POLITEKNIK LPP YOGYAKARTA

Penyedia SDM Perkebunan yang Profesional dan Berkarakter

SURAT KETERANGAN
No: 17A/SKet/UPPM/VI/2023

Direktur Politeknik LPP menerangkan bahwa Dosen tetap Politeknik LPP atas nama Yudhi Pramudya, S.P., M.App.Se (NIDN 0520049301) telah melaksanakan publikasi ilmiah ke *IOP Conference Series: Earth and Environmental Science* untuk terbitan Volume 1200 Juni Tahun 2023 dengan judul artikel *"Converting Sawdust To Biochar and Its Mineral Content A Preliminary Analysis"* Penerbitan publikasi ini telah dikoordinasikan dengan UPPM Politeknik LPP, termasuk dalam hal pelaksanaan dan pelaporan penelitiannya.

Demikian surat keterangan ini dibuat, agar dapat dipergunakan dengan sebaik-baiknya.

Mengetahui,
Ketua UPPM

Lestari Hetalesi Saputri, S.T., M.Eng.

Yogyakarta, 24 Juni 2023
Direktur

Ir. Muhamad Mustangin, S.T., M.Eng,IPM

Program Book

GreenVC 2022

The 6th International Symposium
on Green Technology for Value Chains 2022

**"Innovations in Sustainable Resources
and Environment Facing 5.0 Society"**

November 22-23, 2022

Organized by:
Research Center for Environmental and Clean Technology
National Research and Innovation Agency, Republic of Indonesia

BRIN
BADAN RISET
DAN INOVASI NASIONAL

G20
INDONESIA
2022

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Welcoming Remarks by
Chairman of Research Organization for Life Sciences and Environment
National Research and Innovation Agency, Republic of Indonesia (BRIN)

It is my pleasure to welcome all delegates to this virtual conference of 6th International Symposium on Green Technology for Value Chains 2022 (GreenVC 2022). Sincere appreciation for your effort to collaborate virtually in this conference.

This **GreenVC 2022** is one of international conference coordinated by BRIN in 2022. Since 2021, BRIN becomes a platform for national and global collaboration by its open access infrastructure and research opportunities for academics, industries, and related stakeholders to expand the research and innovation accessibility.

Environmental issues become main topic in global sectors. Sustainable Development Goals (SDGs) induce all frameworks to elaborate the human activities with respect to environment. Nowadays we are facing 5.0 society era which force the community to adapt advanced technology in their daily life especially in environmental issues. With the capable human resources, through Organization Research of Life Science and Environment, BRIN become frontiers to conduct and bridging those accelerations on environmental-friendly technology and innovations.

Through this conference we expect the experience sharing and scientific communication could be built to strengthen the global network between academicians, researchers, and environmental organization. I do hope this **GreenVC 2022** becomes the excellent platform to enhance the environmental and clean technology innovations for sustainable resources in the future.

In this moment I would like to extend my sincere gratitude to the organizing committee for their dedication and hard work in organizing this event.

Dr. Iman Hidayat

Head of Research Organization Life Science and Environment BRIN

Opening Remarks by
Head of Research Center for Environmental and Clean Technology,
Research Organization for Life Sciences and Environment, BRIN

Dear distinguished speakers, presenters, and participants,

It is my great pleasure to welcome you to this virtual conference of 6th International Symposium on Green Technology for Value Chains 2022 (GreenVC 2022). The GreenVC 2022 is an annual international symposium since 2016 that consistently gathers experts, practitioners, and academics to share knowledge, exchange experiences, and information through meaningful discussions on the latest innovation and technologies in environmental issues.

This year in 6th GreenVC 2022, we invited the environmental and clean technology community to join and submit papers abstracts under the following themes: Recent Innovations in Sustainable Environment facing 5.0 Society.

A total of 119 presenters from Indonesia and abroad will present their papers which are divided into 8 topics, that are (1) waste treatment and valorization, (2) clean water and drinking water treatment, (3) environmental monitoring, modelling, and assessment, (4) climate change mitigation, (5) environmental remediation and reclamation, (6) environmental nanotechnology, (7) green materials and process, and (8) clean technology.

Besides that, keynote speakers from Japan, Korea, Zambia and the USA will present 5 interesting topics, that are (1) biomonitoring of human exposure to environmental chemicals in the context of exposome, (2) waste-to-energy, (3) green technology, (4) microplastic issue, and (5) microalgae research and development.

I hope that GreenVC 2022 will be an excellent platform to increase green and clean technology innovation for sustainable resources in the future. This conference will create sharing of scientific experiences and communication to strengthen global networks between academics, researchers and environmental organizations.

I would like to take this opportunity to express my deepest gratitude to the organizing committee for their dedication and hard work in organizing this event. Also, many thanks to all the speakers, presenters and participants who joined this conference.

Dr. Sasa Sofyan Munawar

Head of Research Center for Environmental and Clean Technology BRIN

**Opening Remarks by
the Chair of the 6th International Symposium
on Green Technology for Value Chains 2022
(GreenVC 2022)**

Distinguished delegates and participants,

It is an honor for us to welcome you all to this international symposium. Even still facing after pandemic situation, we could gather here to exchange knowledge, experience, and sharing the recent environmental issues.

The 6th International Symposium on Green Technology for Value Chains (GreenVC) 2022 that will be virtually held on 22-23 November 2022, is organized by Research Center for Environmental and Clean Technology – National Research and Innovation Agency (BRIN), under coordination with BRIN International Conference 2022.

This symposium invited six keynote speakers who are expert in environmental and clean technology. It also be attended by 119 presenters affiliate in Japan, United Kingdom, and Indonesia who will share their recent innovation and technology especially in waste treatment and valorization; environmental monitoring, modelling, and assessment; climate change mitigation; environmental remediation and reclamation; environmental nanotechnology; green materials and process, and also water, sanitation, and hygiene.

We would like to acknowledge our publishing partner IOP Publishing for their support on publishing the conference proceeding. We also thank to all sponsors Pusyantek BRIN, PT Berca Niaga Medika, Horiba, PT Wiralab, Dynatech, PT Asmin Adisentosa, PT Unitama Perkasa, Mondylia Amerta, and ITS Science Indonesia for their kind support on this symposium.

At this time, I would like to send my sincere gratitude to all scientific committees, reviewers, and organizing committees for their hard work and continuous support to make this event successfully delivered.

We hope this symposium enable to provide platform for further discussions, develop the ideas, expand the global collaboration, and strengthen the network between academics, research institute, and environmental organization on facing 5.0 Society era.

Dr.Eng. Diana Rahayuning Wulan

Chair of GreenVC 2022

SYMPOSIUM SCHEDULE DAY 1

Tuesday, November 22, 2022

Time	Program	Duration
07.30 – 08.15	Registration	00:45

08.15 – 08.35	Opening ceremony
	- Dr. Sasa Sofyan Munawar
	  (Head of Research Center for Environmental and Clean Technology, BRIN)
	- Dr. Iman Hidayat
	  (Chairman of Research Organization for Life Sciences and Environment)
		00:20

08.35 – 08.40	Break	00:05
08.40 – 09.25	**Keynote session 1** Moderator: Dr. Ir. Agus Sudaryanto, M.Sc.	
	Keynote speaker 1 Prof. Kurunthachalam Kannan (Departments of Pediatrics and Environmental medicine, New York University School of Medicine, New York) "Biomonitoring of human exposure to environmental chemicals in the context of exposome"	00:45
09.25 – 10.10	Moderator: Dr. Ir. Wahyu Purwanta, M.T.	00:45
	Keynote speaker 2 Assoc. Prof. Muhammad Aziz (Institute of Industrial Science, The University of Tokyo) "Highly-energy efficient biomass and waste conversion to hydrogen: toward sustainable decarbonization"	
10.10 – 10.55	Moderator: Prof. Dr. Ir. Suhendar I Sachoemar, M.Si.	00:45
	Keynote speaker 3 Kwanyoung Kim, Ph.D. (Green Technology Center, Korea Institute of Science and Technology, Korea) "ASEAN-ROK green transition and carbon neutrality joint response and its sustainable governance establishment and implementation strategy development"	
10.55 – 11.00	Break	00:05
11.00 – 11.45	Oral session 1 (X01 – X02)	00:45
11.45 – 12.15	Oral session 2 (X03)	00:30
12.15 – 13.00	Break	00:45
13.00 – 14.15	**Parallel oral session 1**	01:15
	Room A (A01 – A05)	
	Room B (B01 – B05)	
	Room C (C01 – C05)	
	Room D (D01 – D05)	
14.15 – 15.15	**Parallel oral session 2**	01:00
	Room A (A06 – A09)	

Time	Program	Duration
	Room B (B06 – B09)	
	Room C (C06 – C09)	
	Room D (D06 – D09)	
15.15 – 15.30	Break	00:15
15.30 – 17.00	**Parallel oral session 3**	01:30
	Room A (A10 – A15)	
	Room B (B10 – B15)	
	Room C (C10 – C15)	
	Room D (D10 – D15)	
17.00 – 17.05	**Closing for day 1**	00:05

Join zoom meeting for day 1

https://zoom.us/j/94116072257?pwd=T013dENqZTZvQ1YzZ1czcU5JMVA0Zz09

Meeting ID: 941 1607 2257

Passcode: 065456

Oral Session 1 and 2

Tuesday, November 22, 2022

Oral session 1
Moderator: Dr. Widyarani

Time	Presenter	Title	Zoom Username/ID
11.00 – 11.20	Akira Sai	Psychological distress among urban slum sanitation workers during the Covid-19 pandemic	X01_Akira Sai
11.20 – 11.40	Ken Ushijima/ Neni Sintawardani	Sanicamp: an event to stimulate young people's interest and curiosity about water and sanitation	A02_Ken Ushijima/ Neni Sintawardani
11.40 – 11.45	Q & A session		

Oral session 2
Moderator: Raden Tina Rosmalina, M.Si.

Time	Presenter	Title	Zoom Username/ID
11.45 – 12.15	Nelfriani	Protecting the Environment with Reliable Instrument Agilent GC/GCMS/MS	X03_Nelfriani

Parallel Session Schedule
Room A

(Topic: Waste treatment and valorization;
Environmental remediation and reclamation)

Tuesday, November 22, 2022

Parallel oral session 1
Moderator: Dr. Herlian Eriska Putra

Time	Presenter	Title	Zoom Username/ID
13.00 – 13.15	Wahyu Purwanta	A study on the implementation of a circular economy in municipal solid waste management in the new capital city of Indonesia	A01_Wahyu Purwanta
13.15 – 13.30	Lies Indriati	The Evaluation of used diapers recycling process in Bank Sampah Bersinar	A02_Lies Indriati
13.30 – 13.45	Reba Anindyajati Pratama	The challenges in sustaining waste banks in Serang City: how far the circular economy can go?	A03_Reba Anindyajati Pratama
13.45 – 14.00	Ismi Khairunnissa Ariani	Production of bio briquettes from pineapple peels as alternative renewable energy	A04_Ismi Khairunnissa Ariani
14.00 – 14.15	Iin Parlina	Inventory analysis of potential electronic waste generation in Setu, Tangerang Selatan	A05_Iin Parlina

Parallel oral session 2
Moderator: Dr. rer.nat. Apt. Rina Andriyani, M.Si.

Time	Presenter	Title	Zoom Username/ID
14.15 – 14.30	Isa Nuryana	Expression of laccase in *Pichia pastoris* and its potential activity for biodegradation of ampicillin	A06_Isa Nuryana
14.30 – 14.45	Evi Susanti	Floating treatment wetlands using *Vetiver sp* and *Heliconia sp* as aquaculture wastewater treatment	A07_Evi Susanti

Time	Presenter	Title	Zoom Username/ID
14.45 – 15.00	La Ode Muhammad Muchdar Davis	Uptake and translocation of lead and cadmium in wild-found species for phytoremediation	A08_La Ode Muhammad Muchdar Davis
15.00 – 15.15	Denalis Rohaningsih	The efficacy of *Vetiveria zizanioides* in horizontal subsurface flow constructed wetland for treating textile waste	A09_Denalis Rohaningsih

Parallel oral session 3
Moderator: Dr. Novi Fitria

Time	Presenter	Title	Zoom Username/ID
15.30 – 15.45	Khalda Afifah Haris	Potential quantity of liquid fuel from pyrolysis of plastic waste in Labuan Bajo	A10_Khalda Afifah Haris
15.45 – 16.00	Rudi Nugroho	Denitrification of ammonium nitrate industrial wastewater using sulfur and limestone packed bioreactor	A11_Rudi Nugroho
16.00 – 16.15	Nurul Setiadewi	Microplastic occurrence and characteristics in wastewater: a case study in Setiabudi Jakarta WWTP	A12_Nurul Setiadewi
16.15 – 16.30	Veny Rachmawati	Removal of color, phenol and sulfide from batik wastewater using immobilized *bacillus licheniformis* in bentonite mineral	A13_Veny Rachmawati
16.30 – 16.45	Feri Karuana	Investigation of slagging fouling and corrosion coal co-firing with biomass synthetic waste in drop tube furnace	A14_Feri Karuana
16.45 – 17.00	Aisyah	Radioactive fission waste of the conversion of high enriched uranium to low enriched uranium target on 99Mo production	A15_Aisyah

Parallel Session Schedule
Room B

(Topic: Environmental monitoring, modelling and assessment)

Tuesday, November 22, 2022

Parallel oral session 1
Moderator: Miranti Ariyani, M.I.L

Time	Presenter	Title	Zoom Username/ID
13.00 – 13.15	Novi Fitria	Effect of storage time on in-situ parameters and total nitrogen analysis results of tofu liquid waste samples	B01_Novi Fitria
13.15 – 13.30	Ida Munfarida	An environmental impact assessment of restaurant operational: A case study of RM Restaurant, Garut-Indonesia	B02_Ida Munfarida
13.30 – 13.45	Muhammad Haqqiyudin Robbani	Characterization, risk assessment, and potential utilization of fly ash from the first municipal solid waste incinerator in Indonesia	B03_Muhammad Haqqiyudin Robbani
13.45 – 14.00	Astried Sunaryani	A web-based numerical model for sustainable management of Lake Batur, Bali: preliminary results	B04_Astried Sunaryani
14.00 – 14.15	Kemal Maulana Alhasa	Prototype design urban monitoring several gaseous pollutants using low-cost electrochemical sensor	B05_Kemal Maulana Al Hasa

Parallel oral session 2
Moderator: Hanny Meirinawati, S.Si., M.Sc.

Time	Presenter	Title	Zoom Username/ID
14.15 – 14.30	Arianto Budi Santoso	Indonesian Lake Information System: It is timely to be in one platform	B06_Arianto Budi Santoso
14.30 – 14.45	Rizky Pratama Adhi	Estimating baseline CO_2 emission from waste collection and transport activity to TPST Bantargebang, Jakarta	B07_Rizky Pratama Adhi
14.45 – 15.00	Ratih Nurjayati	Multi criteria analysis for solid waste management	B08_Ratih Nurjayati

Time	Presenter	Title	Zoom Username/ID
		system in Indramayu coastal area	
15.00 – 15.15	Cynthia Henny	The occurrence of microplastics in the surface water of several urban lakes in the Megacity of Jakarta	B09_Cynthia Henny

Parallel oral session 3
Moderator: Mariska Margaret Pitoi, M.Sc.

Time	Presenter	Title	Zoom Username/ID
15.30 – 15.45	Anies Ma'rufatin	Effect of the implementation of community activity restriction policies during the COVID-19 pandemic on air quality	B10_Anies Ma'rufatin
15.45 – 16.00	Anna Fadliah Rusydi	Groundwater nitrogen concentration changes in an urbanized area of Indonesia over ten years period	B11_Anna Fadliah Rusydi
16.00 – 16.15	Raden Tina Rosmalina	Accuracy of photoelectrochemical COD on comparison with dichromate method on water sample	B12_Raden Tina Rosmalina
16.15 – 16.30	Sugiarti	Study of total dissolved solids (TDS) and total suspended solids (TSS) in estuaries in Banten Bay Indonesia	B13_Sugiarti
16.30 – 16.45	Susi Sulistia	Atmospheric concentrations of polybrominated diphenyl ethers (PBDEs) in passive air sampler from Batam Island, Indonesia	B14_Susi Sulistia
16.45 – 17.00	Riana Yenni Hartana Sinaga	Environmental impact study on conversion of multilayer metallized packaging to paving blocks with a life cycle assessment (LCA) approach	B15_Riana Yenni Hartana Sinaga

Parallel Session Schedule
Room C

(Topic: Green material and process; Climate change mitigation)

Tuesday, November 22, 2022

Parallel oral session 1
Moderator: Dr. Sri Priatni

Time	Presenter	Title	Zoom Username/ID
13.00 – 13.15	Wawan Kosasih	Preparation and characterization of omega-3 concentrate from lemuru fish (*Sardinella longiceps*) oil	C01_Wawan Kosasih
13.15 – 13.30	Hidawati	The effect of Carrageenan content on (L)-Lactic Acid production using *Lactobacillus plantarum*	C02_Hidawati
13.30 – 13.45	Hidayat	Chemical properties of biochar from rice husk under low - temperature pyrolysis	C03_Hidayat
13.45 – 14.00	Shelvi Listiana	Deep eutectic solvent as eco-friendly catalyst for synthesis hydroxyphenyl glycine methyl ester	C04_Shelvi Listiana
14.00 – 14.15	Fajar Al Afghani/ Muhammad ihsan sofyan	Coconut coir utilization as a catalyst precursor in the transesterification process of used cooking oil into cocodiesel	C05_Fajar Al Afghani/ Muhammad ihsan sofyan

Parallel oral session 2
Moderator: Dr. Monna Rozana

Time	Presenter	Title	Zoom Username/ID
14.15 – 14.30	Fathan Bahfie/ Lavita Indriani Br. Ginting	Study of titanium dioxide (TiO_2) extraction process from ilmenite Banten	C06_Fathan Bahfie/ Lavita Indriani Br. Ginting
14.30 – 14.45	Kiki Kurniawan	Chemical properties of biochar from avocado (*Persea americana*) seed using x-ray fluorescence spectrometer under Low temperature pyrolysis	C07_Kiki Kurniawan
14.45 – 15.00	Endra Triwisesa/ Yudhi Pramudya	Biochar from mahagony (*Swietenia mahagony l.jacq.*) woods and its chemical	C08_Endra Triwisesa/ Yudhi Pramudya

Time	Presenter	Title	Zoom Username/ID
		properties under low temperature pyrolysis as soil improvement	
15.00 – 15.15	Apip Amrullah	Distribution of phenolic compounds from marine macroalgae via pyrolysis	C09_Apip Amrullah

Parallel oral session 3
Moderator: Melania Hanny Aryantie, S. Hut., M.T.

Time	Presenter	Title	Zoom Username/ID
15.30 – 15.45	Erlangga Abdillah	The effect of teak plantation growth on air temperature and O_2 levels in green open spaces of the research and innovation department of perhutani forestry institute (PeFI)	C10_Erlangga Abdillah
15.45 – 16.00	Yanto Sudiyanto	Groundwater exploration using 2D resistivity method in water supply for prevention of peatland fire at Kahayan Kuala Area, Central Kalimantan	C11_Yanto Sudiyanto
16.00 – 16.15	Hilda Lestiana	Detecting the sensitivity of water content and deficiency rainfall during positive Indian Ocean Dipole events	C12_Hilda Lestiana
16.15 – 16.30	Moch. Ikhwanuddin Mawardi/ Khaerul Amru	Analysis of net zero emission index for several area in Indonesia using individual carbon foot print and land-use covered	C13_Moch. Ikhwanuddin Mawardi/ Khaerul Amru
16.30 – 16.45	Ressy Oktivia	Barrier analysis to leverage the climate change mitigation-adaptation implementation action in mangrove forest and its surrounding community villages	C14_Ressy Oktivia
16.45 – 17.00	Fitri Dara	Study on properties of rigid polyurethane foam as a thermal building insulator at varied mixing conditions	C15_Fitri Dara

Parallel Session Schedule
Room D

(Topic: Climate change mitigation; Environmental nanotechnology; Water, sanitation and hygiene)

Tuesday, November 22, 2022

Parallel oral session 1
Moderator: Dr. Arniati Labbani

Time	Presenter	Title	Zoom Username/ID
13.00 – 13.15	Raissa Anjani	Green Map application for supporting coastal eco-village development related to climate change mitigation-adaptation in Brebes Regency	D01_Raissa Anjani
13.15 – 13.30	Firman Prawiradisastra	Forensic assessment of landslides induced by environmental changes in Cimanggung, Sumedang, an important step for the future disaster prevention	D02_Firman Prawiradisastra
13.30 – 13.45	Budi Heru Santosa	Exploring household flood resilience index using composite indicator method	D03_Budi Heru Santosa
13.45 – 14.00	Budi Kartiwa	Water level and soil moisture monitoring for peatland fire risk indicator	D04_Budi Kartiwa
14.00 – 14.15	Widiatmini Sih Winanti	The assessment of climate change research in support of Indonesia's net zero emission target – case study at BRIN	D05_Widiatmini Sih Winanti

Parallel oral session 2
Moderator: Dr. Eng. Dani Permana

Time	Presenter	Title	Zoom Username/ID
14.15 – 14.30	Swasmi Purwajanti	Green synthesis of Ag nanoparticle-decorated MgO microspheres by *Curcuma xantorrizha* extract and its potential antimicrobial activity	D06_Swasmi Purwajanti
14.30 – 14.45	Arniati Labanni	*Uncaria gambir Roxb.* mediated synthesis of highly	D07_Arniati Labanni

Time	Presenter	Title	Zoom Username/ID
		stable silver nanoparticles in the presence of triethanolamine as capping agent	
14.45 − 15.00	Windri Handayani	Phytotoxicity study of silver nanoparticles on germination of water spinach (*Ipomoea aquatica Forsk.*) and green mustard (*Brassica rapa L.*) seeds	D08_Windri Handayani
15.00 − 15.15	Isnaeni	Carbon dots for improving water and oil absorption of sponges	D09_Isnaeni

Parallel oral session 3
Moderator: Panji Cahya Mawarda M.Sc., Ph.D.

Time	Presenter	Title	Zoom Username/ID
15.30 − 15.45	Mahmud Aditya Rifqi	Handwashing skill and contamination of coliform bacteria in the hands of urban-slum primary students in Indonesia	D10_Mahmud Aditya Rifqi
15.45 − 16.00	Sri Mulyani Suharno	Evaluation of human urine purification using rice husk charcoal as the adsorbent	D12_Sri Mulyani Suharno
16.00 − 16.15	Wilda Naily	Distribution of *Escherichia coli* and coliform in groundwater at Leuwigajah and Pasirkoja District, Bandung Raya, Indonesia	D13_Wilda Naily
16.15 − 16.30	Diana Rahayuning Wulan	Trihalomethanes formation potential of polluted tropical river water and its correlation with UV-Vis spectral ratio: A case study in Citarum River, Indonesia	D14_Diana Rahayuning Wulan
16.30 − 16.45	Ardie Septian	Removal of dibenzofuran contaminated groundwater using electrochemical activated persulfate	D15_Ardie Septian

SYMPOSIUM SCHEDULE DAY 2

Wednesday, November 23, 2022

Time	Program	Duration
08.00 – 09.00	Registration	01:00
09.00 – 09.05	Opening	00:05
09.05 – 09.50	**Keynote session 2** Moderator: Dwindrata Basuki Aviantara, S.Si., MSMC	
	Keynote speaker 4 Dr. Go Suzuki (National Institute for Environmental Studies, Japan) "Methodology to prevent microplastics pollution: Efforts for tackling plastic pollution in Japan"	00:45
09.50 – 10.35	Moderator: Dr.rer.nat. Chandra Risdian	00:45
	Keynote speaker 5 Dr. Kengo Suzuki (Euglena Co., Ltd., Japan) "Research and development on the functionality of components derived from *Euglena*"	
10.35 – 10.40	Break	00:05
10.40 – 12.10	**Parallel Oral Session 1**	01:30
	Room A (A16 – A21)	
	Room B (B16 – B21)	
	Room C (C16 – C21)	
	Room D (D16 – D21)	
12.10 – 13.00	Break	00:50
13.00 – 13.45	**Keynote session 3** Moderator: Dr. Hanies Ambarsari	
	Keynote speaker 6 Prof. Imasiku Anayawa Nyambe (1. Zambia Academy of Sciences; 2. Geology Department and University of Zambia (UNZA) IWRM Centre) "Environmental Impact of copper and lead mining to water, agricultural plants and human health in Zambia"	00:45
13.45 – 13.55	Break	00:10
13.55 – 15.25	**Parallel Oral Session 2**	01.30
	Room A (A22 – A27)	
	Room B (B22 – B27)	
	Room C (C22 – C27)	
	Room D (D22 – D27)	
15.25 – 15.40	Break	00:15
15.40 – 16.55	**Parallel Oral Session 3**	01:15
	Room A (A28 – A32)	
	Room B (B28 – B32)	
16.55 – 17.05	Break	00:10
17.05 – 17.10	**Closing day 2**	00:05

Join zoom meeting for day 2

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Passcode: 065456

Parallel Session Schedule
Room A

(Topic: Waste treatment and valorization; Environmental nanotechnology)

Wednesday, November 23, 2022

Parallel oral session 1
Moderator: Umi Hamidah, Ph.D.

Time	Presenter	Title	Zoom Username/ID
10.40 – 10.55	Ikbal	A series anaerobic-aerobic down-flow hanging sponge (DHS) reactor for the treatment of palm oil mill effluent (POME)	A16_Ikbal
10.55 – 11.10	Andik Irawan	Study on biogas production from coffee-waste and cow-dung fermentation and its use towards reducing emissions from coffee roasting	A17_Andik Irawan
11.10 – 11.25	Prihartanto	Characteristics of humate soil from landfill mine in Bantargebang integrated solid waste treatment facility, Indonesia	A18_Prihartanto
11.25 – 11.40	Cut Keumala Banaget	Torrefaction of municipal solid waste (MSW)	A19_Cut Keumala Banaget
11.40 – 11.55	Ahmad Shoiful	Palm oil mill effluent (POME) treatment using combined anaerobic-microalgae down-flow hanging sponge (DHS) reactor	A20_Ahmad Shoiful
11.55 – 12.10	Ernoiz Antriyandarti	The development of waste bank management to improve household income in Surakarta City	A21_Ernoiz Antriyandarti

Parallel oral session 2
Moderator: Sandia Primeia, Ph.D.

Time	Presenter	Title	Zoom Username/ID
13.55 – 14.10	Samdi Yarsono	Organic waste handling with cylindrical rotating perforated drum type; case study of Ciater Permai, South Tangerang, Indonesia	A22_Samdi Yarsono
14.10 – 14.25	Kuat Heriyanto	Simulation of neutron shielding performance of Al-Cd alloy for radioactive waste container	A23_Kuat Heriyanto
14.25 – 14.40	Sri Wahyono	Identification and analysis of municipal solid waste pre-treatment to improve waste quality for waste to energy facility	A24_Sri Wahyono
14.40 – 14.55	Ali Rahmat	Chemical properties of coffee waste biochar under different temperatures of pyrolysis	A25_Ali Rahmat
14.55 – 15.10	Rossy Choerun Nissa	Characterization of microcrystalline cellulose from red seaweed *Gracilaria verucosa* and *Eucheuma cottonii*	A26_Rossy Choerun Nissa
15.10 – 15.25	Hanies Ambarsari	The effectiveness of coconut shell charcoal and activated carbon on deodorization of sludge from ice cream industry WWTP	A27_Hanies Ambarsari

Parallel oral session 3
Moderator: Dr. Swasmi Purwajanti, M.Sc.

Time	Presenter	Title	Zoom Username/ID
15.40 – 15.55	Fransiska Sri Herwahyu Krismastuti	Irradiation time dependent of the ZnO/GO composite formation on the photodegradation of Rhodamine B	A28_Fransiska Sri Herwahyu Krismastuti
15.55 – 16.10	Gita Genecya	Optimization of mechanical properties of carrageenan-based bioplastic as food packaging	A29_Gita Genecya
16.10 – 16.25	Vienna Saraswaty/ Een Sri Endah	Phyto-assisted synthesis of zinc oxide nanoparticles using mango (Mangifera	A30_Vienna Saraswaty/ Een Sri Endah

Time	Presenter	Title	Zoom Username/ID
		indica) fruit peel extract and their antibacterial activity	
16.25 – 16.40	Athanasia Amanda Septevani	Production of nanocellulose using controlled acid hydrolysis from large-scale production of micro-fibrillated cellulose derived from oil palm empty fruit bunches	A31_Athanasia Amanda Septevani
16.40 – 16.55	Vithria Nida	Antibacterial potential of zinc oxide nanoparticles derived from pineapple peel aquous extract	A32_Vithria Nida

Parallel Session Schedule
Room B

(Topic: Environmental monitoring, modelling, and assessment; Climate change mitigation)

Wednesday, November 23, 2022

Parallel oral session 1
Moderator: Dr. Kemal Maulana Alhasa, S.T., M.Sc.

Time	Presenter	Title	Zoom Username/ID
10.40 – 10.55	Agus Sudaryanto	Spatial distribution of atmospheric polychlorinated biphenyls (PCBs) in Jakarta Great Area using passive air sampler	B16_ Agus Sudaryanto
10.55 – 11.10	Nilawati	The effect of geomembrane plastic usage on microplastic and heavy metal contamination in salt field	B17_Nilawati
11.10 – 11.25	Dwi Sarah	Mapping the environmental impacts from land subsidence hazard in Pekalongan City and its correlation with the subsurface condition	B18_Dwi Sarah
11.25 – 11.40	Asep Mulyono	Assessment of soil vulnerability index for surface runoff in Kawal watershed, Bintan island	B19_Asep Mulyono

Time	Presenter	Title	Zoom Username/ID
11.40 – 11.55	Fuzi Suciati	Chemicals of concern for sustainability of Indonesian textile	B20_Fuzi Suciati
11.55 – 12.10	Moch. Hilmi Zaenal Putra	Modelling and mapping the environmental impact from debris flow hazard on alluvial fans for sustainable development in Bangga and Poi Villages, Sigi, Central Sulawesi	B21_Moch. Hilmi Zaenal Putra

Parallel oral session 2
Moderator: Astried Sunaryani, M.T.

Time	Presenter	Title	Zoom Username/ID
13.55 – 14.10	Suhendar I Sachoemar/ Haryanti	The assessment of sustainable aquaculture model to improve the aquatic environment and productivity in the Indonesian coastal area	B22_ Suhendar I Sachoemar/ Haryanti
14.10 – 14.25	Iif Miftahul Ihsan	Health risk assessment of PM2.5 and PM10 in KST BJ Habibie	B23_Iif Miftahul Ihsan
14.25 – 14.40	Wahyu Garinas	Mining waste quality (mercury) and effect on river water quality around the small-scale gold mining locations (case study: West Sumbawa location)	B24_Wahyu Garinas
14.40 – 14.55	Imroatushshoolikhah	Benthic macroinvertebrates community to response environmental factors in a crater lake (study case: Lake Menjer, Indonesia)	B25_Imroatush shoolikhah
14.55 – 15.10	Relita Novianti	Water quality and financial feasibility analysis in the development effort of farming milkfish in Pabean Ilir Village, Indramayu, West Java	B26_Relita Novianti
15.10 – 15.25	Tastaptyani Kurnia Nufutomo	Analysis and identification of Citarum watershed pollution for monitoring	B27_Tastaptyani Kurnia Nufutomo

		the sustainability of water resources	

Parallel oral session 3
Moderator: Ir. Lies Indriati

Time	Presenter	Title	Zoom Username/ID
15.40 – 15.55	Handy Chandra	An overview of the circular economy activity for small island wastes and marine debris	B28_Handy Chandra
15.55 – 16.10	Sabudin/ Insan Nur Sulistiawan	Identifying environmental variables in potential flood hazard area using machine learning approach at Musi Banyuasin Regency, South Sumatra	B29_Sabudin/ Insan Nur Sulistiawan
16.10 – 16.25	Ikhsan Budi Wahyono	Spatial distribution of carbon dioxide (CO_2) fluxes in the Sunda Strait and west of Sumatra waters	B30_Ikhsan Budi Wahyono
16.25 – 16.40	Raissa Anjani/ Hengky Siahaan	Initial growth of four endemic species in degraded peat swamp forest revegetation in effort to support climate change mitigation and adaptation	B31_Raissa Anjani/ Hengky Siahaan
16.40 – 16.55	Rusmi Sri Wiyati	Climate change mitigation by implementation of circular agriculture system: a preliminary study on community perspective and preferences on organic waste valorization	B32_Rusmi Sri Wiyati

Parallel Session Schedule
Room C

(Topic: Green material and process; Environmental remediation and reclamation)

Wednesday, November 23, 2022

Parallel oral session 1
Moderator: Dr. Desak Gede Sri Andayani

Time	Presenter	Title	Zoom Username/ID
10.40 – 10.55	Ardi Ardiansyah	Synthesis and characterization of calcium phosphate (tricalcium phosphate/calcium pyrophosphate) from snail shell (*Achatina fulica*)	C16_Ardi Ardiansyah
10.55 – 11.10	Chandra Risdian	Conversion of soybean meal as agro-industrial by-product for production of antibacterial and antioxidant agents by actinobacteria	C17_Chandra Risdian
11.10 – 11.25	Diah Ratnaningrum/ Chandra Risdian	Protease production by soil bacteria for green technology: screening and optimization	C18_Diah Ratnaningrum/ Chandra Risdian
11.25 – 11.40	Dian Andriani	Optimization of edible film production: natural dyes addition	C19_Dian Andriani
11.40 – 11.55	Elsy Rahimi Chaldun	Physicochemical Properties of Sodium Alginate from Brown Alga *Sargassum aquifolium* and *Sargassum cinereum*	C20_Elsy Rahimi Chaldun
11.55 – 12.10	Silvy Djayanti	Quick sterilization spirulina powder through dry ozonization for pharmaceutical preparations	C21_Silvy Djayanti

Parallel oral session 2
Moderator: Nurfitri Abdul Gafur, Ph.D.

Time	Presenter	Title	Zoom Username/ID
13.55 – 14.10	Fitri Yola Amandita	The growth of mercury-resistant bacterial consortium at different levels of pH, temperature and C:N ratio	C22_Fitri Yola Amandita
14.10 – 14.25	Rissa Anungstri	Passive removal of sulphate and heavy metals from acid mine drainage using sewage sludge and fly ash	C23_Rissa Anungstri
14.25 – 14.40	Irma Melati	Chromium (VI) bioremediation potential of dark septate endophytic (DSE) fungi	C24_Irma Melati
14.40 – 14.55	Wahyu Widiyono	Value chain of cocopeat bio-textile for reclamation of degraded land in Indonesia	C25_Wahyu Widiyono
14.55 – 15.10	Aryanti	Potential of irradiated inoculants consortium for zinc accumulation in rice mutant lines	C26_Aryanti
15.10 – 15.25	Gunawan Pratama Yoga/ Rina Andriyani	Removal of mercury using local isolate of *Penicillium* sp. strain A4 and its toxic effects on fish	C27_Gunawan Pratama Yoga/ Rina Andriyani

Parallel Session Schedule
Room D

(Topic: Water, sanitation and hygiene;
Environmental monitoring, modelling and assessment)

Wednesday, November 23, 2022

Parallel oral session 1
Moderator: Ardie Septian, S.Si., Ph.D.

Time	Presenter	Title	Zoom Username/ID
10.40 – 10.55	Rizka Maria	The geo-environmental influence on hydrogeochemical conditions in the Tanjaknangsi volcanic region	D16_Rizka Maria

Time	Presenter	Title	Zoom Username/ID
10.55 − 11.10	Syuhada	Preliminary study of microplastic in bottled drinking water	D17_Syuhada
11.10 − 11.25	Sri Irianti	Implementation of drinking water quality surveillance and household water management practices in selected provinces	D18_Sri Irianti
11.25 − 11.40	Muhibbudin Al Fahmi	A review of ammonium issues in Indonesian groundwater: Potential sources and removal methods	D19_Muhibbudin Al Fahmi
11.40 − 11.55	Taty Hernaningsih	Application of the concept of smart city and smart water management for new capital city	D20_Taty Hermaningsih
11.55 − 12.10	Danar Agus Susanto	Perceptions of consumers, housing supervisors, and planners on the house plumbing system	D21_Danar Agus Susanto

Parallel oral session 3
Moderator: Willy Cahya Nugraha, M.Sc., Ph.D.

Time	Presenter	Title	Zoom Username/ID
13.55 − 14.10	Satmoko Yudo	Water quality data analysis from monitoring system (onlimo) at 16 stations location in priority watersheds and lakes	D22_Satmoko Yudo
14.10 − 14.25	Budi Kurniawan	The development of action plan of Jeneberang River pollution control based on the calculation of total maximum daily load	D23_Budi Kurniawan
14.25 − 14.40	Tiny Agustini Koesmawati	Mercury analysis from fish samples using Cold Vapour-Atomic Absorption Spectrophotometry (CV-AAS) method with Sodium Borohydride as the reductor	D24_Tiny Agustini Koesmawati
14.40 − 14.55	Agung Riyadi	Seasonal hydrodinamic pattern and effect of	D25_Agung Riyadi

Time	Presenter	Title	Zoom Username/ID
		marine sediment distribution in Banten Bay	
14.55 – 15.10	Irfan Budi Pramono	Effect of rainfall on assessment of hydrologic sustainability in Citanduy Sub Watersheds	D26_Irfan Budi Pramono
15.10 – 15.25	Fajar Yudi Prabawa	Mapping a vicious-cycle of community gold mining (CGM): case study of a CGM site at Sukabumi Regency, Indonesia	D27_Fajar Yudi Prabawa

KEYNOTE SPEAKERS

Keynote Speaker 1

Prof. Kurunthachalam Kannan

Professor in the Department of Pediatrics, and Department of Environmental Medicine at New York University School of Medicine

Dr. Kurunthachalam Kannan is a Professor in the Department of Pediatrics, and Department of Environmental Medicine at New York University School of Medicine. Before joining NYU in 2020, he was the deputy Director of the Division of Environmental Health Sciences at Wadsworth Center, New York State Department of Health in Albany, New York. He has published over 800 research articles in peer-reviewed journals. Dr. Kannan is a highly cited researchers in Environmental Sciences with an H-index of 140 (google scholar). He is known for his work on the discovery of perfluorochemicals in the global environment, among several others. Currently his research is focused on biomonitoring of human exposure to organic pollutants. He was on the editorial board of several journals and editor-in-chief of several journals. He has mentored more than 15 Master's and doctoral level students and advised more than 60 postdoctoral research associates in his laboratory. Dr. Kannan is well known internationally for his work on contaminants in the environment.

Biomonitoring of human exposure to environmental chemicals in the context of exposome

Kurunthachalam Kannan
Departments of Pediatrics and Environmental medicine, New York University School of Medicine, New York, USA
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Long term, low-level exposure to a variety of toxic environmental chemicals present in the environment can interfere with hormone function and contribute to the development of a variety of diseases and health problems. To address the exposure to toxic chemicals to which people are exposed, and the amounts of chemicals in people's bodies, many developed nations have implemented nation-wide biomonitoring programs. Biomonitoring is the direct measurement of people's exposure to toxic substances by measuring the substances or their metabolites in human specimens, such as blood or urine. Biomonitoring is one of the important tools in the study of exposome, which is the totality of human environmental exposures from conception onwards.

To complement the results obtained in biomonitoring studies, we also measured contaminants in various exposure sources including dust, indoor air, cosmetics, and food samples for the calculation of daily exposure doses using the direct measurements. A comparison was made between the exposure doses calculated using the biomonitoring approach and the direct measurement of contaminants in food, air, dust and personal care products. Biomonitoring of phthalate exposure in the US yielded a median exposure dose in the US population of approximately 500-600 μg/day. However environmental exposure assessment from known sources accounted for only 98 μg/day. This approach helped in the identification of novel metabolites of toxic chemicals in human specimens. Several multinational studies were conducted to elucidate global exposure patterns of emerging environmental contaminants.

Current research is focused on developing multiclass chemical analysis methods, effect biomarkers, elucidating the association between chemical exposures and health outcomes in populations. Efforts are made to link biomonitoring with exposomic studies and in developing human adverse outcome pathways in disease etiology. The exposure assessment studies are further advanced to the concept of exposome which includes biomonitoring and metabolomic analyses of human specimens.

Keynote Speaker 2

Associate Prof. Dr. Eng. Muhammad Aziz
Institute of Industrial Science, The University of Tokyo

Dr. Aziz is currently an Associate Professor at Institute of Industrial Science, The University of Tokyo, Tokyo, Japan. He received B. Eng., M. Eng., and D. Eng. degrees from Kyushu University, Japan, in 2004, 2006 and 2008, respectively, in the field of mechanical engineering. He was working previously as associate professor (2015-2019) and assistant professor (2011-2015) at Tokyo Institute of Technology, researcher at Institute of Industrial Science, The University of Tokyo (2009-2011), mechanical designer at Seiko Epson Corp. (2008-2009), and lecturer at Ritsumeikan Asia Pacific University (2007-2008). In April 2019, he was selected as UTokyo Young Excellent Researcher 2018 promoting him for the current position. He was the President of International Indonesian Scholars Association (Ikatan Ilmuwan Indonesia International) during 2020–2022.

His general research areas are advanced energy systems. His research interest includes power generation, energy management system, renewable energy utilization, process modeling, smart grid, electric vehicle, battery, hydrogen production, storage and utilization, ammonia production and utilization, heat exchanger enhancements, hydrogen combustion, waste-to-energy. He has published more than 175 peer-reviewed journals, 25 books and book chapters, and more than 200 proceedings. In addition, he is also active as a reviewer for more than 60 distinguished journals related to energy research. He also owns Japanese patent related to mechanical movement (drive) adopted until today.

He has received several awards including Young Researcher Award from Asian Pacific Confederation of Chemical Engineering Congress in 2012, Outstanding paper award from Journal of Chemical Engineering of Japan in 2013, Japan Institute of Energy Award for Encouragement from Japan Institute of Energy in 2016, The Best Paper Award from Japan Society of Energy and Resources in 2018, and UTokyo Young Excellent Researcher 2018 in 2019.

He owns and manages some national and international research projects including Japan Science and Technology (JST, Japan), Japan International Cooperation Agency (JICA, Japan), Japan Society for the Promotion of Science (JSPS, Japan), New Energy and Industrial Technology Development (NEDO, Japan), New Energy Promotion Council (NEPC, Japan), and others collaborative research with industries and universities.

Highly-energy efficient biomass and waste conversion to hydrogen: toward sustainable decarbonization

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Decarbonization has become an important task for all the country to achieve carbon neutrality. Massive adoption of renewable energy has been taken as one of the decarbonization policies. However, renewable energy sources generally face some challenges, including fluctuation, availability, and technological readiness. Among those renewables, biomass and wastes are considered potential, especially in terms of low fluctuation and technological readiness. Both resources are potential to cover both base-load and adjusting power generation as they can be stored and their operation can be controlled. On the other hand, hydrogen is getting higher interest currently due to its characteristics of cleanliness and high energy efficiency. The conversion of those biomass and waste to hydrogen is considered as the excellent method to simultaneously generate and store the carbon-free energy. Some technologies to convert biomass and waste to hydrogen include bio- and thermos-chemical routes. Furthermore, a new technology called as chemical looping hydrogen production has been developed to convert those biomass and waste directly to hydrogen, while separating the generated CO_2. Therefore, a negative CO_2 system can be achieved. The chemical looping hydrogen production technology has three circulated reactors, including reducer, oxidizer, and combustor. An oxygen carrier is utilized as the medium to transfer oxygen and heat among the reactors.

Keynote Speaker 3

Kwanyoung Kim, Ph.D.
Director of Green Technology Partnership Initiative
Senior Researcher of Center for Climate Technology Cooperation.

Kwanyoung Kim, Ph.D received a Ph.D. in Business & Technology Management from KAIST in 2015. He was an Adjunct Professor of Business and Technology Management, Department of Industrial Management, Korea University of Technology & Education, Korea. Currently he is a director of Green Technology Partnership Initiative, Korea Institute of Science and Technology, Korea. He is also a Senior Researcher of Center for Climate Technology Cooperation. He has many international and domestic teaching experiences. His research interest in Green and Climate Change, Renewable Energy, Solid Waste Management. He is also interested in Organizational & Professional Commitment, Organizational & Professional Identification.

ASEAN-ROK green transition and carbon neutrality joint response and its sustainable governance establishment and implementation strategy development

Kwanyoung Kim
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By innovative green STI and Climate Technology policy & technical support with demand survey for sustainable demand analysis and development systematization, it is needed to do joint response for green transition and carbon neutrality among ASEAN Member States (AMSs) and Korea. ASEAN-Korea green transformation joint response and its ASEAN-Korea cooperation for development of implementation strategy through green transition and carbon-neutrality joint response through national capacity enhancement support and green transformation support by policy mentoring and program & project discovery as well as by the regional green STI transformation cooperation with local government in ASEAN Member States (AMSs) are heading up the two outputs such as the establishment of ASEAN-Korea Green Transition Joint Response Governance and the development of the Green Climate Cooperation Governance Implementation Strategy.

The four modules of the initiative are composed of:
1) ASEAN-Korea Green Transition Joint Response and its Demand Survey Systematization with the activities such as analysis and demand survey, discussion of agenda, capacity building by workshop, and policy suggestion

2) ASEAN-Korea Green Technology Joint Response and its Governance Establishment and Implementation Strategy Development with the activities such as analysis and discussion of agenda, workshop and policy mentoring

3) ASEAN-Korea Green Transition Joint Response and its Sustainable Business Plan Development and National Innovation Capacity Enhancement with the activities such as discussion of agenda, workshop, policy-mentoring and training and development for capacity-building

4) ASEAN-Korea Green Transition Joint Response and its Regional Development Cooperation Program Development for Regional Green Transition Effectiveness with the activities such as discussion of agenda, workshop, policy-suggestion and capacity-enhancement.

This research is expected to strengthen bilateral and multilateral cooperation in green STI and climate technology for preparing green transition joint response and to strengthen support for securing sustainable reductions in greenhouse gases among ASEAN and Korea.Exploring of the potential laccase-producing fungi from the tropical forest for degradation of polycylic aromatic hydrocarbons (PAHs)

Keynote Speaker 4

Dr. Go Suzuki

Material Cycles Division, National Institute for Environmental Studies, Japan

Dr. Go Suzuki received a Ph.D. in Agriculture from The United Graduate School of Agricultural Sciences, Iwate University, Japan in 2005. He started his career at the National Institute for Environmental Studies in 2002 as a Research Assistant, became a Postdoctoral Fellow in 2005, and then promoted to a full time Researcher in 2010. He received a Superlative Postdoctoral Fellowship from Japan Society for the Promotion of Science and conducted research at the Ehime University (2008–2010). He also spent a year at the BioDetection Systems B.V. and VU University Amsterdam in Netherlands as a visiting researcher (2009–2010). He was promoted as a Senior Researcher in April 2015 and as a Chief Senior Researcher in April 2021. His current research focus is mainly on risk management of plastic and related compounds during plastic lifecycle.

Methodology to prevent microplastics pollution: Efforts for tackling plastic pollution in Japan

Go Suzuki, Kosuke Tanaka, Yusuke Takahashi, Hidetoshi Kuramochi, Masahiro Osako
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The inadequate collection and disposal of plastic waste has caused marine plastic pollution to become a most pressing environmental issue. As part of the United Nations Environment Programme, the United Nation Environment Assembly has implemented an initiative "End Plastic Pollution: Towards an internationally legally binding instrument", which resolves to set up an Intergovernmental Negotiating Committee (INC) to draft a legally binding agreement by 2024 and to create a science-policy panel on chemicals and waste to fill the gap between science and policy. To do this, the INC needs up-to-date scientific knowledge of marine plastic pollution. In Japan, under such circumstances, Ministry of the Environment (MOE) has been engaged in marine plastic pollution and the National Institute for Environmental Studies researches the lifecycle of plastics—design, production, reuse, disposal, and recycling—to collect scientific findings for more effective and efficient reduction of plastic waste and pollution. This presentation summarizes efforts by MOE, our previous studies, outlines current results, and introduces future directions of our research on the emissions and control of microplastics (plastics <5 mm in length) during recycling and management of plastic waste. We hope that the results will contribute to a better understanding of the behavior and fate of microplastics in the environment that will help us to "End Plastic Pollution".

Keynote Speaker 5

Kengo Suzuki, Ph.D.
Executive Officer CTO and R&D Company Co-CEO of Euglena Co., Ltd. Japan

Kengo Suzuki, Ph.D, currently works in Euglena Co., Ltd as Research and Development Company Co-CEO. Euglena Co., Ltd. is a biotechnology company that researches, develops, produces, and markets microalgae. Received his PhD in the field of medical science from Kitasato University in 2019 and in Agriculture from the University of Tokyo in 2016. His career at Euglena starts at 2005 until now. Since the establishment of the company, he has been engaged in the production and development of Euglena-derived biofuel. His research interest mainly in the field of Phycology, Food science, Molecular biology and Immunology Currently, he is also appointed as visiting professor at the University of Gadjah Mada (UGM).

Research and development on the functionality of components derived from *Euglena*

Euglena is a microalga of about 0.05 mm in size that lives mainly in freshwater swamps, ponds, and rice paddies. *Euglena* can efficiently produce proteins while performing photosynthesis on its own. Therefore, it has been considered as a potential material that can solve the world's food shortages with a low environmental burden. The high nutritional value and usefulness of *Euglena* have led to expectations that it could be used as food, but the difficulty of mass cultivation has prevented the material from reaching the market. However, in 2005, Euglena Co., Ltd. achieved outdoor mass cultivation for food use. Since then, *Euglena* has been widely distributed as food and is now used as a supplement and food material.

So far, oral intake of *Euglena* has been shown to have the potential to bring about various effects such as improvement of lifestyle-related disease symptoms, intestinal environment, and immune modulation. We introduce research which provided evidence for getting the certificate of food with function claims designated by Japanese government for *Euglena*, development of gene editing technology of *Euglena*, the research to confirm the effect of paramylon using genome-edited strain which is gene deletion mutant of EgGSL2 gene, an enzyme involved in paramylon synthesis. We furthermore show more applicable study such as, the development of a health product related to prebiotics, "Green tempe", in Indonesia by adding microalgae to the fermentation process, that is "Green fermentation" as fermentation remodeling and the development of an algae production system that supports material circulation and contributes to improving human health, based on the assumption that people will be living on the Moon in 2040.

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Keynote Speaker 6

Prof. Imasiku Anayawa Nyambe
Vice President, Zambia Academy of Sciences
O.R. Tambo Africa Research Chairholder at UNZA – Water Conservation

Professor Imasiku Anayawa Nyambe, the Vice-President of the Zambia Academy of Sciences and a Full Professor of geology in the Geology Department of the School of Mines and Coordinator of the University of Zambia (UNZA) Integrated Water Resources Management (IWRM) Centre, a Centre that he established in 2006. He has a Ph.D in earth sciences (sedimentology) 1993 from University of Ottawa, Ontario, Canada. He has an H-Index of 24, and published over 150 articles. Professor Nyambe has recently been awarded the O.R. Tambo Africa Research Chair – Water Conservation, 2020 at UNZA.

Environmental impact of copper and lead mining to water, agricultural plants and human health in Zambia

Imasiku Anayawa Nyambe
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Mining has been known to fuel the socio-economic development of many countries, for example in Zambia, large-scale copper-cobalt mining developed in the 1930s and have continued to be in existence since that time. This has supported the social and economic development of the country accounting for about 93% of all of Zambia's foreign exchange earnings in 1991, and up to 80% in 2016. Copper production surpassed tonnages of over 600,000 tonnes between 1964 and 1980, and climbed to over 800,000 tonnes from 2011 to 2021.

A century of mining meant that the mining companies had to have licenses to discharge waste into the environment. Having these huge copper tonnages as well as open-cast operations, mining has created 1.899 million tonnes of overburden, covering an area of about 206,465ha, approximately 77 million tonnes of waste rock amounting to an area of 388 ha, 40 million tonnes of slag in an area of 279 ha, 791 million tonnes of tailings in an area of 9,562ha; with a total of 216,257ha occupying land for other purposes based on 2005 data. These have negatively impacted the environment and the ecosystem resulting in chemical pollution of water resources and agricultural plants in the Copperbelt region. Cobalt (Co), copper (Cu), manganese (Mn), selenium (Se), sulphates (SO4), calcium (Ca) and magnesium (Mg) markedly exceeding the permissible values for surface waters in the European Union. Limits for cadmium (cd), nickel (Ni) and zinc (Zn) and lead (Pb) also exceed the standards.

Processing facilities consisting mainly of crushers, concentrators, smelters and refineries produce tailings that feed into tailing impoundments providing dust fallout on dry sections of the impounded areas affecting plant life, whereas their dams leak, discharging a pulp rich in iron (fe) and other heavy metals. The pH of waste waters from ore dressing plants employing chemical technologies fluctuated between 2.04 and 3.62 when insufficiently limed. The contents of Cu in these precipitates vary between 800 and 2,500 ppm, Co between 780 and 1,900 ppm, arsenic (As) between 2.7 up to 350 ppm, and Pb between 14 and 270 ppm. The contents of toxic elements in stream sediments reach 1,296 ppm arsenic, 3,660 ppm cobalt, 1,257 ppm chromium, 65,460 ppm copper, 6.47 ppm mercury, 48 ppm molybdenum, 360 ppm nickel, 1,370 ppm lead, 3,590 ppm zinc and 2.1 % sulphur total.

In agricultural plants, high concentration in roots and leaves have been noted in cassava roots and leaves for both arsenic and copper greater than 5 ppm and 200 ppm respectively growing near smelter plants mainly, and tailing impoundments. Consumption of foods that grow up in polluted sites can be a health risk to humans and in Kabwe, Central Province of Zambia, where lead mining closed in 1994 after almost 100 years of mining, this has been a serious problem because blood lead levels particularly in children are above the reference level of 5.5 µg/dL to as much as above 50 ug/dl in some children. In contaminated soils, the lead can be above 20,000 pm and in some plants as much as 35ppm.

In conclusion and recommendation, there should be application of soil amendments to immobilize lead, copper and arsenic in the soil such as compost, animals manure, biochar, and phosphate fertilizers before planting, and mix in the topsoil – to reduce lead, copper and arsenic levels in the edible plant parts and improve crop growth. In Kabwe, complete covering with clean top-soil the source area is recommended. Thorough washing of vegetables before cooking such as cassava leaves and other vegetables as lead, copper and arsenic containing dust particles accumulate on the vegetables whilst in the field. Thorough washing of vegetables before cooking has been shown to significantly reduce the concentration in cooked food as a simple, very effective practice that also promotes general hygiene. Therefore monitoring, maintaining standards and public awareness are strongly recommended as government is still finding a way of dealing with these environmental issues.

ORAL SESSION

X01

Psychological distress among urban-slum sanitation workers during the COVID-19 pandemic

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Abstract. COVID-19 has brought an unprecedented crisis to human beings and caused a tremendous impact on our lifestyle, and subsequently health and well-being. In the fight against this enormous event, essential workers (e.g., healthcare workers), also known as frontliners and/or key workers, have put in huge effort to save lives and keep community clean and hygienic, and functioning. During this period of time, their dedicated service has been widely recognized, appreciated and praised as indispensable by general public, government leaders and media. However, this does not discount the fact that they are physically and psychologically distanced by society due to the nature of their work and the strongly-held fear that they are the carriers of the pathogen. Indeed, many studies reported high levels of anxiety, depression, fear and subsequent poor quality of sleep and impaired mental well-being. This also includes sanitation workers such as garbage collectors, who work at the expense of their safety, health and dignity. Given the inevitable daily contact with various kinds of wastes that may expose them to the highly contagious virus, it is highly possible that negative reactions from society are directed at this occupational group, which may cause a sense of fear among the workers, particularly among those without personal protective equipment. Furthermore, this may subsequently lead to the above-mentioned adverse mental health outcomes. In this regard, the present study sought to explore psychological distress faced by 60 urban-slum garbage workers that are the formal sector of street cleaners (N = 40) and informal sector of garbage collectors (N = 20) in Bandung, West Java, Indonesia through established instruments that are designed to evaluate anxiety, depression, self-esteem and quality of life along with the fear of COVID-19. Our findings are discussed in relation to existing literature on essential workers' mental well-being, which convey important implications for scholars, governments, and health practitioners targeting this population.

Keywords: COVID-19; garbage workers; mental well-being; occupational health; sanitation

X02

SaniCamp: an event to stimulate young people's interest and curiosity about water and sanitation

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Abstract. Research collaborations in the field of sustainable sanitation that have been carried out by our team so far have focused more on community actors in general, especially on adults. Observations in the community on material flow related to sanitation and sanitation infrastructure almost only involve adults, assuming they are responsible and decision-makers for this. The introduction and application of technology to make life easier for users often faces challenges or rejection from the intended users for various reasons, for example not in accordance with customs or religious rules, being considered difficult, etc.

On the other hand, youth and children normally more easily accept and adapt to something new. Their acceptance of new environmental-friendly technology will further increase the chances of acceptance by older people or parents who also play a more frequent role as decision-makers in a family or community. The role of young people as agents of change to improve sanitation and the environment is a concern in this study.

The Sanitation Camp or SaniCamp program during the Covid-19 pandemic was carried out to introduce simple principles of sustainable sanitation, observe the opinions of youth who are more open-minded to issues of sanitation and technology, and then discuss among themselves about their observations on sanitation, water and sanitation. The participants were a group of youth from a high school in Bandung - Indonesia, a group of youth from a high school in Furano, Hokkaido - Japan, and a group of young people from an NGO in an area of Lusaka - Zambia. The event was held online only for half a day due to the significant time difference between Indonesian-Japanese participants and participants from Zambia. In this presentation, only the activities of the Indonesian and Japanese groups will be reported. Both groups are high school students.

Keywords: SaniCamp; youth; sanitation; water; wastewater

X03

Protecting the Environment with Reliable Instrument Agilent GC/GCMS/MS

Nelfriani

PT. Berca Niaga Medika

Abstract. Monitoring contaminants in environmental matrices such as air, water, and soil, and broadening the understanding of how these chemicals can affect human and animal health, is critical but often very challenging. Today's challenges have never been greater, whether analyzing contaminants in wastewater and purity of drinking water, measuring indoor air quality, responding to natural or man-made disasters, or identifying emerging contaminants. The environmental analysis must be done more reliably, more efficiently, and with even higher quality results than ever before.Gas chromatography/mass spectrometry (GC/MS/MS) is widely regarded as the analytical technique of choice for the analysis of semivolatile organic compounds (SVOCs), microplastics, chemical residue in water, wastewater, and many more. PT Berca Niaga Medika is one of Agilent's distributors in Indonesia. If, you are involved in the measurement of organic chemicals in water, soil, or air. We have the right solution—instruments, chromatography workstations, consumables, and services designed specifically to meet your needs.

A01

A study on the implementation of a circular economy in municipal solid waste management in the new capital city of Indonesia

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Abstract. The new capital city in East Kalimantan is designed with the concept of a smart and sustainable city where waste management will implement a smart trash system with the concept of a circular economy. Key Performance Indicator (KPI) of the sanitation sector, among others, 60% of waste will be recycled either into materials and/or energy. The management system design is carried out in the core area of the central government which is projected in 2045 to have a population of 276,125 people with a waste generation rate of 0.75 kg/cap/day. All data from the collection, transportation and processing system will implement a computerized IoT. From the source, the waste will be separated into seven colors of plastic bags where for vertical buildings a gravity chute will be used, while the parcels/blocks will use a pneumatic waste collection system as the collection method. The waste will then be taken to an integrated waste management site with a front-load truck of 74 tons/day. In this place, waste will be sorted by type of biowaste, paper, plastic, metal, glass and domestic hazardous waste. In this study, the calculation of KPI fulfillment is carried out in two scenarios. In the first scenario, 35 tons/day of inorganic waste will be recycled, while 39 tons/day will be processed in a waste-to-energy incinerator. A total of 15 tons/day of sludge from WWTP will also be burned along with waste in the incinerator. The heat from the combustion will be used to turn a steam turbine and generate electricity. The second scenario is that if the recycling ecosystem has not been established, all the waste will be burned in the incinerator and will generate 250 MW of electricity for the internal plant. Both scenarios can meet the KPI of 60% recycled waste.

Keywords: Circular economy; KPI; recycle; recovery; waste;

A02

The Evaluation of used diapers recycling process in Bank Sampah Bersinar

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Abstract. Disposal of used baby diapers is starting to cause environmental pollution problems. Bank Sampah Bersinar located in Kecamatan Bale Endah, Kabupaten Bandung, West Java Province - Indonesia, implements the recycling technology of used baby diapers with capacity of around 200 kg/day as one way to reduce the pollution load caused by the used baby diapers' disposal. The recycling process consists of shredding & screening, cooking/pulping, manual pressing/squeezing, washing and air drying. The performance of process has been evaluated and reported in this paper. The evaluation was done by observing the material balance, and in addition, the quality of process' output were also evaluated. In general, there are 3 components that can be obtained, i.e. fiber, SAP (super absorbent polymer) and a wrapper consisting of plastic and other complementary materials. This study was focused on only the fiber and wrapping fractions. The result showed that the overall recycling efficiency was around 33%, consisted of 1.12% fiber and 31.9% plastic. The biggest materials loss was occured at the shredding/screening process. About 51% of material was left in the shredder, and cannot be forwarded to the cooking/pulping process. Both fiber fraction and plastic fraction still contained contaminants, i.e. SAP and plastic flakes in the fiber fraction, as well as SAP and fibers in the plastic fraction. The fiber fraction was cleaned in the manual pressing/squeezing and washing process after cooking/pulping process, while the plastic fraction was separated directly after the shredding process without cleaning/washing process. The presence of SAP in the plastic fraction causes the drying process was difficult since the water is bound by SAP. Three methods of 2-stage washing have been tried, i.e. using a laundry bag, directly without a laundry bag, and washing with counter current system. Plastic fraction with 10-6% of moisture after air dried for 4 days were resulted by using the second and third methods. Recycled fiber resulted was identified as long fiber, as much as 73% with a fiber length greater than 2mm. Visually, the fiber fraction contained small plastic flakes which were difficult to separate manually. The cooking process carried out at a temperature of around 180°C reduced the number of microorganisms in the fiber fraction; but it was not significant for the plastic fraction. Overall, the applied process still needs to be improved, especially in order to reduce the materials loss and get a cleaner fiber and plastic fractions, as well as the minimization of manual processes.

Keywords: long fiber; recycled fiber; recycled plastic; recycling; SAP; used diapers

A03

The challenges in sustaining waste banks in Serang City: how far the circular economy can go?

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Abstract. The existence of a waste bank is designed to reduce the city's waste problem. However, not all regions can implement a waste bank program to deal with municipal solid waste. In 2019, Serang City was only able to manage 42.54% of municipal waste out of 167,850 tons of waste/year, including the contribution from the waste banks. This study aims to determine the challenges of implementing waste banks and the impact of the circular economy in Serang. This study uses a qualitative approach which describes the results qualitatively-quantitatively. Information and data were obtained from primary and secondary sources during the fieldwork. Questionnaires and structured interviews were used to gather the performance data and public perceptions of waste banks. This study found several findings; a) the positive response of the community by 91% to the existence of waste banks, b) the motive behind the establishment of waste banks and memberships is environmental aspects, c) there were 33% of waste banks with <10 members and tend to stagnate, while others have an increasing number of members from year to year, d) the problems faced by waste banks in Serang include aspects of human resources, managerial, infrastructure, and product diversification, e) the existence of waste banks economically has not made a significant contribution due to simple management system, lack of product diversification. Thus the reduction ability was only 0.3%. Another problem encountered is that cooperation with off-takers is not done on a contractual basis, which leads to uncontrolled prices.

Keywords: challenges; circular economy; sustainability; waste bank

A04

Production of bio briquettes from pineapple peels as alternative renewable energy

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Abstract. The need to investigate an eco-friendly and renewable alternative energy source has been prompted by issues relating to the depletion of conventional fuel resources and environmental concerns. The best green energy alternative to meet the rising demand for renewable energy is bioenergy, which also encourages the sustainable use of agricultural waste. This study was carried out to investigate the utilization of pineapple peels as one of the highly produced agricultural waste for bio briquette production. Furthermore, this study aims to determine the characterization of bio briquette by using different variations in the composition of sewage sludge, pineapple peels, and adhesive types. This research used rejected papaya, cow dung, and starch as the binding agent. The briquettes' physical properties and calorific values were determined using gravimetric analysis and bomb calorimeter. The sludge, peels, and binding agents were blended together in the ratios of (90:0:10); (70:20:10); (60:30:10); (30:60:10); (20:70:10); and (0:90:10). The briquettes were produced based on the ratios using hydraulic briquette press. The density of briquettes produced ranges from 0.28 to 0.93 gr/cm3. The result shows that quality briquettes are produced from 0% sludge, 90% peel, and 10% starch as proportion. This composition shows water content, ash content, volatile matter, fixed carbon, and calorific value of 5%, 11%, 13%, 76%, and 4.753,99 Cal/gr, respectively. Calorific values increased as the composition of pineapple peels increased. Moreover, briquette with starch as the binding agent has better physical properties compared to adhesive from rejected papaya and cow dung.

Keywords: bio briquette; cow dung; pineapple peel; renewable energy; sewage sludge; starch

A05

Inventory analysis of potential electronic waste generation in Setu, Tangerang Selatan

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Abstract. Electronic waste (E-waste) is currently one of the waste streams with the greatest rate of growth due to the incredible technological advancement and greater use of information and telecommunications (IT) technologies. One of the main concerns regarding environmental contamination that people throughout the world have is the management of electronic waste. This is due to the quickly rising use of technological devices. As a result, electrical and electronic equipment has a finite shelf life and eventually becomes outdated. Lack of knowledge regarding the amount of the waste produced and the transit of materials is one of the problems Indonesian government has while handling e-waste. This study's objective is to outline the possibilities for the production of electronic waste in Setu, Tangerang Selatan. Online surveys of respondents from the household were used as the methodology, but just for appliances like the refrigerator, air conditioner, television, laptop, and cellphone. Since this problem becomes one of the most difficult parts to gain the closest data to the real waste stream, it is thought that this method is an effective way to gather the vast amounts of data required for the government to establish related policies. Forty residences in Setu Sub-District, South Tangerang City, were surveyed using a modified UNEP questionnaire. The study's findings revealed that, in terms of quantity—78 units produced as opposed to 244 units of the products listed—cellphones are the most frequently produced electronic waste. Meanwhile, the refrigerator accounts for the biggest percentage of e-waste in terms of weight, or 40.93 percent. The findings of this study help policymakers create a formal e-waste management system by allowing them to calculate the amount of e-waste generated in Setu, South Tangerang. Additionally, the approach used can be a useful, user-friendly tool to produce the closest real data that are typically required by the Ministry of Environment and Forestry, such as to develop a database that becomes a part of Sistem Informasi Pengelolaan Sampah Nasional (SIPSN), or National Waste Management Information System.

Keywords: e-waste; e-waste generation; data inventory; Setu;

A06

Expression of laccase in *Pichia pastoris* and its potential activity for biodegradation of ampicillin

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Abstract. The presence of antibiotics in the environment has currently become more concern and needs to be addressed. Among various methods, biodegradation by harnessing specific enzymes such as laccase to reduce antibiotics has attracted attention due to its excellent ability and performance. In this study, laccase encoding gene from *Trametes hirsuta* (White-Rot Fungi) was introduced and integrated into an expression host, Pichia pastoris. Furthermore, the expression of laccase was then investigated for its activity to degrade ampicillin antibiotic. The enzyme activity was determined using *Syringaldazine* as a substrate, while biodegradation of ampicillin was tested into Gram-positive and negative bacteria using disk diffusion assay. The laccase could be successfully expressed with the highest activity when methanol was induced in the culture at 2% and showed its potential to eliminate the ability of ampicillin as an antibacterial. This study indicates the use of laccase for bioremediation of antibiotic pollution is considered as a promising approach since it is safe, sustainable, and eco-friendly.

Keywords: Ampicillin, Biodegradation, Laccase, *Pichia pastoris*

A07

Floating treatment wetlands using *Vetiver sp* and *Heliconia sp* as aquaculture wastewater treatment

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Abstract. The main elements needed are the quantity and quality of water in aquaculture practices. The rest of the use of pellets as additives and the results of excretion of aquatic biota will produce liquid waste characteristics with high nutrient and organic matter content. One of the efforts to treat wastewater is using floating treatment wetlands (FTWs). This study aims to analyze changes in the concentration of nutrients and organic matter using *Vetiver sp* and *Heliconia sp* plants in a sewage treatment system using FTWs. The research was conducted on a laboratory scale using a tarpaulin pool with a batch system. The wastewater originated from catfish farming ponds. The study was carried out using 12 test ponds with various plant treatments, plant surface cover area, and the depth of the pond used. Samples were taken and measured every five days for 30 days. Water quality parameters are total nitrogen (TN), total phosphorus (TP), nitrate (NO_3^-), nitrite (NO_2^-), ammonia (NH_4^+), orthophosphate (PO_4^{3-}), chemical oxygen demand (COD) and in situ parameters include dissolved oxygen (DO), pH, temperature, and conductivity. During 30 days of treatment, the results showed that treatment 7 was adequate for TN rights at 75.35% and nitrate was 90.70%, treatment 1 was sufficient for TP rights at 92.55%, and treatment 5 was acceptable for ammonia at 94.64% and nitrite at 97.93%. Almost all samples tested were effective for COD, while the phosphate in the study showed a fluctuation until the end of the experimental period. The principal component analysis on day 30 showed that the contribution of the four main components to the total variance reached 86.76%, and the gift of the five main components reached 92.14%. The four main components' eigenvalues are 3.63; 2.76; 1.88; 1.23. Based on the more significant component loading values, the parameters included in the first component with a variance of 33.47% are TN, TP, conductivity, and phosphate. While the second component with a variance of 25.08%, namely COD, nitrite, pH, and temperature. The third component with a variance of 17.07% is DO and nitrate, and the fourth component with a variance of 11.14% is ammonia. Based on the analysis results, the parameters of TN, TP, conductivity, phosphate, COD, nitrate, pH, and temperature can represent the organic characteristics of changes in the concentration of nutrients and materials in aquaculture wastewater compared to other parameters.

Keywords: floating treatment wetland (FTW), water quality, aquaculture wastewater

A08

Uptake and translocation of lead and cadmium in wild-found species for phytoremediation

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Abstract. Environmental degradation and pollution due to heavy metals, especially Lead (Pb) and Cadmium (Cd) have been increasing. Therefore, an appropriate environmental restoration technology is urgently needed. One of the alternative cost-effective green technology is phytoremediation. The purpose of this research is to determine the potential of plants that could be used as Pb and Cd bioaccumulators. Five plant species that are highly potential as Pb bioaccumulator were examined, namely *Saccharum spontaneum, Acorus calamus, Ipomoea fistulosa, Ludwigia hyssopifolia,* and *Eichhornia crassipes* were studied with increasing concentration of Pb treatments 0 ppm, 100 ppm, 200 ppm, and 300 ppm. While five plant species highly potential as Cd bioaccumulator were studied, namely *Limnocharis flava, Colocasia esculenta, Ipomoea fistulosa, Commelina benghalensis*, and *Eichhornia crassipes* with increasing concentration of Cd treatments 0 ppm, 25 ppm, 50 ppm, dan 75 ppm. The research was conducted for eight weeks at the greenhouse to analyse the plant growth rate and heavy metal absorption of the plants and its media. The result revealed that *Ipomoea fistulosa* absorbed the highest Pb with biomass increment rate up to 27.07 gr/week and bioconcentration factor ratio of 1.46 under 300 ppm Pb treatment. While *Colocasia esculenta* showed absorbed the highest Cd with the highest biomass increment rate of 36.96 gr/week under 75 ppm Cd treatment accompanied by a high ratio of bioconcentration factor 1.03 on 50 ppm Cd.

Keywords: Cadmium; Lead; phytoaccumulator; phytoremediation

A09

The efficacy of *Vetiveria zizanioides* in horizontal subsurface flow constructed

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Abstract. Textile waste released into rivers often triggers a decrease in water quality and causes harm to its aquatic ecosystem. Textile waste which may contain nutrients, organic compounds, and heavy metals can be managed using constructed wetland system. Vetiver grass is known for its ability in treating polluted waters, though the information related to its potential in controlling textile waste pollution in riparian areas is still limited. This study aims to determine the efficacy of a pilot scale constructed wetland system using vetiver grass (*Vetiveria zizanioides*) for the removal of several pollutants in a riparian area polluted by textile waste. The waste flowed horizontally through the sub-surface layer of the system with a retention hydraulic time of 2 days. The waste concentration was diluted to 20%. Three systems were made by varying the porous size of planting media using coarse gravel, fine gravel, and sand. The systems then run for 3 months. Of the three CW systems, the highest Removal Efficiency (RE) was achieved for the N-ammonia parameter with an average removal efficiency amount of above 60%. The highest RE nutrient was achieved by the system with sand in the growing media, with RE N-ammonia of more than 80%. RE values were fluctuating until the end of the observation which may occur because the system is not yet stable. It may take longer operation time to get better system performance in removing the pollutants contained in the textile industry waste.

Keywords: textile waste, constructed wetland, vetiveria zizanioides, vetiver grass

A10

Potential quantity of liquid fuel from pyrolysis of plastic waste in Labuan Bajo

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Abstract. Labuan Bajo is one of the super-priority tourist destinations expected to attract more international tourists to increase foreign exchange. To make this a reality, a combination of programs that support tourism and master plans, including solid waste management, is needed. On the topic of solid waste management, private sectors have developed a circular economy to handle plastic waste. However, this plan is obstructed by the high cost of transporting plastic waste to recycling factories located in Pasuruan, East Java. Pyrolisis technology can be an alternative technology to treat solid waste without transporting it outside of Labuan Bajo. A study of pyrolysis technology is needed before it can be applied, including the quantity of liquid fuel produced by the pyrolysis process. This liquid fuel can be utilized to fulfill the community demands, such as the demand for engine fuel. This research aimed to ascertain the potential quantity of liquid fuel that can be produced by the pyrolysis process using plastic waste from Labuan Bajo. The method used in this research was a quantitative analysis by calculating liquid fuel quantity from Labuan Bajo waste quantity and composition data and pyrolysis efficiency. From this analysis, it is estimated that 753 kg/day of liquid fuel can be obtained from 1,045 kg of plastic waste per day. This quantity can supply 1.06% of engine fuel demand in Labuan Bajo.

Keywords: liquid fuel; Labuan Bajo; plastic waste; pyrolysis

A11

Denitrification of ammonium nitrate industrial wastewater using sulfur and limestone packed bioreactor

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Abstract. One of ammonium nitrate industries in Indonesia is located in West Java. This industry produces wastewater containing 1890 mg/L ammonia-nitrogen, 1800 mg/L nitrate-nitrogen, and 51 mg/L nitrite-nitrogen. In industrial treatment, this wastewater is treated using activated sludge nitrification and anoxic denitrification by adding carbon source such as metanol or glucose. Denitrification process using autotrophic bacteria was applied in the wastewater treatment as an alternative method for reducing the cost of wastewater treatment. The bacteria can grow and develop on elemental sulfur. This paper presents the results of industrial wastewater treatment of ammonium nitrate by two process: nitrification using activated sludge and denitrification using sulfur and limestone packed bed bioreactors. Sulfur is used as an electron donor, reducing nitrate to nitrogen gas with the sulfate as a by-product. Limestone is used as a material that can minimize the pH decrease caused by the sulfate formation. The results showed that the ammonia-nitrogen concentration decreased by 97% (from 1890 to 67 mg/L) within 2 days. The residence time applied in this study was from 1 to 4 days; the longer the residence time, the higher the efficiency of nitrogen nitrate reduction. The highest efficiency of nitrate-nitrogen reduction was 96%, achieved at a residence time of 4 days at the nitrate-nitrogen initial concentration of 2.000 mg/L. The water pH during the denitrification process was in the range of 6.5–7.5, meeting the pH quality standard to be discharged into the environment.

Keywords: Ammonium nitrate; denitrification; limestone; nitrification; sulfur; wastewater

A12

Microplastic occurrence and characteristics in wastewater: a case study in Setiabudi Jakarta WWTP

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Abstract. Wastewater treatment plant (WWTP) can act as a barrier but also as entrance routes for microplastics (MPs) to aquatic environment. This study investigated the occurrence, characteristics, and removal of MPs in Jakarta WWTP, namely Moving Bed Biofilm Reactor (MBBR) Setiabudi. Sampling technique, extraction methods, and quantification as well as characterization of MPs was carried out based on some related previous studies. The results showed that MPs concentration found in the influent is 17,1 (± 5,65) items/L, and it is reduced to 7,1 (± 0,07) items/L in the effluent, indicating that about 56,45% of MPs in raw wastewater is removed during the treatment. Based on the daily effluent discharge and MPs removal rate, it is estimated that around 1775 of MPs are released from the WWTPs each day. The light microscopic used as a quantification and characterization methods resulted that MPs was widely distributed in the 45-5000 µm range. The color of MPs in both influent and effluent is mainly composed of transparent (43,66 - 36,02%) and black (24,17 - 11,27%). Based on shape category, fibers (81,04 - 67,6%) are the dominantly found in two sampling points, followed by fragments (15,16 - 26,76%), films (1,89 - 1,41%), microbeads (0,47 - 1,41%) and foams (1,42 - 2,81%). The characteristic of MPs such as sizes and shapes affects the MPs removal in WWTP. Our findings demonstrates that the existence of MBBR in Setiabudi WWTPs can substantially reduce the MPs pollution from raw wastewater, however, MPs discharged into the environment is still considerably high.

Keywords: abundances; characteristics; microplastics; removal; wastewater treatment

A13

Removal of color, phenol and sulfide from batik wastewater using immobilized *bacillus licheniformis* in bentonite mineral

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Abstract. In Indonesia, batik industry is the largest home-based textile industry. However, batik wastewater produced by batik industry did not accompany by Waste Treatment Plant. This resulted in several pollutants such as dyes, phenols, and sulfides contained in batik wastewater which have the potential to pollute the environment. In particular, phenol in low concentrations is toxic to the environment. Wastewater treatment is carried out to reduce the concentration of pollutants to meet the acceptable quality standards so did not pollute the environment. Among physical and chemical methods, biological treatment has advantages such as being more economical and environmentally friendly. *Bacillus sp.* is an aerobic and facultative bacteria that is effective as a biological agent in treating organic waste. Literature studies indicate that the immobilization or encapsulation of microbes can increase the efficiency of pollutants degradation. In this study, biological treatment using *Bacillus lincheniformis* immobilized in bentonite mineral can remove color, phenol and sulfide with the highest removal efficiency values of 68% for color, 100% for phenol, and 93% for sulfide.

Keywords: *Bacillus licheniformis*, Batik Wastewater, Bentonite, Biological Treatment, Water Pollution

A14

Investigation of Slagging Fouling and Corrosion Coal Cofiring with Biomass Synthetic Waste in Drop Tube Furnace

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Abstract. Plastic waste can be utilized directly as a biomass fuel in a coal-fired power plant (CFPP) or as portion of a coal mixture through co-firing. Differences in characteristics can cause problems during combustion, especially in plastic containing high alkali and chlorine content. The purpose of this research is to analyze the features of coal combustion with a plastic mixture in order to evaluate the combustion effects. Combustion is carried out using a drop tube furnace (DTF) by analyzing the potential for slagging, fouling and corrosion of the ash produced from each fuel based on probe observation and ash analysis. From the results of burning coal, the ash is clean and not sticky, in contrast to the results of burning coal with a mixture of 25% plastic which produces a dark color and has a tendency to stick to the probe. High K_2O and Cl content in ash sampel from coal combustion with plastic have a significant impact on the formation of slag on the probe. Burning coal with a mixture of biomass synthetic waste of 25% is an unsafe composition on slagging, fouling and corrosion.

.**Keywords:** High alkali content; chlorine content; ash deposit observation; drop tube furnace

A15

Radioactive fission waste of the conversion of high enriched uranium to low enriched uranium target on 99Mo production

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Abstract. In the past, ^{99m}Tc produced by PT Industri Nuklir Indonesia (PT. INUKI) was carried out through processing of ^{99}Mo parent radioisotope that was produced using high enriched uranium target. Due to restriction on the use of high enriched uranium (HEU) by the International Atomic Energy Agency, PT. INUKI have converted the process by using low enriched uranium (LEU) target. The purpose of this study is to determine the change of radioactive fission waste characteristic in ^{99}Mo production due to the conversion process. The characteristics of radioactive fission waste generated from low enriched uranium target was calculated using ORIGEN 2.1 program. The results shows that the radioactive fission waste contains radionuclides of activation products, actinides, and fission products. The conversion produced smaller activity of ^{99}Mo compared to that of using HEU target, which were 397 compared to 1010 Ci. The conversion generated radioactive fission waste with smaller content of remaining ^{235}U but with greater content of actinides, particularly ^{239}Pu. The activity of ^{239}Pu in the radioactive fission waste from LEU was 29.1 µCi, approximately 19 times compared to that of using HEU which was 1.52 µCi. After 50 years decay time, this radioactive fission waste was calculated to have specific activity of 6.54×10^8 Bq/g, lower than that of high enriched uranium target which was 3.01×10^9 Bq/g. This radioactive fission waste requires management with a high safety level.

Keywords: ^{99}Mo, ^{99m}Tc, ORIGEN 2.1, Radioactive Fission Waste

A16

A series anaerobic-aerobic down-flow hanging sponge (DHS) reactor for the treatment of palm oil mill effluent (POME)

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Abstract. Palm oil mill effluent (POME) contains very high organic compounds that must be treated before being discharged into the environment. Pond technology has been widely used for the treatment of POME; however, it requires a huge area of land. Down-flow hanging sponge (DHS) reactor has shown a high removal pollutant efficiency, less energy and land area requirement. This study aims to investigate the performance of a series of anaerobic (R-3) and aerobic (R-4) down-flow hanging sponge (DHS) reactor in treating POME. The reactor was continuously supplied with POME in three different phases for 165 days. COD loading rate was set at 3, 6 and 12 kg-COD/m^3·day in Phase 1, Phase 2 and Phase 3, respectively. Hydraulic retention time (HRT) was set as 47 min and 50 min, in R-3 and R-4, respectively. The reactors showed good performance for pollutant removal efficiency, especially COD. In Phase 1, the average of COD removal rate was 2.68 and 0.27 kg-COD/m^3·d in R-3 and R-4, respectively. In Phase 2, when the COD loading rate was increased, the average of COD removal rate achieved 4.12 and 1.53 kg-COD/m^3·d in R-3 and R-4, respectively. In phase 3, the COD loading rate was doubled to 12 kg-COD/m^3·day, the average of COD removal rate of 5.81 and 2.90 kg-COD/m^3·d was achieved in R-3 and R-4, respectively. During operation, concentration of nitrate fluctuated in R-4, which indicated that nitrification has occurred. Phosphate can be reduced in R-3, but only small portion can be removed in R-4. Total suspended solid (TSS) can be effectively removed in R-4. These results revealed that a combination of anaerobic-aerobic DHS reactor showed good performance in removing pollutants, such as COD and TSS. Therefore, DHS technology can be used as polishing treatment of treated POME.

Keywords: aerobic; anaerobic; COD; down-flow hanging sponge (DHS); palm oil mill effluent (POME)

A17

Study on biogas production from coffee-waste and cow-dung fermentation and its use towards reducing emissions from coffee roasting

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Abstract. The production of high-quality coffee for export is an important industry in Indonesia. However, coffee processing produces unavoidable waste and emissions to the environment; 1kg of cherry beans (CB) involves 3kg of water for processing (2kg for floating selection for CB, 1kg for wash-fermentation). Wastewater from processing can be as much as twice the mass flow of the raw feedstock materials. CB processing results in the following mass flows: Cherry skin (44%), beans (20%), parchment (5%), pulp (4%), silverskin (0.5%) and water (26.5%). This study utilizes the wastewater from the washed-coffee processing such as; fermentation-washed, and coffee pulp. The materials were mixed with cow dung from local farms for anaerobic processing in a one-gallon digester. This research took into consideration three variations, firstly, cow dung mixed with water in the same content [1:1]; second, cow dung and wastewater (fermentation-wash) [1:1]; third, cow dung and pulp [1:1]. The resulting biogas will be analyzed with gas chromatography for comparison. The yield of biogas will be used to consider the potential for supplying heat and electricity for use in the coffee roasting process. Alternative energy sources will also be considered, in the following combinations, first; biogas and electricity (solar panels), second; biogas and electricity (fossil), and third; LPG and electricity (fossil). Life Cycle Assessment is used to calculate the scenarios' Global Warming Potential (GWP). This study will be used as a pilot project toward a zero waste and zero emission coffee industry. The scenario with the lowest GWP can be used as a reference for the sustainability of coffee production.

Keywords: wastewater, fermentation, anaerobic, biogas, GWP

Characteristics of humate soil from landfill mine in Bantargebang integrated solid waste treatment facility, Indonesia

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Abstract. The Bantargebang Integrated Solid Waste Treatment Facility (SWTF) in Bekasi City has the largest landfill site in Indonesia. It received more than 85% of municipal solid waste from the Jakarta Province in 2021. Since the landfill has been almost filled, the government operated a landfill mine (LM) facility in 2020. One of the mined material potentials from the LM is humate soil, which can be used for agriculture purposes. About 100–150 tons of material was mined daily. This research aims to characterize and evaluate the potential of the mined material (MM) from the SWTF as a humate soil source for agriculture use. About 100 kg of daily sample was taken from a randomly selected collection vehicle, which operated in the IVB Sub-Zone of the LM. Sampling was performed for eight consecutive working days between March 2–15, 2022. Composition analysis was conducted on all samples, followed by sieving and classifying the MM into fine (<10 mm), medium (10–30 mm), and coarse (>30 mm) fractions. These fractions were further analyzed for moisture, volatile solids (VS), ash, carbon (C), and nitrogen (N) contents. The data were compared to quality standards for compost products. The results showed that the fine and medium-sized fractions consisted of soil-like material (SLM) of 14% and 20%, respectively. The coarse fraction contained plastics, wood, and textile, which made it unsuitable for agriculture use. The SLM moisture was 56.92–63.47%, VS 50.81–53.11%, ash 21.32–24.54%, C 52.87–55.67%, N 1.89–2.10%, and C/N ratio 25.17–29.46. These characteristics met the quality standards for compost material, except for the high moisture content. Therefore, the MM can be considered to be used for agriculture purposes, after moisture content reduction. A toxicological test is recommended to be conducted to ensure the safe use of the SLM.

Keywords: humate soil; landfill; mine; recovery; solid waste

A19

Torrefaction of municipal solid waste (MSW)

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Abstract. Torrefaction is a thermochemical processing method that is widely used to produce valuable solid product from biomass. Torrefaction improves biomass properties including the reduction of moisture content and an increase to the heating value. Therefore, torrefaction can be considered as a promising method to treat municipal solid waste (MSW) which would not only solve the MSW management problem but also produce solid product which has the potential to be used as fuel. This study aims to examine the char properties and quantities from the application of the torrefaction process to MSW (particularly dried kitchen waste and plastic waste categorized as LDPE and PET) as well as the effects of operational conditions on char products. The Torrefaction process was conducted using a 1.9 litre reactor, with heating tape, as a heat source. Approximately 150g of feedstock was placed inside the reactor for each torrefaction experiment with different temperatures (175°C, 200°C and 225°C) and different particle sizes (1cm, 1.5cm, and 2cm). Torrefaction at temperature of 225°C increased higher heating values (HHV) of LDPE and PET, from 19.17 to 24.50 MJ/kg, while the HHV of food waste increased from 11.18 to 17.04 MJ/kg. Besides the char product, torrefaction of LDPE and PET produced liquid products with HHV up to 34 MJ/kg. Char quantities produced after the torrefaction process can be measured as mass yield, mass yield after torrefaction at a temperature of 225°C is quite low, below 50% (mass yield from LDPE and PET torrefaction is 14.77% and from food waste it is 30.03%). Besides temperature, feedstock size variation also proved to change the char properties and had a significant affect on char quantities. The bigger the feedstock size used, the lower HHV but higher the mass yield.

Keywords: food waste; fuel properties; LDPE and PET; solid waste treatment; torrefation

A20

Palm oil mill effluent (POME) treatment using combined anaerobic-microalgae down-flow hanging sponge (DHS) reactor

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Abstract. Palm oil mill effluent (POME) generated from production of palm oil contains organic and inorganic contaminants that can be a nutrient source for microorganisms such as bacteria, fungi, and microalgae. In this study, POME was treated using a combined anaerobic (R-1) and microalgae (R-2) in down-flow hanging sponge (DHS) reactor. *Chlorella pyrenoidosa* was immobilized in sponge carrier of R-2 and LED lights were used for 12 hours per day to support microalgae growth. The DHS reactors were continuously operated for 165 days in three phases with different COD loading rates, namely 3, 6 and 12 kg-COD/m^3·day in Phase 1, Phase 2 and Phase 3, respectively. The hydraulic retention time (HRT) was set at 46 min and 52 min in R-1 and R-2, respectively. The highest COD removal rate was achieved at 6.93 kg-COD/m^3·day and 4.85 kg-COD/m^3·day in R-1 and R-2, respectively. In addition, phosphate removal was to be maximum of 68% in both reactors. Increasing concentration of nitrate in R-2 indicated that nitrification may occur in the reactor. The pH of effluent of R-1 was relatively stable at neutral conditions, while pH value of R-2 effluent slightly increased. Based on visual observation, bacteria biofilm also growth in microalgae reactor (R-2). Synergistic bacteria-microalgae may play an important role in pollutants removal. Moreover, microalgae can reduce the production of carbon dioxide from the respiratory activity of microorganisms through photosynthetic process. The results showed that a combined anaerobic and microalgae DHS reactor can be used as an alternative for POME treatment because they have a shorter HRT and can be applied in a small area.

Keywords: Palm oil mill effluent (POME); anaerobic; microalgae; *Chlorella pyrenoidosa*; down-flow hanging sponge (DHS)

A21

The development of waste bank management to improve household income in Surakarta City

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Abstract. Establishing a waste bank in Surakarta City is not only intended to manage household waste. It is hoped that the waste bank that is formed in every community's environment can also be a place to improve the community's economy. Since 2014, Environmental Services (DLH) Surakarta City has continued promoting a waste bank formation. Until 2020, the total number of recorded waste banks in Surakarta City is 123; in 2021, there will only be 70 waste banks. However, not all waste banks can run well. Therefore, this study tries to find out how to develop waste bank management to improve household income in Surakarta City. This study uses a descriptive method and Miles and Huberman analysis. The results show that only 57% of waste banks in Surakarta have received training in waste bank management, and only 28.6% have adequate facilities and infrastructure. In addition, 22.8% of waste banks in Surakarta do not have facilities and infrastructure at all. There are 13 waste banks (18.6%) inactive. The number of administrators also varies from 2 to 49 people. Most of them are women, as well as waste bank customers whom women also dominate. The salaries of waste bank administrators are also not standard, often even below the minimum wage. The weighing schedule is once a week to once a month. This scheduling causes residents or customers not to be able to deposit trash at any time. The turnover of waste banks in Surakarta from the inorganic waste collection is around Rp. 10,000-Rp. 1,000,000 per month. Those findings indicate that in the development of waste bank management, it is necessary to provide training to the management of the waste bank and assistance in the form of facilities and infrastructure. Waste banks need to increase the flexibility of waste collection and weighing days. Waste banks also need staff or administrators who actively manage and serve garbage pick-up services to customers' homes. The staff or administrators must have an adequate salary to maintain and improve their performances. Waste banks should continuously innovate on how to use waste, collect and save systems, so it becomes a regular income generating for households that are customers. Since most waste bank administrators and customers are women, it is fascinating to add activities related to the household that attract women to increase engagement with the waste bank, ultimately improving household income. This study provides recommendations on how to maintain and increase the activity of the waste bank so that it is more beneficial for household welfare and improving the environmental quality.

Keywords: environment; household; income; Miles and Huberman analysis, waste bank

A22

Organic waste handling with cylindrical rotating perforated drum type; case study of Ciater Permai, South Tangerang, Indonesia

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Abstract. This study was conducted in South Tangerang, involving a residential area with population around 120 persons. The research was conducted in 20 days with average daily volume of 60-80 kg of total and 30-40 kg of organic waste. The originality of this work is a rotational cylindrical organic waste processing equipment with perforation holes and water disposal, with a total capacity of 60 liters. The process involved reacting organic waste with soil containing degrading microorganisms and rotating it 5-6 times after each inserting waste. This tool is placed in an open area exposed to provide sufficient sunlight and adequate air circulation. In the initial test, this tool was placed in 80 separate locations in each resident's house. It requires up to 5 kg of soil with decomposing bacteria to start the process, and then roughly 1 kilogram of organic waste is added every day. After 20 days of testing, the volume of organic waste has dropped by 46 percent of the total incoming garbage. It is envisaged that the community will be able to use this invention independently in order to minimize the load of urban garbage accumulation. Furthermore, the development of this waste processing instrument is the first step toward establishing the habit of sorting garbage in each citizen's household.

Keywords: organic waste, rotating waste processor, urban waste, waste management

A23

Simulation of neutron shielding performance of Al-Cd alloy for radioactive waste container

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Abstract. Neutron shielding material is necessary for container of radioactive waste which emitting neutron, such as spent fuel from research reactor. This study aims to determine the shielding performance of Al-Cd material for neutron radiation emitted by radioactive radiation. The calculation simulation is done using MNCP5 software. Shielding Al-Cd was simulated to withstand neutron radiation sourced from a standard Am-Be source with an energy of 4.5 and 2.53 x 10-8 MEV. The results of the research on Cd alloys can increase the neutron shielding performance of Al, by 2.3 times in the form of alloys and 1.2 times for coated Al materials with Cd. Cd-Al material in the form of Alloy is better at absorbing neutrons than Al material coated by Cd.

Keywords: Neutron shielding, Cadmium, Aluminum, Radioactive Waste.

A24

Identification and analysis of municipal solid waste pre-treatment to improve waste quality for waste to energy facility

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Abstract. The quality of municipal solid waste affects the performance of incinerator waste to energy plant. This study aims to identify and analyze the pre-treatment process for municipal waste in order to improve the quality of municipal waste which will be used as feedstock to waste to energy plant using pre-treatment equipment in terms of process rate, mass balance, and waste quality before and after pre-treatment. The waste studied came from resident housing in DKI Jakarta and the pre-treatment facilities used consisted of a feeder conveyor, trommel screen, and sorting conveyor, as well as an excavator. Research was done quantitatively. The research methods used include sampling the composition and quality of waste both before and after pre-treatment; calculating the capacity of the pre-treatment equipment by testing the garbage feed to the pre-treatment facility with a certain amount of waste and a certain time; and calculating the mass balance of waste in the form of bulky material, waste smaller than 5 cm, separated recyclable material, and combustible material. From this research, it is known that the pre-treatment process using existing equipment and assisted by excavators and 17 workers in one work shift (7 hours) can handle 39.06 tons of waste. From the pre-treatment process, 10.5% of bulky waste was obtained, 27.6% of materials smaller than 5 cm, recyclable materials (metal, glass, and plastic) 1.5% and 59.5% combustible materials. The combustible material that will be used as feedstock for the incinerator was relatively free from bulky material, inert material, and hazardous material. The calorific value of combustible material from the pre-treatment process also increased to 8.80 MJ/kg from 6.61 MJ/kg (waste before pre-treatment). Thus, it is concluded that waste after pre-treated had good quality as a feedstock of incinerator waste to energy.

Keywords: waste, composition, quality, mass balance, pre-treatment

A25

Chemical properties of coffee waste biochar under different temperatures of pyrolysis

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Abstract. One abundant waste in the coffee shop industry is coffee powder or bean waste due to the expired. To control the coffee waste, it can be converted to be biochar which is useful for soil amendment. The purpose of this study was to determine the chemical properties of biochar derived from coffee waste. Producing biochar was done by burning the coffee waste using a furnace with a temperature of 250°C and 350°C, then ground and sieved with a size of 355 micrometers carried out at the Research Center for Limnology and Water Resources. Chemical property analysis was carried out by using X-Ray Fluorescence Spectrometer (XRF) at Lampung Advanced Characterization Laboratory- BRIN. Based on the results of the analysis using XRF showed that the highest content in terms of the macronutrient of biochar is Potassium (K) around 88%, then Phosphor (P) around 2.7%, and Sulfur around 1%.

Keywords: waste, composition, quality, mass balance, pre-treatment

A26

Characterization of microcrystalline cellulose from red seaweed *Gracilaria verucosa* and *Eucheuma cottonii*

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Abstract. Cellulose is a natural organic polymer extracted mainly from lignocellulosic biomass. The industrial processing of seaweed produces a large amount of solid fibrous waste, which is a source of serious environmental problems. The increase in seaweed production that continues to increase also has seaweed waste that can be used as an additional source of cellulose raw materials. This study investigated the utilization of *Gracilaria verucosa* and *Echeuma. cottoni* waste as raw materials to produce high-quality micro cellulose. *G. verucosa* and *E. cottoni* waste is treated chemically through alkali, bleaching, and acid hydrolysis to obtain pure cellulose microfibers. The morphology characteristic from SEM presented the difference between raw waste material before and after being extracted to cellulose. After the extraction process, it is seen that there is stranded fiber which is indicated as cellulose. The X-Ray Diffraction (XRD) and Fourier Transform Infrared Spectroscopy (FTIR) showed that extracted cellulose almost has a similar appearance to the microcrystalline cellulose standard. The similar peaks between 3100 and 3700 cm^{-1} indicated stretching vibration of O-H and C-H bonds.

Keywords: Seaweed waste, micro cellulose, *E. cottoni*, *G. verucossa*

The effectiveness of coconut shell charcoal and activated carbon on deodorization of sludge from ice cream industry WWTP

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Abstract. Coconut shell contains several components of biomass including cellulose, lignin, pentosan which can be used in the form of charcoal as a bioabsorbent. Sludge waste is a residue formed as a by-product of wastewater treatment at a wastewater treatment plant (WWTP) emitting odors that can disturb local residents. This study aimed to deodorize ice cream slurry waste using coconut shell charcoal and activated carbon as the odor adsorbent. The ratio of each adsorbent and ice cream waste was based on the preliminary experiment, namely 1:1, 1:3, 1:5, 1:6, and 1:7. The measurement parameters for the sludge were odor value, pH, temperature, and water content which were measured per day. Ammonia and sulfide levels were measured using the titration method, while protein levels were determined using a UV- Vis spectrophotometer. Odor reduction in sludge waste mixed with activated carbon as adsorbent was better than that with coconut shell charcoal by which an optimum mass ratio at a ratio of 1:3 with a decrease of 97.13% could be obtained within 7 days. The ammonia levels in the sludge waste decreased from 10,276 mg/kg to 308 mg/kg by the use of coconut shell charcoal with a mass ratio of 1:1 and to 252 mg/kg by the use of activated carbon with a mass ratio of 1:1 at the end of the experiment. The sulfide content in the sludge waste decreased from 1.2149 mg/L to 0.0483 mg/L in the sample with coconut shell charcoal as an adsorbent with a mass ratio of 1:1 and to 0.0483 mg/L in samples with activated carbon adsorbent ratio of 1:1 at the end of the experiment.

Keywords: activated carbon; coconut shell charcoal; deodorization; ice cream sludge waste

Irradiation time dependent of the ZnO/GO composite formation on the photodegradation of Rhodamine B

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Abstract. Rhodamine B is one of the dyes used in the dyeing of paints, acrylic and fabrics as well as biological products. It is highly toxic to organism when directly discharged into water. Therefore, in this study, degradation of Rhodamine B in water by zinc oxide/graphene oxide (ZnO/GO) composite was investigated. The zinc oxide (ZnO) was recovered from zinc ash, a waste from galvanization industries, by acid leaching proses using hydrochloric acid (HCl), while the GO was synthesized by Tour method. The nanocomposite of ZnO/GO was synthesized using microwave irradiation and characterized by means of Scanning Electron Microscope (SEM), X Ray Diffraction (XRD), and Fourier Transform Infrared (FTIR). The effect of irradiation time during ZnO/GO nanocomposite formation on the photocatalysis activity of the nanocomposite in degrading Rhodamine B under UV rays was studied. The irradiation time was varied for 6, 8 and 10 minutes. The characterization results confirm that ZnO, GO and the nanocomposite of ZnO/GO have successfully synthesized. The ZnO/GO nanocomposite was also responsive to UV rays and able to degrade Rhodamine B, as one of the examples of water pollutant. The highest degradation of Rhodamine B is achieved by the ZnO/GO nanocomposite prepared at 10 minutes irradiation. The results of this study demonstrate that the microwave irradiation time affects the ability of the nanocomposite in degrading the Rhodamine B.

Keywords: zinc oxide, zinc ash, Rhodamine B, irradiation, photocatalysis

Optimization of mechanical properties of carrageenan-based bioplastic as food packaging

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Abstract. Plastic is widely used as food packaging because it has good mechanical and physical properties. However, plastic that has been used as food packaging is petroleum-based plastic that is not renewable and not biodegradable; thus, plastic waste has become one of the sources of environmental garbage pollution. One option to overcome this environmental problem is to make bioplastic using biodegradable and renewable sources, one of which is carrageenan. Carrageenan is a polysaccharide used in bioplastic synthesis, but it has shortcomings in terms of mechanical properties; therefore, it needs additional supporting materials to improve its mechanical properties. This study aims to obtain optimal mechanical properties such as tensile strength, elongation, and modulus of elasticity; of the carrageenan-based bioplastic added with montmorillonite at (10%, 20%, and 30%) concentrations and glycerol at (1%, 2%, 3%, 4%, and 5%) concentrations. Optimization is carried out in two stages; the first stage is the optimization of glycerol concentrations, and the second stage is the optimization of montmorillonite concentrations. Experimental results show that the optimum variation is at a concentration of glycerol 3% and montmorillonite 20% with a tensile strength value of 3,43 MPa and elongation of 47,015%.

Keywords: bioplastic; carrageenan; montmorillonite; mechanical properties

A30

Phyto-assisted synthesis of zinc oxide nanoparticles using mango (*Mangifera indica*) fruit peel extract and their antibacterial activity

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Abstract. A facile and eco-friendly procedure was developed to fabricate zinc oxide nanoparticles (ZnO NPs) using mango fruit peel (MFP), a by-product agroindustry, extract. The ZnO NPs were fabricated by using zinc acetate and MFP extract at neutral pH (pH 7) environment. In this investigation, the MFP extract acted as the reducing and capping agent. The UV-visible spectrum confirmed the formation of ZnO NPs, showing an absorption peak at 368 nm. The presence of ZnO crystalline phase was identified by X-ray diffraction analysis. The fourier transform infrared evaluation demonstrated that the biomolecules present in the MFP extract actively contributed to zinc ion reduction. According to scanning electron microscopy image, the surface morphology of ZnO NPs showed a mixture of spheric and flake like shapes with an average particle size below 100 nm. Based on antibacterial analysis using agar disc diffusion method, the biosynthesized ZnO NPs at 3% w/v were active against *Escherichia coli, Bacillus subtilis,* and *Staphylococcus aureus* with diameter inhibition of 8, 19, and 10 mm, respectively. In summary, this present work highlights that ZnO NPs can be synthesized using a by-product of agroindustry. More importantly, the biosynthesized ZnO NPs can be applied as an antibacterial agent.

Keywords: mango; nanoparticles; oxide; peel; zinc

A31

Production of nanocellulose using controlled acid hydrolysis from large-scale production of micro-fibrillated cellulose derived from oil palm empty fruit bunches

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Abstract. Nanocellulose has generally known as a versatile material, which is suitable for various applications due to its unique physicochemical properties including light-weight, easily tunable surface functionalization and excellent mechanical properties. This research aims to characterize and synthesize nanocellulose produced from acid hydrolysis of large-scaled micro-fibrillated cellulose (MFC) derived from oil palm empty fruit bunches by varying concentrations of H2SO4 from 20 to 35 v/v %. The obtained large-scaled MFC had a density of 1.01 kg/m3 and was dominantly composed of 71% of cellulose, which was in agreement with infrared spectroscopy analysis. After acid hydrolysis of MFC, there were gradual changes in the colour of the obtained nanocellulose dispersion from light white to darker colour with the increasing acid concentration, in which the over hydrolysis occurs at 35 % of acid concentration. Based on the physical observation of the storage stability for over 1 month, stable nanocellulose dispersions were achieved for the samples produced at a minimum of 25 to 30% acid concentration, as noted by zeta potential above -30 mV indicating the successful formation of typical nano-scale material dispersion and it was also supported by transmission electron microscopy analysis.

Keywords: acid hydrolysis; micro-fibrillated cellulose; nanocellulose; oil palm empty fruit bunches

A32

Antibacterial potential of zinc oxide nanoparticles derived from pineapple peel aquous extract

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Abstract. Pineapple peel waste contains antioxidant molecules. This paper describes a facile, efficient, and environmentally friendly approach for the synthesis of ZnO nanoparticles using pineapple peel aqueous extract. This method aims to reduce the use of harmful chemicals in the production of ZnO nanoparticles using zinc nitrate as a salt precursor and evaluating their antibacterial activity. The synthesized ZnO nanoparticles by using pineapple peel (ZnO-pp) were characterized by X-Ray Diffraction (XRD) analysis, scanning electron microscopy (SEM), and fourier transform infra-red (FTIR) spectroscopy. The SEM images showed that by applying pineapple peel aqueous extract, the ZnO-pp were produced with average particle size below 100 nm with a mixture of flakes and rod-like shapes. The XRD pattern confirmed the wurtzite phase of ZnO. The antibacterial activity of ZnO-pp against Gram-positive and Gram-negative bacteria was evaluated by the agar disc diffusion method. The results showed that at concentrations of 5 and 10 wt%, the ZnO-pp actively inhibited *B. subtilis*. Therefore, phyto-assisted synthesis mediated by pineapple peel wastes is a promising green approach to produce ZnO nanoparticles.

Keywords: antibacterial; nanoparticles; pineapple peel; ZnO

B01

Effect of storage time on in-situ parameters and total nitrogen analysis results of tofu liquid waste samples

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Abstract. Measuring field parameters in the water sample test is included in the Indonesian National Standards of Work Competencies (SKKNI) No. 381 in 2020 and the Indonesian National Standards (SNI) about the water sample test. Field parameters measurement is usually constrained by time management, causing measurement delays and resulting in a mismatch between the measured field parameters and the actual environmental conditions. The field parameters observed in this study include pH, total dissolved solids (TDS), and electrical conductivity. Tofu liquid waste from the tofu factory outlet was used in this study. The field parameters were measured by storage time variation at 15, 20, 25, and 30 minutes respectively. The total nitrogen was analyzed by the Kjeldahl method with storage time variation at 2, 4, 6, and 8 days. The study of pH found no significant difference (sig > 0.05) up to 30 minutes of storage time, while electrical conductivity and TDS significantly differ in 20 minutes. The total nitrogen was stable up to the second day of storage time with the storage temperature of 4-8 °C without using preservatives like H_2SO_4. In monitoring water quality, the results of the analysis of water samples should be as close as possible to the values in their environment. This research proves that sample handling and analysis time of field parameters can change quickly if they are not in accordance with procedures, especially on electrical conductivity and TDS parameters. In addition, this study also proves that without giving H_2SO_4 to tofu wastewater test samples, it can reduce total nitrogen significantly on the second day of storage at a temperature of 4-8 °C.

Keywords: field parameter, storage time, total nitrogen, tofu liquid waste, water sample test

B02

An environmental impact assessment of restaurant operational: A case study of RM Restaurant, Garut-Indonesia

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Abstract. Food is one of the basic human needs, and the availability of restaurants is very important to support human life. In addition, the existence of restaurants in Garut Regency, which is one of the favorite tourist destinations in West Java, will provide benefits for local residents due to the opportunity for working and increasing the original local government revenue. Sustainable restaurant operations should be achieved regarding the impact of restaurant activities on the environment. The objective of the study was to assess the restaurant's operational impact on the environment and develop environmental management and monitoring systems. The analysis was carried out utilizing qualitative and quantitative methods. Data were collected from secondary sources and analyzed to develop environmental management and monitoring. The results show that the environmental impacts of the restaurant operation include a decrease in groundwater quantity and quality, a decrease in surface water quality, and solid waste generation. We recommend environmental management including groundwater conservation, providing the water and wastewater treatment plant and solid waste management. Environmental monitoring should be applied to measuring the quantity and quality of groundwater, surface water quality, and solid waste generation to achieve the environmental quality standard.

Keywords: assessment; environmental impact; housing; restaurant

B03

Characterization, risk assessment, and potential utilization of fly ash from the first municipal solid waste incinerator in Indonesia

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Abstract. Municipal solid waste incineration (MSWI) has been adopted in Indonesia to reduce the volume and mass of the municipal solid waste. However, as a by-product of waste combustion, fly ash generation cannot be avoided. It can cause an environmental problem if not managed properly. Hence, this study aimed to investigate the characteristics of fly ash generated from Indonesia's first waste-to-energy incineration pilot plant and its potential utilization. Fly ash was characterized using X-Ray fluorescence (XRF), BET surface area measurement, pore size distribution (PSD), scanning electron microscopy with energy-dispersive spectrometry (SEM-EDS), and X-ray diffraction (XRD). The characterization results show that calcium oxide was the predominant, around 35-39%, followed by titanium dioxide, silica dioxide, aluminum oxide, and ferric oxide with the value of 11-18%, 12-13%, 8-9%, and 6-10%, respectively. These results demonstrated that MSW incineration fly ash was classified as a very active high-calcium fly ash. The surface structure of fly ash was flaky and complex, with some irregular material. The particle size distribution of fly ash shows that the diameters of most particles were nearly 20 μm. The specific surface area of fly ash was 13.5 m^2/g, the total-pore volume was 0.04 cm^3/g, and the average pore size was 12.33 nm. In addition, the environmental risk assessment was evaluated using the toxicity characteristic leaching procedure (TCLP). TCLP concentration of heavy metals, including arsenic, barium, beryllium, cadmium, chromium hexavalent, copper, lead, mercury, nickel, selenium, and zinc, were lower than the regulatory level, indicating a low environmental risk. Therefore, the fly ash has great potential for utilization as a construction material and geotechnical application.

Keywords: Municipal solid waste incineration (MSWI); fly ash; risk assessment; toxicity characteristic leaching procedure (TCLP); heavy metals

B04

A web-based numerical model for sustainable management of Lake Batur, Bali: preliminary results

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Abstract. Lake Batur is one of The National Priority Lakes according to President Regulation Number 60/2021 with the target of restoring water quality through pollution control programs for floating net fishery (FNF), agriculture, and other anthropogenic sources around the watershed. The regulation also states several internal measures designed to restore the lake's water quality. Unfortunately, detailed information on pollution control priorities, the amount that must be controlled for water quality improvements to be visible, and the effectiveness of internal restoration efforts have yet to be obtained. This can hinder the lake restoration process and furthermore its sustainable management. This study aims to develop a web-based numerical model as an open-source web-service for guiding restoration in Lake Batur. It is accessible via the interactive graphical user interface (GUI) running in a standard web browser and includes tools of varying complexity. The platform provides the user with features to set up some parameters, run and analyse the numerical water quality and the possibility to set up, run and compare various lake management scenarios. The preliminary results show that the model were able to represent existing daily water quality dynamics. Hopefully, the model can be used as a tool for lake restoration and as a part of sustainable lake management.

Keywords: Lake Batur; web-based numerical model; lake sustainable management

B05

Prototype design urban monitoring several gaseous pollutants using low-cost electrochemical sensor

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Abstract. Monitoring atmospheric gaseous pollutants in urban areas is increasingly essential to anticipate poor urban air quality and the increasing number of acute respiratory infections caused by air pollution. Usually, the monitoring of air pollution is conducted by the government and scientists by using accurate and expensive instruments. However, the high-cost installation and maintenance of this instrument caused the limited number of monitoring stations that could be placed. It made it hard to identify the pollutant's local source, especially on an urban scale. Hence, this study designs alternative techniques to monitor several gaseous pollutants using the Low-cost Air Quality System (LAQS). LAQS has enormous potential to be a reference station's auxiliary tool, increasing the resolution of air pollution monitoring systems. Thus, a custom-made low-cost electrochemical sensor was used in this study to detect several gaseous pollutants, including ozone (O_3), nitrogen dioxide (NO_2), and carbon monoxide (CO), together with temperature and relative humidity measurements as well as data logger and GSM module for data storage and transmission, respectively. In the first stage, the prototype will be examined in the laboratory before being installed in the desired location. In lab experiments, the electrochemical sensors demonstrated linear response with a response-time range of 30–120 s, demonstrating that they could be susceptible. The manufacturer's previous factory calibration was used to compare the gas sensors' zero offsets and sensitivity; while the sensitivity was within 3-18%, the offsets varied by 1-10%.

Keywords: Air pollution monitoring, Low-Cost Air Quality Sensor, Laboratory experiment

B06

Indonesian Lake Information System: It is timely to be in one platform

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Abstract. Indonesia owns more than 5000 lakes, varied in type and size, scattered across the country. Fifteen of these lakes have been stated as National Priorities for Restoration owing to their unique characteristics, geological set ups, sociocultural interaction, and rapid eutrophication pressures. Over the last decade, efforts have been put in place to "save" those fifteen lakes, however numbers of lakes facing rapid eutrophication are even doubled. Aligned with actions to restore those lakes, there has been a patchwork of efforts and initiatives across the country to develop lake monitoring programmes led by research institutes or community-based monitoring groups, mostly managed by provincial agencies. However, all these efforts differed in terms of their approach, focus and specific objectives, and often had severely limited resources. Furthermore, many monitoring programs have only been in place for a short time. The central government, on the other hand, is always demanding the up to date condition of those restored lakes as part of the evaluation of the national investment in the restoration programme. We initiate a robust platform that integrates all existing system information, databases, and archives of lake monitoring data. Such platform is targeted to be well informative for the authorities, public and other stakeholders in the way that it not only serves as a monitoring dashboard but also it is able to enhance user's capacities in better understanding the condition and behaviour of their lakes.

Keywords: lake database, lake system information system, national priority lakes, open science data, water quality

B07

Estimating baseline CO_2 emission from waste collection and transport activity to TPST Bantargebang, Jakarta

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Abstract. Municipal solid waste is one of the fundamental problems in DKI Jakarta Province. Increasing population and various human activities had a direct effect on this issue. TPST Bantargebang served and treated all waste in DKI Jakarta Province, and the volume of waste generation reached 7,702 tons per day in 2019. Despite the waste generation, waste collection and transport is becoming an emerging issue. The level of service by the Environmental Agency of DKI Jakarta Province is planned to reach 98% in 2025. Dump and waste trucks come and go in the long queue every day around TPST Bantargebang. Estimating CO_2 emissions from waste collection and transport activity uses daily logbook data, fleet data, and spatial analysis. This study assigned the source point as a temporary disposal site in each sub-district. It showed that the total vehicle kilometer traveled (VKT) reached 71,990.72 km/day, which collected and transported 5,897.67 tons of waste/day. The need for fuel consumption reached 31,989.17 liters of bio-solar per day. If the waste generation increases by 0.082 tons per day, there will be 1 kilometer per day of waste collection and transport and 0.44 liter of fuel consumption. The baseline of CO_2 emission reached 82.98 tCO_2 per day by multiplying the bio-solar emission factor and total fuel consumption.

Keywords: waste generation; waste collection and transport; vehicle kilometer traveled (VKT); fuel consumption; CO_2 emission

B08

Multi criteria analysis for solid waste management system in Indramayu coastal area

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Abstract. Pollution of coastal areas in Indonesia does not occur in one area but is spread over several points on the coastline of Indonesian archipelago. Indramayu Regency, which is one of the coastal areas of Indonesia and has quite large marine resources and tourism assets, for the past few years has experienced a worsening solid waste problem. This research activity was carried out in Cantigi District and Indramayu District, both areas were considered capable of representing the condition of Indramayu Regency which has various regional conditions but generally has resource and tourism assets in coastal areas. Analytical Hierarchy Process (AHP) is a form of decision-making model with multiple criteria. This method is a decision-making method that involves several criteria and alternatives that are selected based on consideration of all related criteria (Saaty, 2004). In the analysis, there are five aspects that become criteria: environmental, financial, social, technical and institutional aspects. This study aims to formulate a solid waste management system in Indramayu Regency with the AHP method approach. The results of the study are to obtain recommendations for solid waste management system options that involved collaboration between the community and UPTD. Optimizing the function of the 3R TPS and socializing with the community about sorting waste activities is one way that can be done.

Keywords: Analysis Hierarchy Process, Coastal Area, Multi-Criteria Analysis, Solid Waste Management System

B09

The occurrence of microplastics in the surface water of several urban lakes in the Megacity of Jakarta

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Abstract. Microplastic pollution in the water bodies of densely populated urban areas may be more severe than any other environment especially in the area with lack of plastic waste management. Urban lakes in Megacity Jakarta, the most populated city in the world, have been severely polluted by plastic waste. The urban lakes studied are sited in the downstream river watershed in which the water flows into the Jakarta's Bay. A previous study found that fish in the Jakarta's Bay has been polluted by microplastics (MPs). To our knowledge, there have been no studies reported on microplastic pollution in urban lakes in Megacity Jakarta. This study investigated 6 urban lakes in the downstream river watershed area of Megacity Jakarta. Grab water samples were collected in the inlet and outlet site of the lakes. The water samples were pretreated and filtered to trap the MPs. The calculation and the identification of MPs were done by using a Macro Stereo Microscope. It was observed that the most downstream urban lakes with dense population and close to the Bay which is the final disposal of plastic wastes from the river channel and run off from the surrounding area, had more abundance of microplastics compared to urban lakes in the area with less population and further from the Bay. The most abundance of microplastics found in the lake's surface water was around 30,000 particles/m^3 whereas the size of 300-500 μm and the foam were the dominant size and type of microplastic found. The study indicates that the majority of small particles of MPs found in the lake's water could become a concern due to their high potential to be consumed by aquatic biota especially fish.

Keywords: microplastic; Megacity Jakarta; urban lakes; water pollution

B10

Effect of the implementation of community activity restriction policies during the COVID-19 pandemic on air quality

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Abstract. The transport sector contributes to the air quality of an urban area. Therefore, the implementation of activity restriction policies during the COVID-19 pandemic was expected to affect the particulate concentrations in the atmosphere. The purpose of the study was to analyse the effect of the implementation of activity restrictions on $PM_{2.5}$ and PM_{10} particulate concentrations in Serpong, South Tangerang. The data concentration of $PM_{2.5}$ and PM_{10} were obtained from the monitoring station of Air Quality and Greenhouse Gas in Geostech Building-Puspiptek Area, Serpong, which were measured in real-time and continuously. The measurement of $PM_{2.5}$ and PM_{10} concentrations was carried out from October 2019 to March 2022. The comparison of $PM_{2.5}$ and PM_{10} concentrations between the activity restrictions were applied and not applied, was tested by a comparative independent t-test two-tailed. The analysis of seasonal variation of $PM_{2.5}$ and PM_{10} concentrations utilizes Pearson correlation analysis with the independent variable was rainfall. In the wet season, the concentration levels of $PM_{2.5}$ and PM_{10} were slightly higher during the activity restrictions. In the dry season, during the activity restriction and relaxation, there was also a difference in $PM_{2.5}$ and PM_{10} concentrations. In conclusion, generally, the concentration of $PM_{2.5}$ and PM_{10} was higher during activity relaxation.

Keywords: activity restriction; air quality; Covid-19; particulate matter; Serpong

B11

Groundwater nitrogen concentration changes in an urbanized area of Indonesia over ten years period

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Abstract. Groundwater contamination by nitrogen poses serious environmental concerns in Indonesia due to urbanization. Nitrogen contamination of unconfined groundwater has been discovered through groundwater research in the urbanized Bandung Region. The region's geology, composed primarily of volcanic rock and has a high degree of permeability, was related to the contamination. Additionally, previous research has demonstrated that land-use variations affect groundwater's nitrogen content. This study examines changes in the nitrate (NO_3^-) and ammonium (NH_4^+) contents in Bandung's unconfined groundwater over ten years. The methods used included statistical analysis, land-uses assessment, and interpretation of hydrochemical data. The study comprises 88 samples of groundwater from 2009, 2015, and 2018 which were collected from primarily three types of land-uses; residential, paddy field, and plantation. Ten-year changes in those land-uses are visible in a 13% increase in settlements, a 38% reduction in rice fields, and a 3% increase in plantations. In 2009, 2015, and 2018, the measured concentrations of NO_3^- ranged from 0 to 42 mg/L, 0.9 to 49 mg/L, and 0.4 to 21 mg/L, respectively. While measured NH_4^+ concentrations ranged from 0.0 to 6.8 mg/L in 2009, 0.02 to 24 mg/L in 2015, and 0.2 to 14 mg/L in 2018, respectively. From 2009 to 2018, NO_3^- levels decreased significantly by about 4.7 mg/L ($p < 0.05$), while NH_4^+ levels increased insignificantly by about 0.6 mg/L ($p > 0.5$). In addition, the 2013 data reveals a distinct trend: from 2009 to 2013, the NO_3^- concentration tended to increase by approximately 1.3 mg/L, although this trend was not statistically significant. Regarding land-use conditions, the plantation region had the highest levels of NO_3^- and NH_4^+. Approximately 7 mg/L of NO_3^- was significantly increased over a decade. During the same period, NH_4^+ concentrations also increased but by a lesser significance, approximately 1.2 mg/L.

Keywords: unconfined groundwater, nitrate, ammonium, Bandung, land-uses

B12

Accuracy of photoelectrochemical COD on comparison with dichromate method on water sample

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Abstract. Chemical Oxygen Demand (COD) is one of critical environmental parameter in determining the organic matter in water matriks. The conventional dichromate method employs hazardous reagents and heat reflux. In order to reduce the hazardous waste, some alternatives method have been proposed to replace the dichromate. Photoelectrochemical COD (PeCOD) method become a promising one for it less time-consuming, environment friendly, and more reliable. For ensuring the result, comparison between PeCOD and dichromate should be conducted. In this study we devoted in analyzing the technical feature of the PeCOD method especially for accuracy on Certified Reference Material (CRM) in order to compare their accuracy performance and identify the advantages and disadvantages of each method. The result showed the PeCOD gave the recovery of (90.64±1.91)%, whereas the dichromate method gave the recovery of (96.36±6.34)%. This result is not really different for CRM recovery by assign value of 300 ppm with tolerance (90-107)% based on Association of Official Analytical Chemist. Based on this result the PeCOD can be used for rapid and accurate quantification of COD and the alternative method determination of COD in environmental sample.

Keywords: COD analysis; photoelectrochemical COD (PeCOD); dichromate method; accuracy.

B13

Study of total dissolved solids (TDS) and total suspended solids (TSS) in estuaries in Banten Bay Indonesia

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Abstract. Banten Bay including its estuaries have sandy sediment. A lot of human activities in Banten Bay and condition of the bay itself could affect its water quality. Fishery as main human activity in estuaries in Banten Bay needs good water quality, to support water biota and to remain fisheries productivity, that support people life's who lived surrounding the estuaries. This study aims to revealed solids content in estuaries in Banten Bay. Research study conducted in four estuaries in Banten Bay. There are Karangantu, Wadas, Cengkok and Pamong. Water sampling conducted three times in 2013 and two times in 2021. Water was sampled compositely in each estuaries. Total Dissolved Solids (TDS) measured insitu in April and October 2021. Total Suspended Solids (TSS) analyzed in May, July and October 2013, also in April and October 2021. TSS analyzed in laboratory. Other physical and chemical parameters also measured and analyzed. Some parameters measured insitu. There are water depth, sechi depth, pH, water temperature, dissolved oxygen, conductivity, salinity, current water and turbidity. Chlorophyl-a and Chemical Oxygen Demand (COD) was measured in laboratory. Result analysis was compared with standard for sea aquatic biota. TSS in all estuaries exceded the standard and TDS in four estuaries still meet the standard. Corellation of TSS and TDS with other parameters analyzed using regresion method. Physical and chemical parameters that affect TDS and TSS analyzed using Principal Component Analysis (PCA). PCA analysis showed that there are two groups of sampling station. Group one consists of Karangantu, Wadas and Cengkok estuaries, another group is Pamong estuary. TDS correlated with turbidity, dissolved oxygen and sechi depth. TSS correlated with salinity.

Keywords: estuaries; solids content; Total Dissolved Solids and Total Suspended Solids; Banten Bay

B14

Atmospheric concentrations of polybrominated diphenyl ethers (PBDEs) in passive air sampler from Batam Island, Indonesia

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Abstract. Environmental contamination by polybrominated diphenyl ethers (PBDEs) - a group of compounds widely used as flame retardant in various applications of electronic and electrical equipments, have been a matter of research concern due to their persistentcy, bioaccumulative nature and toxicity. These compounds could undergo to atmosphere due to their semi volatile which thus potentially distribute and contaminated aquatic and terrestrial environment. Although large studies of atmospheric PBDEs have been conducted worldwide, however, only very a few data has been reported for Indonesia. For atmospheric monitoring of PBDEs, passive air sampler using polyurethane foam (PUF-PAS) has been widely used as one of the most validated techniques at local and global scale. This study aims to elucidate the levels and spatial distribution of PBDEs in the atmosphere derived from PUF-PAS and identify their sources in Batam Island. Fiveteen PUF-PAS were deployed in various locations representing different beckground activities in Batam Island. After deployment around 2 month, PUF were analyzed for fourteen PBDE congeners from mono- to deca-BDE congener using gas chromatography with mass spectrometry (GC-MS). Concentrations of PBDEs varied widely depending on sampling locations, ranging from 7,2 - 2800 pg/m^3. Highest concentrations of PBDEs were found at marina Tanjung Riau (2800 pg/m^3), whereas other locations were much lower including electronic shop (50 pg/m^3), dumping site area (45 pg/m^3), offices (19-36 pg/m^3), residential (15-27 pg/m^3) and remote areas (7,2-15 pg/m^3), which indicating specific emission source according to location. The PBDE profiles were generally predominated by higher BDE congeners especialy BDE-209 on average 81 % (36% - 100%) of the total PBDEs, whereas other congeners constituted lower proportions. These results indicate that the presence of PBDEs in Batam Island is mainly caused by deca- rather than penta- and octa-BDE commercial mixtures, which is consistent with the high consumption of deca-BDE in Asia.

Keywords: Atmosphere, Batam Island, contamination, Indonesia, passive sampler, PBDEs

B15

Environmental impact study on conversion of multilayer metallized packaging to paving blocks with a life cycle assessment (LCA) approach

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Abstract. Plastic waste management in Indonesia is relatively poorly implemented due to the limited number of recyclers. One of the most abundant plastic wastes is multilayer metallized plastic packaging (MLP). This study was conducted to analyze the environmental impacts of MLP and plastic bag waste conversion to paving blocks (PVB) with a life cycle assessment approach and aimed to determine whether such a process brings positive or negative impacts to the surrounding environment. The assessment was performed gate-to-gate on input data, including raw materials, energy, support materials, and output, using openLCA 1.11 software, ecoinvent 3.8 databases, and CML-IA baseline method. Secondary data on waste plastic treatment in a sanitary landfill was inferred from the ecoinvent database for comparative analysis. Environmental impacts arising from production of 1 PVB (20 × 10 × 6 cm, 700 g) are acidification 1.0510×10^{-2} kg SO2 eq, eutrophication 2.5755×10^{-3} kg PO4 eq, freshwater aquatic ecotoxicity 5.9793×10^{-1} kg 1,4-DB eq, global warming (GWP100a) 1.8804 kg CO2 eq, human toxicity 7.8494×10^{-1} kg 1,4-DB eq, and marine aquatic ecotoxicity 1.2509×10^{3} kg 1,4-DB eq. Compared to treatment in a sanitary landfill, conversion of MLP lowered eutrophication, freshwater aquatic ecotoxicity, and marine aquatic ecotoxicity to the environment, whilst other impacts are higher due to energy input in the processes. Conversion of MLP to PVB is proposed as an alternative to plastic waste management.

Keywords. Multilayer Metallized Packaging; environmental impacts; paving blocks; LCA; gate-to-gate; recycling

B16

Spatial distribution of atmospheric polychlorinated biphenyls (PCBs) in Jakarta Great Area using passive air sampler

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Abstract. The atmosphere is the important transport route for semi volatile organic compounds from their emission source via deposition to terrestrial and aquatic ecosystem. Therefore, understanding their levels in air is necessary for assessing their sources, transport and loadings into the environment. For atmospheric monitoring of Persistent Organic Pollutants, including polychlorinated biphenyls (PCBs) passive air sampler using polyurethane foam (PUF-PAS) have been widely used as one of the most validated techniques at local and global scale. In this study, 62 PCB congeners were determined in PUF-PAS deployed at several locations (industrial, dumpsite, urban and rural areas) in Jakarta and its surrounding areas by using gas chromatography equipped with mass spectrometry detector (GC-MS). The objectives of the present study are to elucidate their levels and spatial distribution in the atmosphere. PCBs were widely detected in the PAS samples, with concentrations varied according to location (ranged 29 – 220 pg/m^3), indicating specific location source of these compounds. Highest concentration of PCBs was found in atmosphere of dumpsite followed in the order of industrial>urban>rural areas, suggesting that dumpsite and industrial areas are as emission sources of these compounds. The lighter PCB congeners were the predominant compounds, which correspond to their volatile properties. To our knowledge this is a first study to report gradient concentrations of PCBs according to locations using passive air samples in Indonesia.

Keywords: Atmosphere, contamination, distribution, Jakarta great area, polychlorinated biphenyls, passive air sampler

B17

The effect of geomembrane plastic usage on microplastic and heavy metal contamination in salt field

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Abstract. Salt is made from abundant raw materials that do not need to be purchased, namely sea water. Indonesia, for the last 10-15 years in producing salt, we have used geomembrane plastic in salt field to prevent contamination and increase quality and productivity. However, it is unfortunate that currently seawater has been polluted by plastic waste which has gradually been degraded into small pieces of <5 mm called microplastics. In addition to microplastics, sea water is also polluted by heavy metals. Previous research that the north coast of Central Java has been polluted by heavy metals that exceed the threshold such as Hg, Cd, Cu, Cr, Pb, Ni, Zn, and As. This study aims to analyze the amount of microplastic (MP) and metal contamination in salt. The method used to calculate the amount of MP using a microscope, heavy metals with AAS. Variables that were carried out included sampling location (4 locations) and crystallization process (using and without using geomembrane). The results showed that the amount of MP salt using a geomembrane was higher than that without a geomembrane, respectively 337,375 and 325,75 particles/kg. The average is 331.5625 particles/kg. Salts that use geomembranes have more contamination than those without geomembranes. Other contaminants are heavy metal contamination of Pb, Cu, Hg, As, all of which are still within the threshold.

Keywords: Geomembane plastic, mikroplastic, heavy metal, salt field

B18

Mapping the environmental impacts from land subsidence hazard in Pekalongan City and its correlation with the subsurface condition

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Abstract. Land subsidence in Pekalongan city has affected almost the entire municipality for at least ten years. Land subsidence has occurred in almost all Pekalongan city areas at 2-12 cm/year rates. The direct and indirect environmental impacts of land subsidence are enormous. We aim to map the environmental impacts of land subsidence in Pekalongan city and evaluate the severity of the impacts with the subsurface condition of the affected area. We employed site investigation using resistivity and CPTu soundings at representative sites to reveal the subsurface soils and site survey to map the environmental impacts. Results show that the subsurface condition up to the depth of 30 m consists of alluvial sediment of clay, silt, and organic soils intercalated with lenses of sand. The alluvial sediment in the southern part is dominated by sandy soils and has a higher stiffness with cone resistance of 1-2 MPa and a friction ratio of 50-200 kPa. The subsurface soils in the northern part are dominated by clay, silt, and organic soils with low cone tip resistance of <0.5- 1 MPa, and friction ratio of <0.25-100 kPa. The visible impacts of land subsidence include flood and inundation, settlement of buildings and roads, and cracks in houses and infrastructure. The severity of impacts worsens from South to North of the city. This condition is related to the subsurface stratification and engineering properties, where lower bearing capacity occurs at the north.

Keywords: Pekalongan, land subsidence, impacts, severity, subsurface soil

B19

Assessment of soil vulnerability index for surface runoff in Kawal watershed, Bintan island

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Abstract. Soil erosion is a critical problem in one of the Bintan river basin areas, especially in bauxite ex-mining. After their closure, the open land bauxite ex-mining was revegetated, resulting in land degradation. Soil erosion has severely occurred in Bintan Island, as evidenced by the extent of converted land cleared following deforestation in the basin. Deposition of eroded material causes eutrophication, blockage, and silting of channels and water bodies, as well as flooding in lowlands and coasts. The high rainfall and sparing of vegetation cover led to soil structure ravage and caused further the soil to be unable to store and absorb water during the rainy season, upsurge surface runoff, and impacted increasing erosion rates. The study aimed to evaluate the vulnerability class soil erosion using SVI. The SVI runoff component defines the potential risk of sediment and sediment-bound contaminants' loss via surface runoff. The SVI class is based on slope, digital elevation model (DEM), hydrologic soil group, and soil erodibility.

Keywords: Soil, erosion, SVI, Bintan

B20

Chemicals of concern for sustainability of Indonesian textile

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Abstract. It has been known textiles and textile products may contain hazardous compounds. Formally, all imported textiles and textile products must be registered through Indonesian Custom. Ideally the Indonesian Custom capable of detecting chemicals of concerns in textiles or textile products entering Indonesian territory. However, this is not the case particularly for chemicals listed in the Stockholm Convention. The difficulties arises from lack of identification capability regarding substances listed in the Stockholm Convention that might present in textiles, textile products, and finished products. The Indonesian Government has initiated to assess the presence of persistent organic pollutants (POPs) in Indonesian territory. The results of the assessment is elaborated in the National Implementation Plan (NIP) Document on POPs which was recently updated. Not all substances listed in the Stockholm Convention can be described in depth. Even some POPs such as short-chain chlorinated paraffins (SCCPs) and polychlorinated naphtalene (PCN) have not been included in Indonesian regulation, particularly in Indonesian Customs Tariff Book, as such making extremely difficult to assess them. Nevertheless a preliminary assessment on polybrominated diphenyl ethers (PBDEs) and SCCPs has been carried out. Using TIER 1 approach it was revealed 2,194 tonnes of SCCP was imported from India to Indonesia listed under HS code 38249090 that cover CP52 (contain 50 – 54% chlorinated parrafins). Furthermore prominent issues for chemicals of concern (COC) in textiles were the use of lead containing dyes, nonylphenols (NP) and nonylphenol ethoxylates (NPE). The last two compounds were used in detergents and surfactants during textile manufacturing processes. At the present, nonylphenols and nonylphenol ethoxylates are not listed in Indonesian Laws for regulated chemicals in textiles and textile products or wastewater quality standard for textile industry. Considering the endocrine disrupting properties of nonylphenol and its ethoxylates then their used in textiles should be appropriately controlled.

Keywords: COC, POPs, textiles, textile products, hazardous, sustainability

B21

Modelling and mapping the environmental impact from debris flow hazard on alluvial fans for sustainable development in Bangga and Poi Villages, Sigi, Central Sulawesi

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Abstract. On 2018 September 28, an Mw 7.5 earthquake with a focal depth of about 20 km induced massive landslides along the upstream, followed by 24 events of debris floods which spread to 15 villages in Sigi from September 2018 through December 2021. Debris flow and flash floods on alluvial fan inundated lowland communities, causing severe property destruction and structural damage to bridges and roadways and resulting in an estimated 900 damaged houses. Understanding their historical occurrence is essential to sustainable fan development and minimizing their threat to infrastructure and human life due to their severe geohazard potential. We aim to map the environmental impact and model the past sediment deposition of debris flow in Sigi. The model used Flow-R based on DEMNAS with 8.3 m spatial resolution that intends to understand both flow direction and maximum runout distance of sediment. The result indicates that 13 upstream sub-watersheds be vulnerable to debris flow hazards after the Palu earthquake of 2018. Then, back analysis modeling shows good agreement between predicted and documented debris flow path extent.

Keywords: Sigi; debris flow; impacts; alluvial fan; earthquake

B22

The assessment of sustainable aquaculture model to improve the aquatic environment and productivity in the Indonesian coastal area

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Abstract. The study of the Integrated Multi Trophic Aquaculture (IMTA) model with a closed system (CSIMTA) in the northern coastal area of Karawang, West Java and an open system (OSIMTA) in the southern coastal area of Bantaeng, South Sulawesi, Indonesia was carried out to determine its performance in improving the quality of the aquatic environment and productivity. The CSIMTA model experiment used 4 treatments (P1-Shrimp Monoculture, P2-Shrimp and Tilapia, P3-Shrimp, Tilapia and Gracilaria seaweed, P4- Shrimp, Tilapia, Gracilaria seaweed and green mussels). Meanwhile, the study of the open system model (OSIMTA) was carried out by measuring the physical and chemical parameters of the aquatic environment. Based on the results of the CSIMTA research, it is known that the results of aquaculture integrated with tilapia, shrimp, Gracilaria seaweed and green mussels (P4) are more productive and the quality of the aquatic environment is more stable than the other 3 treatments (P1, P2, P3 and P4). In the P4 cultivation model, a bio-recirculation system has been working where seaweed utilizes liquid waste resulting from the dissolution of feed residues and excrement from tilapia and shrimp as a nutrient supply for growth. Then the organic waste is used by green mussels as a source of feed. The bio-recirculation system also works in the open system integrated culture model (OSIMTA).

Keywords: sustainable aquaculture model, aquatic environment, productivity, coastal area

B23

Health risk assessment of PM2.5 and PM10 in KST BJ Habibie

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Abstract. Puspiptek (The Center for Science and Technology Research) Serpong is an office and laboratory area of 460 ha surrounded by residential, congested traffic and industrial activities. This condition certainly has the potential to increase the concentration of $PM_{2.5}$ and PM_{10} which have an impact on health risks if inhaled by humans. This study aims to analyze the risk characteristics of $PM_{2.5}$ and PM_{10} as the basis for recommendations for managing employee health risks in the Puspiptek area. The research method was carried out descriptively using the Environmental Health Risk Analysis (EHRA) method. Hazard identification as the first stage in the EHRA was obtained by measuring the concentrations of $PM_{2.5}$ and PM_{10} in real-time and continuously, which was the result of direct measurements in the Geostek 820 Air Quality Measurement Station in collaboration with the National Institute for Environmental Studies (NIES-Japan). The next stage is dose-response analysis, and exposure analysis obtained through a questionnaire to then analyze the risk characteristics. The results of the analysis in the form of a risk quotient >1 are categorized as unsafe , while the risk quotient value is categorized as safe. The risk quotient categorization can be used as risk management, so that the presence of $PM_{2.5}$ and PM_{10} does not cause health problems for employees in the Puspiptek area.

Keywords: environmental health risk assessment (EHRA); exposure route; inhalation rate; particulate matter (PM); risk quotient (RQ)

B24

Mining waste quality (mercury) and effect on river water quality around the small-scale gold mining locations (case study: West Sumbawa location)

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Abstract. This study was conducted to determine the metal content of mercury in the flowing river around the small-scale gold mining. Mine wastes from the run of mining dumped into the watersheds and are potentially contaminated the water and sediment in the watershed near the gold mining area. To know the characteristics of the waste and then do the test and the result will be compared with the water standard quality. Water standard quality is used in the environment minister decision No.202 of 2004 and regulation No.82 of 2001. Quality standards for sediment samples are using the Canadian sediment quality guidelines for the threshold effect level (TEL). The result of testing sampling water waste from the area of gold mining is categorized in class IV according to the standards of government regulation No. 82 of 2001. The result of the mercury content in the sediment samples does not meet the standards of Canadian sediment quality guidelines for the threshold effect level (TEL). The content of mercury in the sediment samples from the gold mine site is very high. This is the most likely result of the use of mercury by small-scale miners. The result of these test shows that the sediment mercury samples has been settled for a long time around the watershed. The content of mercury in the mining location indicates that mercury had been contaminating in the area around the small-scale gold mining.

Keywords: gold mining, mining waste, mercury.

B25

Benthic macroinvertebrates community to response environmental factors in a crater lake (study case: Lake Menjer, Indonesia)

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Abstract. Menjer Lake located in the highland area of Central Java has received multiple stressors from anthropogenic activities. Benthic macroinvertebrates as a key indicator for water quality were little known there. Thus, this present research recognizes benthic macroinvertebrate structures in Menjer Lake, Indonesia. Sampling was conducted twice a year seasonally on August and October 2019 in five sites. Some groups were identified into the family and others into the genus level. The physiochemical variables of water quality measured on-site were pH, Dissolved Oxygen, Total Dissolved Solids, Conductivity, ORP, and water clarity. A total of 4312 benthic macroinvertebrates composing of 10 taxa, belonging to seven families were recorded, namely Chironomidae (22.85%), Tubificidae (73.50%), Lumbricullidae (0.68%), Thiariidae (0.21%), Planorbidae (0.45%), Lymnaeidae (0.21%), and Unionidae (0.92%), and Corbiculidae (1.13%). The number of taxa varied between 1 to 3 in each station. Mollusk was the best-represented group with five families. Meanwhile, Tubificidae was shown as the predominant family in abundance both in August (3879 ind/m^2) and October (2008 ind/m^2). Shanon-Wiener index ranged nearly similar between the two seasons, 0.17 to 0.91 in August and 0.0 to 0.91 in October. ANOSIM CAP6 shows that no significant difference among macroinvertebrates abundance (P < 0.05) among locations in Lake Menjer. This community was mostly homogenous. Bray-Curtis analysis using MVSP shows similarities in the taxa compositions between the sites.

Keywords: Benthic, Highland, Lake, Macroinvertebrate, Menjer

B26

Water quality and financial feasibility analysis in the development effort of farming milkfish in Pabean Ilir Village, Indramayu, West Java

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Abstract. The tidal flood that occurred in the coastal area of Indramayu in 2020 caused the farmers in Pabean Ilir Village failed to harvest Vannamei shrimp. After the disaster, the farmers resumed their pond cultivation activities with different commodities, namely milkfish. However, the water quality and profitability in the pond business needs to be studied considering that the farmers have suffered losses due to tidal flooding in the previous year. This study assessed the water quality at several sample points around the pond using the standard method (APHA). The economic and financial feasibility of milkfish aquaculture assessed using cost-benefit analysis (CBA) through interview using a structured questionnaire and focus group discussions with fish farmers individually. In addition, the sensitivity analysis is carried out changes in the amount of production and feed price. This paper gives detailed information on water quality parameters such as water temperature, pH, salinity, dissolved oxygen, nitrite, nitrate, and ammonia. In the present study, all important water quality parameters recorded were within the suitable and safe range for milkfish cultivation. Then, the feasibility of milkfish aquaculture for 10 periods was determined by the value of NPV, BCR, and IRR. As the result, the positive NPV, BCR>1, and IRR > interest rate indicates that the aquaculture enterprise is feasible and profitable.

Keywords: aquaculture, cost-benefit analysis, financial feasibility, milk fish, water quality

B27

Analysis and identification of Citarum watershed pollution for monitoring the sustainability of water resources

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Abstract. Water pollution in the Citarum watershed is an urgent problem to be controlled. Water pollution usually occurs due to the large number of pollutants entering water bodies originating from household waste, agriculture, industry, livestock and land use. This research is located in the upstream Citarum watershed by taking 5 location points, namely at the Outlet Situ Cisanti, Cikawao, Koyod, Rancamanyar, and Nanjung. The locations selection is seen from the sources of pollutants that may enter and contaminate water bodies. This study aims to analyze and identify pollution in the upstream Citarum watershed by looking at the parameters of BOD, TDS, chloride, zinc, total detergent, nitrate, nitrite, lead, mercury, and phenol. This pollutant parameter if it exceeds the water quality standard by the government can have an impact on ecology and human health. The method used is descriptive analysis by comparing monitoring data with river water quality standards PP No. 22/2021, water quality status using by STORET and interpreted through map distribution. The results from measurement of the specified parameters, it can be seen that nitrite at Rancamanyar and Nanjung stations exceeds the quality standard, the value for both stations is 0.07 mg/L and 0.08 mg/L while the nitrite quality standard is 0.06 mg/L. Nitrite indicate that the pollutant comes from agricultural waste, and there was rain at night, it could cause nitrite to be washed into the water. BOD in Cikawao, Koyod, Rancamanyar and Nanjung are exceeds the water quality standard. Higher BOD indicates the river is getting polluted which has standard value 3 mg/L. Other parameters are still below the class 2 Indonesia water quality standard. Water Quality status represents being lightly polluted. It can be caused by rain at night and occur the heavy flow in the Citarum watershed so that pollutants are diluted.

Keywords: Identification, Water Pollutant, Watershed, Citarum, Bandung

B28

An overview of the circular economy activity for small island wastes and marine debris

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Abstract. The national regulation's scheme to tackle trash and debris in small islands and coastal areas in Indonesia is by applying the 3R (reduce, reuse, recycle) program. This concept was written in Presidential Regulation no 97/2017, regarding the National Strategy and Policy of the Management for Household Wastes and Similar Wastes. On the other hand, Presidential Regulation no. 83/2018 regarding Marine Debris Management was focused to minimize trash and wastes leaked into the marine water due to anthropogenic activities. The term circular economy has grown significantly since Boulding initiated it in 1966. The United Nations for Environment Programme (UNEP) has preferred to use the Green Economy since 2008. This paper will present the reality of waste management that occurs in small islands and recommendations for sustainable management according to the circular economy concept. The methodology for this paper was by studying regulations in Indonesia, reviewing circular economy and green economy kinds of literature, and surveying the reality of waste management in small islands in Kepulauan Seribu, Karimun Jawa, and Wakatobi. The results of the study provide a surprising reality but are common in small islands. Non-organic and solid waste that has no economic value (to be recycled) is used as reclamation material. Economical waste for recycling is managed by a waste bank organization. Organic waste is made into compost or burned in an incinerator that is still functioning. The processed waste residue on the island is then transported using a garbage transport ship (specifically for the Kepulauan Seribu). For the Karimun Jawa Islands, residual waste is only collected at the momentary storage place (TPS) in the form of a landfill. Similarly, what happened in the Wakatobi Islands, the residual waste was piled up at the TPS. The implementation of a circular economy concept can only be applied effectively to closed-system under certain management. What is happening on small islands is an open system and the management is varied.

Keywords: circular economy, garbage transport ship, green economy, marine debris, small islands, management

B29

Identifying environmental variables in potential flood hazard area using machine learning approach at Musi Banyuasin Regency, South Sumatra

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Abstract. Meteorological natural disasters are related to climate. Anomaly conditions in warm sea surface temperatures caused the water vapor to overflow into rain-forming clouds, gradually forming high integrated rainfall in some areas of Indonesia. High or extreme rainfall causes a hydro-meteorological disaster in the form of a flood. Musi Banyuasin Regency, South Sumatera, has a concave to flat topography, a swamp area with abundant large and small rivers prone to flood disaster. Between 2012 and 2022, BNPB recorded that 38 locations had been flooded. This study aims to identify environmental variables that affect the potential flood hazards and areas with a high flood hazard level. This study used a maximum entropy model approach based on machine learning techniques. The model analyzed all the findings in the sample data to produce predictive information on the contributing environmental variables. The sample data is 38 flood areas with each preliminary fact and topographic characteristic. Threat components are arranged based on environmental variables (aspect, slope, elevation, land cover, rainfall, and river width). The results indicate that the average rainfall contributes 58%, elevation 26.4%, slope 8.6%, aspect 5.8%, land-cover 1%, and river width 0.1%. Then, the areas with high hazard level of flood indicated in 8 districts, namely Lais, Sekayu, Babat Supat, Keluang, Sungaililin, Lawang Wetan, Babatoman, and Sangadesa

Keywords: flood, hazard level, maximum entropy, machine learning, threat component

B30

Spatial distribution of carbon dioxide (CO_2) fluxes in the Sunda Strait and west of Sumatra waters

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Abstract. CO_2 is one of the main causes of global warming gases which cause global climate change, droughts, forest fires, sea level rise and flooding. Natural CO_2 sinks are the mainland, oceans and atmosphere. Indonesian waters has the potential to absorb CO_2 due to their high primary productivity. This study is to understand the variability of CO_2 in order to determine whether the Indonesian waters act as carbon sources or carbon sinks and fill the CO_2 data gaps. The field survey was conducted at the Sunda Strait and west Sumatra of Indian Ocean during February-March 2010 and April 2010, respectively, using RV. Baruna Jaya III. While for air pCO_2 data was obtained from the average of monthly observations of the Global Atmospheric Watch station in Kototabang Bukittinggi in February, March and April 2010. Concentrations of CO_2 gases in view of the inorganic carbon parameters, acidity, alkalinity and total CO_2 partial pressure varied within the study area. Sunda Strait have a role as carbon source, whereas for the waters at west of Sumatra as carbon sinks. Partial pressure of CO_2 in the Sunda Strait and west of Sumatra is more influenced by the pH. The average net flux of CO_2 in the Sunda strait was 841.603 mol CO_2 cm^{-2} day^{-1} which shows the release of CO_2 from the ocean into the atmosphere occur in this region, while the average net flux of CO_2 in the west of Sumatra was -945.292 mol CO_2 cm^{-2} day^{-1} which shows the absorption of CO_2 by the ocean occurs in the region.

Keywords: carbon, CO_2, flux, global warming, partial pressure, source, sink

B31

Initial growth of four endemic species in degraded peat swamp forest revegetation in effort to support climate change mitigation and adaptation

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Abstract. Peatland plays an important role as a store of carbon stocks both in the soil layer and biomass. The value of carbon stocks in peatlands is strongly influenced by the peatlands quality and potentially to produce carbon emission if natural conditions are disturbed. Revegetation is able to improve the quality and land-cover compared to natural succession. The success of revegetation can be identified from the survival rate and growth performance of planted species. The purpose of this preliminary study was to identify the survival rate and growth of 4 species of revegetation plants in the burnt peatland area located in Pedamaran, Ogan Komering Ilir, South Sumatra in 2017 and 2021. Quantitative descriptive methods were applied in this study. Results show that the growth performance of four endemic revegetation species were different, reflected by diameter of breast height (dbh), height, and the survival rate. Belangeran (*Shorea belangeran*) planted in 2017 has dbh of 43,9 mm and height of 260 cm with the survival rate of 87,5% in the age of 2 years old. In another plot, Belangeran planted in 2021 (1 year old) has a dBh of 5.02 mm and 72.73 cm height with survival rate 87.96%. Other species planted in 2021 namely Pulai (*Alstonia pneumatophore*) showed the highest survival rate (98.61%) compared to Tembesu (*Fragraea fragrans*) (95.97%), Jelutung (*Dyera polyphylla*) (91.67%), and Balangeran. The average dbh growth for pulai was 8.31 mm with 75.60 cm height, tembesu was 3.78 mm with 57.93 cm height, jelutung was 7.97 mm with 56.20 cm heights. Furthermore, all data obtained in this study can be used as basis data for revegetation development to increase growth, survival rate, enhancing carbon stocks, and other efforts in climate change mitigation and adaptation.

Keywords: climate change, growth, peat swamp, revegetation, survival rate

B32

Climate change mitigation by implementation of circular agriculture system: a preliminary study on community perspective and preferences on organic waste valorization

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Abstract. Agriculture is one among four critical sectors identified in Indonesia's National Adaptation Plan with high risk to get impacted by climate change. Agricultural community is dominantly distributed in rural areas with high geographic and social limitations, which resulted in low education and livelihood to start to mitigate the risks. To equip the community with sufficient mitigation strategy, a willingness to collaborate and learn is indispensable. Therefore, a survey-based preliminary study was conducted in Watukumpul village, Pemalang Regency, Central Java, to inquire about villagers' perspective and preference on climate change mitigation, in particular of the agricultural sector. Initial discussion with village apparatus revealed agriculture potentials are weighed down by waste and water management issues. The findings of this research suggested that 85% of respondents identified similar problems, however, only 39% are aware of their involvement as part of the solution. Majority of respondents perceived that governments are responsible for resolving those issues without villagers' involvement. Furthermore, less than 50% of respondents were willing to be trained in processing organic waste. Almost all of them exercised burning solutions for their household wastes. On the other hand, more than 50% of respondents realized that climate change has significantly affected their income. However, around 25% of respondents have applied organic fertilizer to decrease their reliance on agrochemical input. These results suggest that shifting rural communities' perspectives and preferences through an empowering approach is essential to lay the foundation of understanding in a circular economy as a mitigation strategy for the agricultural communities.

Keywords: training; sustainable farming; resilient community; empowerment approach

C01

Preparation and characterization of omega-3 concentrate from lemuru fish (*Sardinella longiceps*) oil

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Abstract. Lemuru fish (*Sardinella longiceps*) oil is the by-product containing long-chain omega-3 polyunsaturated fatty acids (PUFA) that are essential for some disease prevention. For daily intake, saturated fatty acids should be removed from fish oil to obtain PUFA concentrates. Various methods have been observed in producing omega-3 concentrates. This study aimed to produce the omega-3 concentrate from lemuru fish oil using the urea complexation method and to characterize the omega-3 product. Lemuru fish oil was saponified and purified to produce fatty acids and urea was added to the fatty acids to obtain crystal complexes. In this study, crystallization was carried out at -20°C for 24 h with an oil-urea ratio was 1:0.625, 1:1.25, and 1:2.5. The results showed that the highest content of omega 3 (ALA, DHA, EPA) was reached at a ratio of fish oil-urea of 1:0.625. Based on the spectrum FTIR analysis, omega-3 concentrate contained the specific spectrum indicated by HC=CH trans, -C=O (ester), and -C-O (acid) groups. UV-Vis spectra analysis showed that the light exposure affected the stability of omega-3 concentrate, as is evident by the hypsochromic shift of the resulting spectrum.

Keywords: complexation; lemuru fish oil; omega-3; urea

C02

The effect of Carrageenan content on (L)-Lactic Acid production using Lactobacillus plantarum

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Abstract. *Eucheuma cottonii* has been reported as a potential source of carrageenan. In our previous work, carrageenan has been successfully exploited for lactic acid production. As a continuous report, here we investigate the effect of carrageenan content (15 and 30% w/v) on acid lactic production. The lactic acid content was evaluated using high performance liquid chromatography. In addition, the maximum growth of *L. plantarum* and reducing sugar content were also observed. As a result, it was found that the maximum growth of *L. plantarum* occurred at 72 h fermentation, and the sugar reducing content decreased from 30 to 24.80 g L^{-1}. The carrageenan at 30% w/v yielded 9.97 g L^{-1} lactic acid after 72 h fermentation. In summary, our work emphasized the findings that carrageenan can be used as potential substrate for lactic acid production.

Keywords: Carrageenan; lactic acid; *Eucheuma cottonii*; *Lactobacillus plantarum*; fermentation

C03

Chemical properties of biochar from rice husk under low - temperature pyrolysis

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Abstract. Rice husk is one of agriculture waste, which potentially use as soil amendment in the form of biochar. Biochar is carbon which will be useful for soil improvement. The purpose of this study was to determine the chemical properties of biochar derived from the rice husk. The biochar is done by burning the rice husk using a furnace with a temperature of 250°C and 350°C, then ground and sieved with a size of 355 micrometers carried out at the Research Center for Limnology and Water Resources. Chemical property analysis using X-Ray Fluorescence Spectrometer (XRF) at Lampung Advanced Characterization Laboratory- BRIN. Based on the results of the analysis using XRF showed that the dominant content of biochar is Silica (Si) with concentration 70-74%, then Potassium (K) with 12-13%, Phosphorus (P) around 3%, Calcium (Ca), around 4%. Furthermore, Biochar from rice husk is contained several macronutrient which is fulfill the requirement for compost standard, it mean highly potential to be soil amendment to improve the quality of soil.
Keywords: Biochar, Chemical properties, *Rice Husk*, Low Temperature Pyrolysis

C04

Deep eutectic solvent as eco-friendly catalyst for synthesis hydroxyphenyl glycine methyl ester

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Abstract. The Development of sustainable organic synthesis is increasing nowadays in connection with the growing awareness of environmental concerns. As a part of green chemistry, the substitution of solvent or catalyst with greener materials attracts much interest, one of them is the development of deep eutectic solvent (DES) as green media as well as a catalyst for organic synthesis. DES attracts a lot of attention because its components are relatively inexpensive, easy to synthesize, has unique properties such as non-volatile, non-toxic, biodegradable, and adjustable polarity and selectivity as needed. In this study, DES was used as a substitution for a conventional acid catalyst in the synthesis of hydroxy phenyl glycine methyl ester (HPGME). HPGME is an intermediate raw material of beta-lactam antibiotics, such as amoxicillin and cefadroxil. HPGME is usually synthesized through an esterification reaction of hydroxyphenyl glycine (HPG) using an acid catalyst such as sulfuric acid which is corrosive and non-environmentally friendly. DES has been proven in several previous studies as a catalyst in esterification reactions with high selectivity but no use has been found for HPGME esterification. This study used choline chloride (ChCl) as a hydrogen bond acceptor (HBA), while carboxylic acids were used as hydrogen bond donors (HBD). The DES formed was characterized by its chemical structure using FTIR as well as the characterization of its physicochemical properties prior to use. DES was applied to the esterification of HPG with methanol in variable conditions such as the molar ratio of DES to HPG, temperature, and reaction time. The analysis of the product showed that HPGME had been formed guided by structure elucidation as conformation. The result showed that DES has the potential capability to replace acid catalysts in the esterification reaction of HPG to produce HPGME.

Keywords: Deep Eutectic Solvent, Eco-friendly Catalyst, Hydroxyphenil Glycine Methyl Ester, Hydrogren bond acceptor, Hydrogen bond donor

C05

Coconut coir utilization as a catalyst precursor in the transesterification process of used cooking oil into coco diesel

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Abstract. The national area of coconut plantations (*Cocos nucifera* L) in 2020 reached 3,377,376 hectares, with a coconut fruit production of 2,798,980 tons. About 35% of the coconut fruit consists of coconut coir (waste from plantations). Utilizing coconut coir to produce organic catalysts is emerged as an approach to reduce this waste. As a continuous investigation, we also utilized used coconut cooking oil for the production of coco diesel. Thus, this study aims to synthesize an organic catalyst from coconut coir, then apply the catalyst for the trans-esterification process of used coconut cooking oil into coco diesel. The synthesis of organic catalysts was performed by calcining the coconut coir at a temperature of 450 ºC, 1 h. The catalyst was then characterized using XRD, SEM, and BET instrument. The results showed that the coconut coir catalyst had a larger surface area of 184.73 m^2 g^{-1} in comparison with coconut coir powder (without calcination) (1.6871 m^2 g^{-1}). The relatively large surface area remarkably enhances the contact area between the catalyst and the reactants, then accelerating the reaction and tending to provide a higher yield. When the produced coconut coir catalyst was tested for conversion of used coconut cooking oil, it yielded 92.98% coco diesel.

Keywords: catalyst, coconut coir, coco diesel, cooking oil

C06

Study of titanium dioxide (TiO2) extraction process from ilmenite Banten

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Abstract. Ilmenite ($FeTiO_3$), a mineral, can be used as a raw material for producing TiO_2 pigments, ferrous metals, and chemical compounds containing iron. Ilmenite in Indonesia is found in the form of iron sand. Indonesia has iron sand reserves of 927,315,827 tons spread across several regions, including Banten, which has 7 million tons of iron sand reserves. It was noticed that 3,690,304 kilograms of TiO_2 were imported in the year of 2019. The manufacture of titanium dioxide (TiO_2) mostly uses high-grade ilmenite ore, which is obtained from Bangka Island. Whereas the low-grade ilmenite ore in the form of iron sand, which is widely spread in Indonesia, has not been widely processed and utilized. It was reported that the synthesis of TiO_2 from low grade ilmenite uses a sulfate process, which is not environmentally friendly and expensive, producing excess liquid waste. While the synthesis of TiO_2 from high grade ilmenite utilizes a chloride process. Therefore, in this study, we are interested in investigating the synthesis of TiO_2 from low-grade ilmenite ore using alkaline fusion, acid leaching using hydrochloric acid, and the use of citric acid bioreductant. The characteristics of as-prepared TiO_2 are discussed.

Keywords: bioreductant, chloride process, ilmenite, low-grade, TiO_2

C07

Chemical properties of biochar from avocado (*Persea americana*) seed using x-ray fluorescence spectrometer under Low temperature pyrolysis

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Abstract. Persea americana (avocado) seed is one of the abudant wastes from the food industry. To control this problem, avocado seeds can be valorized by becoming biochar, which will be useful for soil improvement. The purpose of this study was to determine the chemical properties of biochar derived from avocado seeds. The preparation of biochar derived from avocado seeds was performed by burning the seeds using a furnace at a temperature of 250°C and 350°C. Subsequently, the burned seeds were grounded and sieved to a size of 355 mm. The preparation of biochar was carried out at the Research Center for Limnology and Water Resources-BRIN. The chemical properties of as prepared biochar were analyzed using an X-Ray Fluorescence (XRF) instrument at Lampung Advanced Characterization Laboratory- BRIN. The XRF evaluation showed that the as prepared biochar was dominated by potassium (K) at concentration of 93%, followed by phosphorus (P) (~3%), and sulphur (S) (1.3-1.4%). The XRF evaluation suggests that the biochar derived from avocado seeds contains important macronutrients which are required for a compost standard. In summary, the prepared biochar has high potential to be used to improve the soil quality.

Keywords: avocado; biochar; Persea americana; pyrolysis; XRF

C08

Biochar from mahagony (*Swietenia mahagony l.jacq.*) woods and its chemical properties under low temperature pyrolysis as soil improvement

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Abstract. Mahogany (*Swietenia mahagoni* (L.) Jacq) seeds are abundantly available in Indonesia. The seeds are still considered a waste. However, considering the organic molecules present in the mahogany seeds, the seeds are a potential source of micronutrients. A study reported that palm dates can be processed into biochar and used for soil amendment. Therefore, as an approach to adding value to mahogany seed waste, we are interested in processing mahogany seeds into biochar. The objective of this work is to determine the chemical properties of mahogany seeds. The preparation of mahogany-derived biochar was performed by burning the seeds using a furnace at a temperature of 250 °C and 350 °C. The as-prepared mahogany-derived biochar was then milled and sieved to a size of 350 micrometers at the Research Center for Limnology and Water Resources. The chemical properties of mahogany-derived biochar were analyzed using an X-Ray Fluorescence Spectrometer (XRF) at the Lampung Advanced Characterization Laboratory-BRIN. The results revealed that six micronutrients were found in mahogany-derived biochar, including Ti, Fe, Cu, Zn, Rb, and Sr. The concentrations of micronutrients that are Fe, Cu, Zn, Rb, and Sr of mahogany derived biochar burned at 250 °C were 2.516%, 0.114%, 0.069%, 0.179%, and 0.267%, respectively. Whereas for mahogany derived biochar burned at 350ºC, the concentrations of micronutrients were 7.077%, 0.123%, 0.087%, 0.180%, and 0.272% for Fe, Cu, Zn, Rb, and Sr, respectively. Suggesting that the burning temperature significantly increased the concentration of micronutrients. More importantly, among the micronutrients detected, the Fe element was found to have the highest concentration. In summary, our work revealed that mahogany-derived biochar can be used for soil improvement.

Keywords: biochar; micronutrient; soil improvement; *Swietenia mahagoni* (L.) Jacq

C09

Distribution of phenolic compounds from marine macroalgae via pyrolysis

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Abstract. *Ulva lactuca* and *Saragassum* sp. are rapidly expanding algae that can be used as a source of bioenergy. Due to its high moisture and inorganic content, direct use of *U. lactuca* and *Sargassum* sp. for energy purposes is widespread. Therefore, thermochemical processing, such as pyrolysis, is required to produce useful products, such as bio-oil. This study seeks to undertake a detailed investigation of the production of bio-oil from *U. lactuca* and *Sargassum* sp. in order to provide useful information for its continued commercialization. The pyrolysis of *U. lactuca* and *Sargassum* sp was investigated for bio-oil production within the temperature range of 400-600 ºC and reaction time of 10–50 min. The highest proportion of bio-oil was retrieved at 500 ºC with yields between 18.5 and 30.2 wt%. As the pyrolysis temperature was raised to 600 ºC, the bio-oil yields slightly increased, but the prolonged reaction time did not lead to a considerable increment in bio-oil production. Gas chromatography/mass spectrometry (GC/MS) was employed to elucidate the chemical composition found in bio-oil products. The results showed that phenolic compounds increased from 9.64 to 16.73 area% as the temperature was increased. The highest phenolic compounds for *U. lactuca* and *Sargassum* sp. were 13.25% and 16.73%, respectively. The variations in the distribution of total phenols may be due to variations in species, sediment, and surrounding water quality. The high phenolic content achieved at the highest possible yield indicates its potential to be used for the production of renewable phenolic resins.

Keywords: phenolic compounds; pyrolysis; sargassum; *Ulva lactuca*;

C10

The effect of teak plantation growth on air temperature and O_2 levels in green open spaces of the research and innovation department of Perhutani Forestry Institute (PeFI)

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Abstract. Urban land utilization for urban facilities construction continues to grow and is accelerating. It will impact the urban heat island making the city uncomfortable and hot. Green open space is a space within a city with its use being more open and containing cultivated plants carrying out ecological, social, economic, and architectural functions. The purpose of this research was to determine the characteristics of green open space and the effect of teak plantation growth on air temperature and oxygen levels. The research was conducted from May to November 2021 with an observational design. The sampling method was developed using the purposive sampling technique based on specific characteristics considering the variations in measured variables: number of trees, daily climate, microclimate difference, oxygen levels, wind speed, different comfort levels, and several other things. The results show that the descriptive study approaches relevance to the observed conditions. The teak arboretum and the former teak garden shed were the green open space at PeFI. Arboretum has a lower temperature and higher humidity than teak bushing, making the arboretum in the cool-climate condition category with an ideal temperature of 26.9 o C in the dry humidity climates category. The scope of PeFi's offices was included in the comfortable index category. The distribution of tilapia oxygen levels in the scope of PeFI was between 20.9 to 21.1%,, resulting the abundance of oxygen in the PeFI environment was highly available with the presence of green open space from the observations at the three research sites.

Keywords: comfort index, green open space, micro climatology, teak plantation, urban ecosystem

C11

Groundwater exploration using 2D resistivity method in water supply for prevention of peatland fire at Kahayan Kuala Area, Central Kalimantan

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Abstract. Forest and land fires that occurred, especially in Central Kalimantan province, had a major impact and disrupted various aspects of life, especially the decline in the quality of the environment and caused health problems for the community, even to the point of disturbing national and international stability. Central Kalimantan province has about 2.4 million hectares of peatland and almost 80% are in the Pulang Pisau district. Around 80% of forest and land fires in 2015 came from peatlands. Prevention, mitigation and preparedness activities in the face of forest and land fires by wetting peatlands during the dry season. One of the efforts to wetting peatlands is by constructing boreholes as a means of providing water sources when land fires occur. The 2D resistivity geoelectric survey has been carried out to determine the location and depth of groundwater drilling. The survey area is located in the Kahayan Kuala Area, Pulang Pisau District, Central Kalimantan Province. Resistivity data acquisition using the schlumberger configuration, cable lengths of 235 m and 470 m with electrode spacing of 5 m and 10 m. The results of resistivity data acquisition showed that resistivity values ranging from 0.05 ohm.m – 282.28 ohm.m with a maximum penetration of 90 m. Interpretation of resistivity data and its correlation with geological materials as follows: for the resistivity value range of 0.05 0hm.m – 45.09 ohm.m was clay and clay peat; resistivity value range 45.09 0hm.m – 124.92 ohm.m was peat; and the resistivity value range of 101.09 0hm.m – 282.28 ohm.m was sandstone and conglomerate, which acts as groundwater aquifer rock. The results showed the potential of groundwater aquifers to estimate at a depth of 15 m – 20 m and 80 m – 90 m.

Keywords: aquifer rock, groundwater, peatland fire, resistivity value, water supply

C12

Detecting the sensitivity of water content and deficiency rainfall during positive Indian Ocean Dipole events

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Abstract. This study aims to detect water content in peatlands associated with rainfall deficiencies and positive Indian Ocean Dipole events. The condition of water content is a biological indicator of peatland ecosystems that commonly contribute to hotspots in Sumatra. Here, we use database data such as water content in peatland areas, rainfall data, and the Indian Ocean Dipole index (DMI) from 2010 until 2020. This study employs the Dipole Mode Index to evaluate the positive IOD events which significantly impact climate change. The spatiotemporal analysis is applied to analyze the water content conditions and deficiency rainfall in positive IOD events. These results demonstrate the raw vulnerability levels between water content and deficiency rainfall conditions when positive IOD occurred and suggested the approach for a hotspot's early warning system.

Keywords: deficiency rainfall; peatlands; positive Indian Ocean Dipole events; spatiotemporal analysis

C13

Analysis of net zero emission index for several area in Indonesia using individual carbon foot print and land-use covered

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Abstract. Indonesia has set a target for reducing greenhouse gas emissions in the Nationally Determined Contribution (NDC) of 29% on its own capability and 41% with international assistance in 2030. Besides that, Indonesia also plans to initiate action to achieve net zero emissions by 2050 as outlined in the Long-term Strategy for Low Carbon and Climate Resilience (LTS-LCCR) 2050 document. The Net Zero Emission target is the mandate of the UNFCCC Paris Agreement which aims to achieve the UNFCCC goal of limiting global temperature rise to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels. The IPCC document in 2021 stated that the increase of atmospheric temperature in 2020 has reached around 1.3°C, while the NOA monitoring reports stated that the global average carbon dioxide in 2021 is 414.72 ppm. This increase is mainly due to the use of fossil fuels, where human activities make the largest contribution, which is 75%. Therefore, to detect the amount of carbon emissions can be done by calculating the individual carbon footprint. The results of individual carbon footprints research in 2017, in Puspiptek Serpong area was 3.1-6.6 tons of CO_2e/person/year, in Semarang was around 3.84 tCO_2e/person/year and Medan was around 2.52 tCO_2e/person/year. National data published by the Ministry of Environment and Forestry in the period 2010-2018 was 3.40-9.29 tCO2e/person/year. This individual carbon emission can be offset with the sequestration of land-use covered. This study calculates the ratio of carbon emissions from individual carbon footprint to carbon sequestration obtained from satellite imagery map of land-used covered, especially mangrove forests in several regions in Indonesia to achieve net zero emissions, or referred to the net zero emission index.

Keywords: individual carbon footprint; net zero carbon emission; offsetting; sequestration

C14

Barrier analysis to leverage the climate change mitigation-adaptation implementation action in mangrove forest and its surrounding community villages

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Abstract. In the Nationally Determined Contribution document (NDC), Indonesia has a target for reducing greenhouse gas emissions of 29% on its own capability and 41% with international assistance by 2030, and plans to initiate action to achieve net zero emissions by 2050 as outlined in the Long-term Strategy for Low Carbon and Climate Resilience (LTS-LCCR) 2050 document. Mangrove forest ecosystems absorbs carbon emissions 4-5 times greater than terrestrial forests, used as one of sources to achieve Indonesia's NDC and LTS-LCCR targets. Mangrove forest is also a barrier to coastal abrasion. Mangrove forests can be damaged by natural causes and also due to human activities. Socialization of its importance and improving the economic community welfare around mangrove forests are important factors to prevent damage and maintain its sustainability. The improving economic community efforts can be carried out by applying mitigation-adaptation actions/economic activities of the community. This activity aims to analyze the barrier and challenges in preserving mangrove forests as well as in applying the technology/economic activities in accordance with local potential, to improve the welfare of the mangrove forest surrounding community in the Indramayu and Brebes districts. The data will be obtained from field surveys while barrier analysis will be carried out using the methods that have been used in the preparation of Indonesia's Technology Action Plans (TNA). The barrier analysis will include technical, social, regulatory, financial, institutional, capacity building, and social and cultural barriers. These barriers will be analyzed, mapped and identified, and then causal relations of the barriers, as well as market mapping, can be carried out and identified, so that the enabling framework to translate problems into solutions can be determined. Finally, the recommended solutions and action plans for implementation can be determined.

Keywords: barrier analysis; climate change; economic activities; mangrove forest; mitigation-adaptation

C15

Study on properties of rigid polyurethane foam as a thermal building insulator at varied mixing conditions

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Abstract. The concept of zero-energy building is one of the promising ways to significantly improve energy efficiency, meaning the reduction of greenhouse gas emissions. The use of rigid polyurethane foam (RPUF) has been widely used as insulation material in building panels because of its excellent properties including light-weight, strength, durability and lower thermal conductivity. This study aims to determine the effect of mixing conditions on the production of RPUF at varied mixing speeds (300, 500, and 1000 rpm) corresponding to its density, mechanical, and insulation properties. It was observed that the well-defined physical structure of RPUF was obtained at the minimum mixing speed of 500 rpm. The foam density changed with the increasing speed of the mixing process, from 39.8 kg/m^3 at 500 rpm foam to 51.30 kg/m^3 at 1000 rpm. This might be because of the possible loss of blowing agent due to excessive mixing speed as noted by the constrained foam expansion and the shorter time for the free rise process. Based on the morphological analysis, the uniform cell size for 500 rpm foam was observed for both parallel and perpendicular to foam rise. Further, the thermal insulation property of obtained RPUF was significantly lower than that of conventional building materials like concrete as supported by thermal conductivity analysis of obtained RPUF at 38.1 ± 0.2 mW/m. K. This research is one of the key technologies to reduce the energy consumption for heating and cooling buildings and thus creating a potential strategy for climate change mitigation.

Keywords: climate change mitigation; green building; rigid polyurethane foam; thermal conductivity; thermal insulation

C16

Synthesis and characterization of calcium phosphate (tricalcium phosphate/calcium pyrophosphate) from snail shell (*Achatina fulica*)

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Abstract. Snail (*Achatina fulica*) is one of the sources of duck fodder commonly used by local breeders to meet the protein needs of poultry farms. However, its shells as a by-product are rarely used and just become waste. To overcome this problem, we tried to utilize the waste as a source of bioceramics. Snail shells contain a lot of calcium which can be used as a calcium precursor to make bioceramics. Two of the bioceramics that have the potential are tricalcium phosphate (TCP) and calcium pyrophosphate (CPP). They are mostly used as material for bone regeneration and have advantages in terms of biocompatibility and osteoinductivity. In this study, we tried to synthesize and characterize calcium phosphate from snail shells by the coprecipitation method. It was then analyzed using XRF, XRD, FTIR, EDX and SEM to see its characteristics. Results showed that snail shells (raw material) as measured by XRF contained 81.83% of calcium and mixed calcium phosphate bioceramics (TCP and CPP) were successfully synthesized. The average size of the formed crystal was 17.00 nm. The surface shape of the formed particles was irregular and showed flux, sphere, and fracture shapes. Nevertheless, there were still interfering compounds found resulting from this process and further purification needs to be conducted.

Keywords: *Achatina fulica*, calcium phosphate, TCP, CPP

C17

Conversion of soybean meal as agro-industrial by-product for production of antibacterial and antioxidant agents by actinobacteria

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Abstract. Actinobacteria are mainly found in soil and some of them have properties that are common to bacteria and fungi, despite having quite distinct characteristics. Unlike bacterial colonies in general which are clearly slimy and grow rapidly, some groups of actinobacteria colonies grow slowly by showing a powdery consistency and are tightly attached to the agar surface. Observations on a colony under the microscope showed that many of them form asexual spores for their reproduction. Many metabolite compounds generated by actinobacteria have promising activity like antioxidant and antagonistic activity against bacteria and fungi. The production of these compounds depends not only on the strain of the organism but also on the medium in which it is grown and the growth conditions. Moreover, agricultural by-products such as soybean meal are known to have high protein content, thus it can be potentially used as an alternative media for actinobacteria. In this research, ten actinobacterial strains were isolated from the soil under different trees. After 7 days of cultivation with the medium containing soybean meal, the cultures were subjected to ethyl acetate extraction. Three extracts exhibited antibacterial properties against *Bacillus subtilis* with a zone diameter ranging from 10-12 mm. However, none of them were active against *Escherichia coli* and *Staphylococcus aureus*. Interestingly, all the extracts demonstrated antioxidant DPPH radical scavenging activity with the extracts of four strains showing more than 25% inhibition activity.

Keywords: Actinobacteria; soybean meal; antibacterial agent; antioxidant agent; DPPH

C18

Protease production by soil bacteria for green technology: screening and optimization

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Abstract. Protease is a type of enzyme that hydrolyzes proteins into peptides and amino acids. The demand for protease for green technology in some industries like detergent, food, and leather is increasing nowadays. Some soil bacteria, especially *Bacillus* strains, are known to have the ability to produce protease. Compared to other sources like plant and animal origin, microbial protease has more advantages as it can be produced at an industrial scale, short cultivation time, and are easy to harvest. This research aimed to screen the proteolytic bacteria from the soil samples collected under mango trees and to study the optimum condition for protease production using response surface methodology (RSM). Three bacterial strains (SH2CR, SH4CR, and SC3CR) were isolated and showed to have proteolytic activity. One of them, SH2CR, was further studied using a fermenter for a one-liter production scale with the medium containing skim milk at 30°C. In the cultivation time of 24 hours, it was found that the strain could produce high protease activity (clear zone of 18.1 mm/50 μl) with skim milk concentration of 2% and 200 rpm of agitation.

Keywords: protease; green technology; soil bacteria; response surface methodology; skim milk

C19

Optimization of edible film production: natural dyes addition

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Abstract. In this paper, the current state of base material for edible film production will be reviewed as well as the improvement of edible film properties for food preservation. The addition of natural dyes to enhance the edible film appearance is also discussed. Commercial natural dyes with various concentrations have been added to the nata de coco-based edible film formulation and characterized. The use of natural brown dye from caramelized carrot is known as the best option based on the analysis of the physical properties of the film. The tensile strength, elongation, and Young's modulus of the edible film with 1% v/v brown dye were 20.69 MPa, 18.43% GL, and 236.42 MPa, respectively. The water vapor transmission rate (WVTR) of nata de coco edible film with brown dye also meets the Japanese Industrial Standard (JIS), which was 1.37 g/m2. Improvements in edible films are expected to continue due to the growing demand in the food industry for environmentally friendly packaging that also serves as food preservation.

Keywords: edible film; nata de coco; natural dyes; physical properties

C20

Physicochemical Properties of Sodium Alginate from Brown Alga *Sargassum aquifolium* and *Sargassum cinereum*

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Abstract. Synthesis and characterization of sodium alginate from brown alga *Sargassum aquifolium* and *Sargassum cinereum*, the Dompu Islands, West Nusa Tenggara, Indonesia. Knowledge of the physicochemical properties of sodium alginate becomes an excellent opportunity to support further processing in its application. The aims are to synthesize and characterize sodium alginate from brown alga *S. aquifolium* dan *S. cinereum*. The extraction by acid pathway, due to cell disruption and addition Na_2CO_3 for extraction. HCl was added to convert acid alginate into alginate, then transform acid alginate into sodium alginate using NaOH. NaOCl and IPA were used for purification. Physicochemical properties were characterized using SEM-EDS, FTIR, and TA/DTA. The morphological structure of synthetic sodium alginate shows that layer structure and other impurities have been successfully removed through the purification process. FTIR spectrum as indicated by the presence of functional groups at the following wavelengths OH at 3200-3400 cm^{-1}, and CH_2 at 2915 cm^{-1}, CO double bonds at 1614 cm^{-1}, the presence of mannuronic acid and uronic acid, which function the CH group stretches at 828-935 cm^{-1}. TGA/DTA results showed a reduction in thermal stability at 250-300°C. Synthesis of sodium alginate from *S. aquifolium* dan *S. cinereum* has been successfully performed. The morphological structure showed layer structure and no impurities. FTIR spectrum, which is indicated by the presence of functional groups at the following wavelengths OH at 3200-3400 cm^{-1}, and CH_2 at 2915 cm^{-1}, CO double bonds at 1614 cm^{-1}, the presence of mannuronic acid and uronic acid which function the CH group stretches at 828-935 cm^{-1}. Thermal stability between 250-300°C. So, it is suitable for its applications.

Keywords: sodium alginate, *S. aquifolium* , *S. cinereum*, synthesize, characterization

C21

Quick sterilization spirulina powder through dry ozonization for pharmaceutical preparations

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Abstract. Quick sterilization using dry ozonation technology had been developed to destroys microorganism contamination effectively. It is an easy, inexpensive, safe, and environmentally friendly technology. It was also reported that by applying quick sterilization on pharmaceutical preparations, the product quality meets the standard government regulations. In this work, we investigate the potency of quick sterilization towards spirulina powder. A set of parameters including the bioactive content and microbial levels contamination were observed. In addition, the effect of sterilization time (1, 2, 3 and 4 min), flow rate (1, 2, 3 and 4 LPM), and ozone dose (1, 2, 3 and 4 ppm) were also evaluated. The results showed that about 40 gr of spirulina powder were successfully sterilized using quick sterilization in 100 gr closed reactor at temperature of 27oC. The optimum operating conditions were 2 LPM in a closed reactor with a volume less than 50%, 2 mins sterilization time and 2 ppm ozone dose. When the bioactive content was evaluated, the sterilized spirulina powder contains 99.5% phycocyanin content, suggesting that the sterilization has no effect on the bioactive molecules. More importantly, in comparison with traditional sterilization using UV light at 60 mins, similar results were observed. In summary, this technology is a very promising and potential for being applied in a large-scale sterilization of spirulina powder for pharmaceutical industry.

Keywords: dry, ozonization, pharmaceutical, phycocyanin, spirulina

C22

The growth of mercury-resistant bacterial consortium at different levels of pH, temperature and C:N ratio

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Abstract. The study was conducted to investigate the growth of mercury-resistant bacterial consortium under the influence of different pH, temperature, and C:N ratio. The study was conducted as a part of a research on mercury bioremediation of contaminated agricultural land using indigenous bacteria. The isolates were obtained from contaminated sites around mercury-based gold processing machinery in Sukabumi regency, Indonesia. The selected isolates has been molecularly identified, namely *Exiguobacterium indicum/acetylicum* (Mer07), *Enterobacter mori* (Mer18), *Acinetobacter junii* (Mer20), *Bacillus cereus/mycoides* (Mer23), and *Enterobacter cloacae/ludwigii* (Mer27), and tested for their resistant to $HgCl_2$ up to 50 ppm and have been proven to effectively reduce mercury from culture media. Consortium suspension was inoculated into two sets of media: 1) TSB with pH of 4.8, 6.1, 8.5, and 9.7; 2) Mineral salts with addition of glucose and peptone to create C:N ratio of 20:1, 30:1, and 40:1 and pH was set to 7.4. As comparison, a solution contained mercury-contaminated sludge soil was added to the same set of media and regarded as microbial community. The growth curves show that the bacterial consortium tends to grow better compared to the microbial community, especially in the media of TSB with incubation temperature of 20° and 35° C. In the same media with temperature of 45° C, the growth of both consortium and community under high pH (8.5 and 9.7) was higher than the one under lower pH (4.8 and 6.1). Meanwhile in mineral salts media, the influence of the inoculant was not remarkable, except under incubation temperature of 35° C. Moreover, the C:N ratio did not affect the growth of neither the bacterial consortium nor the microbial community, as confirmed by the ANOVA that the average of this variable was insignificantly different. The variance analysis also indicated that the growths were significantly different only when the pH was 4.8.

Keywords: bioremediation; Hg; indigenous microorganism; pollutant degradation

C23

Passive removal of sulphate and heavy metals from acid mine drainage using sewage sludge and flyash

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Abstract. This study aims to calculate the removal efficiency (%RE) of metals and sulphate and the constant rate of sulphate reduction from acid mine drainage (AMD) passive treatment principles named permeable reactive barrier in batch test prior column test. A moderate pH increase, optimum removal efficiency, and less leached metals from reactive material were expected at the end of treatment. Three media mixtures contain variation of domestic sewage sludge (SE), mess hall compost (CO), cocopeat (CP), fly ash (FA) was simulated. All reactive materials are solid waste from other operation units. The AMD was collected from copper mining waste rock dump which contained high sulphate, metals and low pH. Batch tests were conducted in series of glass bottles in an anaerobic chamber, wih sub-samplings were taken at day 0, 7, 14, and 28. At the end of treatment, indicated that M1 mixture with composition of SE, CO, CP, FA by 110:30:10:10 (%w/w) resulting in highest sulphate removal (44%), highest alkalinity generation 1431 mg/L. %RE of Al, Cd, Co, Cu, Fe, Zn were expected to be 100%, Ni 82%, Se 57%, and Mn 98%. Leached metals such As, B, Ba, and Sr were still occurred. The main mechanism that controlling the reaction from M1 mixture was a combination between sulphide precipitation enhanced by Sulphate Reducing Bacteria (SRB) activities and hydroxide precipitation. The results showed that the water pH was 8.3, organic carbon was 665 mg/L, high SRB colony, and in reducing conditions (ORP -309 mV). The reaction of sulfate reduction or organic biodegradation was assumed to follow first order reaction. Data experiments were plotted with linear regression and rate constants for M1, M2, M3, were 0.0283 d^{-1}, 0.0184 d^{-1}, 0.0151 d^{-1} respectively. Some factors that may inhibit bacterial growth are the As that toxic for SRB and competitive methanogenic bacterial activities.

Keywords: acid mine drainage; permeable reactive barrier; sewage sludge; flyash

C24

Chromium (VI) bioremediation potential of dark septate endophytic (DSE) fungi

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Abstract. Manufacturing activities release an extensive quantity of wastes containing hazardous material like hexavalent chromium [Cr (VI)] into the surroundings, threatening human health and the ecosystem. Fungi can be victimized as an efficient Cr (VI) remediation implement. The six isolates of dark septate endophytic (DSE) fungi (KSP, CPP, PP, DD, K.III.3.4, TKC) were evaluated for their tolerance and removal ability to varied Chromium VI (Cr VI) concentrations (10, 30, and 50 mg/L). The quantification of Cr (VI) removal was analyzed using the 1,5-diphenylcarbazide method by UV-Visible spectrophotometer (Hitachi-U 2900). The results showed that all the DSE isolates were highly tolerant to Cr (VI) concentrations up to 50 mg/L with a tolerance index (TI) of 0.89-1.22. These fungal strains showed no significant growth ($p > 0.05$) from the controls. Furthermore, all test fungi exhibited an efficient removal capacity of more than 99% of 50 mg/L Cr (VI). The results indicated that DSE fungi are potential agents for bioremediation of Cr (VI) polluted surroundings like manufacturing wastewater. It is the first report on the ability of DSE fungi to remove Cr VI.

Keywords: Chromium VI, DSE fungi, removal efficiency, tolerant index.

C25

Value chain of cocopeat bio-textile for reclamation of degraded land in Indonesia

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Abstract. Soil degradation is a serious problem in Indonesia and the world. To anticipate this problem, it can use cocopeat, derived from coconut fiber which is its source of very abundance in Indonesia. The aim of the research is to understand the impact of bio textile application to prevent run-off erosion that is indicated by cover crop growing. Materials consisted of a cocopeat pressed block bio-textile, a dimension of 30 cm x 30 cm square, and a 2.5 cm thickness. It was completed by seed coating of the fast-growing legume cover crop of Calopo (*Calopogonium mucunoides* Desv.) with the mycorrhiza arbuscular fungi, N-fixing bacteria, P and K-solubilizing bacteria. Research methods were bio-textile installed to cover plots in the sloping area of the Adaro Mining Company, South Kalimantan from September 2018 to March 2019. The result indicated that seeds germinated around 30-40 days after planting and their biomass covering of plot almost up to 100 % after 5 months later, and the cocopeat bio-textile plate are still in good function until 6 months observation in the field. We hope this innovation can provide a problem solution to erosion and landslides, and increase the economic value-added chain of cocopeat.

Keywords: bio-textile; coated seed; cocopeat; erosion; value-added chain.

C26

Potential of irradiated inoculants consortium for zinc accumulation in rice mutant lines

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Abstract. Inoculants consortium consist of *Aspergillus niger, Azotobacter sp, Bacillus cereus* and *Trichoderma harzianum* can be used to absorb the metal or mineral and its accumulated in the part of the plants. The objective of this research was to utilize of gamma irradiated inoculants consortium to accumulate of Zn in rice seeds and breeding rice plants. Irradiated of gamma rays by the dose of 250 Gy have been conducted to the inoculants. Zinc (Zn) is essential micronutrient and its plays a number of important functions, this is only obtain by intake of foods. Rice is a staple food for Indonesian people, increasing of Zn concentration in rice through fertilization and gamma irradiated recombinant inoculant is an effective method to accumulate Zn in rice seeds. Seven number of Mira-1 rice mutant lines together with their wild type, and Inpari Zinc rice variety were used in this experiment. Plants of each number of rice mutant lines were divided in group of experiment, i.e; group as a control which was without any insertion; group by adding of 10 kg/ha $ZnSO_4$, and 20 kg/ha of $ZnSO_4$, another group with inoculant consortium and adding with 10 kg/ha $ZnSO_4$ and 20 kg/ha of $ZnSO_4$. The experimental designed used Randomized Block Desgn (RBD) with 3 replications. Treatment methods to insert of inoculant to the plants was by mixed of inoculant to soil media and kept it 24 hours before planting. Zinc content in rice seeds measured by XRF instrument. The result shown that combination of irradiated inoculants consortium with 10 kg/ha of $ZnSO_4$ was the best treatment for accumulation of Zn in rice plants. The treatment was also influence on biomass, TF and BAF values.

Keywords: Zn accumulation, irradiated inoculants consortium, rice mutant lines, zinc sulfat

C27

Removal of mercury using local isolate of *Penicillium* sp. strain A4 and its toxic effects on fish

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Abstract. Mercury (Hg) is one of the heavy metals that is very commonly found in waters and sediments. Mercury and its derivatives are highly toxic, so their presence in the aquatic environment can be very detrimental. Aspergillus fungi are known to reduce Hg levels in pollutants. To determine the toxic effect of Hg after being reduced, local isolates of *Penicillium* sp. strain A4 then performed a toxicity test on the Juvenile of Carroline Platy fish (*Xiphophorus maculatus*). The research conducted was the growth of fungal isolates on Potato Dextrose Broth medium with the addition of Hg at 7 days of incubation, calculating the value of Hg concentration before and after fungal activity. The acute toxicity test used two serial concentrations (50% and 100%) of PDB-Hg media from fungal removal and one control with three repetitions. Acute toxicity test was carried out for 48 hours by looking at the number of deaths of *X. maculatus*. The results obtained in this study were a decrease in the concentration of Hg (3.14 -0.797 ppm) in PDB-Hg media on the activity of isolates of *Penicillium* sp. strain A4 resulting in 74.6% mercury removal. Acute toxicity test results show concentrations of 50% and 100% can cause 100% death. The results of this study can be used as initial data to determine the quality criteria for waste containing mercury that can be discharged into river bodies and strategies for using fungi applications using local isolates of *Penicillium* sp. strain A4 which has the potential for wastewater treatment before being discharged into the waters to reduce its toxic effects.

Keywords: fish, fungi, mercury, removal, toxicity

D01

Green Map application for supporting coastal eco-village development related to climate change mitigation-adaptation in Brebes Regency

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Abstract. Coastal areas have a tendency to fluctuate in terms of physical character and socio-economic conditions. Mangrove forests in coastal areas play an important role in climate change as carbon sequestration, which is greater than terrestrial forests by 4-5 times. It is also a protection against coastal abrasion and tidal flooding. Human activities in coastal areas around mangrove forests can cause damage to the mangrove forest ecosystem. The dynamic conditions in coastal areas require the certain management concept to accommodate all human interests while maintaining the mangrove forest ecosystem and environmental sustainability. This concept will be able to manage and develop the coastal area around mangrove forest ecosystem into a climate change-related to eco-village through the use of spatial and regional planning. All processes must consider community and ecology quality, as well as its role in climate change mitigation-adaptation, holistically. The purpose of this study is to carry out mapping in the coastal areas of Indramayu and Brebes Regencies so that all of the site potencies (especially economy and tourism), existing problems, solutions that have been carried out and planned, can be identified. as an effort to improve social, economic, and ecological conditions. The mapping at the site activities will be carried out using green maps tools, through the collection of secondary data, field verification and SWOT analysis. Indramayu and Brebes have existing potencies on fisheries, farming, and trading. However, there should be several activities in coastal villages that support ecosystem sustainability. As mentions mangrove ecotourism, seafood processing, forest farmers group, and cultural events. Green maps as study result will play a major role in supporting the arrangement of coastal areas, develop recommendations and can be used as consideration in eco-village development plans, related to climate change mitigation and adaptation, in Indramayu and Brebes Regencies.

Keywords: climate change; coastal; eco-village; green map; mangrove; mitigation-adaptation

D02

Forensic assessment of landslides induced by environmental changes in Cimanggung, Sumedang, an important step for the future disaster prevention

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Abstract. Forensic analysis is an important way to assess a landslide event. The principle of forensics is to look backward in space and time before the landslide occurred. In this study, landslide forensics was evaluated rapidly and efficiently but with comprehensive results. The findings guide the critical step of disaster prevention in the future. A case study has been conducted in Cimanggung, Sumedang, covering lithological aspects, geological structures, and geomorphology analysis. Hydrology, land cover, and land-use changes contributing to the landslide disaster, and rainfall triggering the landslide were investigated. In addition, drones were used to investigate detailed spatial geomorphology and important surface features of landslide tracks for determining landslide development. Land cover changes often result in adverse environmental impacts. The forensic assessment of the landslide that occurred in Cimanggung, Sumedang, on January 9, 2021, revealed the role of environmental changes. There have been conversions of land cover from the open land to mining and to a residential area. These modifications have an impact on water balance and add a surface burden to the site. Changes in land conditions and hydrology, along with geohydrology, are essential aspects of the landslide incident. Because of the high rainfall rate, there is more water runoff and infiltration into the ground. The underground flow could be concentrated in a paleo valley formed by thicker unconsolidated sediments. The combination of these aspects destabilized the slope causing it to slide. Therefore, environmental monitoring activities on land cover changes, geohydrology, and hydrology are essential, as demonstrated by the Cimanggung landslide case. Water management and detailed hazard zonation of the area are needed. Examples include the delineation of the site that can or cannot be built upon and rainwater storage for clean water supply for residents. Drainage improvement can be established to prevent excessive runoff and centralized infiltration.

Keywords: forensic; landslide; environmental changes; monitoring; water management

D03

Exploring household flood resilience index using composite indicator method

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Abstract. Population growth and urbanization in suburban areas combined with climate change have increased pressure on the environment and flood vulnerability. Hence, mitigation efforts are required to overcome the increased flood likelihood. When floods occur, flood-affected households need adequate flood resilience. Planning efforts to increase household flood resilience requires an adequate understanding of the factors that affect household flood resilience. This study aims to explore the factors influencing household flood resilience. The composite indicator method was applied to process data on socio-economic, social capital, flood risk perception, institutional, communication and information, and household environment, including preparedness aspects for floods, using questionnaire data with 354 flood-affected households as respondents. The results showed that the composite indicator method could be used to measure the household flood resilience index (HFRI); in the Gembor sub-district, HFRI was 2.82; in Gebang Raya, it was 3.07; and in Periuk, it was 2.95. We conclude that although HFRI is an abstract object, it can be approached using a composite indicator method. The flood risk manager can use the HFRI to develop planning efforts to increase household flood resilience based on influencing factors. This study recommends further research to validate the flood resilience index obtained and explore whether these factors have varying weights.

Keywords: flood resilience; composite indicator; household; flood risk

D04

Water level and soil moisture monitoring for peatland fire risk indicator

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Abstract. The management of peat water table is the key to optimizing the yield and reducing the environmental impact of the cultivation of peatlands. This paper presents the results of a study of the dynamics of water table on peat land according to the implementation of water management techniques as well as the characteristics of certain peatlands and analysis of water level and soil moisture data as input for early warning models of peatland fire risk. The study was conducted during 2018 at the palm oil plantation in Pangkalan Pisang Village, Koto Gasib Sub District, Siak District, Riau Province. Observation of peatland water table was carried out using a water level logger at each of the midpoints of 3 oil palm blocks measuring 30 ha each. Meanwhile, soil moisture content was observed using a logger with a humidity sensor at 2 depths. The results of the study show that the water table (WT) is very dynamic and fluctuating both temporally and spatially. Between April - November 2018, for 3 topo-sequent blocks observed, the depth range of MAT is 39 - 109 cm, 9 - 77 cm, and 5 - 91 cm, respectively. The results of the temporal observations indicate that the rate of decrease in MAT that occurs after the rain has stopped, for the 3 topo-sequent blocks observed were 10.3, 10.6 and 13.6 mm / day respectively. The study showed a significant correlation between soil moisture values in dry weight percent and the level of risk of land fires. Soil moisture (SM) is less than 100% dry weight, highly flammable, while SM above 250% dry weight is safe from the risk of land fires. The SM value between 100-250% dry weight is included in the criteria of caution for land fires.

Keywords: early warning fire risk, peat land, soil moisture, water table

D05

The assessment of climate change research in support of Indonesia's net zero emission target – case study at BRIN

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Abstract. The Paris Agreement, related to the commitment of each country to achieve net zero carbon emissions, adopted since COP-21 2015. The Indonesian government has ratified the Paris Agreement and committed to start efforts in achieving this target by 2050. Indonesia is also committed to the achievement of reducing carbon emissions by 2030 as stated in the Nationally Determined Contribution (NDC) document. Climate change mitigation and adaptation technology is one of the important pillars in achieving these targets. Research and innovation technologies related to climate change are needed to support these achievements. In Indonesia, research and innovation of climate change technology is important to support the availability of reliable and affordable local technologies. It is also necessary to obtain technologies that can reduce more carbon emissions, as an effort to achieve global emission targets. The IPCC 2021 reports that the implementation of the NDC of all countries will only meet one-third of the achievement of the Paris Agreement targets. This study reports the results of the identification of research and technological innovations related to climate change that have been carried out by research institutions in Indonesia, in an effort to be able to integrate them in achieving the targets of the NDC and the Paris Agreement in Indonesia.

Keywords: assessment, climate change, net zero emission, technology

D06

Green synthesis of Ag nanoparticle-decorated MgO microspheres by *Curcuma xantorrizha* extract and its potential antimicrobial activity

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Abstract. Water pollution caused by bacteria is one of the global severe environmental concerns which could cause serious damage for public health and ecological system. Therefore, it is an important to develop antibacterial agent with high activity towards gram positive and negative bacteria. MgO is an important inorganic oxide and has been widely used in many fields. Many studies have shown that MgO nanoparticles have good antibacterial activity. In this study MgO-microspheres are synthesized using facile and low-cost method, utilizing bittern, by-product of salt production, as Mg^{2+} precursor to realize the circular economy concept. The synthesized MgO-microspheres were characterized using a suite of techniques including X-ray diffraction (XRD), Scanning Electron Microscope (SEM) and Fourier Transform Infra-Red (FTIR) analysis. The results in this study indicated that MgO-microspheres could be a promising candidate for the treatment of wastewater contaminated by bacteria due to its facile preparation, low cost, environmentally friendly characteristic and high antibacterial activity.

Keywords: water pollution, magnesium oxide, microspheres, bittern, antibacterial

D07

Uncaria gambir Roxb. mediated synthesis of highly stable silver nanoparticles in the presence of triethanolamine as capping agent

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Abstract. Study of silver nanoparticles (AgNPs) fabrication has gained a great interest especially for pharmaceutical application due to excellent antibacterial properties. AgNps are well known for the inhibitory and bactericidal effects both on possitive and negative gram bacteria. However, utilization of some chemical reducing agents in the synthesis process can be harmful to environment and human body. A green synthesis of silver nanoparticles has been succesfully conducted using *Uncaria gambir Roxb.* as bioreducing agent and triethanolamine as capping agent, reacted with aqueous $AgNO_3$ as precursor. The formation of silver nanoparticles was visually revealed by colour change from yellow to brown. It was also confirmed by UV-Visible Spectroscopy (UV-Vis) which showed peak at 402-414 nm. The result of X-Ray Diffraction (XRD) analysis showed 4 peaks referring to well-crystallized face-centered cubic silver nanoparticles. Transmission Electron Microscope (TEM) analysis showed that spherical silver nanoparticles have been formed with diameter of 2 – 17 nm with mean diameter of 9 nm. The result showed that the presence of triethanolamine (TEA) could enhance the stability of colloidal nanoparticles and reduce the size up to 40%. This study was confirmed that the *Uncaria gambir Roxb.* aqueous extract can be used to mediate rapid, environmentally friendly, and less expensive silver nanoparticles fabrication.

Keywords: green synthesis; silver nanoparticles; triethanolamine; *Uncaria gambir Roxb.*

D08

Phytotoxicity study of silver nanoparticles on germination of water spinach (*Ipomoea aquatica* Forsk.) and green mustard (*Brassica rapa* L.*)* seeds

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Abstract. Silver nanoparticles (AgNPs) are metal nanoparticles used for many applications in the healthcare and industrial fields. The use of AgNPs worldwide can reach 500 tons per year. This usage can even increase the release of silver metal into the environment, which causes nanoparticles to be potentially sedimented in the aquatic environment and accumulate in organisms. Our previous research successfully synthesized silver nanoparticles through a biosynthetic method using *Diospyros discolor* Willd. (Velvet apple) leaf extract. Therefore, this study aimed to determine the phytotoxicity effect of biosynthetic AgNPs on water spinach (*Ipomoea aquatica* Forsk.) and mustard green (*Brasscia rappa* L. var. caisin) seeds. This study has five treatments: distilled water for positive control, 10 mM $AgNO_3$ for negative control, and biosynthetic AgNPs with concentrations of 30, 40, and 50 mg/L. The seeds were soaked for 24 hours in the AgNPs and germinated for 14 days to observe the phytotoxicity symptoms. Observations on the seeds germination included germination rate (%), germination rate index, fresh and dry weight, also the plant height. The results showed that the AgNPs had a toxic effect on *B. rapa*. Meanwhile for the germination of *I. aquatica*, exposure to AgNPs did not show phytotoxicity symptoms. The results show that each type of plant can have a different response to exposure of silver nanoparticles.

Keywords: biosynthesis; *Brassica rapa; Ipomoea aquatica*; phytotoxicity; silver nanoparticles.

D09

Carbon dots for improving water and oil absorption of sponges

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Abstract. Oil spill in is one of the hazardous problems in the ocean. Cleaning the oil spill requires expensive and specific technologies. Nowadays, advanced techniques such as skimmer, oil dispersion agents, in-situ burning and solar-heated oil-absorbent are frequently used to solve the problem. For oil-absorbent materials, further development is still required to enhance oil dan water absorption. Carbon dots is one of the promising nanoparticles that can be used to improve oil absorption. In this work, we conjugate carbon dots made of pencil leads into several types of sponges. The purpose of this work is to improve oil and water absorption. Our experiment results show that 2 until 5 nanometer size of ethanol soluble carbon dots are successfully synthesized using simple electrochemical process. UV-Vis absorption and FTIR spectra show clear energy transition and functional groups in carbon dots. We use 5 different sponges with various mass density from 9 until 166 mg/cm3. Conjugation of carbon dots into sponge is simply done by immersing sponge in carbon dot solution and drying it. This conjugation makes the mass of sponge increase by few milligrams. We examine the water and oil absorption capacity of each sponge. Water and oil absorption capacity is different for each sponge. In general, the addition of carbon dots in sponges can increase water absorption capacity by three-fold. Furthermore, one type of sponge decreases oil absorption capacity after carbon dost conjugation. Other types of sponges show improving of oil absorption capacity by two-fold after carbon dot conjugation. We believe that this work can be further improved to get higher water and oil absorption.

Keywords: biosynthesis; *Brassica rapa; Ipomoea aquatica*; phytotoxicity; silver nanoparticles.

D10

Handwashing skill and contamination of coliform bacteria in the hands of urban-slum primary students in Indonesia

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Abstract. Poor water, sanitation, and hygiene practices lead to diarrhea risk, and handwashing effectively prevents the spreading of pathogens. Unfortunately, the handwashing skills of lower grades children were poor, especially in urban-slum areas in developing countries, including Indonesia. Students tend to ignore the handwashing process, including the completeness step by step. This study aimed to measure the association between handwashing skills and contamination of Coliform in the hands of students. This study's design was a cross-sectional with 238 participants chosen by purposive sampling in an elementary school in an urban-slum area in Bandung, Indonesia. The data collection involved handwashing observation using a checklist and hand swabs for coliform bacteria detection. The data were analyzed using JMP-SAS with chi-square and regression analysis. This study showed that no participants could complete the recommended handwashing steps of WHO; students did a range of 2-8 number of handwashing steps. There was no significant difference in the handwashing skill of students by grade and gender, but higher grades tended to have more good handwashing skills. Most students did five or more steps of handwashing (64.3%) and used soap (82.4%), but less than 40 seconds (84.0 %) duration in handwashing. The ability to handwash was poor in lower grades and significantly different for the number of handwashing steps and using soap (p<0.05). Coliform bacteria were found in 91.2% of participants, and higher grades had significantly lower Coliform than the lower grades. The coliform count was significantly correlated with the number of handwashing steps (p<0.05). The result indicated that education on proper handwashing is essential to reduce the number of Coliform bacteria on students' hands, and handwashing education needs to be improved in elementary school.

Keywords: Handwashing skill; coliform; bacteria; urban-slum; students

D12

Evaluation of human urine purification using rice husk charcoal as the adsorbent

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Abstract. The abundant amount and availability of human urine can potentially be re-used for water and nutrient resources. Nutrient content in urine, primarily N and P, can cause water eutrophication and worsen the environment. Urine is not easily managed separately because it is usually integrated with black water or domestic wastewater that flows to the sewer from households or other public facilities. The global community's decline in water quality and the increase in water consumption have given many impetuses to technological breakthroughs that can recover essential nutrients from waste for reuse. In addition, the high water content of urine also provides an incentive to reuse or recycle most of the water contained in urine for public purposes. Rice husk charcoal is a waste product from burning husks used as fuel in the tofu-making process. This research aimed to identify urine purification to obtain clean water using rice husk charcoal as an adsorbent. The urine was processed using rice husk charcoal in 30 mesh as an adsorbent. The contact time and hose type were varied to identify the effect on the adsorption performance. The urine absorption using rice husk charcoal with 60 minutes contact time showed the highest removal based on the absorbance value of 27.18% in 487 nm wavelength and 28.25% in 668 nm wavelength. On the other hand, the adsorption using a curved hose showed better performance than the straight hose. The curved hose adsorption could decrease the urine concentration by 25.30-29.24% in 487 nm wavelength and 28.50-30.19% in 668 nm wavelength. In addition, the urine total dissolved solids (TDS) decreased by 73-76%. Therefore, the rice husk charcoal could be used as the adsorbent of human urine.

Keywords: human urine; adsorbent; rice husk charcoal; clean water

D13

Distribution of *Escherichia coli* and coliform in groundwater at Leuwigajah and Pasirkoja District, Bandung Raya, Indonesia

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Abstract. *Escherichia coli* and coliform are frequently detected in groundwater, and their abundant presence shows that groundwater has been contaminated. Some variables, including common public knowledge of clean living and crowded settlements, contribute to the growth of *E. coli* and coliform in groundwater. This result in domestic waste, as a source of pollution, will be adjacent to clean water sources (wells). The objective of this study was to map the distribution of total coliform and *E. coli*. The study was carried out in Pasirkoja and Leuwigajah in Bandung City, West Java, Indonesia. The 3M Petrifilm Coliform Count Plate is being used to monitor 37 wells. The distribution of *E. coli* and coliform are representative using Quantum Geographic Information System (QGIS) software. The result showed that the number of *E. coli* is 0 - >2500/100ml and total coliform is 0 - >2500/100ml. *E. coli* and total coliform distribution are towards the east of Leuwigajah and the west of Pasirkoja.

Keywords: Coliform; *Escherichia coli*; Groundwater; 3M Petrifilm; QGIS

D14

Trihalomethanes formation potential of polluted tropical river water and its correlation with UV-Vis spectral ratio: A case study in Citarum River, Indonesia

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Abstract. The presence of Natural Organic Matter (NOM) and Anthropogenic Organic Matter (AOM) in polluted river water leads to the formation of carcinogenic disinfection by-products (DBPs) during the water chlorination process. This study aims to determine the DBPs formation potential including trihalomethanes (THMs) and Haloacetic acids (HAAs) of polluted tropical river water. The samples were taken from the Citarum River, Bandung, Indonesia. The NOM and AOM were characterized using UV_{254} and UV_{355} while DBPs formation were determined using THM4 and HAA5 formation potential. The THM4 and HAA5 formation potential of the samples are exceed the USEPA regulation standards and has high toxicity (LC_{50}) values. This water source needs sufficient treatment to remove the DBPs precursors to provide healthy and clean potable water.

Keywords: Polluted River; Disinfection by-products; Natural Organic Matter; Anthropogenic Organic Matter

D15

Removal of dibenzofuran contaminated groundwater using electrochemical activated persulfate

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Abstract. Polycyclic aromatic hydrocarbons (PAHs) pollutant produced in the manufactured gas plant (MGP) in the vicinity of coastal area is a serious threat to groundwater supply. Dibenzofuran (DBF), one of the dominant PAHs found in MGP, was treated using electrochemical activated persulfate candle (ECO-PSC) in the presence of electrolite solution (Cl- and SO42-). The removal efficiency of DBF was 72.8% within 1 h. The effect of FeII in the ECO-PSC system was investigated. The optimum FeII concentration was 1.2 mM in the presence of SO42-, with the highest pseudo-first-order rate (kobs) and removal efficiency percentage (%) were 2.482 h−1 and 76.3%, respectively. Between Cl- and SO42-, SO42- increased the kobs and % removal more than those of Cl-. Radical species involved in the reaction was elucidated using electron spin resonance (ESR). Byproducts of DBF oxidation was analyzed using LC−MS, where three byproducts were identified: salicylic acid, 1,2-dihydroxydibenzofuran, and diphenyl ether. The electrochemical activated persulfate is a promising technique for removing PAHs pollutant in groundwater.

Keywords: Dibenzofuran; electrochemical; groundwater; persulfate; pseudo-first order

D16

The geo-environmental influence on hydrogeochemical conditions in the Tanjaknangsi volcanic region

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Abstract. Groundwater in volcanic areas flows from the recharge to the discharge and dissolving rock minerals undergo hydrochemical changes. Anthropogenic influences in the form of increasing built-up land and plantation activities in upstream areas raise concerns about changes in groundwater hydrochemistry. Hydrogeochemical and environmental characterization of groundwater in volcanic regions is essential to trace the rock water interaction. This study aims to determine the geo-environmental influence on the hydrogeochemical conditions in Pasirjambu volcanic areas. The method used in bivariate analysis, Gibbs and Piper diagram to determine the hydrochemical changes. Sampling of groundwater as many as 16 samples consisting of 5 dug wells, nine drilled wells, and two springs taken during the dry season. The results of the correlation analysis of Ca^{2+}, Mg^{2+}, and Na^+ cations strongly correlate with the HCO_3^- anion; the piper diagram shows the dominant hydrochemical facies in the study area, namely $CaHCO_3$, $MgHCO_3$, and $NaHCO_3$. The results of the Gibbs diagram analysis show the rock's water interaction leads to a dominant condition compared to the exchange of rainwater. The bivariate analysis showed the weathering of Ca^{2+}, Mg^{2+}, and silicate minerals. Residues of anthropogenic activities such as agriculture, plantations, and livestock will increase the levels of Cl^- and SO_4^{2-} ions. Environmental conditions with poor sanitation can affect the hydrochemical conditions of groundwater. The hydrochemical characteristics of groundwater are necessary for the sustainable management of groundwater resources.

Keywords: groundwater, environmental, volcanic, hydrogeochemistry, anthropogenic

D17

Preliminary study of microplastic in bottled drinking water

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Abstract. Microplastics are widely discussed and have become growing attention because of their negative impact on the environment and the well-being of living organisms. The presence of microplastics has been discovered in aquatic ecosystems as well as in atmospheric fallout from various sources, such as garments, microbeads used in personal care products, and other materials. Some international studies have found microplastics in some foods and beverages such as honey, beer, table salt, and, drinking waters. However, there are still few accurate analytical techniques for identifying and classifying microplastics. This preliminary study was carried out to investigate the presence, physical properties, and, the type of microplastic contaminated in 120 ml plastic cup mineral water from the traditional market in South Tangerang. Five local brands of plastic cup mineral water are used for this research. The samples were examined for the presence, size, and, shape of microplastics using a digital microscope. Furthermore, material identification was conducted using Microscope – Fourier Transform Infra-Red (FTIR) to analyze the type of contaminant present in the samples. All examined samples were contaminated, and the majority of pollutants in the 120 ml plastic cup mineral water were fibers with lengths between 0.042 and 3.668 mm. According to the material identification result using Microscope-FTIR, materials found in most samples were cellulosebased polymers, which are widely used as well as natural textile or synthetic fibers. The typical bands identified as cellulose in FTIR spectra are 1429, 1364, 1338, and 1029 cm^{-1}, respectively. These bands are associated with the vibrations of the -CH2, -CH, -OH, and C-O bonds in cellulose. Only one brand of the samples under investigation included polyethylene, the substance used to make lead cups. In its FTIR spectrum, polyethylene-specific peaks may be seen at the 1460 cm^{-1} for C-H vibration and the 720 cm^{-1} for CH_2 mode.

Keywords: cup mineral water, digital microscope, microplastics, microscope-FTIR

D18

Implementation of drinking water quality surveillance and household water management practices in selected provinces

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Abstract. Safely managed drinking water (SMDW) is a prerequisite for maintaining human health and well-being. Therefore, Water Safety Plan (WSP) and drinking water surveillance are appropriate approaches to achieve the target of Sustainable Development Goal (SDG) 6, particularly the highest ladder of drinking water services of SMDW. The study was carried out as part of a comprehensive drinking water assessment in four regions, including quality of improved water sources, drinking water quality of healthcare settings, and households in 2019. A total of 175 households were selected to determine water management practices and drinking water quality. A structured questionnaire was applied to obtain household water management practices. Moreover, the drinking water quality included physical, bacteriological and selected chemical parameters, which were examined at site locations and accredited laboratories. A qualitative inquiry was also carried out to elicit information on the existing drinking water surveillance. The study revealed that 46.86% of households used piped water, followed by protected dug wells (30.29%), boreholes (12.00%), and refilled water (10.86%) as primary drinking water sources. There were 6.00% of households experienced water scarcity. In complying with Health Ministerial Decree 492/2010, only 43.43% of household water sources were free from *Escherichia coli,* dominated by urban households. Majority of households complied with chemical quality of several parameters. Overall, the drinking water surveillance did not fully comply with Health Ministerial Decree 736/2010, particularly dealing with sample size, the availability of reagents, and comprehensive reports and recommendations. The interesting finding was that the proportion of households with SMDW as the highest ladder was only 7.80%. As such, the improvement of drinking water surveillance starting from the availability of appropriate surveillance guidelines and improvement of risk management are urgently needed. All drinking water companies should implement the WSP as they provide piped water services for most studied households.

Keywords: drinking water quality surveillance; household drinking water practice; safely managed drinking water, SDG6

D19

A review of ammonium issues in Indonesian groundwater: Potential sources and removal methods

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Abstract. Groundwater is one of the clean water resources that play a crucial role in the development of a region. On the other hand, it has been reported that human activities harm the quantity and quality of groundwater. One of the global concerns with groundwater is the presence of high levels of ammonium (NH_4^+), which degrades its quality. The existence of NH_4^+ in high amounts indicates anthropogenic disturbances. In this study, we review the problems in Indonesian groundwater and evaluate the land-uses condition in relation to this nitrogen species' concentration. In addition, this research presents practical strategies for reducing ammonium-groundwater concentrations. Our land-uses analysis revealed that the highest NH_4^+ concentration is found in the groundwater of a densely populated settlement area. In this region, the NH_4^+ values exceeded around 85 mg/L, which is most likely due to insufficient sanitation and a high load of domestic sewage. Furthermore, other land uses, those are agricultural, fishpond, and industrial, are likely related to NH_4^+ contributions in groundwater as well, which is up to 11.64 mg/L. The lower NH_4^+ concentration tends to be found in low population density areas, with the values reported lying in <1 mg/L. This result emphasizes that increased NH_4^+ content in groundwater is mainly due to human activities. Moreover, the results of an evaluation of several methods for reducing ammonium in water indicate that cation exchange and adsorption have the potential to reduce ammonium levels by 90 percent or more. Besides having a high reducing percentage, these methods do not require complicated application procedures.

Keywords: adsorption; ammonium; cation exchange; groundwater; human activities; land-use

D20

Application of the concept of smart city and smart water management for new capital city

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Abstract. The Indonesian government has decided to relocate the State Capital/ Ibu Kota Negara (IKN) from DKI Jakarta to East Kalimantan Province, partitioned into North Penajam Paser and Kutai Kartanegara Regencies. One of IKN's visions is to build a smart, modern city that meets international standards. The efficient and sustainable management of water resources is an important aspect of smart city management. As a result, the new IKN must implement smart water management. This paper investigates the concept of smart cities and smart water management to be applied to the new IKN to construct an integrated, sophisticated, and sustainable clean water supply system that meets the future expectations of all IKN residents. The method analyzes various concepts related to smart cities and smart water management applications worldwide and in Indonesia. Data from the Smart Water Management System were examined, including the smart water grid, flood early warning system, and water quality online monitoring system. Based on the investigation and analysis results, the Smart Water Grid in the water network system, leak detection, water conservation, and water quality monitoring are all required. In addition, the Flood Early Warning System must be utilized to provide early warning to minimize losses or victims caused by flood disasters. Besides that, Water Quality Online Monitoring System is required to monitor water quality in rivers, reservoirs/lakes, and industrial Wastewater Treatment Plant outlets online and in real-time, as well as to prevent better pollution quickly. The integrated implementation of smart cities and smart water management concepts will produce safe, healthy, and sustainable drinking water services. Furthermore, it can reduce financial losses, better serve urban and rural residents' water resource needs, and increase the potential for water conservation.

Keywords: concept, smart city, smart water management, the State Capital

D21

Perceptions of consumers, housing supervisors, and planners on the house plumbing system

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Abstract. The plumbing system is a piping system in a building or house. The plumbing system consists of clean water, wastewater, and rainwater. The purpose of this study was to determine the perceptions of consumers, supervisors, and planners of the plumbing system in public housing. The research method used in this research is descriptive qualitative with primary data collection through surveys of the public housing developers in Solo and Semarang, Makassar, and Palembang. The results showed that the consumer's perception of the plumbing system in house buildings was not good due to the lack of consumer knowledge about the plumbing system. While the perception of house planners and supervisors regarding the plumbing system is good, building planners and supervisors know that there are rules and standards regarding plumbing systems and equipment. However, the existence of SNI 8153:2015 regarding the plumbing system has not been fully utilized for housing. The provision of housing at affordable prices has an impact on the use of plumbing equipment. The equipment specifications cannot optimally meet existing standards because they must consider the production costs of house construction and the house's selling price.

Keywords: plumbing, public housing, SNI

D22

Water quality data analysis from monitoring system (onlimo) at 16 stations location in priority watersheds and lakes

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Abstract. To support government activities in dealing with critical rivers and lakes contained in the RPJMN and government regulations related to 15 Priority Watersheds and 15 Priority Lakes, it is necessary to carry out water quality pollution control activities. One of the efforts currently being made is to carry out pollution control activities for river and lake water quality through the application of continuous, online, and real-time online water quality monitoring technology. The purpose of this activity is to analyze water quality data in rivers and lakes and evaluate the performance of the telemetry equipment system in recording data, which simultaneously affects the performance of the monitoring station itself. The water quality data to be analyzed in this study is primary data from multi-probe sensor-based water quality monitoring from 2016 to 2020 at 16 monitoring station locations spread across S. Ciliwung, S. Cisadane, and S. Citarum, S. Serayu, and S. Bengawan Solo and Lake Toba. Monitoring uses a multi-probe sensor with 11 parameters, namely Temperature, DHL (Electrical Conductivity), TDS (Total Dissolved Solids), Salinity, DO (Dissolved Oxygen), pH, Turbidity, SwSG (Seawater Specific Grafity), Nitrate, Ammonia, and ORP (Oxidation Reduction Potential). The method used is to identify and analyze monitoring data compared to Government Regulation of the Republic of Indonesia Number 22 of 2021 concerning the Implementation of Environmental Protection and Management as well as to perform descriptive statistical analysis and determine the status of water quality using a pollution index. The results of the analysis show that there is an indication of an increase in pollution above the quality standard in the Ciliwung River area in 2020, especially the Nitrate and Ammonia parameters. Then the Monitoring Station located at the Istiqlal Mosque on the Ciliwung River shows that the DHL value continues to increase from 2016 to 2020. The determination of the water quality status for 2016–2020 at all monitoring stations shows the pollution index value is moderately polluted. Then from the results of the identification of the performance of the telemetry equipment system in recording monitoring data, it is known that the stations located at Way Sekampung Station, Lampung, and Dayeuhkolot Station, Kab. Bandung has very low performance, while Manggarai Station, South Jakarta, and Pengairan Station, Kab. Majalaya has a pretty good performance. It is hoped that the results of this research activity can provide input for managers of online water quality monitoring stations in improving the management of Onlimo equipment in recording river and lake water quality data.

Keywords: Online monitoring water quality technology, water quality pollution control, online monitoring water quality station, rivers and lakes.

D23

The development of action plan of Jeneberang River pollution control based on the calculation of total maximum daily load

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Abstract. Jeneberang watershed is one of the priority watersheds of the Ministry of Environment and Forestry in the Sulawesi Island region and the location of various important economic activities that contribute around 2% to the national GDP. The results of water quality monitoring in 2018 and 2019 presented that the average water quality status of the Jeneberang river was moderately polluted. This study aims to develop the action plan of water pollution control based on the calculation of the total maximum daily load (TMDL) to meet the river water quality standard. The method used in this study is the application of numerical model of water quality combined with the spatial approach for calculating the TMDL. The calculation results using a combination of these models indicated that the load of existing pollutants entering the Jeneberang River from upstream to downstream was 4,844.87 kg. BOD/day while the TMDL is 3,552.97 kg. BOD/day, therefore a load reduction of 1291.9 is required. Although it is found in several segments in the river where the TMDL is greater than the existing load. Furthermore, the study result also shows that it is necessary to reduce the water pollution load from the domestic, industries, livestock activities and from the combination of agriculture and built-up land by 871.37, 14.86, 337.28, and 68,39 kg. BOD per day, consecutively. The calculation results reveals as well that the total number of wastewater treatment plant needed to reduce the pollution load from domestic sector in the entire Jeneberang Watershed is 122 units with a budget of Rp.121.86 billion. To reduce the pollution load from the livestock sector, a total of 350 units of biodigester with a total budget of Rp. 7.35 billion is necessary. Meanwhile, there are 46 inspectors and a budget of Rp.10 billion per year are required to supervise industries.

Keywords: action plan, total maximum daily load, water pollution load, numerical model, spatial approach

D24

Mercury analysis from fish samples using Cold Vapour-Atomic Absorption Spectrophotometry (CV-AAS) method with Sodium Borohydride as the reductor

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Abstract. Marine fish have the potential to accumulate pollutant of heavy metals, such as mercury, from anthropogenic activities that can harm people who consume it. Marine fishes like bandeng, banjar, bawal, selar, tenggiri, and tuna are consumed a lot by people in Bandung. All these kinds of fish were analyzed using CV-AAS method with US-EPA in 2006 and the reductor is replaced by Tin (II) Chloride with Sodium Borohydride. Variation in sample preparation process includes drying the sample using oven and ultra-vacuumed using freeze dryer. After drying the samples of bandeng and tuna, the results are characterized by SEM-EDX and FTIR. The result of SEM-EDX in the frozen-dried samples shows that the morphology of the fibers are intact while in hot-dried samples the fibers are damaged. During characterization using FTIR, there is a slight shift of wave number. The comparison of mercury level was measured by CV-AAS, analyzed using one-way ANOVA, and the result shows insignificant values. The mercury level obtained from every sample shows that the value is below SNI 2009 standard (0.5 ppm). Therefore, it is concluded that the samples are safe to be consumed.

Keywords: CV-AAS, Freeze Dryer, Marine fish, Mercury, Oven

D25

Seasonal hydrodinamic pattern and effect of marine sediment distribution in Banten Bay

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Abstract. This study is to see the pattern of current velocity and direction at the time of high tide, high tide, low tide and lowest low tide during the west and east monsoons as well as to see an increase in sedimentation. Oceanographic and environmental baseline data used in this study consisted of bathymetry, tides, winds, waves, ocean currents, temperature, salinity and sediment. The model used is DHI MIKE 21 Flow Model FM. Based on the calculation of determining the type of tide using the Formzahl formulation, 1.54, which means that the tides in the study area are classified as single dominant mixed tides. The dominant wind direction comes from the east with a percentage of 27.378%, with each detail of wind speed 1-2 m/s as much as 4.207%, wind speed 2-4 m/s as much as 12,500%, wind speed 4-6 m/s as much as 9.878% and wind speeds of 6-8 m/s as much as 0.060%. the direction of the dominant wave coming from the east with a percentage of 52.671%, with details of each wave height 0.1-0.2 m as much as 0.719%, wave height 0.2-0.4 m as much as 9.06%, wave height 0, 4-0.6 m is 21.541%, wave height is 0.6-0.8 m is 16.780%, wave height is 0.8-1.0 m is 4.486% and wave height >1 m is 0.136%. In the west season, the maximum current velocity is 0.112 m/s with the dominant current direction coming from the northeast to the southwest and approaching the coast. In the east season, the maximum current velocity is 0.112 m/s with the dominant current direction coming from the northeast to the southwest and approaching the coast. There is a change in bad level/sedimentation around the port for 1 year from 0.02 m to 0.28 m.

Keywords: current velocity and direction, seasonal pattern, Banten Bay, sedimentation

D26

Effect of rainfall on assessment of hydrologic sustainability in Citanduy Sub Watersheds

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Abstract. Hydrology is one of the criteria for monitoring and evaluation (monev) of watersheds management as stated in the Minister of Forestry Regulation Number P.61/Menhut-II/2014. So far, the use of various hydrological parameters for monev of watersheds has not been evaluated whether these parameters truly reflect the condition of the watershed. This study aims 1) to evaluate the effect of rainfall on hydrological criteria of each sub-watershed, which include: flow regime coefficient, annual flow coefficient, sediment load, and water use index, and (2) to evaluate the effect of rainfall on watershed carrying capacity. This analysis is crucial to see the development of forest and land rehabilitation efforts in restoring degraded land. Data collection was carried out from 2008 to 2016 in each of the sub-watersheds of Citanduy watershed, which are Cijolang, Cikawung, Cimuntur, Ciseel, and Upper Citanduy. From this research, it is known that flow regime coefficient, annual flow coefficient, sediment load, water use index, and flood frequency are strongly influenced by rainfall so the result in evaluating watershed carrying capacity may vary depending on the rainfall. Besides being influenced by rainfall, flow regime coefficient, annual flow coefficient, and sediment load are also affected by land cover, while the slope affect the sediment load.

Keywords: monitoring; evaluation; watershed carrying capacity; Citanduy

D27

Mapping a vicious-cycle of community gold mining (CGM): case study of a CGM site at Sukabumi Regency, Indonesia

Prabawa FY

Abstract. Community's Gold Mining (CGM) in Indonesia is presently still containing never ending problems, with less solutions, since decades. The problems are such CGM activity's impact on health and nature from mercury use, environmental degradation, spill of state's economy from illegal depletion of resource, etc. There are progresses in the efforts in problem solving. Even though, the main problems are still long-lasting. To understand the factual problems, it is needed to recognize the CGM's basic variables, and its connectivity. This study aims to map the small-scale gold mining activity in variables, and developing them to be a causal model. Study took place at Kertajaya Village, Sukabumi Regency Indonesia, during 2018-2020, which there are some blocks of CGM existing, and more than a 1000 people working informally as miner. The ArcGis and System Dynamics Software were used, the data is supported by conducting observation and investigative methods. The variables of the model are grouped in 3 basic mining steps, and the sustainable aspects of social - economy and environment. As the result, we can see clearly, the existing variables connected in a causal relation loop, an endless cycle, containing unsolvable problems, a high dynamism of miners in spatial movement, that in this study it is called: vicious-cycle of CGM.

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Converting sawdust to biochar and its mineral content: A preliminary analysis

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Abstract. In Indonesia, soil degradation is occurring. A strategy to improve soil conditions is by applying biochar as a soil amendment. On the other hand, Indonesia is an agricultural country with many types of biomass that can be converted into biochar. Sawdust of mahogany, teak, and sappan wood from the furniture industry is easy to find and has great potential as raw materials for biochar. This study used X-ray fluorescence spectrometry to determine the mineral content of sawdust biochar from mahogany, teak, and sappan wood sawdust, especially the ash fraction. Biochar was created by burning sawdust woods in a furnace at temperatures ranging from 250°C to 350°C. In general, the main mineral (ash fraction) content of wood sawdust biochar was calcium (CaO) at concentrations ranging from 51 to 72%, with sappan sawdust biochar having the highest concentration at 70–72%. The potassium (K_2O) concentration ranged from 9–23%, with mahogany sawdust biochar having the highest concentration (23%). The phosphorus (P_2O_5) content ranged from 2 to 10%, with teak sawdust biochar having the highest concentration at 7–10%. Moreover, teak sawdust contained 15-20% silica, and sappan sawdust biochar contained 6-8% Fe. The mineral content in biochar ash included alkaline cations; if the biochar is applied to the soil, then a mineralization process may occur and the cations could improve pH conditions through a liming mechanism. This result is only general information; further research is required to produce more comprehensive data.
Keywords: biochar; mahogany; mineral content; sappan wood; sawdust; teak

1. Introduction

Land degradation is a global issue due to its negative impact on productivity and food security [1]. Almost 33% of the earth's land surface has been affected by global soil degradation [2]. Runoff and erosion are the primary cause of global soil degradation. Because of degraded soil structure and lower soil fertility, heavily eroded soils have low productivity and provide a poor environment for root growth [3]. This issue is particularly acute in developing countries such as Indonesia, where heavy rainfall and land-use change exacerbate land degradation. One strategy that can be applied is to use biochar as an ameliorant to improve the soil condition.

Biochar is a carbon-rich product produced by pyrolyzing biomass resources in an oxygen-depleted environment [4]. Biochar is a stable organic material, but its function and form in the soil are comparable to clay minerals [5]. Biochar is a soil conditioner that can improve soil health indefinitely. Biochar can boost nutrient uptake, reduce nutrient leaching, increase water retention capacity, enhance cation exchange capacity, stimulate biomass and microorganism abundance, and help neutralize soil pH [6].

From an environmental standpoint, biochar is also very important for managing agricultural waste. Many farmers have not properly disposed of agricultural waste. There is much agricultural waste that is not used and is even burned. Mahogany, teak, and sappan sawdust are examples of waste that can be used to make biochar. Biochar can also help to reduce climate change and global warming. Returning biochar to the soil reduces the amount of greenhouse gases in the atmosphere. Biochar that has been added to the soil does not easily decompose, allowing it to last for a long time. Biochar, which is high in carbon, will significantly reduce the potential for CO_2 emissions into the atmosphere. Microbes that thrive in biochar improve the carbon-to-nitrogen ratio, reduce nitrogen loss and NO_2 emissions by preventing/limiting anaerobic NO_2 production, and increase nitrogen availability/efficiency for plant growth [7].

Furthermore, biochar aids in the reduction of waste disposal and waste management issues that can result in methane gas production (CH_4). Biochar, in addition to improving soil and increasing plant growth, plays a role in pest and disease control. Biochar has been shown to help reduce borer attacks on rice and pepper mites. Biochar has also been shown to control various plant diseases, including pathogens in the soil and on the soil surface. The toxic properties of biochar, modification of microbes in the soil, changing soil pH, affecting the availability of nutrients and water, and inducing plant resistance are all disease control mechanisms demonstrated by biochar [8].

Indonesia is an agricultural country with many biomasses. Sawdust is one promising biomass that can be converted to biochar. Sawdust is a tiny piece of wood that falls as a powder from wood when cut with a saw [9]. In other words, sawdust is a waste of small particles produced by sawmilling industries, pulp and paper mills, and wood processing. Sawdust biochar can increase soil organic carbon and pH [10], as well as influence plant height, number of leaves, leaf area index, crop growth rate, and yield [11]. However, the research on biochar's potential as a nutrient source for plants is still limited. This study aimed to determine the mineral contents of sawdust biochar from mahogany, teak, and sappan wood sawdust using X-ray fluorescence spectrometry. X-ray fluorescence spectrometry (XRF) is a non-destructive and environmentally friendly analysis method because no chemicals are used. However, the data can only be used as general information and only can capture data from ash fraction, but it will be helpful as the basic data for the next experiment.

2. Methods

This research was conducted at the Research Center for Limnology and Water Resources, Bogor, in May–July 2022. The materials for this study were three sawdust materials, namely mahogany sawdust, teak sawdust, and sappan sawdust. The tools used in this research were 50-ml porcelain cups, sieve, furnace, and XRF Omnian ED-XRF Panalytical Epsilon 3 XLE. The sawdust material was put into a 50-ml porcelain cup until it was full, then covered and wrapped with aluminum foil. Even though the porcelain cup had a lid, the purpose of wrapping it using aluminum foil was to limit the sample's contact with oxygen during the pyrolysis process. The sample was put in the furnace for four hours at temperatures of 250°C and 350°C [12, 13, 14]. Afterward, the sample was left cool to room temperature, then the sample was mashed and sieved using a 335-micrometer sieve. The sieved sample was used for XRF analysis at the Lampung Advanced Characterization Laboratory-BRIN. Descriptive data analysis was carried out by comparing the mineral content of biochar burned at temperatures of 250°C and 350°C.

3. Result and discussion

Indigenous peoples in the Amazon rainforest added biochar to soils [15]. The terra preta ("dark soil") had significantly increased soil fertility and carbon levels compared to the surrounding natural soil after the addition of biochar. These properties have been maintained for over 500 years, indicating that biochar is a long-term soil amendment and carbon sink [15-16]. Through pyrolysis or carbonization, the feedstock or raw material can be converted into biochar. Producing biochar from sawdust would be an alternative method of waste disposal, and using biochar in soil amendment could significantly reduce

GHG emissions from the soil [17]. Moreover, converting to biochar is a strategy for waste management and conserving the environment.

The characteristics of biochar depend on the type of raw material and producing process, such as pyrolysis temperature. Biochar's properties are primarily determined by the process of thermal decomposition, or pyrolysis, which can take place under four conditions: gasification, fast pyrolysis, moderate pyrolysis, and slow pyrolysis. Gasification (at >800°C) produces mostly gas, whereas fast (600–700°C) and moderate (500–600°C) pyrolysis produce bio-oil. Slow pyrolysis (at <400°C) produces a solid material known as biochar [18]. The temperatures used in this study were 250°C and 350°C, which were chosen because the process of carbonization of organic materials begins only at 220°C [19]. The effect of different temperatures of pyrolysis can be found in Table 1 and Table 2, where the mineral content is part of the biochar ash.

Table 1. Mineral content of biochars from mahogany, teak, sappan wood sawdust, and date seed.

Material source	Mineral content (%)				
	P_2O_5	K_2O	CaO	SO_3	MgO
Mahogany sawdust					
MBc250	7.016	23.952	63.068	2.561	-
MBc350	6.263	23.473	59.945	2.139	-
Δ	0.753	0.479	3.123	0.422	-
Teak sawdust					
TBc250	10.132	15.806	51.005	-	-
TBc350	7.131	18.855	53.175	-	2.477
Δ	3.001	3.049	2.170	-	2.477
Sappan sawdust					
SBc250	3.270	9.804	70.927	-	-
SBc350	2.416	10.374	72.940	1.207	-
Δ	0.854	0.570	2.013	1.207	-
Date seed [12]					
DBc250	12.539	57.990	18.976	8.299	-
DBc350	14.015	58.278	15.230	7.165	2.463
Δ	1.476	0.288	3.746	1.134	2.463

Table 1 shows the dominant mineral contents of biochar (ash), which are associated with macronutrients. All biochars contained P_2O_5 (phosphor), K_2O (potassium), CaO (calcium). Moreover, SO_3 (sulfur) was only found in mahogany sawdust biochar, sappan sawdust biochar, and date seed biochar. Meanwhile, MgO (magnesium) was only found in teak sawdust and date seed biochar, specifically at 350°C of pyrolysis temperature. The dominant mineral content of biochar (ash fraction) from wood-based raw material was calcium (Ca), which was found in mahogany sawdust biochar at 59–63%, teak sawdust biochar at 51–53%, and sappan sawdust biochar at 70–72%. The dominant mineral content of biochar (ash fraction) from date seed was potassium (K), where the concentration was 57–58%.

Table 1 shows that in the three biochars from sawdust, increasing the temperature would decrease the concentration of P_2O_5. On the other hand, the concentration of P_2O_5 in date seed biochar increased following the increase in pyrolysis temperature.

For K_2O, increasing the pyrolysis temperature increased the concentrations in teak sawdust, sappan sawdust, and date seed biochars, while the opposite occurred for mahogany sawdust biochar. For CaO,

increasing the pyrolysis temperature increased the concentrations in teak and sappan sawdust biochars, while the opposite occurred for mahogany sawdust and date seed biochars. Increasing the concentration of chemical content due to the increasing pyrolysis temperature was previously observed [20].

The decrease of SO_3 concentration when pyrolysis temperature increased was found in mahogany sawdust and date seed biochars. However, some minerals appeared when the temperature of pyrolysis was 350°C. Pyrolysis temperature affected the mineral content in this study. The response of pyrolysis temperature depended on the raw material type. Similar to the statement by Claoston et al [21], the influence of pyrolysis temperature and time on the composition and chemical structure of biochar can significantly impact its nutrient content. Moreover, Chan and Xu [22] explained that the loss of volatile molecules from the feedstock, such as carbon, hydrogen, and oxygen, may explain the increase in biomass nutrient content caused by thermal degradation. Not only increasing the concentration, but the thermal degradation also can decrease the concentration because the nutrient was degraded at a specific temperature and evaporated. Every organic material has different proportions of cellulose, hemicellulose, and lignin contents, where the composition may influence the time of thermal degradation and nutrient content in the end.

Table 2. Other mineral content of biochar from mahogany, teak, and sappan wood sawdust.

Material source	Mineral content (%)							
	SiO_2	Fe_2O_3	TiO2	CuO	ZnO	Rb_2O	MnO	SrO
Mahogany sawdust								
MBc250	-	2.354	0.453	0.093	0.056	0.127	-	0.205
MBc350	-	6.713	0.394	0.101	0.071	0.129	0.104	0.211
Δ	-	4.359	0.059	0.008	0.015	0.002	0.104	0.006
Teak sawdust								
TBc250	20.681	0.944	0.665	0.039	0.033	-	0.089	0.082
TBc350	15.957	0.854	0.689	0.041	0.027	0.015	0.121	0.104
Δ	4.724	0.090	0.024	0.002	0.006	0.015	0.032	0.022
Sappan sawdust								
SBc250	4.118	8.712	0.847	0.086	0.052	0.014	0.272	0.132
SBc350	3.670	6.475	0.724	0.071	0.042	0.009	0.253	0.105
Δ	0.448	2.237	0.123	0.015	0.010	0.005	0.019	0.027
Date seed								
DBc250	-	0.809	-	0.232	0.433	0.056	0.507	0.117
DBc350	-	0.863	-	0.233	0.488	0.064	0.538	0.102
Δ	-	0.054	-	0.001	0.055	0.008	0.031	0.015

Table 2 shows the other mineral contained in the biochar (ash). Teak sawdust biochar contained much silica (SiO_2), while sappan sawdust biochar also contains high iron (Fe_2O_3). Furthermore, other minerals such as TiO_2, CuO, ZnO, Rb_2O, MnO, and SrO were also contained in the biochars albeit the concentrations were low. The Fe in sappan sawdust biochar needs to be considered if the sappan sawdust biochar is used as a soil amendment because the Fe can be toxic to plants. However, that consideration can be neglected until more proper and specific research related to the mineralization and toxicity of biochar is done.

Red soils are found worldwide in tropical and subtropical regions, accounting for more than 45% of the total land area [23]. In Indonesia, ultisol soil, also known as red soil, accounts for 25% of the total land area. Ultisol soil's pH is low, with a high Al, Fe, and Mn saturation, a low base saturation, and a low organic matter content [24–28]. Low pH is almost always found in tropical and subtropical regions

and is exacerbated by land degradation. The precipitation of H^+ ions, the presence of acidic gases such as SO_2 and NO_3, and the application of ammonium-based fertilizers (NH_4^+) all contribute to the low pH [29,30]. A decrease in soil pH (<5.5) can be caused by the substitution of H^+ and Al^{3+} ions for basic cations such as Ca^{2+}, Mg^{2+}, and K^+. Furthermore, Al and Mn mineral dissolution can contribute to soil acidification. This condition increases the toxicity of metals such as Al, Mn, and Fe while decreasing essential minerals such as phosphorus, reducing soil fertility and crop yield [31]. According to mineral analysis, the three biochars contained alkaline cations, such as Ca, Mg, and K. When biochar is applied to acid soil, the alkaline cations in the biochar are expected to displace the acid soil's exchangeable H^+ and Al^{3+} ions. Free H^+ ions can react with OH^- ions and neutral water, CO_3^{2-} or HCO_3^- ions to form unstable H_2CO_3, which dissociates easily to form CO_2 and H_2O. Applying biochar will have liming effects, raising soil pH, improving soil fertility, and increasing crop productivity in the long term. However, only data from ash fraction can be detected in current research. Further research about alkaline contents in biochar is needed.

The effect of pyrolysis temperature on the mineral content in this research was still unclear, due to only two temperatures (250°C and 350°C) being tested. Further experiment to investigate the effect of pyrolysis temperature is needed by applying several temperatures as a treatment with replications to ensure statistical significance.

4. Conclusion

The main mineral content of biochar (ash fraction) from wood sawdust was calcium (CaO), with a concentration range of 51–72%, with the highest concentration was found in sappan sawdust biochar at 70–72%. The potassium (K_2O) concentration ranged from 9–23%, with the highest concentration was found in mahogany sawdust biochar at 23%. The phosphorus (P_2O_5) content was 2–10%, with the highest concentration was found in teak sawdust biochar at 7-10%. Moreover, teak sawdust biochar ash contained 15–20% silica, while sappan sawdust biochar ash contained 6–8% Fe. Furthermore, the biochars contained alkaline cations. If they are applied to the soil, a mineralization process may occur that can improve pH conditions through a liming mechanism. This result is only general information; further research is required to produce more comprehensive data.

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Author note and authorship
The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism. A Rahmat is the main author in this article. A Rahmat contributed in conceptualization research, conduct experiment, data analysis, draft correction. Y Pramudya contributed in conceptualization research, data analysis, writing original draft. E Triwisesa contributed in conceptualization research, preparation raw material, conduct experiment.

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