ICEPP 2021

CONFERENCE PROGRAM

2021 9th International Conference on Environment Pollution and Prevention

VIRTUAL CONFERENCE

November 19-21, 2021

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Welcome Address

We are pleased to welcome you to attend 2021 9th International Conference on Environment Pollution and Prevention (ICEPP 2021) during November 19-21, 2021. We will hold virtual conference due to COVID-19 pandemic.

ICEPP 2021 is dedicated to providing a forum for researchers and practitioners in the field to share ideas, designs, and experiments.

This conference program is highlighted by three outstanding Keynote Speakers and seven Invited Speakers. They are Professor Edmond Yat-Man LO from Nanyang Technological University, Singapore; Professor Koh Hock Lye from Sunway University, Malaysia; Professor R. J. (Dick) Haynes from the University of Queensland, St Lucia, Queensland, Australia; Assoc. Prof. Dr. Jun Wang from East China University of Science and Technology, China and serve as the Vice Dean of School of Art Design and Media; Associate Professor Su Yean Teh from Universiti Sains Malaysia, Malaysia; Dr. Angela T. Ragusa from Charles Sturt University, Australia; Dr. Fu-Ming Chang from Da-Yeh University, Taiwan, China; Dr. Md. Mizanur Rahman from University Technology Malaysia, Malaysia; Dr. Meisam Ahmadi Ghadikolaei from University of Macau, Macau and Associate Professor Xiang Li from Chiba University, Japan


With the important efforts of the whole committee, the evaluation of all the accepted papers will be performed based on the reports from anonymous reviewers, who are qualified in the field of Environment Pollution and Prevention. We wish to express our sincere appreciation to all the individuals who have contributed to ICEPP 2021 conference in various ways.

We would like to thank all the authors who have contributed to this conference, and also the organizing committee, reviewers, speakers, chairpersons, sponsors and all the conference participants for their support to ICEPP 2021.

We wish all of you enjoy ICEPP 2021 conference!

Conference Chairs

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

Prof. Yu Hong
Beijing Forestry University, China
Committee

**Conference Chairs**

Prof. R. J. (Dick) Haynes, The University of Queensland, St Lucia, Queensland
Prof. Yu Hong, Beijing Forestry University, China

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Dr. Marise Keller Santos, IFRS - Campus Viamão
AGENDA

Online Presentation Instructions........................................................................................................7

Speaker Introductions.........................................................................................................................8

November 19 | Friday GMT+11

13:00-14:00 Committee Test................................................................................................................18
14:00-18:00 Authors Test (Session 1-8) ................................................................................................18

November 20 | Saturday GMT+11

Opening Remarks
11:00-11:05 Prof. R. J. (Dick) Haynes.................................................................................................22

Keynote Speeches
11:05-11:45 Prof. Edmond Yat-Man LO............................................................................................22
11:45-12:25 Prof. Koh Hock Lye...........................................................................................................23

Invited Speeches
13:30-13:55 Assoc. Prof. SuYeanTeh....................................................................................................30
15:45-16:10 Dr. Angela T. Ragusa.........................................................................................................37
16:00-16:25 Dr. Fu-Ming Chang...........................................................................................................43

Session Details
13:55-15:40 Session 1..........................................................................................................................25~29
  XN5022-A  XN5012-A  XN5003  MD4005  XN5021  XN5045-A  SY8002

13:55-15:55 Session 2..........................................................................................................................31~36
  XN6003  XN5038-A  XN5029  XN5046  XN5037  MD4007  XN6013-A  MD4008

16:10-18:10 Session 3..........................................................................................................................38~42
  XN5028-A  XJ6007  XN5014-A  XN5016  XN5015-A  XN5020  XN6010-A  YN6009-A

16:25-18:10 Session 4..........................................................................................................................44~47
  XN5018  XN6005  MD4010-A  XN6004  XN5044  XN6009  XN5030

November 21 | Sunday GMT+11

Keynote Speeches
11:20-12:00 Prof. R. J. (Dick) Haynes.................................................................................................48
AGENDA

Invited Speeches

13:30-13:55  Dr. Md. Mizanur Rahman ................................................................. 49
13:55-14:20  Dr. Meisam Ahmadi Ghadikolaei ...................................................... 50
15:50-16:15  Asso. Prof. Xiang Li ........................................................................... 69

Session Details.

14:20-16:35  Session 5 .............................................................................................. 51–56
  XG0006  XN5025  XN6012  XN5036-A
  XN6007-A  XN5035-A  YN5010  XN5039  XG1001

13:30-15:45  Session 6 .............................................................................................. 57–63
  XN5032-A  XN5034-A  XN5033-A  XN5040-A
  YN5009  XN5031-A  YN1006  YN1001  YN1005-A

16:40-18:55  Session 7 .............................................................................................. 64–68
  XJ6005  XJ6002  XJ5004  XJ5003-A
  XJ6010  XJ5005  XJ5007  XN5042  MD4006

16:15-18:30  Session 8 .............................................................................................. 70–75
  SY8003  YN6008  YN1004-A  YN6007
  OJ0003  YN5006  XG1002  YN2002-A  YN2001
AGENDA

Instructions for Online Presentations

➢ Time Zone
The time shown in this schedule is Greenwich Mean Time +11 (GMT+11) Please set-up your laptop time in advance.

➢ Equipment Provided by the Presenters
1. A computer with an internet connection (wired connection recommended)
2. USB plug-in headset with a microphone (recommended for optimal audio quality)
3. Webcam (optional): built-in or USB plug-in

➢ Environment requirement
1. Quiet Location and Proper lighting
2. Stable Internet Connection
3. Suitable Background

➢ Duration of each Presentation
Keynote Speech: about 35 Minutes of Presentation and 5 Minutes of Question and Answer.
Invited Speech: about 20 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

How to use ZOOM

Step 1: Download Zoom from the link: https://zoom.us/download
China Mainland Users: https://www.zoom.com.cn/download

Step 2: Sign up an account.

Step 3: Set up the languages and do some basic test.

Step 4: Get familiar with the basic functions: Rename, chat, raise hands, and screen share, etc.

1. Rename: Before you enter the conference room, please change your name to Paper ID + Name
2. Chat and raise your hand: During the session, if you have any questions about the operation of zoom, please let us know by clicking “raise your hands” and use “chat” to communicate with conference secretary
   During the Question section, if you have any questions about keynote speakers or authors, you can also click “raise your hands” or “chat”
3. Share Screen: Please open your power point first, and then click “share screen” when it’s your turn to do the presentation.

Notes: How to join the conference online
1. Find your paper ID and suitable meeting ID on the conference program.
2. Open the ZOOM, click the join, paste the meeting ID, then you can join the conference.
3. Click the stop share after you finish your presentation
Keynote Speaker I

Prof. Edmond Yat-Man LO

Nanyang Technological University, Singapore

A/P Edmond Lo is currently the Deputy Director of the Institute of Catastrophe Risk Management (ICRM) at NTU, Singapore. He joined NTU in 1996 where he was Head of the Division of Environmental and Water Resources Engineering (2005-08) and Chair of the School of Civil and Environmental Engineering (2008-2011). A/P Lo’s current research work is in flood risk management for S.E. Asian cities with a particular view of how flood resiliency evolves as cities develop under the influence of growing urbanization and climate change. He co-leading ICRM’s efforts in the CREATE Future Resilient Systems program, a multi-university effort led by ETH Zurich. He is also co-PI in ICRM’s flagship Natural Catastrophe and Data Analysis Exchange project wherein high resolution satellite imaging is being applied to develop building exposure models for risk assessment in major Southeast Asian cities.
Speaker Introduction

11:45-12:25 | November 20 | Saturday GMT+11

Meeting ID: 93856881984

Keynote Speaker II

Prof. Koh Hock Lye

Sunway University, Malaysia

Professor Koh is a proponent for the practical application of research to achieve the United Nation Sustainable Development Goals (UN SDGs). He conducts society-oriented research and outreach that integrate the three pillars of the SDGs (economic, environmental, social) in the areas of clean water and sanitation SDG6, and life under water SDG14 and life on land SDG15. His research has been published in numerous journals, spanning topics such as conservation, ecology, biodiversity, tsunami simulation, resilient communities, affordable healthcare, climate adaptation strategies, and the application of mathematical modelling and artificial intelligence to enhance food security. Prof Koh Hock Lye received his BSc from University Malaya, and holds both an MA and a PhD in Mathematics from University of Wisconsin, Madison. He served as an associate for six years from 1982 to 1986 at the International Centre for Theoretical Physics in Trieste Italy.
Keynote Speaker III

Prof. R. J. (Dick) Haynes

The University of Queensland, St Lucia, Queensland, Australia

Professor 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.
Speaker Introduction

13:30-13:55 | November 20 | Saturday GMT+11

Meeting ID: 93856881984

Invited Speaker I

Assoc. Prof. Jun Wang

East China University of Science and Technology, China

Vice Dean of School of Art Design and Media

Prof. Jun Wang’s main research area is urban development strategy, urban planning evaluation, urban sustainable planning, smart low-carbon city. He presided over several national research projects such as National Natural Science Fund of China: an Evaluation Model of Urban Planning Based on "Carbon Emission" Framework; National Social Science Fund of China: Research on Spatial Distribution of Mega Cities under the Framework of Carbon Balance; Scientific research program of the Ministry of housing and urban rural development: Research on System Integration Mode of Low Carbon City. He was also in charge of the low carbon development plan of Xining City, low carbon development strategy of Bengbu City, master plan of Guanzhuang Low Carbon Industrial Park and the Ecological Planning of Dianchi Lake in Kunming.
Speaker Introduction

13:30-13:55 | November 20 | Saturday GMT+11

Meeting ID: 83678980467

Invited Speaker II

Assoc. Prof. Su Yean Teh
Universiti Sains Malaysia, Malaysia

Su Yean Teh received her Bachelor of Mathematics, Master of Science and Doctor of Philosophy in Mathematical Modelling in 2004, 2005 and 2008 respectively, all from Universiti Sains Malaysia (USM). In 2006, she was awarded the UNESCO/Keizo Obuchi Research Fellowship to undertake research on “Management Modelling of Everglades Wetlands Hydrology and Ecosystems” at University of Miami, Florida, USA. Presently, she is an Associate Professor at the School of Mathematical Sciences, USM. Her research interests revolve around mathematical modelling with particular focus on computational simulation of real-life problems to provide insights and to suggest possible solutions. She works on various topics in ecosystem and environmental modelling, many of which were initiated and driven by the needs of the country or industry. She was invited on various occasions to visit University of Miami and Nanjing Forestry University under U. S. Geological Survey grants. She was also sponsored by ICTP to attend four workshops at Abdus Salam International Centre for Theoretical Physics (ICTP) at Trieste, Italy and by Brown International Advanced Research Institutes (BIARI) at Brown University to participate in Climate Change and Its Impacts: Connecting Local Variability and Knowledge in a Global System. She was awarded the prestigious L’Oréal-UNESCO for Women in Science Malaysia Fellowship 2017 for her research on unifying STEM towards sustainable management of our coastal resources. She is currently an Associate Editor of Springer’s Hydrogeology Journal. She has published numerous articles, most notably in Journal of Asian Earth Sciences, Ecosystems, Ecological Modelling, Landscape Ecology, Agricultural and Forest Meteorology, Hydrogeology Journal, Environmental Science and Pollution Research, Theoretical and Applied Mechanics Letters and Journal of Marine Science and Engineering.
Speaker Introduction

15:45-16:10 | November 20 | Saturday GMT+11

Meeting ID: 93856881984

Invited Speaker III

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).
Dr. Fu-Ming Chang is an assistant professor of Bachelor Program for Fire and Safety Science at Da-Yeh University. The areas of academic expertise are civil engineering, water conservancy engineering, urban planning and governance, architecture and interior design. His work focuses on Climate change and Disaster prevention of environment. Currently doing relevant research on Sustainable Development Goals (SDGs), including agricultural development, climate change, and water reuse. In addition, it also runs the community for a long time, assists the community in improving the environment, and integrates local characteristics and develops related industries. His recent publication can be found in Environment related of journal. His favorite place to do research is not his office but his backyard, which opens to the Shei-Pa National Park.
Md Mizanur Rahman is currently a Senior Lecturer at Department of Thermo-Fluids, School of Mechanical Engineering, Universiti Teknologi Malaysia UTM, Johor Bahru, Malaysia. Before joining at UTM, he has served as a Postdoctoral Researcher at Aalto University School of Engineering, Finland. He also has more than 12-year working experience in a government statutory body namely Rural Electrification Board (REB). During his tenure in REB, he has gathered practical experience in dealing with techno-economic and sociocultural challenges faced by rural electrification programme. He has accumulated deep insights towards the solution pathways for the Global Mega-challenge of having 1.2 billion people without access to electricity yet. He has sound understanding into the global energy sector challenges and its societal implications. Dr Rahman has received his Ph.D. in Energy Economics and Power plant Engineering from Aalto University, Finland, M.Sc. in Sustainable Energy Engineering from Royal Institute of Technology KTH, Sweden, and B.Sc. in Mechanical Engineering from Khulna University of Engineering and Technology, Bangladesh. His research interests include rural electrification, energy economics, energy management, energy efficiency and system, sustainable and renewable energy, energy system modelling, Life-Cycle Analysis, distributed power generation, multicriteria evaluation etc. He has several publications in International referred journals in energy engineering domain.
Invited Speaker VI

Dr. Meisam Ahmadi Ghadikolaei

University of Macau, China

Dr. Meisam Ahmadi Ghadikolaei is currently a postdoctoral fellow (university scholarship recipient) in the Department of Electromechanical Engineering at the University of Macau. Before joining the University of Macau, he was a postdoctoral fellow in the Division of Environment and Sustainability at The Hong Kong University of Science and Technology, Hong Kong. He received his PhD in Mechanical Engineering from The Hong Kong Polytechnic University, Hong Kong, Master’s Degree in Mechanical Engineering from the Aligarh Muslim University, India, and Bachelor’s Degree in Mechanical Engineering from the Islamic Azad University/Sari Branch, Iran. His research interests and experiences with 23 publications, include air pollution and vehicular emission control, impacts of particulate matters on human health and the environment, internal combustion engines, alternative fuels, and renewable energy. He is also a reviewer for several high-ranked journals in his discipline, including Applied Energy, Fuel, Energy, Energy & Fuel, SAE International, Environmental Research, etc.
Xiang Li is an associate professor at Chiba University, Japan, belonging to the Graduate school of social sciences. She teaches international policy courses. She graduated from the University of British Columbia, Canada with the bachelor degree of science for natural resources conservation in 2007. She received her science master degree in 2010 and Ph.D. degree in 2013 for International Environmental Economics at the University of Tokyo in Japan. Her research interests are environmental economics and behavioral economics. Among Li’s published academic articles and issued patents, one that focused on climate change adaptation and mitigation strategy has been highlighted and introduced by Nature Climate Change Journal (Nature Publishing Group).
AGENDA

Online Test
November 19, 2021 (Friday) | GMT+11

<table>
<thead>
<tr>
<th>Meeting ID: 93856881984</th>
<th>Meeting ID: 83678980467</th>
</tr>
</thead>
<tbody>
<tr>
<td>13:00-14:00</td>
<td>Committee</td>
</tr>
<tr>
<td>14:00-15:00</td>
<td>Session 1</td>
</tr>
<tr>
<td>15:00-16:00</td>
<td>Session 3</td>
</tr>
<tr>
<td>16:00-17:00</td>
<td>Session 5</td>
</tr>
<tr>
<td>17:00-18:00</td>
<td>Session 7</td>
</tr>
</tbody>
</table>

PS:
1. Please pay attention to your online test time duration and attend the test on time on November 19, 2021.

2. If China mainland users have trouble signing up an account of Zoom, please just ignore the sign-in step and click join a meeting with the correct meeting ID.

3. Please pay attention to the remind tips from the computer screen during online test.

4. If there are a lot of testers in the conference test room at the same time, please wait for a moment patiently. The staff will invite you to test soonest. After finishing the test, you can choose to leave the conference test room by yourself.

5. The content of test includes renaming, chatting, raising hands and screen sharing.
# AGENDA

## Formal Online Presentations

**Keynote Speeches and Conference Presentations**

November 20, 2021 (Saturday) | GMT+11

<table>
<thead>
<tr>
<th>Time</th>
<th>Meeting ID: 93856881984</th>
<th>Meeting ID: 83678980467</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:00-11:05</td>
<td>Opening Remarks</td>
<td></td>
</tr>
<tr>
<td>11:05-11:45</td>
<td>Keynote Speech I</td>
<td></td>
</tr>
<tr>
<td>11:45-12:25</td>
<td>Keynote Speech II</td>
<td></td>
</tr>
<tr>
<td>15:45-16:10</td>
<td>Invited Speech III</td>
<td>16:00-16:25 Invited Speech IV</td>
</tr>
<tr>
<td>16:10-18:10</td>
<td>Session 3</td>
<td>16:25-18:10 Session 4</td>
</tr>
</tbody>
</table>
### AGENDA

#### Formal Online Presentations

**Keynote Speeches and Conference Presentations**

**November 21, 2021 (Sunday) | GMT+11**

<table>
<thead>
<tr>
<th>Meeting ID: 93856881984</th>
<th>Meeting ID: 83678980467</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>11:20-12:00</strong></td>
<td><strong>Keynote Speech III</strong></td>
</tr>
<tr>
<td><strong>13:30-13:55</strong></td>
<td><strong>Invited Speech V</strong></td>
</tr>
<tr>
<td><strong>13:55-14:20</strong></td>
<td><strong>Invited Speech VI</strong></td>
</tr>
<tr>
<td><strong>14:20-16:35</strong></td>
<td><strong>Session 5</strong></td>
</tr>
<tr>
<td><strong>16:40-18:55</strong></td>
<td><strong>Session 7</strong></td>
</tr>
<tr>
<td><strong>13:30-15:45</strong></td>
<td><strong>Session 6</strong></td>
</tr>
<tr>
<td><strong>15:50-16:15</strong></td>
<td><strong>Invited Speech VII</strong></td>
</tr>
<tr>
<td><strong>16:15-18:30</strong></td>
<td><strong>Session 8</strong></td>
</tr>
</tbody>
</table>
**AGENDA**

- **Please join the test session on time.** On November 19, 2021, we will have the test session and online sign-in. Please join the test session before the formal session.

- Please pay special attention to the **time difference** and all schedules are arranged based on **Sydney time | GMT+11**. You can change the time on your watch and phone to **GMT+11** in advance in case you are confused with the jet lag.

- Please try to find a **quiet environment**. In addition to the presentation and question section, the host will mute your microphone all the way.

- Please get familiar with the basic functions: **Rename, Chat, Raise Hands, and Share Screen**.

- Please join the session 10 minutes earlier and attend the whole conference. **Official electronic receipt and certificate** will be sent to you via e-mail after the conference.

- To effectively control the time and avoid some unexpected situations, we advise you **record your presentation** ahead of time (12 minutes of presentation and 3 minutes of Question and Answer for each report) and send video to the conference mailbox before conference date.

- Only the organizer can record the whole video. If you want to record your own presentation, please contact the conference secretary 3 days ahead of conference date. Please **do not record** the video during the meeting.
Opening Remarks（11:00-11:05）
Prof. R. J. (Dick) Haynes
The University of Queensland, St Lucia, Queensland, Australia

Keynote Speeches Chair: Prof. R. J. (Dick) Haynes

Keynote Speech I（11:05-11:45）
Prof. Edmond Yat-Man LO
Nanyang Technological University, Singapore

Topic: “Thermal and Flow Structures in Tropical Shallow Lakes”

Abstract—Shallow lakes are important water bodies as sources of raw water in many tropical countries. Tropical shallow lakes or reservoirs are also susceptible to algal blooms due to high light levels, warm temperatures and abundant ambient nutrient supply. A long term sustainable approach for maintaining water quality requires a strong scientific understanding of the thermal and flow dynamics in these water bodies as interlinked with algal dynamics. How shallow tropical lakes or reservoirs behave hydrodynamically have important consequences in their biological response. Towards such understandings, a series of earlier field data collection was conducted for Kranji Reservoir, a shallow tropical reservoir in Singapore. Both short term and long term data were collected with the short term data being intensively sampled data over July 2012, during Singapore’s Southwest Monsoon season. The short term data comprised meteorological and temperature data, along with microstructure turbulence data. This underpinned analysis for an improved understanding of the thermal and flow structures, particularly on the Surface Mixed Layer (SML) dynamics. The diurnal evolution of the SML showed a daytime layer affected by turbulence billows and winds, and a thicker nighttime layer as deepened by the penetrative cooling. The strength of vertical mixing was important for the vertical shaping of temperature as well as phytoplankton. The longer term ADCP velocity and thermister chain data indicated a three-layer flow and thermal structure during the daytime, and a two-layer structure during the nighttime. Numerical simulations using the Estuary and Lake COmputer Model (ELCOM) also showed this diurnal pattern of flow and thermal structure as mainly driven by upwelling generated by southerly July monsoonal winds and
horizontal temperature gradient induced by the differential cooling. The ELCOM results further revealed the existence of mean flow circulation patterns which changed for daytime and nighttime periods. This has implications for the spatial distribution of chlorophyll concentration during the Southwest Monsoon (as represented by the July period), which was then investigated based on the circulation pattern deduced from ELCOM simulations. Results and implications from both the SML dynamics and mean flow circulations will be further elaborated in the talk.

Keynote Speech II（11:45-12:25）
Prof. Koh Hock Lye
Sunway University, Malaysia

Topic: “Climate Change and Sea Level Rise: Mitigation and Adaptation Strategy for Coastal Populations”

Abstract—Global climate change refers to a change in the state of the climate that persists for an extended period, typically for decades or longer. The Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) published in 2014 has developed four global representative concentration pathways (RCP 2.6, RCP 4.5, RCP 6.0, and RCP 8.5). Under the worst-case scenario of RCP 8.5, the aggregation of adverse effects due to global warming, sea level rise (SLR), reduced precipitation, and rapid urbanization can impair planetary health and generate great risks. Coastal populations are particularly vulnerable to these concentrated risks, with the risks increasing over time. The expected annual economic shortfalls under RCP 8.5 up to 2100 can reach several percentages of annual GDP for low lying coastal cities such as New Orleans, Guangzhou, and Miami, in the absence of adaptation investment. Climate change mitigation refers to actions taken, such as reducing the emission of greenhouse gases, to limit the magnitude of global climate change. Climate change adaptation is the adjustment of natural or human systems aimed at reducing the vulnerability and increasing the resilience to the impacts of climate change. This keynote speech aims to explore concerted efforts to guide and implement climate change mitigation and adaptation strategy to achieve sustainable human health and environmental integration at the local, regional, and international levels.
AGENDA

13:30-13:55 | November 20 | Saturday GMT+11
Meetings ID: 93856881984

https://zoom.us/j/93856881984

Invited Speech I | Chaired by Prof. R. J. (Dick) Haynes

Assoc. Prof. Jun Wang

East China University of Science and Technology, China

Vice Dean of School of Art Design and Media

Topic: “Study on the Ecological Regeneration Strategy of Urban Industrial Sites—Taking Dimond Bay in Dalian as an Example”

Abstract—Guided by the concept of urban renewal, this article summarizes the development and current situation of the renewal and transformation of industrial sites at home and abroad. It also proposes strategies for improving the public space landscape of industrial sites from the perspective of the characteristics of site and public demands. Taking the Diamond Bay Coastal Park in Dalian as an example, the article gives suggestions for improvement from four aspects, its integrality of spatial layout, the protection and inheritance of industrial heritage, the artistic treatment of the site, and the restoration of the ecological base, to finally get the direction of shaping the open space of urban industrial sites. This study offers a new perspective on the shaping of the open spaces of urban industrial sites in the context of inner urban regeneration as an alternative to urban sprawl, with research objective of achieving both environmental and social sustainability.
Exploring Citizens’ Preferences towards Sustainable Plastic Waste Management in Vietnam

Thuy Thi Thanh Phan, Van Viet Nguyen and Chun-Hung Lee
National Dong Hwa University, Taiwan

Abstract—Plastic waste (PW) is considered a global environmental problem, which causes a big challenge for managers to find the best solution to the ocean’s plastic pollution. Vietnam has been listed among top five countries that has been discharged a large amount of PW to the ocean without appropriate management and treatment. Therefore, a research that focuses on understanding citizens’ preferences towards sustainable PW management (PWM) in Vietnam is crucial, which helps to achieve a goal of PW reduction. This study applied a choice experiment to evaluate the effects on citizens’ preferences for reduction of plastic under different levels of environmental awareness; estimated the citizens’ heterogeneity preference for PWM program and developing PWM scenarios based on the results of the empirical analysis. The results indicate that the multi-stakeholder cooperation, the policy on single-use plastics ban, the adoption of green life and zero-waste events, the establishment of waste collection and recycling stations, and the introduction of eco-friendly alternatives are among effective factors influencing PWM. It is also found that the following characteristics affect the citizens’ preferences for PWM program namely: 1) citizens’ awareness of plastic environmental impacts, 2) education level, and 3) citizens’ living areas. Furthermore, this study suggests four PWM scenarios, which were built from the positive-preference attributes, for decision making applied in countries without the adequate PWM policy and infrastructure. These outcomes are expected to be a useful reference for developing the policy and management strategy in the near future, which can to mitigate the PW pollution.
Improved Hydro-processing of Aluminum Dross by Cyclic Use of Secondary Liquid Waste

Mina OTA, Takehito HIRAKI, Takahiro MIKI and Tetsuya NAGASAKA
Tohoku University, Sendai, Japan

Abstract—Annually, tens of thousand tons of aluminum dross, an industrial waste generated during the aluminum production process, is generated. However, recycling and disposal of aluminum dross is extremely difficult due to foul odor and risk of ignition brought about by the reaction between aluminum nitride and metallic aluminum in the dross with water to form ammonia and hydrogen gas. The authors of this study investigated hydro-processing of dross to intentionally react dross and water, however the process was found impractical due to the production of large quantities of secondary liquid waste (SLW). Therefore, in this study, to significantly reduce liquid waste generation, cyclic use of the generated SLW to treat aluminum dross was investigated. About 45 g of dross was placed in 450 ml of ultra-pure water at 50°C and treated by injecting ozone-containing gas (1 L/min) for 24 hours. After treatment, the solution was filtered, and the filtered SLW reused to treat a new batch of untreated aluminum dross. It was found that regardless of the cyclic number, aluminum nitride in the dross was similarly reacted with the filtered SLW. The results lead to while significantly reducing liquid waste generation of hydro-processing of aluminum dross.

Identification of Suitable Electronic Waste Disposal Site in Dhaka

Md Rakibul Hasan Arif and Mohammad Rafayet Hossain
Royal Melbourne Institute of Technology, Melbourne, Australia

Abstract—Dhaka, the capital of Bangladesh, has been experiencing rapid growth, and demand for new technology and electronic products is increasing day by day. This study aims to identify a suitable location for the disposal of e-waste in Dhaka City. Two objectives under this study were selecting relevant criteria and ranking all the criteria for determining a suitable e-waste disposal site. Seven criteria have selected under this study: residence, agriculture, waterbody, commercial land use, road network, soil characteristics, and slope of the study area. After the finalization of factors and identifying suitable parameters, Pairwise Comparison has been used to determine the weightage of all the factors. In this regard, buffer maps of different land use and slope maps have prepared. After converting vector maps into raster, reclassification of all the maps has been done, providing priority scale value from one to five indicating least suitable to most suitable. Weighted overlay analysis has done after reclassifying all the maps, and four potential e-waste disposal sites have found within the study area's territory. But three sites were within cantonment and other restricted areas. A suitable land has located in Tejgaon Industrial Area, which fulfils all the criteria. The surrounding land use of the area is manufacturing and processing activity which is compatible with the
<table>
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<tr>
<th>Session 1</th>
<th>Formation of a Circular Economy to Mitigate the Threats of the COVID-19 Pandemic</th>
</tr>
</thead>
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| Presentation 4 | Maria Vetrova, Dinara Ivanova  
Saint Petersburg State University, Saint Petersburg, Russia |
| 14:40-14:55 | Abstract—The article is devoted to the analysis of the opportunities, risks and threats of the crisis and post-crisis period of the COVID19 pandemic, in particular, the assessment of its impact on the achievement of sustainable development goals. Particular attention is paid to systematizing the short-term and long-term effects of the COVID19 pandemic, affecting the formation of a circular economy. The object of special attention is the role of digital technologies in the formation of closed supply chains, as the basis for the development of a circular economy, which contributes to the highly effective achievement of sustainable development goals. Based on the analysis of best practices, the article provides key technologies that contribute to the spread of the principles of a circular economy at different stages of the formation of closed supply chains, as well as presents the necessary government initiatives to mitigate the threats of the COVID19 pandemic. |
| MD4005     |                                                                                   |

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<tr>
<th>Session 1</th>
<th>Smart Fashion Economy through a Data-Driven Circular Ecosystem: A case study</th>
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| Presentation 5 | Malahat Ghoreishi, Kajal Bhandari and Alessio Franconi  
LUT University, Lappeenranta, Finland |
<p>| 14:55-15:10 | Abstract—While Circular Economy (CE) strategies have been discussed as solutions for negative environmental impacts, companies are facing various challenges in applying CE strategies and redefining their business models. Recent research articulates that to achieve the CE goals, businesses should collaborate with each other within an ecosystem in which values are equally captured among all the stakeholders by governing and managing data flows. In this ecosystem, all the actors and stakeholders can share data, information and solutions regarding to CE to help each other through the path and co-create CE values. Regardless of the transition towards CE, fashion and textile industry is still following the linear economy model (take, make, use, dispose), where only less than 1% of the recycled clothes get back to new life. For textile and fashion industry, data plays a key role in providing transparent flow of information on product’s lifecycle, from circular material resources and design all the way to the recycling and waste management. In this regard, a data-driven ecosystem in which various stakeholders can access the source of right data, can ensure the success of circularity of the entire supply chain. A data-driven strategy can help to engage and train all organizations to build a data-literacy ecosystem towards a common goal. The purpose of this paper is to identify the important role of a data-driven |</p>
<table>
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<tr>
<th>Session 1 Presentation 6</th>
<th>Solid Waste Treatment in the Province of Béjaia between Environmental Impacts and Management Issues</th>
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| XN5045-A               | Aldjia SADI and Meriem NAIMI AIT Aoudia  
| University of Blida, Blida, Algeria |  
| Abstract—Algerian cities as well other cities in developing countries are facing waste disposal problem due to population growth and intense activity. In this study, our focus is on the case of the city of Bejaia which is experiencing enormous difficulties related to garbage treatment. Indeed, all kinds of waste are rejecting continuously without treatment, which constitutes a threat to the local environment and public health. Regarding the domestic waste generated by the city, the treatment consists of collecting and storing waste in wild dumps scattered over the whole territory. This raises questions about the city waste management policies on the one hand, and the environmental impact on the other. In this study, we will focus on the analysis of environmental impacts of Bejaia waste elimination by using water quality indicators. In addition, this paper aims to identify the main inconsistencies linked to waste management, which has led to such a situation of anarchy. Based on this study, we will draw up recommendations to meet sustainable waste management in the city. |

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<tr>
<th>Session 1 Presentation 7</th>
<th>Photovoltaic Panels and Solar Collectors in Cityscape of Bialystok (Poland) and Cordoba (Spain)</th>
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</table>
| SY8002                 | Dorota Gawryluk, Dorota Anna Krawczyk and Antonio Rodero  
| Bialystok University of Technology, Bialystok, Poland |  
| Abstract—The technologies using of renewable sources energy like photovoltaic panels and solar collectors were used in Europe, mainly in southern countries (like Spain) until recently. EU policy of sustainable development and technological development impact on increase of popularity of those technologies in northern European countries like Poland. The research problem of the work is to determinate the appropriate conditions for the location of above-mentioned technology (panels) in the cityscape. The numerous examples of its destruction were noticed because panels were located using only energy efficiency conditions. The research methodology was based on “in situ” research (Bialystok-Poland, Cordoba – Spain) in order to determinate the categories of urban landscape in which panels are located. Technical, climatic, landscape and composition conditions were analysed in order to establish assessment of completed investments. The result of the science work are categories of the urban landscape views in Bialystok and Cordoba, ie architectural and landscape encloses (streets, squares, public gardens), city panoramas. The proposed methodology of assessment of cityscape impact are applicable to the planning, designing and |
investment process for Bialystok and Cordoba. They could be used to another cities also in necessary condition of taking into account the individual characteristic of cityscape. The proposed conclusions can be used in the planning, designing and investment process of another cities due to protection of their cityscape values.
AGENDA

13:30-13:55 | November 20 | Saturday GMT+11

Meetings ID: 83678980467

https://zoom.us/j/83678980467

Invited Speech II | Chaired by Prof. Koh Hock Lye

Assoc. Prof. Su Yean Teh

Universiti Sains Malaysia, Malaysia


Abstract—Mathematical models are instrumental in generating understanding of environmental systems and in providing valuable insights on the possible mitigation and adaptation measures. However, the uptake of the models by decision makers remains a challenge because of the perceived inadequacy of the models in providing useful information and compelling insights to environmental problems and their solutions. This is mainly attributed to the complex interconnection of political, cultural, socio-economic, and environmental factors. The complexity is compounded by diverse issues inherent in climate debate. A model designed for decision-making should therefore directly address the managers’ questions and not be excessively complex beyond what can be supported by data. Further, the adoption of the models’ results by the authorities depends on the costs and benefits of its implementation. In this talk, we will demonstrate the prominent role of mathematical models in supporting decision-making for sustainable management of the environment. We will showcase some case studies, both local and international, where the models’ results have made an impact on decision-making.
AGENDA

Session 2-Environmental Biology and Ecology
13:55-15:55 | November 20 | Saturday GMT+11

Chaired by: Assoc. Prof. Su Yean Teh
Universiti Sains Malaysia, Malaysia

Meeting ID: 83678980467
https://zoom.us/j/83678980467

<table>
<thead>
<tr>
<th>Session 2 Presentation 1</th>
<th>High Andean Woody Plants, between Nursing and Competition Effects in a High Andean Polylepis Forests</th>
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<tbody>
<tr>
<td>XN6003</td>
<td>Carlos Enrique Alvarez Montalván, C Parra, J Alvarez, P Córdova-Mendoza, E Julian-Laime and I Laredo</td>
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<td>Universidad Continental, Huancayo, Peru</td>
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**Abstract**—The diversity of Plants in the Andes is a complex stochastic network, this diversity is characterized by being distributed in three main families: Asteraceae, Poaceae and Rosaceae. The first two are the most diverse and have the Gynoxis and Chusquea genera respectively as the most dominant woody individuals in the last altitudinal floors above 3200 m. a. s. l. However, the Rosaceae family has less richness, it includes the genus Polylepis, present in the last tree line limit above 4300 m.a.s.l. This is the case of mono-specific forests of Polylepis rodolfo-vasquezii, a species highly threatened by anthropogenic impacts such as logging, burning, and llama-sheep farming. These forests are relict and generate a nurse effect, which allows the existence of important diversity such as Gynoxis nitida, Miconia latifolia, Bomarea dulcis and Displostephium rupestri and Brachyotum rostratum. However, the impacts generate complex plants diversity responses, where the nurse effect can become into a competition effect, especially with Gynoxis nítida, which can take advantage of the ecological niche to promote the increase in abundance of its young individuals against those of P. rodolfo-vasquezii, which is reduced by anthropic activities.

<table>
<thead>
<tr>
<th>Session 2 Presentation 2</th>
<th>Identification of Pterins as Characteristic Humic-like Fluorophores Released from Cyanobacteria and Their Behavior and Fate in Natural and Engineered Water Systems</th>
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<tr>
<td>XN5038-A</td>
<td>Zuo Yan-tíng, Li Wen-tao and Li Ai-min</td>
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<td>Nanjing University, Nanjing, China</td>
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**Abstract**—During cyanobacterial blooms, algae cells release a large amount of algae-derived organic matter (AOM), which not only participates in the
biochemical process of organic matter in surface water, but is also an important precursor of disinfection by-products in drinking water. A large number of characterization results based on fluorescence excitation-emission matrix (EEM) show that the intracellular AOM has a special triple-excited humic-like fluorophore (Ex~230, 275 & 350 nm, Em 440–460 nm). Studies based on the fluorescence regional integration method perceived the unique fluorophore as humus (humic acid and fulvic acid), but failed to be interested in further analysis of the potential fluorescence structure. One publication on Nature Communications (Zhao et al., Nature Communications, 2017, 8:15284) believes that the humic-like fluorescent substance released by marine cyanobacteria is an important source of contribution to the fluorescent soluble organic matter (FDOM) in the ocean, but in the negative ion mode, FT-ICR-MS and NMR methods failed to clearly resolve the structure. Thus, in this study, we have identified 6-L-biopterins and their glucosides as candidate structures for the consistently occurring algae-derived humic-like fluorophores (Em 440–460 nm) using a combination of fluorescence excitation-emission matrixes, size exclusion chromatography with fluorescence detector and ultra-high performance liquid chromatography-quadrupole time-of-flight mass spectrometry. In intact algal cells, biopterins and their glucosides existed mainly as their reduced tetrahydrobiopterin (H4Bip) forms, and redox transformation from H4Bip to biopterin occurred with the exposure of intracellular algal organic matter to oxygen. During the degradation experiment under simulated natural conditions, light irradiation facilitated the utilization of biopterin by Microcystic aeruginosa and induced the photochemical degradation of 6-L-biopterin to 6-carboxypterin. The concentrations of 6-L-biopterin (without counting any other derivatives) ranged from 0.20 μg/L to 2.78 μg/L in water samples from 5 lakes in China. For an investigated sample from Lake Tai surface water, biopterin and its derivatives contributed to 24.0±1.1% of UV absorbance at 350 nm and 55.5±1.7% of fluorescence at Ex350/Em450 nm of total chromophoric/fluorescent dissolved organic matter (CDOM/FDOM). During water treatment, pre-chlorination of algae-laden water induced the releases of biopterin and its derivatives into water, and the variation of biopterin fluorescence intensity can be used as a surrogate indicator for predicting algal membrane damage. Once released into water, biopterin could not be effectively removed by the conventional coagulation treatment irrespective of coagulant type, dose and water pH. The identification of ubiquitous pterins as candidate structures responsible for “humic-like” fluorophores is conducive to the understanding of the generation, property, behavior and fate of algae-derived CDOM/FDOM in natural and engineered water systems.

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<tr>
<th>Session 2</th>
<th>Presentation 3</th>
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<tr>
<td>14:25-14:40</td>
<td>Identification and Characterization of Living Zones at Satipo District in the Tropics of Central Peru</td>
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<td>XN5029</td>
<td>C Parra-Vásquez, K Suarez-Bravo, R Caballero-Salas, V Soto-Aquino, Carlos Enrique Alvarez Montalván and S Manrique</td>
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Abstract—At present, the life zones have undergone great changes due to anthropic activities, so the present study was carried out with the aim of identifying and characterizing the life zones of the Satipo district. The applied methodology was the Holdridge life zone classification, the meteorological variables were analyzed, the vegetation cover was identified, also using the ArcGIS, QGIS, ENVI and Microsoft Excel software, the data analysis and field information were processed. In the investigation of bioclimatic factors they show that there are four important determinants: annual biotemperature, mean annual accumulation, humidity provinces and attitudinal levels. Noticing the decline of forests, overpopulation, among others, many companies are choosing to reduce products that lead to the loss of life zones. In the district of Satipo, three life zones were identified and two of a transitory nature of the one hundred and twenty-three existing ones.

Effects of Crude Oil and Chemically Dispersed Crude Oil on the Antioxidant Response and Apoptosis in the Respiratory Tree of Sea Cucumber (Apostichopus Japonicus)

Xishan Li, Nan Li, Yuhang Zou, Zhonglei Ju, Wei Yang, Deqi Xiong and Guoxiang Liao
Dalian Maritime University, Dalian, China
National Marine Environmental Monitoring Center, Dalian, China

Abstract—This study aimed to compare the effects of crude oil and chemically dispersed crude oil on the antioxidant response and cell apoptosis in the respiratory tree of sea cucumber (Apostichopus japonicus). Results showed that compared to the water-accommodated fractions (WAF) of Oman crude oil, chemically enhanced WAF (CEWAF, Oman crude oil dispersed by Guangming-2 chemical dispersant) exposure caused a more significant reduction in the glutathione S-transferase (GST) activity and a more significant increase in the caspase-3 activity. Both WAF and CEWAF exposure had no overt impact on the peroxidase (POD) activity. Besides, Guangming-2 alone exposure caused no remarkable changes in the activities of GST, POD, and caspase-3. This study revealed that the addition of chemical dispersant to disperse crude oil could aggravate the negative effect of crude oil on antioxidant defense enzyme activities (especially GST) and cause severer cell apoptosis in sea cucumber.

Review of the Efficiency of Aquatic Plants in the Wastewater Treatment

Palomino Seguil Yulissa, Vilchez Garay L., Cortez Matencios C., Cornejo Tueros J., Canales Guerra V. and Camargo Hinostroza S.
Continental University, Huancayo, Perú

Abstract—Wastewater treatment uses a phytoremediation strategy that sets
significant trends according to recent research from the 2019-2021 period, being one of the most efficient strategies regarding the removal of pollutants using artificial wetlands with aquatic plants. Therefore, the objective of the review article is to determine the efficiency of the aquatic plant in the phytoremediation process for the treatment of industrial, domestic, and municipal wastewater through a systematic mapping method that allows us to summarize the theoretical framework avoiding. The exclusions also have a comparative descriptive design for the study variables where it has been found that Eichhornia Crassipes is an aquatic weed that removed NO2- and NO3- up to 93% of industrial wastewater, in Pistia stratiotes it removed Turbidity (98.5%), N total (100%), P total (100%) and COD (79.18%) in household wastewater in 60 days. Finally, Azolla Filiculoides removed SO4²- (83%), Cl (76%), PO4³⁻ (84%), NO3- (76%), COD (79%), BOD (63%) and EC (49%) from municipal wastewater in 21 days.

Session 2 Presentation 6  15:10-15:25  MD4007

Elemental Status of European Mole (T. europae) in the Conditions of the Plast Region of the Chelyabinsk Oblast in Russian

M A Samburova, V A Safonov, T S Bratashova and E A O Salimzade
Astrakhan State University, Astrakhan, Russia

Abstract—The changes in the conditions of natural objects are studied for the expansion of the possibilities of biogeochemical indication and ecological-geochemical evaluation of the environment. In the present article, the authors presented the study results on the elemental status of the indicator species European mole (T. europae). The studied specimens inhabited a technogenic formation (tailing dump of the gold-arsenic deposit) and reference areas (> 15 km from the tailing dump). It was established that moles from the tailing dump had lower content of calcium in kidneys (by 1.4 times) and higher content of phosphorus in the liver (by 1.3 times) and fur (1.8 times), and magnesium in muscles (by 1.4 times). The levels of copper and zinc were elevated in all the organs and fur (by 1.4-2.1 and 1.2-1.5 times, respectively). In moles that inhabited the reference areas, a deficiency of selenium was observed (its levels in fur and tissues were 1.7-8.9 times lower than in moles from the tailing dump). It could be associated with a low concentration of selenium in the soil. Animals from the tailing dump had high levels of accumulated toxins, especially mercury, which levels were higher by 98.9 times in the liver, 115.3 times in kidneys, and 70.8 times in muscles than in the respective organs of the moles from the reference areas. Thus, the unfavorable influence of the tailing dump on the conditions of mole habitat and the general ecological situation does not affect the metabolism of macroelements as much as the accumulation of non-essential elements from the group of heavy metals.

Session 2 Presentation 7  15:25-15:40  XN6013-A

Use of Maize (Zea mays L.) as an Energy Crop in the Remediation Technology of Heavy Metal Contaminated Soils

Kokyo Oh, Hongyan Cheng, Yinghe Xie, Jianping Hong, Shinichi Yonemochi,
Tetsushi Yonekura and Yugo Isobe
Center for Environmental Science, Saitama, Japan

Abstract—Heavy metal soil contamination is a threat to the health of human and ecosystems. The physicochemical technologies currently used for soil remediation, such as soil washing, incineration, and solidification usually need extremely high cost and cause damage to soil quality. There is a great need for development of environmental-friendly soil remediation technologies with low cost. In this study, we developed a profitable soil remediation technology with use of maize (Zea mays L.) as an energy crop, which possibly allow owners of the contaminated sites to obtain economic income while remediate the contaminated soils.

The maize was grown in a copper (Cu) contaminated soil with Cu content of 583 mg/kg for two seasons in 2017 and 2018, respectively. The results showed that the maize grew well in the contaminated soil, and the total biomass productivities of maize in 2017 and 2018 were 34.6 t/ha and 41.7 t/ha, with the fruit yields of 9.7 t/ha and 13.3 t/ha, respectively. It was estimated that the gross economic income of the maize as the material for bioethanol fuel production were 2500 USD/ha in 2017 and 3700 USD/ha in 2018. It is also showed that the remediation potential for soil Cu was 674 g/ha in 2017 and 993 g/ha in 2018, showing the maize had a good remediation ability for soil Cu remediation. After two years of remediation, the average Cu concentration in the soil decreased from 583mg/kg to 458 mg/kg, indicating that soil remediation is availably progressing. This study provided a new understanding on how maize was available for soil remediation of heavy metals as an energy crop with large biomass production and high remediation potential (This work was supported by JSPS KAKENHI No.16H05633).

V A Safonov, V V Ermakov and M A Samburova
Astrakhan State University, Astrakhan, Russia

Abstract—Fluorine environmental emissions are often associated with the activities of metallurgical industries. It is common knowledge that fluoride excess negatively affects the state of vegetation, health of animals and human who often suffer from pathologies that are named with the general term “fluorosis”. Soil, water, leaves and fruits of agricultural crops were sampled in the area of aluminum production (Tursunzade, Tajikistan) and the content of fluoride in them was determined as well. Also, the clinical condition of local cattle was evaluated. The X-ray examination was performed for animals of 1-12 months and adult cows. The phosphorus content in the surface water bodies was found to be 1.1-31.5 mg/l, in soils – from 220 to 1000 mg/kg, depending on the distance from the aluminum plant. As for the fruit samples, phosphorus was detected in the amount of 8-122 mg/kg of, as for the cultivated plants leaves – 70-180 mg/kg. The
The highest concentration of fluoride was determined in the mowing of herbage plants (growing in the southwest direction from the plant, at a distance of 2-3 km from it) – 610 mg/kg. The development of fluorosis was diagnosed in cattle, young animals aged 2.5-3 years also suffered from the wear and blackening of the teeth enamel. At the same time animals of different ages demonstrated the tail vertebrae softening and anomalies of bone development. This study revealed the presence of total pollution of all the environmental objects and the need for measures in order to correct the fluoride content in biogeocenoses.
Invited Speech III | Chaired by Prof. Edmond Yat-Man LO

Dr. Angela T. Ragusa

Charles Sturt University, Australia

Topic: “Environmental Prioritization: Employee Beliefs about Environmental Concerns and Actions”

Abstract—Whilst developing and developed nations work to prioritize pro-environmental action, Australia ranked 130 in a global sustainability index in 2020, well behind economically comparable nations. This exists alongside national surveys showing high public support for pro-environmental behavior. As employees increasingly utilize ‘green’ credentials to make career decisions in globally competitive marketplaces, understanding if an employer’s environmental track-record is concerning, and what employer pro-environmental action awareness exists, may encourage large organizations to think critically about future trajectories. This research presents results from primary data collected to explore if employees thought environmental sustainability issues were an employer concern, what issues concerned their employer the most, and what, if any, environmental actions were undertaken. Compared with participants’ demographics, personal environmental concerns, actions, and literacy, results are globally contextualized to demonstrate issue salience and highlight local and global imperatives.
Algorithmic Correction of MOS Gas Sensor for Ambient Temperature and Relative Humidity Fluctuations

Akarsh Aurora
Ashland High School, Ashland, USA

Abstract—In ambient conditions, uncontrolled fluctuations of ambient temperature and relative humidity greatly reduce the accuracy of metal oxide semiconductor-based gas sensors. In this study, an approach for the self-correction against fluctuations of ambient temperature and relative humidity of a gas sensor complex is developed. The main innovation of the work is in the temperature/relative humidity correction method which is accomplished through an active algorithm facilitated by an auxiliary temperature sensor and employing a multivariable polynomial regression model. The sensors employed are metal oxide semiconductors (MOS) with tin oxide (SnO2) being the main sensing material of the sensor element. Using the developed approach, the study performs quantitation of a typical pollutant gas over the temperature range from -10 to 40°C and relative humidity intervals at 35%, 65%, and 95% to compare the precision of the corrected and uncorrected sensor data. This technical solution is attractive in applications where inexpensive temperature and relative humidity stabilization of a gas sensor in highly variable environments or field applications is necessary.
Abstract—Worldwide, sewer networks are designed to transport wastewater to a centralized treatment plant to be treated and returned to the environment. This is a critical process for preventing waterborne illnesses, providing safe drinking water and enhancing general sanitation in society. To keep a perfectly operational sewer network several inspections are manually performed by a Closed-Circuit Television system to report the obstruction level which may trigger a cleaning operative. In this work, we design a methodology to train a Convolutional Neural Network (CNN) for identifying the level of obstruction in pipes. We gathered a database of videos to generate useful frames to feed into the model. Our resulting classifier obtains deployment ready performances. To validate the consistency of the approach and its industrial applicability, we integrate the Layer-wise Relevance Propagation (LPR) algorithm, which endows a further understanding of the neural network behavior. The proposed system provides higher speed, accuracy, and consistency in the sewer process examination.

Computational Study on the Mechanisms and Kinetics of Perfluorooctanoic Acid Wet Decomposition

Muhammad Yasir Khan, Jiaou Song, Milad Narimani and Gabriel da Silva
University of Melbourne, Melbourne, Australia

Abstract—Perfluorooctanoic acid (PFOA) is a widely spread chemical of concern to human and environmental health because of its persistent/carcinogenic nature. PFOA waste is commercially treated in incinerators operated at very high temperatures (~ 1000 oC); however, the exact chemistry of its decomposition is still known. Therefore, understanding the exact decomposition mechanism is important firstly to determine the atmospheric fate of PFOA degradation products and secondly to improve PFOA waste mitigation facilities. In the present theoretical study, we present the decomposition kinetics of PFOA using computational chemistry and statistical reaction rate theory. Our calculations showed that PFOA waste decomposes relatively at a low temperature (haldlife of PFOA at 800 K is 5.1 s) through the formation of perfluorinated α-lactone. The α-lactone is an unstable intermediate and promptly converts to perfluorinated aldehyde and CO. Perfluorinated aldehyde is a stable reaction intermediate that reacts with water and produces HF and perfluorooctanoic carboxylic acid. In summary, our simulation results demonstrate that a long-chain carboxylic acid (C8) decomposes to a corresponding short-chain carboxylic acid (C7) in a stepwise manner. As a result, PFOA waste wet incinerator’s effluent stream will mainly include the following pollutants as the final degradation products: HF, COx, CF2, and COF2.

Satellite Remote Sensing Using Earth Observing System in Environmental Monitoring for Hydropower & Floating Photovoltaic Reservoir (Case Study: Algae Blooming on Cirata Reservoir, West Java-Indonesia)

R T Sibuea, R Pratna, A Hapsari and Yaaresya William Kristi
PT Pembangkitan Jawa Bali – Cirata Hydro Power Plant, Purwakarta, Indonesia
Abstract—This paper describes the application remote sensing satellite for vegetation in the management of the Cirata Reservoir. This reservoir is a provider of raw water for the Cirata hydropower plant, which is the largest hydropower plant in Indonesia. In the next 2 years, the largest floating solar power plant in Indonesia and Southeast Asia will also be built here. The results of monitoring using Earth Observing System, the area of water hyacinth in the Cirata Reservoir is in the range of 100 to 400 hectares. Cleaning of water hyacinth per month is in the range of 25 to 75 hectares per month. This has not been able to compensate for the water hyacinth area cover that can develop, especially during the rainy season which has an impact on increasing the Water Level. Therefore, this paper also presents several management strategies that have been carried out. In Indonesia in particular, there are many reservoirs that have the potential for algae blooming disturbances and the potential for floating solar power plants in the future. The experiment conducted in Cirata can be an alternative in best practice management.

Sesson 3
Presentation 5
17:10-17:25
XN5015-A

Kinetic Model Development for Glyphosate Contaminated Soil Remediation

Milad Narimani and Gabriel da Silva
University of Melbourne, Melbourne, Australia

Abstract—Roundup is the world's most popular weed-killer, and the active component (glyphosate) as well as its metabolite (AMPA), are found throughout our soil, water, and wastes. With the recognition that Roundup is harmful to human health we need to understand how to treat contaminated materials and how it can be safely disposed of. Thermal treatment processes, pyrolysis and combustion, is one of the promising methods for remediation of GP-contaminated soil and wastewater in which contaminants are vaporized in pretreatment stage and then decomposes using these methods in the gas phase. Here, we have developed a kinetic model to find suitable working temperature of reactor vessel and exhaust gas composition. The preferred decomposition channel for both substances involves the elimination of P(OH)3 to yield the imine N-methylene-glycine (from GP) or methanimine (from AMPA), with relatively low barrier heights (ca. 45 kcal mol-1). The half-life of GP and AMPA at 1000 K are predicted to be 0.1 and 4 ms respectively, and they should be readily destroyed via conventional incineration processes.

Sesson 3
Presentation 6
17:25-17:40
XN5020

Field Crop Residue Burning Induced Particulate Pollution in NW India – Policy Challenges & Way Forward

Leena Ajit Kaushal
Management Development Institute Gurgaon, Delhi, India

Abstract—The study aims to provide insights into the effectiveness of numerous policy interventions to curb FCRB-induced air pollution in NW India. The problem is addressed by examining the trend and co-existence of VIIRS retrieved thermal anomalies in NW states (Punjab, Haryana, and UP) and PM2.5 concentrations in New Delhi during the two harvesting seasons (April-May & Oct-Nov) over the period 2014-2020. The results suggest that crop burning activities in NW states significantly impact the neighboring region’s air quality. Moreover, throughout the study, the fire incidences did not significantly reduce
AGENDA

during winters (Oct-Nov); instead, they registered notable growth during summers (April-May). The various governmental measures that primarily revolve around sustainable residue management practices cannot holistically curb the stubble burning practice in NW India and the related air pollution in Delhi-NCR. The study suggests that besides the short-term residue management measures, crop diversification or discontinuing dual rice-wheat cultivation is the only long term measure to regulate widespread stubble burning and the deteriorating air quality.

Study on the Emission Characteristics of Air Pollutants from Agricultural Area

**Min-Wook Kim, Jin-Ho Kim, Sung-Chang Hong and Kyeong-Sik Kim**
Climate Change & Evaluation Division, Department of Agricultural Environment, National Institute of Agricultural Sciences, Rural Development Administration, South Korea

*Abstract*—Fine particulate matter(PM2.5) is produced by chemical reactions between various precursors. PM2.5 has been found to create greater human risk than particulate matter(PM10). Ammonia(NH3), Nitrogen oxides(NOx) are the sources of secondary generation PM2.5. These substances generate PM2.5 through a reaction in the atmosphere. Through a reaction in the atmosphere, NH3 generates PM2.5. It is the causative agent of PM2.5. In 2017 the annual ammonia emission recorded from the agricultural sector was 244,335 tons, which accounted for about 79.3% of the total ammonia emission in Korea in that year. To address this issue, the agricultural sector announced to the inclusion of reducing fine particulate matter and ammonia emissions by 30% in its targets for the year 2022. This may be achieved through analyses of its emission characteristics by monitoring the PM2.5 and NH3.

In this study, the PM2.5 concentration is measured real-time (every 1 hour) by using beta radiation from the particle mass collected on filter paper through a fine dust measuring device(Spirant BAM). NH3 concentration is analyzed real-time by using Cavity Ring-Down Spectroscopy(CRDS). The concentration of Ozone (O3), Nitrogen Dioxide (NO2) was continuously measured and analyzed through ultraviolet photometry and chemiluminescence.

Further, this study established air pollutants monitoring system in agricultural areas to analyze the NH3 emission characteristics. The amount of PM2.5 and NH3 emission in agriculture was measured. Scientific evidence in agricultural areas was obtained by identifying the emission concentration and characteristics per season(monthly) and per hour.

Land Cover Mapping in the Peruvian Amazonia through Sentinel-2 and Machine Learning

**Mateo S. Jaimes-R**
TU-Dresden, Germany

*Abstract*—Satellite-based forest monitoring has becoming a fundamental tool to deal with the actual trends of deforestation and degradation of the ecosystems.
Real time monitoring programmes can create alerts of deforestation that could be responded rapidly, facilitating the task of the competent authorities and enhancing the protection of the forests. The aim of the present research was to generate a classification of the different cover types along and area of “Las Piedras” river watershed, in the state of Madre de Dios River in the southeast of Peruvian Amazon. Thus, contributing to the establishment of a deforestation detection system based on open source satellite imagery. The classification was carried out using multispectral satellite images (Sentinel-2) and field data sampled from June to July 2021. A total of 9 vegetation or forest cover types were identified in the study area (Beaches, Bamboo-Forest, Crops, Build-up-Areas, Forest, Secondary-Forest, Riparian-Forest, Flooding-Vegetation and Water). Hereafter, a random forest classification (RF) was carried out using training vectors, all spectral bands of the Sentinel-2 images, a Copernicus 30 m Global elevation model (DEM) and four spectral vegetation indices (NDVI, NDWI, S2REP, IRECI). The most important band in the classification by its values of correlation, true positives, accuracy and precision was the DEM followed by the shortwave infrared bands (B9 – B11) and the IRECI vegetation index. The overall accuracy of the classification 92% and the Kappa coefficient was 65%. The RF tends to confuse cover types with close structure and composition. In addition, zones of the study area that were difficult to reach were misclassified. More training data is required to accomplish a more accurate classification. This research contributes to the land-planning decisions. Moreover, the authorities and the communities of the area could prioritize areas for restoration and conservation based on the classification obtained.
Invited Speech IV | Chaired by Prof. Kokyo Oh

Dr. Fu-Ming Chang
Da-Yeh University, Changhua, Taiwan, China

Topic: “Experimental Study for Optimizing of Low Impact Development Facilities in Taiwan”

Abstract—With the development of urbanization, continued urbanization and development result in an increase of impervious areas and surface runoff. One of the biggest problems with surface runoff is that rainwater cannot seep into the soil, which means that the rainwater infiltration rate is too low during typhoons or extreme rainfall. The practice of low-impact development (LID) is considered a promising strategy for controlling urban rainwater runoff and urban ecosystems. However, this requires a lot of laboratory work to test the characteristics of LID and propose appropriate management to optimize LID. In this research, we propose an indoor experiment method, which optimizes the size of different types of LIDs by conducting intensive indoor experiments in a tree box experiment project. Optimize the infiltration rate of LID facility units through indoor experiments to reduce surface runoff. Therefore, the main goal of optimization is to increase the infiltration rate, which is an index to quantify the reduction of surface runoff. For the tree box system in the LID facility unit, the best soil ratio is soil plus sand, which significantly reduces surface runoff. We hope that the newly proposed method can inspire the establishment of LID strategies to reduce surface runoff.
Seepage Experiment on a Permeable Dam Formed by Debris Flow from River Tributaries

**Fu-Ming Chang**  
Da-Yeh University, Changhua, Taiwan, China

Abstract—Rivers in Taiwan are characterized by steep slopes, rapid currents, and unstable geology. Frequent typhoons and a long-lasting rainy season drive large amounts of soil and sand deposits into rivers. Because substantial amounts of rainfall converge into the reservoirs, dredging operations must be conducted to minimize damage. Sediment disposition is a common problem in Taiwan’s river systems, particularly in the mountainous areas. River tributaries typically convey numerous rocks and sand deposits, which can form natural dams. Such dams have different permeability levels, depending on the rock composition of their structure. To understand the process of silt movement and the dynamic influence of deposits on downstream geology, an indoor small-scale physical model was designed to replicate an on-site situation. The model was used to simulate the changes of the main river when a particular natural dam is removed or collapsed. The volume of water flow was varied in this experiment to observe the formation and collapse of the permeable natural dam and its impact on the downstream geological properties.

Optimization of Channel Outlet in the Coastal Area – Application to Danang Bay, Vietnam

**Phuoc Quy An Nguyen,** Philippe Gourbesville, Philippe Audra, Ngoc Duong Vo and Diep Ngoc Khoi Vo  
The University of Danang, Danang, Vietnam

Abstract—The water quality of Danang Bay (Vietnam) is one of the major issues on Danang City's coast. The discharge of the Phu Loc channel will be inserted...
through the outlet into Danang Bay. However, the Phu Loc channel receives many sources of wastewater so the highly polluted channel water. Therefore, the outlet of Phu Loc channel has become the environmental hotspot of the Danang Sea.

Mike 21 FM Hydrodynamics module coupled with a water quality model using Mike 21 FM ECOLab module is used to simulate water quality and to identify the spreading of NH4+, which is used as a pollutant tracer. Currently, the outlet of Phu Loc channel generates the polluted area along the coast in different directions depending on the current and the direction of the wind. This study proposes three scenarios of designing the outlet far from the coastline 400 m, 500 m, and 600 m, respectively. The finding of this research demonstrates that the best way to discharge the wastewater from Phu Loc channel would be the outlet to be moved 500 m away from the coastline. NH4+ concentration $> 0.2$ mg/l will cover an area that distributes about 100 m around the coastline. NH4+ concentration $> 0.5$ mg/l covers an area approximately 0.03 km$^2$.

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<tr>
<th>Session 4</th>
<th>Presentation 3</th>
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<tr>
<td>16:55-17:10</td>
<td>Removal of Heavy Metal Ions from Wastewater Via Ion Flotation Method Using Biodegradable Surfactants</td>
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<tr>
<td>XN6004 MD4010-A</td>
<td>Yi Yuxia, Jia Kai, Cao Yijun</td>
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<td>Zhengzhou University, China</td>
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**Abstract**—A novel ion flotation technology using environmentally friendly biodegradable surfactant was developed for removing HMI (heavy metal ions) in wastewater. The results show that heavy metal ions (Cu$^{2+}$ and Pb$^{2+}$) in wastewater can be effectively removed by ion flotation using two biodegradable surfactants, sodium cocoylglycine (SCG) and sodium myristoylglutamate (SMG), as the complexing agent and flotation foaming agent of heavy metal ions. When SCG:HMI is 2.5:1, the HMI removal rate exceeds 99%, while for SMG, the best removal rate was obtained when the molar ratio of SCG and HMI was 2:1. SCG and SMG have high surface activity and foam stability, which is beneficial to flotation process. These two biosurfactants can effectively remove Cu$^{2+}$ and Pb$^{2+}$ in a wide pH range, and the presence of multiple interfering ions in the solution will not reduce the removal rate of heavy metal ions. The reaction mechanism of biosurfactants and heavy metal ions was systematically verified by FTIR, XPS, SEM-EDS. Biosurfactants can form stable complexes with Pb$^{2+}$ and Cu$^{2+}$, and the single bond COOH coordination with metal ions is attributed to the key factor of this higher metal ion removal rate. Compared with SCG, SMG's higher metal ion removal rate at the same molar ratio is mainly due to the existence of two COOH in one molecule. This work provides a new green and economical method for removing heavy metal ions. The studied biosurfactant has a high-efficiency heavy metal ion removal effect, and its degradability and low cytotoxicity can make it obtain the better and more applications.

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<th>Session 4</th>
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<td>17:10-17:25</td>
<td>The Effect of Adding Wood Chips on The Decomposition of Sludge from Seafood Processing Wastewater Treatment System</td>
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<tr>
<td>XN6004</td>
<td>Diep Ngoc Khoi Vo, Makoto Tokuoka, Nhu-Thuc Phan and Van Quang Tran</td>
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<td>The University of Danang, Da Nang, Vietnam</td>
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Abstract—This study evaluates the effect of various wood chips on the sludge decomposition process. Sludge from Surimi processing wastewater treatment system (AS) of Danifood factory in Danang city was mixed with local wood chips as bulking agents (BA) including Khaya senegalensis (K), Acasia (A) and sawdust (S). The weight ratio of AS/BA added to each aerobic model was 1:1, 1.5:1 and 2:1 for K, A and S, respectively. The results showed that variations of temperature and pH were suitable for aerobic biochemical process. K and S model reached 50°C in three days and remained stably for next four days, whereas A reached 50°C after ten days and remained stably for six days. The value of seed germination index from decomposed sludge was more than 80% for K and A whereas 48 – 60 % for S. It is necessary to consider the type or composition of sawdust when utilize it as a BA. In addition, the TOC and T-N of AS after decomposition met Vietnamese standard for organic fertilizer quality, so they could be used to supply nutrients to plants. This study is an important basis for the BAs selection to conduct experiments aim at AS recovery.

Removal of Cu2+ and Al3+ from Wastewater using Fly Ash Modified Basic Oxygen Furnace Slag Geopolymers

N T Sithole
University of Johannesburg, Doornfontein, South Africa

Abstract—Fly ash modified basic oxygen furnace slag geopolymers were synthesized and used as geofilters to remove heavy metals from wastewater. Batch experiment for the removal of metal from wastewater was conducted while the effect of effluent volume, contact time and porosity on the metal removal efficiency were also investigated. A comparative analysis of which metal between Ni2+ and Fe2+ is the easiest to remove from acidic industrial effluents (wastewater) was done. Effect of effluent volume on the metal removal efficiency was conducted under three respective volume thus 500 ml. 1000 ml and 1500 ml. 500 mL effluent volume resulted in higher Ni2+ removal efficiency (84%) whereas 1000 ml and 1500 ml had removal efficiency of 82 % and 78 % respectively. Effect of contact time between geopolymer and wastewater was investigated under 3 minutes interval until it reaches 15 minutes. The equilibrium contact time for the removal of Ni2+ was 12 minutes and its corresponding removal efficiency was 84 % whereas the equilibrium contact time for Fe2+ was 3 minutes with its corresponding removal efficiency being 100 %. Thus Ni2+ was the hardest metal ion to remove from wastewater because it has higher atomic weight and density as compared to water. Removal efficiency also increased with an increase in Porosity of the geopolymer. Porosity was brought about by adding H2O2 solution during geopolymer preparation. The highest removal efficiency (84 %) of Ni2+ was achieved through geopolymer with 1 % porosity whereas geopolymer with 0.5 % porosity had removal efficiency of 82.54 %. Fe2+ achieved 100 % removal efficiency regardless of the porosity because it is the simplest metal to remove.

The Biokinetic Parameters for the Removal of the Biochemical Demand of Oxygen and Coliforms in the Domestic Wastewater Treatment Plant of Pisco
**Pedro Córdova-Mendoza**, Teresa Barrios-Mendoza, Ramiro Zuzunaga-Morales, Isis Córdova-Barrios and Emily Zuzunaga-Concha y José Lévan-Moran
Ciencias del medio ambiente, Ingenieria de procesos, Peru

*Abstract*—The objective of the research was to determine the biokinetic parameters that significantly influence the removal of the biochemical oxygen demand and coliforms in the domestic wastewater treatment plant. Material and methods, primary documentation was used, using the analytical-explanatory method, applied research. Results: The technical standard OS.090, for wastewater treatment plants establishes the maximum permissible limits and the average values of the oxidation lagoon were obtained, with a pH between 8-9, temperature 30.9 ° C, it was evidenced that the oxygen utilization rate values (VUO), for 5h (VUO = -0.1301), 15h (VUO = -0.1257), 35 h (VUO = -0.1187), 60h (VUO = -0.0958) and 80h (VUO = - 0.0885). Discussion: With the consumption of dissolved oxygen, the microbial ecological balance was reached on the third day in the reactor, which allowed obtaining the biokinetic parameters with a K = 0.0097 L / mg * d, Ks = 149.132 mg / l, qmax = 0.0698 h-1, a = 0.041 kgO2 / DBOr and b = 0.0365. Conclusion: The complete mixture of the removal of BOD5 is in a range of 85-95, the tests in the sample at 80 hours reached for the BOD5 of 27 mg / l.

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<tr>
<th>Session 4</th>
<th>Presentation 7</th>
<th>17:55-18:10</th>
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<tr>
<td>XN5030</td>
<td>Biophysical and Socioeconomic Characterization of the Timari River Micro-basin in the Central Tropics of Peru</td>
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<td>E Erazo-Toscano, Carlos Enrique Alvarez Montalván, R Caballero-Salas, A Baltazar-Ruíz, K Rojas-Castillo and M Alomia-Lucero</td>
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<td>Universidad Continental, Huancayo, Peru</td>
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*Abstract*—The study was carried out in the Timari river micro-basin belonging to the Río Negro district of the Satipo province, with the objective of evaluating the influence of the vulnerability to contamination of surface water resources in the Timari-Río Negro river micro-basin. The results in the physical aspect were: area 1061.16 ha with length of channel 7.36 km and 44 tributaries, slope of the channel 12%, mean elevation of 1176.47 meters above sea level; the biophysical aspect presents: temperature from 19.87°C to 24.16°C, precipitation from 1693 mm to 2063 mm, evapotranspiration from 1083.31 mm to 1519.81 mm and slopes ranging from flat to steep. The population in the socioeconomic aspect presents 40% illiteracy and 60% some degree of education, productive activities are based 83% on agriculture and 17% trade, monoculture predominates with 60% and diversified crops at 40%. The flow rate was 0.248 m3 / s; while the raw surface water quality index presents 81.28 characterized as good quality and ends with 41.87 as poor quality.
**AGENDA**

11:20-12:00 | November 21 | Sunday GMT+11

Meetings ID: 93856881984

https://zoom.us/j/93856881984

**Keynote Speech III | Chaired by Prof. Edmond Yat-Man Lo**

Prof. R. J. (Dick) Haynes

The University of Queensland, St Lucia, Queensland, Australia

**Topic:** “ Constructed Wetland Technology for Wastewater Treatment”

*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. Under aerobic conditions, organic pollutants are degraded by the heterotrophic biomass present in the wetland medium and in the plant root rhizosphere (to CO2 and H2O). Under anaerobic conditions fermentation followed by methanogenesis results degradation of organic matter and the release of CH4 and CO2. The traditional, and most effective, mechanism for removal of organic N is by aerobic ammonification and nitrification followed by anaerobic denitrification. Inorganic pollutants (e.g. phosphate and metals) 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 absorbent 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 O2 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.
Invited Speech V | Chaired by Prof. Kokyo Oh

Dr. Md. Mizanur Rahman

University Technology Malaysia, Malaysia

Topic: “Renewable Energy Policy: the Key Success Factors in Germany”

Abstract—Energy-sectors in both developed and developing countries face three major challenges namely emission of greenhouse gases (GHGs), depletion of fossil fuel reserves, and increasing demands. Despite renewable energy retains many advantages over fossil-based energy, its wider dissemination is still restricted in many countries owing to techno-economic, societal and policy barriers. Renewable energy policy is meant to promote renewable energy by overcoming these barriers. Globally more than 140 countries had laid policy measures to promote the development of renewable energy, however, very few countries are successful. Germany is one of the successful countries in the world in developing renewable energy in terms of per capita installation and cumulative capacity expansion. Malaysia, on the other hand, undertook several initiatives in order to increase renewable energy uses to reduce dependency on fossil fuels and to contribute global effort to minimize GHG emissions but is not yet as successful as it desires. This paper examines renewable energy policy of both these countries, and identifies the key success factors in German case. We found that the main success factors of Germany were appropriate and dynamic FiT (Feed-in Tariff) mechanism. German FiT mechanism ensures marginal profits with the negotiated FiT rates.
AGENDA

13:55-14:20 | November 21 | Sunday GMT+11

Meetings ID: 93856881984

https://zoom.us/j/93856881984

Invited Speech VI | Chaired by Prof. Kokyo Oh

Dr. Meisam Ahmadi Ghadikolaei

University of Macau, China

Topic: “Impact of Vehicle Light on Physical Properties of Particulate Matters Emitted from Vehicles”

Abstract—Gasoline and diesel vehicles are one of the main sources of PMs generation which are harmful to human health and the environment. The light emitted from the headlights of these vehicles may cause to make the PMs more/less/not dangerous than the raw PMs to human health and the environment by changing their properties. However, there is no information available in this field. Therefore, this research is presented to investigate the effect of light emitted from one of the most common vehicle headlights (Halogen type) on the physical properties of PMs. Three PM samples taken directly from one diesel vehicle operating at an idle condition, and inside of a diesel particulate filter and gasoline vehicle exhaust pipe (engine was off) were exposed to the vehicle headlight for 6 hrs at 10 cm distance. It is observed that the vehicle light has the potential to change the structure, shape, and size of the PMs, while the fresh PMs from diesel vehicle receives more changes (43.5% increase in particle diameter) compared with the other two samples containing mature/aged PMs (increases of 3.6 and 9.9%, respectively). Also, the effect of the beam from the scanning electron microscope on the PM physical properties is presented.
# AGENDA

**Session 5-Renewable Energy Technology and Environmental Chemical Engineering**

14:20-16:35 | November 21 | Sunday GMT+11

Chaired by: Dr. Md. Mizanur Rahman & Dr. Meisam Ahmadi Ghadikolaei

University Technology Malaysia, Malaysia & University of Macau, China

**Meeting ID: 93856881984**

https://zoom.us/j/93856881984

<table>
<thead>
<tr>
<th>Session 5 Presentation 1</th>
<th>Investment Planning Model and Economics of Wind-Solar-Storage Hybrid Generation Projects Based on Levelized Cost of Electricity</th>
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<tr>
<td>14:20-14:35</td>
<td>Kaiyan Luo, Rui Wang and Qing Liu</td>
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<tr>
<td>XG0006</td>
<td>China Electric Power Planning &amp; Engineering Institute, Beijing, China</td>
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<td><strong>Abstract</strong>—With the goal of peaking carbon emission and carbon neutrality, the Chinese government is promoting a renewable-based power system. Investors pay more attention to hybrid generation projects integrating multi-energy sources with energy storage. It is a business model friendly to the power system. Based on the method of levelized cost of electricity, this study builds an investment planning model of a wind-solar photovoltaic-battery storage hybrid project. Results show that the model effectively optimizes the capacity combination of wind, solar PV and battery storage, and improves the economic competitiveness of the project. The investment planning model can support decision-making in renewable energy investment</td>
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<th>Session 5 Presentation 2</th>
<th>Augmented Kalina Cycle using Renewable Energy as Input for Power Generation</th>
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<tr>
<td>14:35-14:50</td>
<td>Manam Ahmad and <strong>Md Mizanur Rahman</strong></td>
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<tr>
<td>XN5025</td>
<td>University Technology Malaysia (UTM), Johor, Malaysia</td>
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<td><strong>Abstract</strong>—Kalina cycle is an idealized thermodynamic cycle that generates power using a binary mixture as a working substance. Depending on the application, the Kalina Cycle increase power plant efficiency by 10% to 50% over the Organic Rankine Cycle. The relative advantage of the Kalina cycle rises when operating temperatures are reduced and Kalina cycle is generating by mixture. Kalina cycle</td>
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is identified as a bottoming cycle that demonstrates improved efficiency. Ammonia-water mixture is high-energy than a single component. Producing electricity of the inlet turbine and the temperature of the separator increase the performance of the cycle. It may be more effective to use the Kalina cycle for concentrating renewable energy sources such as solar power plants that use direct steam production to enhance heat exchange efficiency, and therefore, increase total system performance. This research attempts to build a Kalina cycle system, which will help to transform the natural source from sunlight to energy. Python open-source software has been used to design and implement the Kalina cycle. The suggested cycles include various types of solar collectors and extra heat recovery technologies. Systems uses a medium temperature heat source to analyze the Kalina cycle for different system characteristics and to conduct parametric research to determine which input temperature, ammonia concentrations, separator temperatures yield the optimal energy production. The Kalina cycle of binary plants generates 30% to 50% more power for a provided heat source. With the Kalina cycle as a bottoming cycle for a cogeneration plant, the exhaust gas temperature has been reduced from 427 K to 350 K, which reduces the environmental impact.

**Session 5**

**Presentation 3**

14:50-15:05

XN6012

**Policy and Legal Issues of the Environmental and Social Inspection in Fishery-Solar Energy**

**Ku-Hsiu Hsiung**

Nankai University, Tianjin, China

*Abstract*—Taiwan serves as the mainly research object in this paper. Due to the positive promotion of photovoltaic installation in Taiwan, the installed capacity of photovoltaic power station with Fishery-Solar Hybrid System is scheduled to 4GW. Photovoltaic power station installed upon the fish pond can achieve the effect of renewable energy generation and fish farming. However, the large area of photovoltaic power station into the fishing village, also have an impact on the original fishing village life. For example, the change of fish farming methods, landscape and ecological impact. Therefore, Taiwan established the “Solar Fishery and Electricity Symbiosis Auditing” in 2020, and this paper will discuss the procedure and law issues of this measure.

**Session 5**

**Presentation 4**

15:05-15:20

XN5036-A

**Laboratory Study on Emission of Gaseous Pollutants from Biomass Burning to Atmosphere**

**Yuping Sun**

University of Science and Technology of China, Hefei, China

*Abstract*—Wildfire, which is mainly burned by biomass fuels, releases a large number of trace gases, plays a vital dynamic role in global warming. The study on the transient emission of gaseous pollutants from regional forest fires has an important impact on the atmosphere and human health. Here, we reported a series
of biomass laboratory experiments on the combustion of typical forest fires fuels collected in Southwest China. The transient concentration of gaseous pollutants was measured online through FTIR, and the visible and infrared images of fuel temperature changes and fuel surface diffusion were also recorded. This study characterized the variation of gas pollutant emissions with four stages (ignition, flaming, smoldering, and burnout). The emission factors (EFs) of 18 trace gases produced from the burning of 7 forest fire fuels were calculated and analyzed by the method of carbon balance, and the emission factors (EFs) of methanol, formaldehyde, and acetaldehyde in Southwest China are reported here for the first time. We focused on emission factors of GHGs, NMHC species, three OVOCs, HCl, and SO2. The results show that the emission factors of different gaseous pollutants vary with fuel species and combustion stage. In addition to C2H2, we also found that the emission factors of NMHC (C1-C3) of pine needles were significantly higher than those of other vegetation types, especially in the smoldering stage. Besides, we explored the correlation between the emission factor (EF) and modified combustion efficiency (MCE) of each gaseous pollution, having shown the importance of the combustion stage in determining the emission factor. In conclusion, the results emphasize the influence of different vegetation fuel types, different vegetation parts, and different combustion stages on emissions, and prove the importance of regional emission factors. Our results provide regional emission data by fuel species and stage, which can be used to model climate change, source distribution, and atmospheric photochemistry. Furthermore, our findings can provide guidance for the control of atmospheric pollution.

**Session 5**  
15:20 - 15:35  
XN6007-A  

**Effect of Head Group Type of Alkylammonium Cationic Surfactants on the Cesium Desorption from Different Clay Minerals**

*Herry Wijayanto* and *Satoru Nakashima*  
Hiroshima University, Hiroshima, Japan

**Abstract**—In response to the decontamination of radioactive cesium from soil, the use of alkylammonium cationic surfactants as desorbing agents for Cs desorption from clay minerals has been conducted extensively. In addition, the contribution of their alkyl chain lengths has been studied well. However, the effect of head group type of alkylammonium cationic surfactants for Cs desorption from clay minerals had not much been discussed in detail. Therefore, this study examined benzyldecyltrimethylammonium bromide (BDAB) and dodecyltrimethylammonium bromide (DTAB), having similar alkyl chain lengths but different head group sizes, to desorb Cs from swelling and non-swelling clay minerals. Clay minerals were firstly contaminated by Cs solution, then followed by desorption experiment using desorbing agents. Batch desorption experiment indicated that, in general, desorption efficiency for all studied clay minerals increased by increasing cationic surfactants concentration. In swelling clay
minerals such as Na-montmorillonite (Na-MMT) and Ca-montmorillonite (Ca-MMT), Cs desorption was accompanied by interlayers expansion. BDAB showed higher Cs desorption efficiency from Na-MMT than DTAB due to larger Na-MMT interlayers expansion after intercalation of BDAB (bigger head group size). In contrast, Cs desorption efficiency from Ca-MMT was relatively similar, which corresponded to the identical interlayers’ expansion after intercalation of both BDAB and DTAB.

Cs desorption from non-swelling clay mineral kaolinite (KNT) was more governed by surfactant micelles. In comparison to surfactant ions, surfactant micelles had a stronger affinity to the clay surface; thus, Cs desorption efficiency would be higher. 80% of Cs desorption was achieved by BDAB 6 mM, while a similar percentage of Cs desorption was achieved by DTAB 20 mM due to micelle formation in lower concentration for BDAB than DTAB. At certain concentrations (50 mM), BDAB and DTAB showed similar Cs desorption efficiency (90%) due to the same affinity caused by similar alkyl chain lengths. It was suggested that hydrophobicity of their alkyl chain took over the role for Cs desorption at high concentrations, whereas both cationic surfactants were completely formed to be micelles.

For non-swelling clay mineral illite (ILT), BDAB and DTAB even showed similar Cs desorption efficiency with HCl as a control. This was due to the existence of frayed edge sites in ILT, which provokes strong cesium retention. It was concluded that the use of different head groups of alkylammonium cationic surfactants had different Cs desorption mechanisms among various clay minerals.

### Presentation 6

**Physicochemical Properties and Toxicological Characterization of Particulate Matter from Coal Fire**

**Li Kaili,** Zhang Yongming and Zhang Qixing

University of Science and Technology of China, Hefei, China

**Abstract**—Background: Coal fires are hidden, persistent and ubiquitous. Coal fires release large quantities of smoke particles, which can cause serious health problems for exposed populations. However, little is known about the physical and chemical properties and health effects of particulate matter (PM) from coal fire.

Methods: We carried out laboratory simulation experiments of coal fire smoldering, collected coal fire smoke particles and analyzing their physical and chemical properties. Mice were exposed to PM from coal fire (0, 3 mg/m³, 10 mg/m³) through sniffing devices, and were sacrificed and evaluated for biological toxicity after one week, two weeks, and two weeks after exposure (fourth week).

Results: Coal fire PM, with a mass median diameter (MMAD) of 150-170 μm, contains heavy metals such as Cu, Fe, Mn, Co, Zn, and PAHs. BaP is the main contributor to the overall carcinogenicity of PAHs mixtures. The content of Ba, Al and Fe increased in the lung, liver and kidney. Sub-acute exposure of mice to coal fire particles caused the increase of BALF inflammatory factors (TNF-α, MIP-2...
and IL-6), the infiltration of inflammatory cells in lung tissue and the widening of alveolar septum. The content of ALT, ALP, LDH, BUN and CRE in serum increased. The liver tissue changes morphology, and inflammatory lesions and megakaryocytes and binuclear cells appear. Oxidative stress marker SOD activity decreased, GSH depletion and MDA increased in lung, liver and kidney tissues. The above results did not return to the baseline level during the two-week recovery period, and the presence of PM was still observed in the ultrastructure of the lung.

Conclusion: Exposure to PM from coal fire can cause oxidative stress and inflammatory reactions in the lungs. The particles (or some components) can translocate to the liver and kidney and induce oxidative stress to cause functional impairment. The PM cannot be completely removed in two weeks. Incomplete lung, liver and kidney recovery and pro-oxidant and pro-inflammatory environment may lead to long-term chronic diseases.

**Session 5**
**Presentation 7**
**15:50-16:05**
**YN5010**

**Preparation of Cotton Straw Based Multi-Pore Biomass Charcoal, Characterization and Electrochemical Properties**

**Jing Tao Dai, Ying Yang, Wen Xuan Zheng and Li Na Wang**

College of mechanical and electrical engineering, Tarim University, Alar, Xinjiang

*Abstract*—Cotton Straw Based Porous biochar was prepared by using cotton straw as raw material and anhydrous calcium chloride as activator. The morphology and structure of the product were characterized by TG-DSC, XRD, Raman, SEM, TEM and N2 adsorption desorption analysis, and the electrochemical properties were also analyzed. The results show that the specific surface area of the sample prepared at 650 °C is 487.68 m2•g⁻¹, the average pore diameter is 5.97 nm, the total pore volume is 0.67 cm³•g⁻¹, and the micropore volume is 0.15 cm³•g⁻¹. The first discharge capacity of the lithium-ion battery with this sample as anode material is 1533.5 mA•h/g at 0.1 C rate, 570.1 mA•h/g after 100 cycles, and 596.1 mA•h/g after 500 cycles at 1 C rate, which indicates that the sample has good rate performance and cycle performance.

**Session 5**
**Presentation 8**
**16:05-16:20**
**XN5039**

**Polyethylene Terephthalate Waste as a Mobilizer for Heavy Metals in Gold Mine Tailings**

**Tebogo Mashifana**

The University of Johannesburg, Doornfontein, South Africa

*Abstract*—The accumulation of gold mine tailings (GMT) and polyethylene terephthalate plastic waste (PW) continue to impact the ecosystem negatively, and strategies are required to counteract these issues to maintain a sustainable environment. This study investigated the use of PW as a binder to mobilize heavy metals in GMT. Plastic was used as a binder to develop specimens. were developed using plastic as a binder, the geotechnical and geochemical properties of the specimens were studied. The leachability of heavy metals from developed
specimens was also studied. GMT and PW ratios of 80:20; 70:30, and 60:40 were investigated. The mineralogy and elemental composition of GMT and developed specimens showed that was quartz and silicon oxide were the predominant constituent in the materials. The specimen with the highest unconfined compressive strength yielded the lowest water absorption. The concentration of heavy metals in the PW-based specimens was lower than in the raw GMT. Waste plastic can be used as a sustainable binder to mobilize contaminants in GMT. The proposed solution can solve and prevent environmental pollution caused by GMT and WP.

Session 5
Presentation 9
16:20-16:35
XG1001
Possibility for Production of Biogas from Manure in Bulgaria
Ivaylo Ganev, Rositsa Velichkova, Elitsa Gieva, Kalin Filipov and Lubomir Dimitrov
Technical University of Sofia, Sofia, Bulgaria

Abstract—The permanent consumption increasing of energy, foods, techniques and other goods and serviced worldwide leads to the intensifier of their production and to the constant market expansion. In turn, the processes taking place in some of these productions are responsible for the deterioration of the quality of the environment. Over the last decade, science and industry have followed the environmental policies and one of the developing approaches is being the use of by-products as raw materials for new production. The waste to energy technologies meets the requirements both of sustainable managing of wastes and energy production by sources with zero carbon footprint. Typical for this technological approach is its local application and in this study is performed an overview analysis of the possibilities for utilization of livestock manures in systems for production of biogas in Bulgaria. Based on the statistical data for number, and type of farm animals in the country for 2020, their localization, and the potential for gas production of their manure, the calculations were made. The obtained results are presented by regional division and it was estimated that total 1142 installation with 500 kWh capacity could be realized in the investigated farms plants. The obtained results are promising and they are prerequisite for further technological and economic investigations of this waste to energy technology.
# AGENDA

**Session 6 - Animal Husbandry and Livestock House Environmental Monitoring**  
13:30-15:45 | November 21 | Sunday GMT+11  
**Chaired by: Prof. R. J. (Dick) Haynes**  
The University of Queensland, St Lucia, Queensland, Australia  
**Meeting ID: 83678980467**

https://zoom.us/j/83678980467

<table>
<thead>
<tr>
<th>Session 6 Presentation 1</th>
<th>Measurement of Dust Concentration in a Open-type Korea Native Cattle House according to Season and Feed Type</th>
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<tbody>
<tr>
<td>13:30-13:45 XN5032-A</td>
<td>Measurement of Dust Concentration in a Open-type Korea Native Cattle House according to Season and Feed Type</td>
</tr>
</tbody>
</table>

**Eunmi Lee,** Sil Jin, Jeongil Won, Seonsik Jang and Gijun Choi  
Hanwoo research institute, Pyeongchang, South Korea

**Abstract**—This study was conducted to investigate the amount of dust generated during season and feeding in open type Korea Native Cattle house. 4 farms were surveyed from July 16, 2020 to August 31, 2021. And this study were tested in Yanggu and Hoengseong, Gangwon-do which were located at 214.50±11.78m and 247.50±82.88 heads were raised. Dust concentration of TSP, PM10, PM2.5 according to season were measured in and out farm for 15 hours from evening to next morning. And PEM(Personal Environmental Monitor) connected with AirChekTOUCH were used. Also, Dust concentration of TSP, PM10, PM2.5 according to feed type were monitored by Portable Aerosol Spectrometer in and out farm during feeding concentration and hay for 10 minutes, respectively. And temperature, humidity, air volum and moisture content of each feed were investigated during monitoring dust generation. The temperature of spring and autumn(3∼4, 9∼11month), winter(12∼2month), summer(6∼8month) were 17.65±0.22b, 3.58±0.30c, 25.98±0.18a°C (P<0.0001). The humidity of season were 55.33±0.81b, 25.46±1.12c, 69.52±0.67a% (P<0.0001). And Air volum of season were 0.23±0.02b, 0.35±0.03a, 0.37±0.02a m/s (P<0.0001). The moisture content of concentration and hay were 10.76±0.69b, 11.57±0.51b, 38.56±1.90a% (P<0.0001),respectively. The concentration of TSP out and during feeding concentration, hay, TMR were 77.54±51.26 b, 216.06±52.44 b, 970.55±47.83 a, 58.07±271.87 b µg/㎥ (P<0.0001). Also, the concentration of PM10 and PM2.5 during feeding hay were significantly higher than others(P<0.0001). The concentration of TSP during spring and autumn(3∼4, 9∼11month), winter(12∼2month), summer(6∼8month) were 58.56±6.33b,
The concentration of PM10 and PM2.5 during winter were also significantly higher than other seasons (P<0.0001). In conclusion, the concentration of TSP, PM10, PM2.5 in the open type Korea Native Cattle house were higher in winter because of low humidity and higher during feeding hay than others.

### Session 6

#### Presentation 2

**13:45-14:00**

**XN5034-A**

<table>
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<tr>
<th>Characteristic of Atmospheric Particulate Matters and Ammonia in Swine Breeding Area in Republic of Korea</th>
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<tbody>
<tr>
<td>Taehwan Ha, Siyoung Seo and Saemee Woo</td>
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<tr>
<td>National Institute of Animal Science, Animal Environment Division, South Korea</td>
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</tbody>
</table>

**Abstract**—Ammonia (NH3) emissions in the Republic of Korea totaled 308 kilo tons in 2017, of which 227 kilo tons (73.5%) of ammonia was emitted from livestock manure. Ammonia and oxides of sulphur and nitrogen form secondary fine particulate matter, PM2.5, through chemical reactions in the atmosphere, and ammonia is known to play an important role in the formation of the secondary PM2.5. However, the effect of ammonia gas emitted from livestock breeding areas on the concentration of the PM2.5 in the atmosphere has not been accurately identified. Pig was selected as the target livestock species because of the largest amount of ammonia emissions from pigs among livestock breeds in the Republic of Korea. The purpose of this study was to measure and evaluate the concentrations of NH3, PM10, PM2.5 in the atmosphere in Boryeong-si, Chungcheongnam-do and Hongseong-gun, Chungcheongnam-do, where pig is reared most in the Republic of Korea. Since March 1, 2020, the NH3, PM10 and PM2.5 have been continuously measured at the experimental sites. The average NH3, PM10 and PM2.5 concentrations in Boryeong-si were 76.1 ppb, 45.6 μg/m3 and 27.1 μg/m3, respectively, and the average concentrations in Hongseong-gun were 62.3 ppb, 40.8 μg/m3 and 20.2 μg/m3, respectively. The concentration at the two sites was compared using the T-test, and the concentration at the Boryeong-si was significantly higher than those of Hongseong-gun in the three factors. In addition, there is a statistically significant correlation between NH3 and PM2.5 of two sites, but the r-values (0.189 and 0.138) are too low to give a significance meaning.

### Session 6

#### Presentation 3

**14:00-14:15**

**XN5033-A**

<table>
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<tr>
<th>Assessment of Ammonia Emissions and Investigation of Measurement Methods in Open Poultry Houses</th>
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<tr>
<td>Joonyoung Roh, Seongmin Kang and Eui-chan Jeon</td>
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<tr>
<td>Sejong University, Seoul, South Korea</td>
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</tbody>
</table>

**Abstract**—Main gases emitted from livestock houses include NH3, H2S, CO2, VOCs, and particulate matter (PM-10, PM-2.5), among which NH3 and H2S are the most emitted. Ammonia released into the atmosphere combines with nitrogen oxides (NOX) or sulfur oxides (SOX) to form PM-2.5 considered a major
Recently, the importance of PM-2.5 management is increasing due to the high concentration of PM-2.5 in Korea. Therefore, it is necessary to calculate emission factors that reflect domestic characteristics.

As a result of investigating the method of estimating ammonia emission in open poultry houses, PMUs using an electric sensor, SMDAE that absorbs ammonia in a sponge, and Tracer gas method that calculates emissions using a stable gas were investigated.

In European countries such as the Netherlands, studies on ammonia emissions from open poultry houses are in progress, and related studies are presented in the VERA test protocol.

In this study, the ammonia emission of open poultry houses was calculated using the tracer gas method suggested in the VERA test protocol, and the emission difference with other countries was analyzed.

Session 6
Presentation 4
14:15-14:30
XN5040-A

Evaluation of Ammonia Emission from Beef Cattle Farm with Tunable Diode Laser

Siyoung Seo, Taehwan Ha and Mwinwoong Jungsh
National Institute of Animal Science, Animal Environment Division, South Korea

Abstract—Ammonia(NH3) is pollutant gas which is odor substances, and precursor of particulate matter. Approximately 73.5% of the ammonia emission in South Korea is related to livestock manure treatment. Unlike mechanically ventilated farm which is easy to measure emission rate relatively, in naturally ventilated farm, it is hard to divide incoming air and exhaust air and calculate amount of emitted air and ammonia. Therefore, in VERA test protocol, they recommend trace gas method to measure ammonia emission rate of naturally ventilated facilities. The main aim of this study was to measure ammonia emission with Tunable Diode Laser(TDL; Boreal Laser) in naturally ventilated beef cattle farm in Republic of Korea. The TDL and retroreflectors were placed at center line of the barn to measure indoor concentration and outside to measure background concentration of NH3. Also, CO2 concentration was measured as tracer gas to calculate ventilation rate. The experiment was started on 1st, July and ended on 31st, August. Weather conditions like rainfall were considered to progress experiment, therefore ammonia was measured continuously for 22 days with one minute intervals. The average NH3, CO2 concentrations from cow barn were 1.34 ppm, 406 ppm and background NH3, CO2 concentrations were 0.07 ppm, 369 ppm respectively. The average ammonia emission rate was 0.00483 kg∙NH3/hr∙cow. The correlation between ammonia emission rate and indoor temperature was evaluated by pearson analysis. There isn’t significant correlation between ammonia emission rate and indoor temperature, because ammonia volatilized actively at any time, due to minimum temperature of night-time was 23.0 °C.
**Abstract**—The study was conducted to determine the growth performance of the Rhode Island Red Chicken fed duckweed meal as a protein ingredient of the organic feeds for free-range chicken. The 75-day old experimental birds were subjected to the three (3) dietary treatments consisted with the control, 10%, and 15% duckweed meal of corn-duckweed meal based organic chicken diets. The nutrient composition of the experimental diets was 14.0% CP, and 2639–2697 ME, kcal kg\(^{-1}\). The feed consumption, FCR, gain in weight, final weight, ADG, average cost per kg of LW produced, mortality rate, and haematology values which include: Hemoglobin (HGB); Hematocrit (HCT); Leucocyte count, Segmenters (Neutrophils) and Lymphocytes were the parameters used to evaluate the effects of the treated diets on the growth performance of the 75-day old Rhode Island Red. The results revealed that no significant effect was observed on the growth performance of 75-136 days old Rhode Island Red (RIR) as affected of the corn-duckweed meal-based feed formulation. Nevertheless, diets containing 15 % duckweed meal recorded to have the least FCR value of 5.23 and cost per kg of LW produced of Php 105.52/ $2.28. The haematological values were comparable among treatment groups. Further study to evaluate the efficacy of the same feed formulation to starter and grower chicks on digestibility of feed and carcass quality can be conducted.

**Abstract**—This study was conducted to investigate the amount of dust generated during season and feeding in open type Korea Native Cattle house. 4 farms were surveyed from July 16, 2020 to August 31, 2021. And this study were tested in Yanggu and Hoengseong, Gangwon-do which were located at 214.50±11.78m and 247.50±82.88 heads were raised. Dust concentration of TSP, PM10, PM2.5 according to season were measured in and out farm for 15 hours from evening to next morning. And PEM(Personal Environmental Monitor) connected with AirChekTOUCH were used. Also, Dust concentration of TSP, PM10, PM2.5 according to feed type were monitored by Portable Aerosol Spectrometer in and out farm during feeding concentration and hay for 10 minutes, respectively. And temperature, humidity, air volum and moisture content of each feed were investigated during monitoring dust generation. The temperature of spring and
autumn(3~4, 9~11 month), winter(12~2 month), summer(6~8 month) were 17.65±0.22b, 3.58±0.30c, 25.98±0.18a ℃ (P<0.0001). The humidity of season were 55.33±0.81b, 25.46±1.12c, 69.52±0.67a% (P<0.0001). And Air volum of season were 0.23±0.02b, 0.35±0.03a, 0.37±0.02a m/s (P<0.0001). The moisture content of concentration and hay were 10.76±0.69b, 11.57±0.51b, 38.56±1.90a% (P<0.0001), respectively. The concentration of TSP out and during feeding concentration, hay, TMR were 77.54±51.26 b, 216.06±52.44 b, 970.55±47.83 a, 58.07±271.87 b μg/㎥ (P<0.0001). Also, the concentration of PM10 and PM2.5 during feeding hay were significantly higher than others (P<0.0001). The concentration of TSP during spring and autumn(3~4, 9~11 month), winter(12~2 month), summer(6~8 month) were 58.56±6.33b, 78.72±6.33a, 54.06±6.33b μg/㎥ (P=0.0192), respectively. The concentration of PM10 and PM2.5 during winter were also significantly higher than other seasons (P<0.0001). In conclusion, the concentration of TSP, PM10, PM2.5 in the open type Korea Native Cattle house were higher in winter because of low humidity and higher during feeding hay than others.

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<th>Session 6</th>
<th>Presentation 7</th>
<th>15:00-15:15</th>
<th>YN1006</th>
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<tbody>
<tr>
<td>Effect of Climate Change Perception on Production and Identification of Adaptation Strategies: Case of Professional Poultry Farmers in Segou, Mali</td>
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Mahamadou Soumaila KONTE and Boubacar Mariko
Université de Ségou, Ségou, Mali

Abstract—This study analyzed poultry farmers’ Climate Change (CC) perception and its effects on poultry production and identified the adaptation strategies in Ségou, Mali. The data collection was exhaustive, 72 registered farmers. Confirmatory factor analysis was used to analyze farmers’ CC perception and Tobit model to determine its effects on production. The perception on “motivation” was rejected for nonconformity. The analysis showed noncollinearity and the Tobit model adequacy. The results showed a dominance of individual entrepreneurs and family businesses at 72% and 26% respectively. Among producers 96% heard of CC but 89% did not participated in any training. CC-related disasters affected 95% of farmers and only 3% received help. Innovation, reliance on information and the perception of the effect of CC on mortality and loss of production influenced positively the production while the perception of the effects of CC on growth and development of animals influenced it negatively. Contrary to income from off-farm activities 2 socio-economic variables also positively affected production, namely the number of children and the number of wives. The study recommends strong involvement of Malian authorities against the effects of CC through promotion of pro-environmental techniques and technologies, training, financial support to overcome disasters.

| Session 6 | Presentation 8 | Variation of Quality Parameters of Total Mixed Ration Recipe Briquettes with Extended Storage Period |
Wishma M. Karunanayaka, Deepthi Nayananjalie, Sharini C. Somasiri, Amali P. Kumari, Jayantha B. Adikari, Viraj R. Weerasingha and Sumudu S. Wimalasiri
Rajarata University of Sri Lanka, Anuradhapura, Sri Lanka

Abstract—Six dried total mixed ration (TMR) recipes were formulated according to Completely Randomized Design and pressed into briquettes to enhance the keeping quality. All briquettes were stored for 6 months and each was analysed for physical parameters, nutrient composition and shelf life. The interaction (period x treatment) effect was not significant in nutrients except for crude protein and ash contents. It was also not significant in shelf life parameters; yeast and mould counts and total plate counts in the recipe briquettes during six months period. There was no significant interaction effect on colour parameters; lightness (l*) and yellowness (b*) however, it was higher (p<0.05) for redness. The interaction effect was significant (p<0.05) for weight- and height-loss of the TMR briquettes. Thus, these TMR recipe briquettes could be stored for up to six months without any deleterious effect on physical, nutritive- and keeping quality parameters.

Boubacar MARIKO, Abdoulaye TOURE and Sounkalo TRAORE
Université de Ségou, Ségou, Mali

Abstract—High ambient temperature during the hot season is deterrent to a profitable poultry venture. Breeding of poultry species resilient to heat stress prevailing during the hot season is an adaptive strategy which is suitable for low-income tropical and subtropical countries. The objective of this study was to compare the physiological and behavioral adaptive responses of the white and the pearl black guinea fowl breeds in Mali, during the hot-dry season. A total of 30 adult indigenous guinea fowls (14 pearl black and 16 white) of both sexes, reared intensively, were used. Cloacal and surface (head, back, feet) temperatures, respiratory and heart rates were measured during the relatively cold (7:00 a.m.) and the hot (2:00 p.m.) periods of the day during the hot-dry season. Hyperventilation, drinking, feeding and resting of fowls were also recorded at the same periods. The results indicated that there was no significant difference between the parameters of the two breeds at 7:00 a.m. At 2:00 p.m., when the ambient temperature recorded was (minimum 39 °C), respiratory rate, surface temperature and proportion of fowl hyperventilating and resting where significantly increased in both breeds compared to that of 7:00 a.m. At the same time period, the proportion of fowl feeding and drinking was decreased in both breeds. At 2:00 pm, the surface temperature was significatively higher in pearl black compared to white breed. There was no statistical difference in the cloacal temperature between both guinea fowl breeds on the one hand and between both time periods on the other hand. In conclusion, both guinea fowl breeds are well
adapted to the high ambient temperature but white breed appear to have a slightly better physiological response compared to pearl black breed of guinea fowl during the hot-dry season.
Influencing Factors of the Development of Green Building by Designers Based on Grounded Theory

Ying Zhang, Jian Kang, Hong and Jin, Yan Zhang
Harbin Institute of Technology, Key Laboratory of Cold Region Urban and Rural Human Settlement Environment Science and Technology, Ministry od Industry and Information Technology, Harbin, China
Urban Construction Research Institute of Heilongjiang Province, Harbin, China

Abstract—Green building has become a trend in the development of future buildings, thereby significantly changing the general direction of building development and creating an environment for sustainable development. In this study, 40 designers were selected to conduct in-depth interviews using the grounded theory method, and the interview data were deeply extracted, resulting in four core categories, namely technology determination, personnel resources, technology management, and economic factors. This study aimed to construct a theoretical framework around the core categories and analyse their relationship, explore the influencing factors of the development of green building in China from the perspective of designers, and encourage effectively improved development of green building.

Building Information Modeling Application in Engineering Design Performance Prediction

Wen-Bin Chiu
Operations, Pacific Engineers & Constructors, Ltd, Taipei, Taiwan
National Taiwan University, Taipei, Taiwan

Abstract—Engineering design constitutes a critical factor in a construction project, and the process has fundamentally impacted the performance. Previous research on design performance has established the relationships between project attributes
and performance measures. Recently, there is growing interest in measuring the benefits of BIM on project performance, but less attention on design performance. Evaluating design performance based on the relationships between the use of BIM inputs and outputs becomes essential. This paper presents a systematic analysis correlating BIM uses with engineering performance to better predict industrial construction projects. Applying project data collected through BIM application surveys and the statistical variable reduction techniques to develop multiple linear regression models of the engineering design performance evaluation, the best prediction was achieved and validated. The study results show that the correlation between BIM uses and engineering performance measures is significant, and the engineering design performance can be predicted from BIM uses attributes.

<table>
<thead>
<tr>
<th>Session 7</th>
<th>Research on the Restoration of the Small-sized Post Station Building in the Period of Balhae in the Northeast of China</th>
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| Presentation 3 | Yueliang Xia and Jianfei Dong  
Harbin Institute of Technology, Harbin, China |

**Abstract**—Balhae was a tributary state of the Tang Dynasty. It was founded in 698 AD and died in 926 AD in northeast China. It is a vast country with a complete network of post stations. At present, there is no original structure of the Balhae post building in the world. According to archaeological investigation, some small post building sites were found on the Balhae Post road, which were named "24 stones" by the academic circle because of their peculiar construction methods. Based on the technology of digital modeling and field investigation, this paper restores the image of the small-scale post station and promotes the cultural value of the post station building in Balhae.

<table>
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<tr>
<th>Session 7</th>
<th>Two Novel Types of ITZ Elements based on BFEM to Model the ITZ in RAC</th>
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| Presentation 4 | Yao Wang  
Beijing University of Technology, Beijing, China |

**Abstract**—The interfacial transition zone (ITZ) between the aggregate and cement mortar inside the concrete has an essential influence on its mechanical properties. In particular, for recycled aggregate concrete (RAC), the influence of its internal multiple ITZs cannot be neglected and its effect is far more intense. In this paper, based on the Base Force Element Method on complementary energy principle, two types of ITZ structures are presented to simulate the multiple ITZs of RAC, which are the ITZ element that can characterize the actual thickness of ITZ and the spring element model with zero thickness. Based on the BFEM, the compliance matrix and nodal displacements of the two ITZ elements are derived as explicit expressions and do not require Gaussian integration. In addition, the compliance matrix and nodal displacements have uniform expressions independent of the element form, the number of element nodes and the element dimension. Subsequently, the uniaxial tensile and compressive numerical
simulations were performed for the RAC at both ITZs, respectively. The failure modes and the stress-strain curves were obtained. It is shown that the both presented two types of ITZ element are effective elements to simulate the ITZ in RAC as well as for studying the mechanical properties of ITZ.

<table>
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<tr>
<th>Session 7</th>
<th>Recognition Efflorescence from Digital Images by using Machine Learning: Application of Support Vector Machine and Random Forest</th>
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| Presentation 5 | **Ching-Lung Fan**  
Republic of China Military Academy, Kaohsiung, Taiwan, China |

**Abstract**—Conventional manual inspections of building images are time-consuming, costly, and contain inconsistent examination standards. Developing an automatized defect and damage detection method has been pursued by the construction industry. Because understanding building surface conditions and making timely maintenance decisions are crucial. This study applied digital images and perform detection procedures such as image processing, data training, and testing. In addition, performance was evaluated using supervised machine learning methods. Confusion matrix indicators were used to compare the recognition performance of two supervised machine learning–based methods: a support vector machine (SVM) and random forest (RF). The results indicated that the accuracy of the SVM for recognition efflorescence of reinforced concrete (RC) was up to 90.2%. It presented the most satisfactory classification performance during comprehensive evaluations. The SVM enables clearly distinguishing differences between normal RC and concrete with efflorescence. In addition, digitized surface damage areas and quantity could indicate the extent of building degradation and be a quick reference for damage scope and severity estimation.

<table>
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<tr>
<th>Session 7</th>
<th>Using the Moisture Retention Property of Recycled Coarse Aggregates for Self-Curing of High Performance Concrete</th>
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</table>
| Presentation 6 | **Zainab Awadh**, D. Dashti, S. Al-Bahar and J. Chakkamalayath  
Kuwait Institute for Scientific Research, Safat, Kuwait |

**Abstract**—The influence of using saturated surface dry recycled coarse aggregates (SSD-RCA), as replacement of normal coarse aggregates (NCA) on the properties of hardened concrete is discussed in this paper. Concrete mixes were prepared using two different mixing procedures, and by replacing normal coarse aggregates (NCA) with 10% and 30% recycled coarse aggregates. The self-curing curing of concrete due to the incorporation of RCA was evaluated by determining the compressive strength, splitting tensile strength, water absorption and percentage of voids of concrete under two different curing conditions. The compressive and the splitting tensile strength were comparable for both air and water curing mixes at 28 days with 10% and 30% replacement, indicating the influence of self-curing effect through the use of RCA. This study exploits the benefits of rather
<table>
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<th>Session 7</th>
<th>Effect of Moisture Content on the Compressive Strength of a Local Rammed Earth Construction Material</th>
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| 18:10-18:25 XJ5007 | **Omar M. Al-Sudays** and **Omar M. Alawad**  
Qassim University, Buraydah, Saudi Arabia |

*Abstract*—Finding sustainable and economical materials for building construction is a vital topic recently due to the negative effects of some current construction materials on the environment and also its relatively high cost. Local materials can be considered as a suitable alternative for building construction materials to minimize the environmental impacts. For example, rammed earth construction type uses local materials which typically consist of a mixture of gravel, sand, clay, and silt. Cement can be added with low fractions as a stabilizer and to improve the mechanical properties of rammed earth, such as compressive strength. This study focuses on assessing the moisture content effect on the compressive strength of the cement stabilized local rammed earth materials. A number of samples with various moisture content, i.e. 4%, 6%, 10%, and 14% were established and examined using a universal test machine in this study. The moisture content is found to significantly affect the compressive strength of the stabilized rammed earth local materials. Samples with 10% moisture content reached the highest compressive strength (average is 4 MPa) compared with others. Samples with 4% moisture content have the least compressive strength, i.e. average is 1.97 MPa.

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<th>Session 7</th>
<th>Effect of Synthesis Conditions on Mechanical Strength of Aluminium Slag Modified Waste Foundry Sand Geopolymers</th>
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| 18:25-18:40 XN5042 | **N. T Sithole** and **M.T.M Nkosi**  
University of Johannesburg, Doornfontein, South Africa |

*Abstract*—The waste foundry sand was alkaline activated into geopolymers to reduce their environmental pollution. The waste foundry sand was blended with aluminium slag and alkali activated to produce geopolymers. Aluminium slag was used to supplement WFS with alumina because as it has low content of alumina. The main parameters tested were the effect alumina content, concentration of alkali, liquid to solid ratio, and temperature. The optimum synthesis parameters were a geopolymer prepared with 2% aluminium, 3 M NaOH solution, liquid solid ratio of 0.15 and curing temperature and time of 80°C and 5 days respectively. The optimum parameters yielded the highest UCS of 4.7 MPa. The developed aluminium slag modified waste foundry sand geopolymers met the minimum requirements for ASTM C126-99 and ASTM C216-07a.

Hung Duy Nguyen, Quang N H Do and Laura Macchio
University of Padova, Padua, Italy

Abstract—In line with the sustainable trend in the construction industry worldwide, there have been a number of studies that examined risks in Green Building (GB) projects recently. This study aimed to assess risk factors that GB projects often face through a questionnaire survey with 69 GB practitioners in Vietnam. Notably, this study evaluated GB risk factors according to three features: likelihood occurrence, the magnitude of impact, and risk controllability. The results indicated the top five crucial risks are "Owners lacks determination"; "Lack of experience of designers about GB"; "Project managers lack experience in GB projects"; "Underestimation of initial investment cost"; and "Project managers lack design management experience." This paper could be a helpful reference for the construction industry by providing a profoundly assessing GB projects' risks. Additionally, this study contributes empirical research of risk assessment in GB projects in Vietnam. Therefore, this study may contribute to the development of sustainable trends in the construction industry worldwide.
Invited Speech VII | Prof. R. J. (Dick) Haynes

Assoc. Pro. Xiang Li

Chiba University, Japan

Topic: “Risk Factors Affecting Farmers’ Feed Rice Production in the Kanto Region and the Tohoku Region of Japan”

Abstract—This study examined risk factors affecting farmers’ feed rice production in Japan. A total of 128 complete responses were collected from farmers in the Kanto region and the Tohoku region of Japan during the period from November 2019 to April 2021. Of the total completed survey responses, 43.8% of them had experiences to produce feed rice, and 56.3% of them did not have experience to do so. Risk perception in overall and by regions were estimated. \( \chi^2 \) tests and Fisher’s exact tests were performed to examine the risk perception differences between experienced group and non-experienced group. We found that farmers perceived labour force, revenue stability, policy, and environmental change to be important risk factors. Environmental change is the most selected risk factor. Compared to farmers in the non-experienced group, farmers in the experienced group were more concerned about these risks. However, there is an exception. In the Kanto region, more farmers in the non-experienced group perceived environmental change to be a risk factor. The findings of this research indicated that the government may need to consider additional supports to cover the loss from climate-related disasters when updating policies that promote the production of feed rice.
**AGENDA**

**Session 8-Agricultural Engineering and Animal Science**

16:15-18:30 | November 21 | Sunday GMT+11

Chaired by: Assoc. Pro. Xiang Li  
Chiba University, Japan

**Meeting ID:** 83678980467  
[https://zoom.us/j/83678980467](https://zoom.us/j/83678980467)

<table>
<thead>
<tr>
<th>Session 8 Presentation 1</th>
<th>Principle of Geoengineering: Meteorological and Geographical Conditions of the Department of Junín for the Generation of Precipitation in Agriculture</th>
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</table>
| SY8003 | **Paola Andrea Jeremias Espinoza, Lilian Fiorella Mucha Huaire**  
Universidad Continental, Perú.  
Universidad Nacional de Ingeniería, Perú.  

*Abstract*—Geoengineering attempts to remedy the climate crisis through the intervention of dynamic systems to mitigate future scenarios of water drought in agriculture. The provinces of the department of Junín were identified as having the meteorological and geographical conditions where precipitation should be generated for the benefit of agriculture. The meteorological data was obtained from SENAMHI for the period 2000-2020, cloud information derived from the GOES-16 satellite belonging to NOAA was used and the satellite images were resampled using the cubic convolution method to evaluate the cloud parameters under the bands (C02, C03, C07, C08, C10, C11, C13, C15 and C16) in areas with cloud altitude between 6-8 km in the Andes and in the eastern part between 5-7 km within the study area. From this analysis, favourable cloud clusters were identified in relation to the arid zones with extensive croplands where rainfed irrigation is used, using the geodatabase of the Ecological and Economic Zoning (ZEE) of the Regional Government of Junín.

<table>
<thead>
<tr>
<th>Session 8 Presentation 2</th>
<th>Effect of Temperature on the Dehydration of the Pulp of Three Ecotypes of the Species Mauritia flexuosa (Aguaje), on the Antioxidant Capacity, Total Polyphenols and Anthocyanins of the Oil Extracted by Cold Pressure, Ucayali-Perú</th>
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</table>
| YN6008 | **C. Ruiz, K. D. Arancibia, S. D. Camargo, A. S. Da Cruz, R. E. Canahuire, GEIMY MAGALY CAMARGO HINOSTROZA and W. G. Llatance**  

*Abstract*—For the extraction of oil by cold pressure, the pulp is previously
dehydrated, this being a component susceptible to temperatures. The effect of temperature was evaluated (T1 = 50 ºC and T2 = 60 ºC) of dehydration of the pulp of three ecotypes of aguaje (amarillo, ponguete and shambo) on the antioxidant capacity, the content of total polyphenols and anthocyanins in the oil extracted by cold pressure. A completely random design was used, with factorial arrangement, then the variables were subjected to an analysis of variance with a significance level of (p<0.05) where it is indicated that there is a difference between the three levels of ecotypes and two levels of temperature: with respect to the content of antioxidants, total polyphenols, and anthocyanins, confirming this significance with Tukey's multiple mean comparison analysis. The anthocyanin content for the ecotype (amarillo) with a temperature of 50ºC (2.07 mg/100g). The ecotype (ponguete) with dehydration temperature of 50 º C has a higher value in antioxidant capacity carried out by the ABTS method (55705.9 µmol trolox/100). The total content of polyphenols was the ecotype (shambo) at a temperature of 50º (30.1 mg EAG/100g).

Session 8
Presentation 3
16:45-17:00
YN1004-A

Phenotypic and Morphological Characteristics of Malaysian Kedah-Kelantan Cattle (Bos Indicus)

Mohammed Sirajul Islam, Nurhusien Yimer Degu, Abd Wahid Haron, Faez Firdaus Jesse Bin Abdullah, Mark Hiew Wen Han, Kamalludin Mamat-Hamidi and Hafizah Binti Mohamad Zawawi
Universiti Putra Malaysia, Selangor, Malaysia

Abstract—Phenotypic and morphological measurements are the most essential aspect for indigenous breed improvement and conservation. This investigation was aimed to study the phenotypic and morphometric characteristics of indigenous Kedah-Kelantan (KK) cattle. Data were collected from 184 KK cattle (male 102 and female 82). Color pattern of body coat, muzzle, face, eyelash, horn, tail switch, hoof and legs were recorded for the phenotypic characteristics. Body length, face length, ear length, horn length, tail length, rump length, height at wither, hip height, heart girth, flank girth, tail base, face width and rump width were measured for morphometric characterization by using measuring tape and stick. Brown is the predominant coat color in KK cattle consisting more than 82% along with other few coat color pattern. Black (73.9%) and brown (26.1%) skin color was recorded in KK cattle. The overall mean of head length, face width, ear length, horn length, wither height, heart girth, body length and rump length were 42.5± 4.5, 17.3±2.9, 19.8±3.1, 9.9± 4.4, 104.3±7.1, 127.4±13.2, 98.3±12.3 and 32.4±4.1 cm respectively in irrespective of sex differences. All morphometric measurements of length, girth and width parameters were significantly (p<0.05) greater in male compared to female KK cattle except tail length and base circumference within 24-36 months of ages. The results of correlation coefficient and multiple regression analysis clearly revealed that body length is the best estimator for body weight in KK cattle. Average birth weight recorded for male and females were 20.1±0.3 and 18.9±0.2 kg respectively with highly significant
(p<0.001) difference. Similarly, body weight was 135.9±5.4 and 109.9±2.7 kg with highly significant variation between sexes. The phenotypic and morphometric measurements revealed the Malaysian KK cattle are comparatively small sized with brown coat color. The data generated from this study would be useful in identification in situ conservation of the KK breed.

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<tr>
<th>Session 8</th>
<th>Presentation 4</th>
<th>17:00-17:15</th>
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<tr>
<td>GIS Mapping of Salt Farms and Salt Supply Chain Actors in the Visayas and Mindanao, Philippines</td>
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Cavite State University, Cavite, Philippines

**Abstract**—The 2010 survey of the Nutrition Council of the Philippines (NCP) revealed dramatic changes in the level of participation of the salt supply chain actors and their production, processing, and marketing activities. Among the industry’s biggest challenges are: salt remains excluded from the list of priority commodities of the government; the changes in weather patterns due to climate change which adversely impact the production cycle; prominence of traditional methods of production; and low productivity of local farms. While remote sensing technologies including geographic information system (GIS) mapping have been widely adopted for the improvement of agricultural productivity in the Philippines, use of such in research that focuses on salt production and supply chain is still very limited. GIS maps are perceived as effective information library and decision support tool that can help the supply chain of the neglected salt industry. This study focused on the mapping of salt farms and their supply chain actors from selected salt production sites in the Visayas and Mindanao islands. Eleven provinces were included in the surveys of market intermediaries and end-consumers who were traced from salt producers. Their geographic coordinates were recorded and satellite and Google Earth images of the supply chain actors were digitized in ArcGIS 10.5 software to generate the maps, physical characteristics of which were examined for possible patterns. Results show that in Mindanao, the market areas (or the salt traders) are concentrated in Zamboanga del Sur particularly in Aurora and Zamboanga City, but the producers are in Alubijid and El Salvador City, Misamis Oriental. In the Visayas, traders are more scattered and are greater in number than in Mindanao.

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<tr>
<th>Session 8</th>
<th>Presentation 5</th>
<th>17:15-17:30</th>
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<td>A Low-Cost Distributed Network for Crop Growth Optimisation in Plant Factories</td>
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**Antoine Bossard**
Kanagawa University, Yokohama, Japan

**Abstract**—Crops, such as for rice, are first grown in plant factories before being planted and cultivated in a field. Efficient operation of such plant factories is thus key to a successful harvest, and several theoretical models and systems have been
proposed in the literature to optimise the management and production capacities of these agricultural facilities. To this end, we describe in this paper a low-cost monitoring solution for a plant factory, based on a network of sensing devices. Compared to previous works, our proposal keeps the system costs at a minimum and achieves a higher fault tolerance by relying on a distributed network. In other words, we give in this paper a constructive proof of the feasibility of a cost-minimal fault-tolerant monitoring solution.

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<thead>
<tr>
<th>Session 8</th>
<th>Prototype of Portable Robusta Coffee Harvesting Machine</th>
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<tbody>
<tr>
<td>Presentation 6</td>
<td>Thatchapol Chungcharoen, Nuttapong Ruttanadech1, Sansanee Sansiribhan, Ronnachart Munsin, Ratiya Thuwapanichayanan, Arkom Palamanit and Warunee Limmun</td>
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<td>17:30-17:45</td>
<td>King Mongkut’s Institute of Technology Ladkrabang, Prince of Chumphon Campus, Department of Engineering, Chumphon, Thailand</td>
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<td>YN5006</td>
<td>Abstract—The limitations of machine size and cost are main problems for coffee harvesting using machine picking. Therefore, the prototype of Robusta coffee harvesting machine with portable and low cost was designed and created in this research. Moreover, the effects of bristle hardness, bristle size and brush rotation speed on the coffee harvesting efficiency were investigated. The experimental results showed that the prototype of portable Robusta coffee harvesting machine was effective to harvest the Robusta coffee. It provided the highest coffee harvesting efficiency of 75.24% by using the bristle hardness of 75 shore A, bristle size of 8 mm and brush rotation speed of 700 rpm. The bristle hardness, bristle size and brush rotation speed were significantly affected the coffee harvesting efficiency. The coffee harvesting efficiency was increased when increasing the bristle hardness from 60 shore A to 75 shore A and the brush rotation speed from 600 rpm to 700 rpm. On the other hand, the increase of bristle size from 8 mm to 10 mm provided the lower coffee harvesting efficiency.</td>
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<th>Session 8</th>
<th>Possibility for Using a Biochar for Sustainable Agriculture. Case Study in Bulgaria</th>
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<tbody>
<tr>
<td>Presentation 7</td>
<td>Rositsa Velichkova, Wandong Zheng, Radostina Angelova, Detelin Markov, Iskra Simova, Ivan Ivanov, Ivan Denev, Martin Pushkarov and Peter Stankov</td>
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<td>17:45-18:00</td>
<td>Technical University of Sofia, Sofia, Bulgaria</td>
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<td>XG1002</td>
<td>Abstract—In both industrialized and developing countries, soil loss and degradation are observed at unprecedented rates and with profound implications for soil ecosystem properties. In many regions, loss of soil productivity occurs despite the intensive use of agrochemicals, in parallel with the adverse environmental impact of soil and water resources. In paper is given an experimental study of soils in Bulgaria with and without biochar.</td>
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### Session 8 Presentation 8

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<th>18:00-18:15</th>
<th>Analysis of the Consumption of Processed Cassava and Maize Flour in Bukavu City: Upgrading Opportunities in Agricultural Value Chains</th>
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<tr>
<td><strong>Jacques Sadiki</strong>, Muzee Léon Kazamwali, Stany Vwima, Philippe Lebailly</td>
<td>Université de Liège, Gembloux, Belgique Université Évangélique en Afrique (UEA), DR Congo</td>
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*Abstract*—This study analyses the consumption of cassava and maize flour in Bukavu city within South Kivu province. The commercialization of cassava and maize flour in South Kivu is increasing due to the rise of urban demand for processed products. This study explores the business opportunities related to maize and cassava chains in South Kivu.

A survey was carried out from August to September 2019 among 145 urban households randomly selected in the three municipalities of Bukavu. Data were collected based on semi-structured questionnaires with households. Results that suggest that domestically processed cassava flour dominated cassava value chain while imported maize flour was the most consumed and popular on the market. High quality, competitive price, attracting packaging, willingness to buy local products were the main motivations driving the purchase of maize and cassava flour. Results reveal a possibility of upgrading products and services of the value chain and increasing price of the products while remaining competitive on the market. Functional upgrading will ensure product quality as well as a consistent supply. A promotion campaign for local products and proper packaging and labelling of local products should be given attention in order to ensure traceability, value addition and increase consumer awareness of these products. This makes certification a challenge but an asset for exporting to the regional market. These opportunities can only be exploited if there is a good coordination between stakeholders in the value chain.

### Session 8 Presentation 9

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<td><strong>E. R. Mussari</strong></td>
<td>Mediterranea University of Reggio Calabria, Reggio Calabria, Italy</td>
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*Abstract*—Pollinator decline is one of the most significant ecological problems of the 21st century. This decline threatens human food security and global economy. In order to address this problem governments across Europe and the USA have introduced national pollinator conservation strategies. These strategies, however, significantly differ in approaches to conservation. The differences at least in part stem from lack of consensus in the literature on whether pollinator biodiversity or abundance of a few common species determines crop pollination. Critical evaluation of empirical evidence In the last years, the private expenditure on animals has grown increasingly; in Italy, the average number of pets recorded since the advent of Covid-19, was one per citizen. In addition, the Assalco-Zoomark 2021 report declares an increasing awareness of ecological
aspects by operators in the veterinary sector.
All these data show that the community is ready to live in balance with the animal world; however, one of the most important responsibilities of men, such as taking care of the other species, continues to be obsolete: for example, in Italy, which is the cradle of biodiversity, there are only 13 veterinary (academic) hospitals. Most of the clinics and ambulatory were not designed as a new structure to accommodate such services, but rather, as an interstitial space obtained from existing buildings suitable for the occasion. Does not exist centralized systems that regulate veterinary health care, there is no architectural language that makes these structures recognizable.

Great advances have been made in recent years in the direction of ethology; specifically, relational ethology seems to be one of the disciplines that come closest to the behavioral and cognitive dynamics of animals, insisting on the power of the relationship that exists (and can exist) between man and animal. So, why not imagine that architecture and design could interface with relational ethology, to generate a conscious and appropriate way to rethink the spaces of animal care? This could be a way not only for preserving health but also for the psycho-emotional well-being of the species that surround us.