract—The neighborhood design (ND) factors such as land-use mix (LUM), street connectivity and housing density have the potential to enhance the walking. A limited number of studies have investigated the association of ND factors with walking in developing countries. Therefore, the objective of this study is to compare the ND factors and investigate their association with walking. The LUM, street connectivity and housing density were measured objectively while walking was calculated subjectively (n-1,042adults). Independent sample t-test and Binary logistic analysis has been used to investigate the comparison and association between ND factors and walking. The results show that two out of three ND indicators are significantly different in both types of neighborhoods and have positive association with walking Therefore, it can be concluded that, for the sake of walking in developing countries, the neighborhoods should have mix of different land-uses and well-connected streets rather than sealing the neighborhoods with walls.

M5002 (Session 4) Presentation 4 (17:15~17:30)

Evolution of Pastoral Livelihood Strategies in an Arid Region: A Case Study in Northern Xinjiang, China

Xuhuan Dai, Bo Li, Zhilong Wu, Bo Nan, Yao Fan
Beijing Normal University, Beijing, China

Abstract—The pastoral livelihood evolution perspective provides an important lens for looking at complex human-land relationships and pastoral transformations on arid land. This study explored the evolution process of pastoral livelihood strategies and driving factors in northern Xinjiang from 1987 to 2017 and analyzed the internal determinants of grazing and nonfarm participation in 2017. Based on the classification tree method, livelihood strategies were classified into nomadic, agro-pastoral, diversified with grazing, sedentary farm, sedentary diversified, and nonfarm household. The livelihood change rate accelerated over time, and livelihood strategies displayed three stages: nomadic, nomadic and sedentary farm coexistence, and dominated by sedentary diversified strategy. The evolution was principally because of the increased support of pastoralist settlement policy, the development of oasis agriculture and secondary and tertiary industries, and the natural conditions of pastoral areas. Contemporarily, households with rich natural capital and livestock tend to adopt grazing; a lack of these assets and higher Mandarin level enhance the propensity for nonfarm participation. Accordingly, policy interventions for benign pastoral livelihood transformation and sustainable development on arid land should emphasize the synergetic development of agriculture and non-agriculture to facilitate livelihood diversification.

M0035 (Session 4) Presentation 5 (17:30~17:45)

New Promises AI Brings into Circular Economy Accelerated Product Design: Review on Supporting Literature

Malahat Ghoreishi, and **Ari Happonen**
LUT University, Lappeenranta, Finland

Abstract—Promoting and applying circular strategies in the product planning stage by industrial designers have significant environmental impacts. Product design have an enormous influence on sustainable ecology. Huge amount of data analysis in designing circular products as well as reducing human biases in testing and prototyping are the main reasons of urging digital technologies in industries. Digitalization assets in ecodesign in collaboration with human and as a complement for human skills. This study found the circular design tools and strategies which can help organizations in their product designs and the way artificial intelligence enhances product circularity. Real-time data transformation and analysis ability can help in massive data analysis which is less time consuming and less energy consumption is needed. In addition, rapid prototyping and fast testing will reduce the waste in design process. Furthermore, AI transfers precise data and information on materials and products' availability, condition and accessibility which makes easy monitoring and enables remote maintenance as well as reuse, remanufacturing and repair opportunities.

M3009 (Session 4) Presentation 6 (17:45~18:00)

Controllable Preparation of Metal Compounds for Batteries and Environmental Electrocatalysts

Haosen Fan
Guangzhou University, Guangzhou, China

Abstract—Transition metal chalcogenides, consisting of metal atoms (Fe, Co, Ni, Zn) and chalcogens (O, S, Se, Te), have been attracting significant attentions in the past few years because they have potential applications in a variety of energy devices including including solar cells, fuel cells, sensors, Li-ion batteries, supercapacitors and sodium ion batteries. In recent years, metal chalcogenides have been studied as high performance anode materials for lithium and sodium ion batteries. However, controllable and precise synthesis of metal chalcogenides with hierarchical structure is still a big challenge. Recently, metal-organic frameworks (MOFs) have been used as precursors in the preparation of hollow and porous structures of metal chalcogenides because of their well-defined morphology, high surface areas and uniform porous structures. Among them, Prussian blue and its analogues consisting of metal ions coordinated to rigid organic cyano groups have been developed to design and prepare various porous micro/nanostructures of metal oxides, sulfides, selenides and carbides due to their unique size- and shape-dependent properties, which have the potential applications in the energy storage field due to their unique and fascinating structures.

M0045 (Session 4) Presentation 7 (18:00~18:15)

Innovation System through Biomimicry Concept Towards Sustainability

Mohd Yazid Mohd Yunos, Nur Afikah Idrus, Nor Kalsum Mohd Isa, Noor Fazamimah Mohd Ariffin
University Putra Malaysia, Serdang, Malaysia

Abstract—Sustainability is one of tremendous approach in innovation system that gives impact on efficient infrastructure to become a vast effort in Malaysia government. Throughout research study overview, most of extension technology knowledge in innovation system perspective basically on outsource of innovation and identity that synchronize with technical, social and institutional change. However, the management sector such as policy makers and

stakeholders, facilities conductor and system information still not considered as important. Based on biomimicry potential concept is attempt a multi-disciplinary task evolve an optimizing opportunities in establishing the innovation development system especially towards successful productive infrastructure. Hence, the qualitative method by reviewing related documents and paper as effective way to systematically analyze the auto regression of documentation towards new innovative features in order to access the extension technology knowledge in system product. The comprehensive descriptive data of biomimicry that applied integration between science and technology drive the mimic for solutions of human problems through the study of natural designs, systems, and process is exploiting new perspective thinking and appreciation to surrounding element to goes beyond dynamic and efficiency of infrastructure development. As conclusion, this paper noticed that the government, policy makers and administrators should promote the researchers in using this biomimicry concept that will boosting and broadening the research knowledge innovation brokering activities.

M0046 (Session 4) Presentation 8 (18:15~18:30)

Concentration of Copper (Cu) in Tinfoil Barb Fish (*Barbonymus schwanenfeldii*) of Kuantan River and Pinang River, Pahang, Malaysia

Nadzifah Yaakub, Shu Qi Choong And Wan Marlin Rohalin
Universiti Sultan Zainal Abidin, Besut, Malaysia

Abstract—Fish is one of the important animal protein sources for human consumption. Due to the lower content of fat or carbohydrate in white-fleshed fish compared to other animal meat makes they become an important part of a healthy diet (Ibrahim et al., 2014). In several decades, the issue of heavy pollution in water bodies, particularly in the freshwater system concerns in society. Heavy metals are mostly toxic although some heavy metals are essential at a low level for enzymatic activity and other biological processes. If this essential metal exceeds the required level of living beings they will become toxic and lethal to the living organism (Pandey & Madhuri, 2014). In the heavy metals polluted water bodies, the heavy metal is distributed in the water bodies, tended solids and sediments and finally enter the human food chain. During the lifetime of fish in heavy metals polluted water, they can accumulate large amounts of heavy metal in the water through food, water and sediments since they are at the top of the aquatic food chain. The metals also can bioaccumulate in fish by ingestion directly through food, diffusion across the skin, and breathing through gills (Rajeshkumar & Li, 2018). Then, these taken heavy metals are carried to organs via blood path. It can reach high concentrations by bonding to metal-binding proteins in tissues and stay over a long period. Considering the high demand for fish in human consumption, intake of contaminated fish could have adverse effects on human health. This may include serious threats like renal failure, liver damage, cardiovascular diseases, and even death.

The issue on the accumulation of heavy metal in aquatic ecosystems such as river had been arisen in Malaysia. The occurrence of this issue is due to water pollution by heavy metals that release from anthropogenic activities, such as bauxite mining. In 2013, bauxite mining is started at Pahang on a small-scale. Due to the high demand of bauxite, many irresponsible parties used unregulated and unscrupulous mining methods in bauxite mining at Pahang to generate more profit. Eventually, these irresponsible parties conducted bauxite washing illegally at nearby river lead to the occurrence of ‘red river' with a high level of heavy metals content (Academy of Sciences Malaysia, 2017).

Detection of toxicity of heavy metal in freshwater fish at Pahang is vital to provide information about the current level of heavy metal in fish to the local of Pahang as that area may have a potential risk of toxicity of heavy metal in fish. This information can be consulted by society about the potential risk in consuming fish that accumulate heavy metal above a certain level in their diet. This study determines the concentration of copper (Cu) in Barbonymus schwanenfeldii (Lampam Sungai) and water of Kuantan River and Pinang River. Besides, the water quality parameters and water quality index (WQI) were also determined for both Kuantan River and Pinang River.

Dinner 18:30

One Day Tour

December 20, 2019 (Friday) 9:00~17:00

(Tips: Please arrive at the Mantra Bell City before 8:50 a.m. The following schedule is only for participants who registered the visit & tour. The following places are for references, and the final schedule should be adjusted to the actual notice.)

1. (9:00) Assemble at Mantra Bell City

2. (10:00-12:00) Visit Maru Koala & animal park

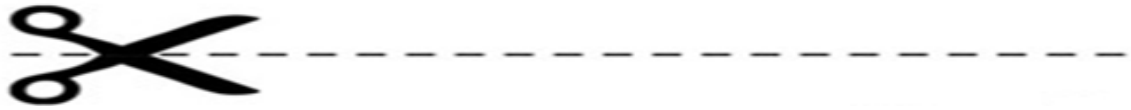
Here you can watch kangaroos, koalas and other Australian unique creatures. Feed kangaroos and parrots in person. A Closer Look at Koala's Life Trends. You can also experience mini golf on a pirate ship and daily shearing shows. Travel to Phillip Island, Australia's endemic fairy penguin habitat. Along the way, visit the Mary Safari Park to see and feed Australia's famous koalas, wombats and kangaroos. A chocolate factory (at your own expense) with a chocolate waterfall and amazing chocolate-made statues, watch the chocolate making and taste delicious chocolates. Finally, arrive at Phillip Island, the penguin paradise before sunset, admire the penguin parade, and watch the special scenery of penguins homing on the walkway very close to the penguins.

3. (12:00-16:30) Dandenong Mountain Botanical Garden

In the Grand Picnic Garden in the Dandenong Mountain area, you can meet wild parrots and purchase feed at your own expense (purchased on the spot by the vending machine at the site price). Experience the ancient Puffing Billy steam train, listen to the whistle of a steam train, and run on the pristine mountain railway. SkyHigh Mountain View overlooks Melbourne. Visit the botanical garden to see various trees and flowers. Visit the Chandon winery and experience wine tasting at your own expense (based on site price).

4. 16:30 Come back to Mantra Bell City

Note



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