UNIVERSITI PUTRA MALAYSIA
BERILMU BERBAKTI

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OHOW 2024

IIS UTokyo SYMPOSIUM No. 125

The 3rd International Symposium on One Health, One World

"EMPOWERING PLANETARY HEALTH THROUGH SCIENCE AND ENGINEERING INNOVATIONS"

10-12 Dec 2024 | Mercure Living Hotel,Putrajaya, Malaysia

Organized by

UNIVERSITI PUTRA MALAYSIA
BERILMU BERBAKTI

INSTITUT KAJIAN PERLADANGAN
INSTITUTE OF PLANTATION STUDIES

Co-organized with

OneHealth OneWorld

INSTITUTE OF INDUSTRIAL SCIENCE THE UNIVERSITY OF TOKYO

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INSTITUTION OF GEOSPATIAL AND REMOTE SENSING MALAYSIA

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PROGRAM AND ABSTRACT BOOK

MESSAGE FROM
VICE CHANCELLOR, UNIVERSITI PUTRA MALAYSIA

Bismillahirrahmanirrahim.

Assalamualaikum warahmatullahi wabarakatuh and Salam Sejahtera,

It is my pleasure to welcome all of you to the 3rd International Symposium on One Health, One World (OHOW2024). I would like to express my gratitude to the organizing committee and our co-organizers, the University of Tokyo and IGRSM, for their dedication in making this event possible. It is an honor for Universiti Putra Malaysia (UPM) to host this significant symposium, where we unite as global citizens to address the theme: "Empowering Planetary Health through Science and Engineering Innovations."

At UPM, we are committed to a holistic vision that aligns with the principles of One Health and One World. Our aim is to lead in tropical agriculture while integrating health, agriculture, and environmental initiatives. Our state-of-the-art facilities enable groundbreaking research that delivers practical solutions to pressing challenges.

Partnerships are vital in realizing the One Health vision. Together, we strive to leverage scientific and engineering innovations to enhance food security, combat zoonotic diseases, mitigate climate change, and foster resilient ecosystems.

As we move forward, let us view this symposium as a call to action. I encourage each of you to share your insights and explore new collaborations. Thank you for your commitment to empowering planetary health. Let us make this symposium a milestone in our shared journey.

Thank you, and I wish you all a productive and inspiring day ahead.

YBHG. DATO' PROF. DR. AHMAD FARHAN MOHD SADULLAH

MESSAGE FROM
OHOW2024 CHAIRPERSON
DIRECTOR, INSTITUTE OF PLANTATION STUDIES,
UNIVERSITI PUTRA MALAYSIA

Assalamualaikum warahmatullahi wabarakatuh and Salam Sejahtera,

I am pleased to welcome all participants to the 3rd International Symposium on One Health, One World (OHOW2024). This year, OHOW2024 features four keynote lectures, twelve invited speakers, three forum panelists, and over 100 participants from seven countries, including Malaysia, Japan, India, China, Indonesia, the Philippines, and Bangladesh.

This symposium serves as a vital platform for exchanging ideas and fostering collaboration to enhance expertise in sustainable development and innovation. It encompasses a range of interdisciplinary topics, including environmental sustainability, food security and agricultural innovation, public health, and technological advancements. The aim is to drive the development of cutting-edge technologies and impactful research that yield significant societal benefits.

On behalf of the IKP organizing committee, I wish to extend my sincere gratitude to our keynote and invited speakers. Their remarkable expertise and commitment to their fields enhance the value of this event, and it is a privilege to have them with us. The knowledge and ideas shared at OHOW2024 are anticipated to foster future collaborations and lead to impactful research outcomes.

I would also like to express my gratitude to our generous sponsors. A special thank you to our Diamond Sponsor, Applied Agricultural Resources Sdn Bhd; our Gold Sponsors, Roundtable on Sustainable Palm Oil and KMK Agro Global Sdn Bhd; and our Bronze Sponsors, FWF World Solutions and the Ministry of Tourism, Arts and Culture, Malaysia. Your unwavering support has been instrumental to the success of this symposium, and your contributions inspire a commitment to excellence in advancing our mission.

Lastly, I would like to thank the organizing committee for their hard work and dedication in making OHOW2024 a reality. I wish all participants a fruitful and enriching symposium and look forward to the collaborative opportunities that will arise from this event.

Thank you.

PROF. TS. DR. SITI KHAIRUNNIZA BEJO

MESSAGE FROM
OHOW2024 CHAIRPERSON
DIRECTOR, ONE HEALTH ONE WORLD RESEARCH INITIATIVE,
THE UNIVERSITY OF TOKYO, JAPAN

Welcome to OHOW2024

In light of the global spread of COVID-19, the importance of the Manhattan Principles declared in the United States in 2004, known as "One Health One World (OHOW)," was re-emphasized. OHOW outlined "12 action plans" for international organizations to collaborate across disciplines to prevent and control zoonotic diseases and preserve ecosystems. "One Health" emphasized that the health of humans, livestock, and wildlife was interconnected, necessitating collaboration between medicine and veterinary science. "One World" extended this concept, highlighting that the health and biodiversity of humans, livestock, and wildlife depended on the cleanliness and health of the environment, including water, soil, and air. This also encompassed cyberspace, defined as part of the global commons.

The 3rd OHOW symposium was jointly organized by the One Health One World Research Initiative, the University of Tokyo, Japan, and Universiti Putra Malaysia. The OHOW symposium included topics such as climate change and green recovery, international public health research in Asia, infrastructure management and sustainable built environments, and urban safety and disaster mitigation.

Beyond the academic program, we curated networking opportunities, social events, and cultural experiences that provided a platform for meaningful interactions, collaborations, and the forging of lifelong connections. We encouraged all participants to take full advantage of these moments, as they often led to serendipitous encounters and sparked innovative ideas.

Thank you.

PROF. DR. WATARU TAKEUCHI

ABOUT UNIVERSITI PUTRA MALAYSIA

Universiti Putra Malaysia (UPM) is a leading research university in Malaysia and is first established as the School of Agriculture in 1993. The school was located on a 22-acre piece of land in Serdang and offered two programs – a three-year diploma program and a one-year certificate course in Agriculture. In 1947, the school was declared as the College of Agriculture Malaya by Sir Edward Gent, the then Governor of the Malayan Union.

The establishment of Universiti Pertanian Malaysia came about when the College of Agriculture in Serdang merged with the Faculty of Agriculture, University of Malaya. Dr. Mohd. Rashdan bin Haji Baba, the then principal of the College of Agriculture Malaya, was appointed as the first Vice-Chancellor by virtue of the provision of Section 18 of the Universities and University College Act, 1971. With the first intake of 1,559 students, Universiti Pertanian Malaysia had its first academic session in July 1973 in three central faculties and one basic division: the Faculty of Veterinary Medicine and Animal Sciences, the Faculty of Forestry, the Faculty of Agriculture and the Division of Foundation Studies.

In the early 80s, UPM extended its area of studies to include the field of Science and Technology (S&T). In 1997, the name Universiti Pertanian Malaysia was changed to Universiti Putra Malaysia by former Prime Minister, Tun Dr. Mahathir Mohammad, as a strategic gesture to portray the status of UPM as a center of higher education capable of providing education in various fields of studies, especially in science and information technology that spearheaded national development in the new millennium.

ABOUT INSTITUTE OF PLANTATION STUDIES

The establishment of the Institute of Plantation Studies (IKP) was approved by the Department of Higher Education, Malaysia in 2004 to become a Centre of Excellence for the advancement of plantation and agricultural agrotechnology and problem solving to commodity crops issues. Currently, IKP has three research laboratories: Laboratory of Sustainable Agronomy and Crop Protection (SACP), Laboratory of Plantation System Technology and Mechanization (PSTM) and Laboratory of Processing and Product Development (PPD) to cover the upstream, midstream, and downstream activities of plantation crops.

To date, IKP is actively involved in research and consultancy projects covering plantation crops such as palm oil, rubber, cocoa, tea, pepper, coconut, pineapple, and durian. IKP activities mainly support the National Agricommodity Policy 2021-2030 (DAKN2030) to tackle issues and challenges faced by the plantation industry such as sustainability demand (to meet global export demand), stagnant productivity (soil infertility, pest and diseases, and overdependence on foreign labour), and lack of value-creation (limited-value added products and limited development of downstream product/technology). With various backgrounds of researchers in IKP and strong collaborations with government agencies, plantation companies and technology providers, IKP would dedicate its experience and expertise to agricultural and plantation research areas.

ABOUT UNIVERSITY OF TOKYO

The University of Tokyo was established in 1877 as the first national university in Japan. As a leading research university, UTokyo offers courses in essentially all academic disciplines at both undergraduate and graduate levels and conducts research across the full spectrum of academic activity. The University aims to provide its students with a rich and varied academic environment that ensures opportunities for both intellectual development and the acquisition of professional knowledge and skills. To learn more about the University of Tokyo, please visit the pages below.

SYMPOSIUM OVERVIEW

DAY 1 | 10 DECEMBER 2024

TIME	PROGRAMME	
08.30 – 09.00	**REGISTRATION** Arrival of participants and distinguished guests	
09.00 – 10.00	**OPENING CEREMONY | VENUE: MEETING ROOM 7,8,9** • Negaraku Anthem and Putra Gemilang • Doa Recitation • Welcoming speech by YBhg. Prof. Ts. Dr. Siti Khairunniza Bejo (Chairperson OHOW2024) • Officiating speech by YBhg Dato' Prof. Dr. Ahmad Farhan Mohd Sadullah (Vice Chancellor, Universiti Putra Malaysia) • Launching of PLANTATION STUDIES eProceedings • MoU Signing Ceremony between UPM and - PT Riset Perkebunan Nusantara, Indonesia - Roundtable on Sustainable Palm Oil • Photography session	
10.00 – 10.30	Coffee break and Networking	
10.30 – 11.00 11.00 – 11.30 11.30 – 12.00 12.00 – 12.30	**KEYNOTE LECTURES | VENUE: MEETING ROOM 7,8,9** **CHAIRMAN: Prof. Dr. Wong Mui Yun (Institute of Plantation Studies, UPM)** Assoc. Prof. Dr. Koji Matsumoto (Hokkaido University) **"Satellite Imagery Method for Estimating Construction Years of Road Bridges"** Assoc. Prof. Dr. Helmi Zulhaidi (Universiti Putra Malaysia) **"Remote Sensing for Climate Change, Green Recovery and Sustainability"** Mr. Yen Hun Sung (Roundtable on Sustainable Palm Oil (RSPO) **"Impact of RSPO to the People and Planet"** Q&A	
12.30 – 14.30	Lunch break (all participants) and Summit meeting (invited only)	
14.30 – 15.50	**PARALLEL SESSION 1A** **VENUE: MEETING ROOM 7** **CARBON EMISSION & BIODIVERSITY** Chairman: Assoc. Prof. Dr. Md Rahedul Islam (Pabna University of Science and Technology)	**PARALLEL SESSION 1B** **VENUE: MEETING ROOM 9** **SMART CITIES & TRANSPORT** Chairman: Gs. Dr. Norizah Kamarudin (Universiti Putra Malaysia)
16.00 – 17.10	**PARALLEL SESSION 2A** **VENUE: MEETING ROOM 7** **INNOVATIVE SYSTEMS** Chairman: Ts. Dr. Muhammad Hazwan Hamzah (Universiti Putra Malaysia)	**PARALLEL SESSION 2B** **VENUE: MEETING ROOM 9** **DISASTER & POST DISASTER** Chairman: Sr. Gs. Dr. Siti Nur Aliaa Roslan (Universiti Putra Malaysia)
17.30	**WELCOME HI-TEA | VENUE: THIRTY6 Executive Lounge at Level 35**	

DAY 2 | 11 DECEMBER 2024

TIME	PROGRAMME	
09.00 – 10.30	**PARALLEL SESSION 3A** **VENUE: MEETING ROOM 7** **INFRASTRUCTURE MANAGEMENT** Chairman: Ts. Gs. Dr. Wan Nor Zanariah Zainol @ Abdullah (Universiti Putra Malaysia)	**PARALLEL SESSION 3B** **VENUE: MEETING ROOM 9** **CLIMATE CHANGE & WATER RESOURCES** Chairman: Gs. Dr. Nik Norasma Che'Ya (Universiti Putra Malaysia)
10.30 – 11.00	Coffee break and Networking	
11.00 – 12.30	**PARALLEL SESSION 4A** **VENUE: MEETING ROOM 7** **INTERNATIONAL PUBLIC HEALTH RESEARCH IN ASIA** Chairman: Assoc. Prof. Dr. Jeark A. Principe (University of the Philippines Diliman)	**PARALLEL SESSION 4B** **VENUE: MEETING ROOM 9** **STRUCTURAL VULNERABILITY** Chairman: Prof. Ir. Dr. Hasfalina Che Man (Universiti Putra Malaysia)
12.30 – 14.30	Lunch break	
14.30 – 15.00	**KEYNOTE LECTURES | VENUE: MEETING ROOM 7,8,9** **CHAIRMAN: Assoc. Prof. Dr. Mohd Rafein Zakaria (Institute of Plantation Studies, UPM)** Assoc. Prof. Dr. Tsuyoshi Minami (The University of Tokyo) **"Chemical Sensors for One Health, One World"**	
15.15 – 16.15 16.15 – 16.45	**FORUM SESSION | VENUE: MEETING ROOM 7,8,9** **"Empowering Planetry Health: The Strategic Roles of Academia and Industry"** **Moderator: Ts. Dr. Anas Mohd Mustafah (Institute of Plantation Studies, UPM)** Panelists: 1. Prof. Dr. Siti Khairunniza Bejo (Director, Institute of Plantation Studies, UPM) 2. Prof. Dr. Takeuchi Wataru (Director, One Health One World Research Initiative, The University of Tokyo, Japan) 3. Mr. Muhamad Ezwan Abd Razak (Head of the Agronomy Section, Applied Agricultural Resources Sdn. Bhd.) Q&A	
16.50 – 17.20	**CLOSING CEREMONY | VENUE: MEETING ROOM 7,8,9** • Best student presenter awards • OHOW2024 review by Prof. Dr. Takeuchi Wataru (Chairperson OHOW2024) • Closing remarks by Ts. Dr. Anas Mohd Mustafah (Co-Chairperson OHOW2024) • Announcement of OHOW2025 by Prof. Dr. Pradeep Kumar Ramancharla (Director, CSIR-Central Building Research Institute)	
17.20	Coffee break and end of OHOW2024 Symposium	
19.30	**NETWORKING DINNER** "Networking Dinner: Academic in Action on Oil Palm Research" (invited only)	

PARALLEL SESSION SCHEDULE | DAY 1, 10 DECEMBER 2024

TIME	SESSION 1A: CARBON EMISSION & BIODIVERSITY | VENUE: MEETING ROOM 7 Chairman: Assoc. Prof. Dr. Md Rahedul Islam (PUST)
14.30	**Invited Lecture: Assoc. Prof. Dr. Jeark A. Principe, University of the Philippines Diliman** "Multi-Scale Assessment of Solar Farm Expansion Using Geospatial Data: A Case of Tarlac City and Tarlac Province, Philippines"
14.40	**Siti Syazwani Mahamad, Universiti Putra Malaysia** "Improvement of Rhamnolipids Production by Pseudomonas aeruginosa RS6 using Waste Glycerol in a Bioreactor System"
14.50	**Daranagama Arachchige Samitha, The University of Tokyo** "Mapping Ganoderma infection in Oil Palm Plantations Across Malaysia and Indonesia using PALSAR-2 Time Series"
15.00	**Amierul Amin Azman, Universiti Putra Malaysia** "Early Stage Weed Detection in Paddy Field Using Hyperspectral UAV and Machine Learning"
15.10	**Zhao Hengyang, Universiti Putra Malaysia** "Detection of Mangrove Area in Peninsular Malaysia Using Landsat-9 Satellite Images"
15.20	**Yohei Kawaguchi, The University of Tokyo** "Estimated Revenue Characteristics Focused on the Long-term Benefits of Greening"
15.30	**Siti Nurul Afiah Mohd Johari, Universiti Putra Malaysia** "Machine Learning Performance on the Classification of Bagworm Infestation Area Using SMOTE Method"
15.40	**Wan Nor Zanariah Zainol @ Abdullah, Universiti Putra Malaysia** "Estimation of Carbon Stock in Tree Seedlings of a Restoration Forest by Using Biomass Conversion and Expansion Factor"
15.50	**Q&A**

TIME	SESSION 1B: SMART CITIES & TRANSPORT | VENUE: MEETING ROOM 9 Chairman: Gs. Dr. Norizah Kamarudin (UPM)
14.30	**Invited Lecture: Assoc. Prof. Dr. Yudai Honma, The University of Tokyo** "Optimal Location of Wireless Power Transfer Systems for Urban Resilience and Sustainable Transportation"
14.40	**Koki Nishioka, Kanazawa University** "Impact Assessment of Fare Increases and Consciousness of Railway Users' Regarding the Hokuriku Shinkansen Tsuruga"
14.50	**Taiki Mukouyama, Tokyo Denki University** "Research on Appropriate Use of Demand Cabs for Transportation Purposes"
15.00	**Yuki Minematsu, Kanazawa University** "A Basic Analysis to Identify the Dynamics of Public Transport in Dili, Democratic Republic of Timor-Leste"
15.10	**Tatsuya Kondo, The University of Tokyo** "Investigating the Relationship Between City Compactness and Liveability in Japan"
15.20	**Motoya Ueda, The University of Tokyo** "Proposal of Base Loop strategy for Multi-Retailer and Multi-customer Delivery Service by Automated Delivery Robots"
15.30	**Yang Yifan, Japan Advanced Institute of Science and Technology** "Estimation of Ground Deformation in Suzu City with SAR Data and RTK-GPS Data"
15.40	**Hiroto Kawakami, Kanazawa University** "Analysis of the Measurement of Population Flow Based on Non-contact Sensing Devices in Phitsanulok Province, Thailand"
15.50	**Q&A**

PARALLEL SESSION SCHEDULE | DAY 1, 10 DECEMBER 2024

TIME	SESSION 2A: INNOVATIVE SYSTEMS | VENUE: MEETING ROOM 7 Chairman: Ts. Dr. Muhammad Hazwan Hamzah (UPM)
16.00	**Invited lecture: Dr. Kishor S Kulkarni, Kanazawa University** "Sustainable Built Development and Climate Change Adaptation: A Case Study from Leh, Ladakh, India"
16.10	**Halimatun Saadiah Hafid, Universiti Putra Malaysia** "Non-chlorinated Cellulose Extraction Strategy from Agricultural Biomass and Its Potential Application as Packaging Materials"
16.20	**Ashish Pippal, CSIR-Central Building Research Institute** "Seismic Resilient & Sustainable Construction Utilising Stones & Woods in Kath Kuni Construction Style"
16.30	**Abhishek Regmi, The University of Tokyo** "Automated Extraction and Segmentation of Tunnel Utilities Using 3D LiDAR Data for Enhanced Damage Detection"
16.40	**Takashi Miyazawa, Tokyo Denki University** "Testing the Effectiveness of An Incentive-based Bicycle Reallocation Approach in a Shared Cycle System"
16.50	**Izzah Farhana Ab Aziz, Universiti Putra Malaysia** "The Study of Potential Phosphate Reduction in Synthetic Wastewater by Using Calcined Crushed Waste Concrete"
17.00	**Ashish Kapoor, CSIR-Central Building Research Institute** "Influence of Mix-Constituents on the Printability and Compressive Strength of Binary and Ternary Cementitious Composite Made of Agro-Industrial Waste"
17.10	**Q&A**

TIME	SESSION 2B: DISASTER & POST DISASTER | VENUE: MEETING ROOM 9 Chairman: Sr. Gs. Dr. Siti Nur Aliaa Roslan (UPM)
16.00	**Invited Lecture: Prof. Dr. Tetsuro Ito, The University of Tokyo** "Analysis of What Should Be Done After a Disaster and the Current Situation in Japan"
16.10	**Invited lecture: Prof. Dr. Debi Prasanna Kanungo, CSIR-Central Building Research Institute** "Comprehensive Assessment of the Pernote Landslide, Ramban District, Jammu & Kashmir Union Territory (India)"
16.20	**Yoshifumi Yamaya, Kanazawa University** "Analysis of Cruise Ship Passengers' Behavior During Earthquake Disaster - Case Study of Kanazawa Port"
16.30	**Daichi Naoi, Kanazawa University** "An Analysis of Evacuation Factors for Families with Infants and Toddlers Considering Privacy in Evacuation Shelters"
16.40	**Nureen Natasya Mohd Saufi, Universiti Putra Malaysia** "GIS Characterisation for Fire Weather Index (FWI) in Peatland Forest"
16.50	**Taiki Mashio, Kanazawa University** "The Current Status of Resident Displacement in the Noto Peninsula Earthquake-stricken Area in 2024"
17.00	**Rajesh Kumar Dash, CSIR-Central Building Research Institute** "Field Investigation of the 30th July 2024 Wayanad Debris Flow of Western Ghat, India"
17.10	**Q&A**

PARALLEL SESSION SCHEDULE | DAY 2, 11 DECEMBER 2024

TIME	SESSION 3A: INFRASTRUCTURE MANAGEMENT | VENUE: MEETING ROOM 7 Chairman: Ts. Gs. Dr. Wan Nor Zanariah Zainol @ Abdullah (UPM)
09.00	**Invited lecture: Assoc. Prof. Dr. Yuta Izumi, Muroran Institute of Technology** "Study on an Early Warning System for Disaster Mitigation Using Ground-Based SAR"
09.10	**Hanli Hu, The University of Tokyo** "Effect of Mixing with Steel Slag on Modification of Simulated Under-sieve Residue"
09.20	**Shunsuke Iwai, The University of Tokyo** "Automation of Rebar Segmentation in GPR Using Binary Images Focusing on Diagonal Convexity and Downward Opening Search Clustering Algorithm"
09.30	**Yuuta Baba, Kanazawa University** "Analysis of Satisfaction Evaluation of Foreigner to Japan at Restaurants in Regional Sightseeing Cities-Study of the using Review Data from Travel Information Websites"
09.40	**Takuma Ooba, Shibaura Institute of Technology** "Estimating Pavement Condition Using Publicly Available Satellite Imagery for Data-Driven Road Maintenance Planning"
09.50	**Athena L. Marquez, University of the Philippines Diliman** "Potential Assessment of Vertical Solar PV Systems for Power Production and Thermal Performance in Tropical Building Envelopes"
10.00	**Koki Nakabayashi, Kanazawa University** "Economic Impact Analysis Considering Reconstruction Assistance during Large-Scale Earthquake Disasters"
10.10	**Ami Shirai, Asano Taiseikiso Engineering Co. Ltd.** "Effective Use of Tunnel Face Observation Records During Tunnel Construction for Renewal of Abandoned Tunnel"
10.20	**Q&A**

TIME	SESSION 3B: CLIMATE CHANGE & WATER RESOURCES | VENUE: MEETING ROOM 9 Chairman: Gs. Dr. Nik Norasma Che'Ya (UPM)
09.00	**Invited lecture: Prof. Dr. Tamilarasi Suresh, St.Peter's Institute of Higher Education and Research** "Droughts and Deluges: Navigating Water Resource in SDG perspective and Saving Water Resource Using IOT"
09.10	**Invited lecture: Assoc. Prof. Dr. Md Rahedul Islam, Pabna University of Science and Technology** "Exploring the Surface Water Status of AWD Irrigated Rice Paddy Fields Integrating SAR-UAV and IoT to Climate Change Mitigation"
09.20	**Yong Yan Shee, Universiti Teknologi Malaysia** "The Potential of Land Use/Cover Changes Associated with the InVEST Habitat Quality Model for Habitat Quality Analysis in River Basins"
09.30	**Chihiro Naito, The University of Tokyo** "Correlation and Timing Between Regional Water Stress Factors and Oil Palm Yield Using 22-Year Satellite Data in Malaysia and Indonesia"
09.40	**Nuzul Hijri Darlan, PT Riset Perkebunan Nusantara** "Adapting to Climate Change: Mitigative and Adaptive Approaches in Indonesia's Palm Oil Industry"
09.50	**Ronghua Ma, Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences** "What Drivers the Eutrophication Evolution of Lakes in China: Climate Change or Human Acitvities?"

10.00	**Muhammad Adib Mohd Nasir, Universiti Putra Malaysia** "Future Water Availability for Rice Irrigation: The Role of Machine Learning and Global Climate Models in Water Resource Management"
10.10	**Xue Kun, Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences** "Horizontal and Vertical Migration of Cyanobacterial Blooms in Two Eutrophic Lakes Observed from the GOCI Satellite"
10.20	**Q&A**

PARALLEL SESSION SCHEDULE | DAY 2, 11 DECEMBER 2024

TIME	SESSION 4A: INTERNATIONAL PUBLIC HEALTH RESEARCH IN ASIA | VENUE: MEETING ROOM 7 Chairman: Assoc. Prof. Dr. Jeark A. Principe (UPD)
11.00	**Invited lecture: Assoc. Prof. Dr. Akira Kodaka, Keio University** "Pattern Analysis of Changes in Production Activities in Thai Industrial Complexes Using Alternative Data"
11.10	**Aina Natassha Hatta, Universiti Kebangsaan Malaysia** "The Status of Psychological Distress, Coping Skills and Health-Related Quality of Life in Relation to Religious Practices Among University Students in Malaysia"
11.20	**Ken Takakuwa, Kanazawa University** "Analysis of Future Estimation of Pharmaceutical Demand During Large-Scale Earthquake Disaster: Case Study of Small Rural City in Japan Using Medical Big Data"
11.30	**Yan Guanyu, Shenzhen University** "What SDGs Don't Measure: Non-actionable Urban Well-being Factors Through GIScience"
11.40	**Avijit Roy, Chembio Diagnostics Malaysia** "Equalizing Better Healthcare"
11.50	**Hishamuddin Hashim, Universiti Putra Malaysia** "Total Carbon Stock Estimation for Rubber Plantation Using Unmanned Aerial Vehicle Imagery"
12.00	**Shuta Notsu, National Institute of Technology, Matsue College** "Rust Appearance Evaluation System for Non-uniform Corrosion Condition of Weathering Steel Using Deep Learning"
12.10	**Q&A**

TIME	SESSION 4B: STRUCTURAL VULNERABILITY | VENUE: MEETING ROOM 9 Chairman: Prof. Ir. Dr. Hasfalina Che Man (UPM)
11.00	**Invited lecture: Prof. Dr. Osamu Murao, International Research Institute of Disaster Science, Tohoku University** "Tsunami Evacuation Risk Changes in Banda Aceh After 2004 Indian Ocean Tsunami'
11.10	**Invited lecture: Prof. Dr. Surender K Negi, CSIR-Central Building Research Institute** "Predicting Building Risk in Land Subsidence-Prone Areas: The Role of Decision Tree Regression Model in Urban Safety"
11.20	**Invited lecture: Dr. Ajay Purushottam Chourasia, CSIR-Central Building Research Inst.** "Simplified Vulnerability Assessment for Masonry Buildings using Fragility Curve"
11.30	**Aoto Sasaki, Kanazawa University** "Development of a Potential Index for Utilization of Vacant Houses Considering Disaster Risk - A Case Study of Hatoyama Town, Saitama Prefecture"
11.40	**Jigang Jiang, The University of Tokyo** "DEM Study on the Stress Distribution of Muck and Foam in the EPB Shield Chamber"
11.50	**Toru Tateishi, The University of Tokyo** "Robustness of Traffic Networks: Analyzing Damage and Recovery Process Against Repeated Disasters"
12.00	**Arliandy Pratama Arbad, The University of Tokyo** "Detection of Millimeter-Scale Deformations in Jatiluhur Dam Using Persistent Scatterer InSAR (PS-InSAR)"
12.10	**R Siva Chidambaram, CSIR-Central Building Research Institute** "Out-of-Plane Behaviour of Masonry Wall Strengthened Using Textile Reinforcement"
12.20	**Q&A**

KEYNOTE 1

Satellite Imagery Method for Estimating Construction Years of Road Bridges

Koji Matsumoto*, Bennie Hamunzala

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In recent years, bridge management systems used in many countries and regions have been graphing the relationship between inspection results (damage levels) and bridge age to make future predictions, as well as to plan necessary budgets and personnel allocation. Therefore, the year of construction is extremely important information in bridge management. However, in many countries, there are numerous bridges for which the year of construction is unknown. In this study, a method using measurement data from the Landsat 5 satellite to quickly and accurately estimate the construction year of road bridges was developed. First, the location information of the target bridges was obtained, and data from those locations were retrieved by inputting a source code into Google Earth Engine. This study focused on NDWI_2, an index representing the presence of water surfaces, which is calculated from the difference between near-infrared and shortwave infrared bands. By applying Cloud Masking to eliminate the effects of clouds and using annual averages to reduce the effect of seasonal variations, noise was significantly reduced, making the temporal changes much clearer. Additionally, the STARS (Sequential T-test Analysis of Regime Shift) method, a change point detection technique, was introduced. The STARS method is a statistical technique that divides time series data into intervals, performs T-tests for each interval, and identifies the point as a change point if the data at a certain time is significantly different from the previous period. This allowed for the objective determination of the construction year even in cases that are difficult to judge visually. The method was applied to road bridges in Japan and Cambodia, and a comparison of the estimated values with the actual construction years revealed that the method can generally estimate the construction year of road bridges accurately.

Keywords: satellite imagery, road bridges, construction years

KEYNOTE 2

Remote Sensing for Climate Change, Green Recovery & Sustainability

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The increasing severity of climate change, marked by rising temperatures, extreme weather events, and shifting ecosystems, necessitates immediate and effective responses. Remote sensing, defined as the acquisition of information about an object or area from a distance (typically via satellite or aerial sensors), provides critical data that can inform climate action and sustainability initiatives. This technology enables scientists and policymakers to monitor environmental changes, assess natural resources, and evaluate the effectiveness of mitigation and adaptation strategies. By leveraging remote sensing data, countries can enhance their green recovery efforts - initiatives aimed at rebuilding economies in ways that are environmentally sustainable and resilient to climate impacts.

Keywords: Remote sensing, climate change, green recovery, sustainability, geospatial, mapping, monitoring

KEYNOTE 3

Impact of RSPO on People and Planet

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2024 was an auspicious year for the RSPO as it celebrated its milestone 20th anniversary, marking two decades of pioneering action in promoting sustainable practices in one of the world's largest commodity sectors: palm oil. Since its inception, RSPO has made significant strides towards its vision of making palm oil sustainable, by establishing a robust framework of systems and standards that are steadily transforming how palm oil is produced, traded and consumed globally. The global partnership is an assembly of stakeholders from across the palm oil value chain – including growers, processors and traders, consumer goods manufacturers, NGOs, governments and financial institutions – working together to develop certification systems and guidelines to address the sector's major environmental and social challenges. RSPO's work of the past 20 years has driven positive change in mitigating deforestation, safeguarding biodiversity, conserving high conservation value areas, and supporting small farmers and rural communities dependent on oil palm cultivation in the developing world. These impacts are chronicled in RSPO's Impact Report, a bi-annual publication serving as a touchstone of the global alliance's progress by providing an overview of its impacts aligned with the UN Sustainable Development Goals (SDGs). Key findings include increasing protected areas under RSPO Certification, improved labour conditions, gender welfare, and growing outreach programmes supporting vulnerable communities in Latin America, Africa and Southeast Asia. What's next for the global partnership? As RSPO embarks on its third decade, it remains dedicated to expanding its positive impacts on people and planet. With stronger Standards backed by an innovative digital infrastructure to trace sustainability actions on the ground, RSPO is set to tackle new challenges in the industry – setting a benchmark for sustainable commodity production worldwide.

Keywords: sustainable, RSPO certification, environmental, social

KEYNOTE 4

Chemical Sensors for One Health, One World

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Sensors of our human bodies play important roles in detecting invisible physical and chemical stimuli, which change (or control) our behaviors nonconsciously or consciously. Inspired by such sophisticated sensors endowed into our bodies, the development of various sensor platforms has promoted to detection of physical and chemical stimuli "instead of ourselves." The requirements of sensor abilities are favorable sensitivity, selectivity, quick response, wide response ranges, reusability, repeatability, suppression ability of interference effects, etc., which have been desired to be "beyond the inherent recognition abilities of biological sensing systems." Sensors consist of receptors to detect invisible stimuli, and transducers (or reporters) to amplify the sensor signals [1]. Physical sensors have already been well established in practical situations, while chemical sensors have not been fully used because their development is still at the frontiers. Motivated by this, the author has focused on chemical sensor devices that can easily be fabricated using office printers.

Keywords: Paper, Chemosensor Array, Imaging Analysis, Pattern Recognition, Multi-Sensing

CARBON EMISSION & BIODIVERSITY CCGR22

Multi-Scale Assessment of Solar Farm Expansion Using Geospatial Data: A Case of Tarlac City and Tarlac Province, Philippines

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Over the past decade, countries worldwide have significantly ramped up efforts to utilize renewable energy (RE) sources. This rapid increase in RE adoption is driven by global climate agreements, technological advancements, supportive government policies, and concerns over environmental and energy security. Solar energy has become one of the most widely adopted RE sources, with solar farms playing a key role in enhancing energy security. However, placing solar farms on former agricultural land raises concerns about food security and ecological impacts. This study addresses this issue by using geospatial data to assess solar farm expansion impacts at both city and provincial levels. The analysis utilizes various satellite-derived data, including MODIS land cover (MCD12Q1), VIIRS nighttime lights, AHI-8/9 shortwave radiation, and the SRTM Digital Elevation Model. Additional geospatial layers, such as road networks, power lines, land use/land cover (LULC), and substation locations, are utilized to model solar farm expansion. To predict LULC changes, the study applies transition potential modeling (TPM) methods through CA-Markov simulations in QGIS's MOLUSCE plugin. Results showed a gradual LULC shift from cropland to grassland, then to solar farms over 16 years in city-level analysis. However, the MCD12Q1 dataset's coarse resolution limits the accuracy of solar farm expansion modeling. In provincial-level analysis, the use of the NAMRIA LULC dataset and WoE TPM produced the highest F1 score (0.772) and IoU (0.628), making it the most accurate for modeling solar expansion. By 2040, Tarlac Province is projected to lose approximately 135 ha of cropland due to solar farm expansion, yielding an estimated annual additional capacity of 877.75 MWh and a carbon emissions reduction of 24,105.28 tCO2e. This study highlights the importance of strategic planning in balancing renewable energy expansion for energy security with agricultural land preservation for food security.

Keyword: solar farm, remote sensing, GIS, cropland, MOLUSCE

CARBON EMISSION & BIODIVERSITY CCGR87

Improvement of Rhamnolipids Production by Pseudomonas aeruginosa RS6 using Waste Glycerol in Bioreactor System

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Rhamnolipids (RLs) are glycolipid biosurfactants produced by microorganisms and widely used in industries due to their bioavailability. Limitations in shake flask systems create reproducibility and scalability bottlenecks in RLs production, necessitating advanced systems like bioreactors. This study optimizes RLs production by Pseudomonas aeruginosa RS6 using treated waste glycerol (TWG) as a sole carbon source in a bioreactor system. The parameters optimized using response surface methodology (RSM) were TWG concentration (v/v %), aeration, and agitation rates. Central composite design (CCD) was applied as the experimental design, with analysis of variance (ANOVA) used for data analysis. ANOVA revealed that the quadratic model significantly ($p<0.0001$) represents RLs production. TWG concentration ($p<0.05$) significantly influenced RLs production, while both TWG concentration and agitation rates ($p<0.05$) significantly affected biomass production. Optimal parameters for rhamnolipid production were 2.827% TWG, 1.02 vvm aeration, and 443 rpm agitation. The quadratic model's validity was confirmed, yielding 11.32 g/L RLs and 5.38 g/L biomass in triplicate. Additionally, a kinetic study confirmed the model's reliability, showing YX/S and YP/S values of 5.53 g g-1 and 3.36 g g-1, respectively, highlighting efficient substrate utilization and metabolite production under optimized conditions. RSM as an optimization tool significantly enhanced RLs yield by approximately 4.88-fold compared to previous results obtained in shake flasks. The RLs produced achieved a kerosene emulsion index of 70.12% and reduced surface tension to 28.61 mN/m, highlighting their potential for various industrial applications.

Keywords: *P. aeruginosa*, rhamnolipid, waste glycerol, bioreactor, optimization, response surface methodology (RSM), emulsification index

CARBON EMISSION & BIODIVERSITY CCGR26

Mapping Ganoderma infection in oil palm plantations across Malaysia and Indonesia using PALSAR-2 time series

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The oil palm is a globally vital crop for vegetable oil production and is particularly crucial for Southeast Asia's economy. However, the sustainability of oil palm plantations in this region is under significant threat from Ganoderma disease, which can lead to severe yield loss. Current methods for managing and detecting the spread of this disease are inadequate. This study utilizes a time series of global 25 m resolution PALSAR-2 mosaic backscatter data to identify Ganoderma-infected oil palm plantations across Malaysia and Indonesia from 2015 to 2023. Focusing on the HV polarization, which is sensitive to vegetation structure, temporal changes in backscatter values were examined to detect areas experiencing biomass loss. Using a combination of linear trend analysis and anomaly detection, we identified regions with significant reductions in HV backscatter, potentially corresponding to Ganoderma infection. Thresholding techniques were applied to pinpoint areas of concern, with clusters of negative trends and anomalies highlighting regions at risk. The results of this analysis provide a scalable approach for the detection of Ganoderma infected regions across both Malaysia and Indonesia. Validation of the results will be conducted using high-resolution satellite imagery to confirm infection patterns.

Keywords: oil palm; Ganoderma; time series, PALSAR-2 global mosaic

CARBON EMISSION & BIODIVERSITY CCGR102

Early Stage Weed Detection in Paddy Field Using Hyperspectral UAV and Machine Learning

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Weeds, defined as undesirable plants, can emerge within agricultural fields and compete with crops for essential resources such as soil nutrients, water, space, canopy, and light. The presence of weeds poses a significant agricultural challenge that globally impacts crop productivity. Addressing weed-related losses in rice production systems is crucial as they hinder various field activities throughout the crop growth cycle. This study aims to utilize hyperspectral UAV sensors and machine learning to identify weeds in paddy fields at early stages under different water levels: field capacity (FC), saturated (S), and flooded (FL). The experiment will employ a Split-Plot Design with three replications per treatment to evaluate outcomes using hyperspectral sensors. Hyperspectral imaging shows promise in detecting weeds in paddy fields by leveraging the spectral differences between weed species and paddy plants. The findings indicate that hyperspectral imagery can effectively identify weed species within the paddy field. This study showed that Neural Network (NN) followed by Random Forest (RF) and Support Vector Machine (SVM) the accurate machine learning to discriminate weeds from rice in this experiment about 80 % to 100 % accuracy and the best condition for weeds detection on flooded condition water level. The results demonstrated good separation accuracy for weeds and rice at 476, 519, 554, 587, 620, 653, 688, 723, 758 and 773 nm. The outcomes demonstrated that the ML could distinguish between different types of weeds and rice. The flooded water level in this instance was the most accurate in identifying weeds. It was determined that every weed could be found at 28 DAS and could be effectively distinguished using hyperspectral data and machine learning.

Keywords: Paddy, Hyperspectral UAV, Machine Learning

CARBON EMISSION & BIODIVERSITY CCGR80

Detection of Mangrove Area in Peninsular Malaysia using Landsat-9 Satellite Images

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Mangrove is the main wetland ecosystem in tropical and subtropical coastal areas and plays an important role in coastal ecology. Accurate detection of mangrove cover is very important to improve the stability of coastal ecosystem. Remote sensing technology has been widely utilized for detecting mangrove cover. The newest satellite in the Landsat series i.e., Landsat-9 offers superior performance and numerical quality compared to its predecessors. However, there is a lack of recent data concerning mangrove detection using Landsat-9 in the coastal areas of Peninsular Malaysia. Therefore, this paper aims to detect and extract the temporal and spatial distribution characteristics of mangroves along the coastal area of Peninsular Malaysia by using Landsat-9 images. After pre-processing the original data, the best band combination was selected using the Optimum Index Factor (OIF). Then, the distribution characteristics of mangroves and five other land cover features were determined through visual interpretation. After that, the MLC classifier in ENVI 5.6.3 was used to classify the land covers. The verification process for mangrove area was done by using 500 verification points of actual ground data gathered from Google Earth. The results obtained 0.983 kappa coefficient and an overall classification accuracy of 99.787%. It also demonstrated that the recent mangrove area in Peninsular Malaysia is 95,075 hectares. The temporal and spatial distribution characteristics of mangroves can improve our understanding of the health status of the mangrove ecosystem. This information can also provide the local government with appropriate mangrove protection measures and suggestions for future management policies of mangrove ecological protection.

Keywords: Mangrove, remote sensing technology, Landsat-9 images

CARBON EMISSION & BIODIVERSITY CCGR59

Machine learning performance on the classification of 3 bagworm infestation area using SMOTE method

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A leaf-eating bagworm, Metisa plana (Lepidoptera: Psychidae), is a major pest threat to Malaysian oil palm production, which has the potential to emerge in large numbers and spread rapidly through oil palm plantations. Due to their short lifespan and rapid reproductive cycle, oil palms may eventually suffer from 10%–13% leaf defoliation and up to 40% crop losses. This would have a major negative economic impact on yield production. Currently, a manual census was conducted to determine the precise infestation level; however, it became laborious when covering an extensive area. Unmanned aerial vehicles (UAVs) were selected as an alternative, despite their ability to quickly determine the extent of the bagworm infestation. However, using UAV imagery increases the likelihood of unbalanced data, which could be problematic when assessing the extent of infestation. To tackle the class imbalance problem, Synthetic Minority Oversampling Technique (SMOTE) was applied on machine learning classification using three types of vegetation indices combinations such as NDVI-NDRE, NDVI-GNDVI as well as NDRE-GNDVI. According to the results, there were four model consistently performed with perfect score (F1 score: 100%) across all infestation level especially in the combination of NDVI-GNDVI and NDVI-NDRE namely fine KNN, medium KNN, coarse KNN and cubic KNN. Meanwhile the combination of NDRE-GNDVI performed well in classifying healthy and low level compared to mild and severe infestation. Thus, it can be concluded that even in situations where the data are both balanced and unbalanced, there is a greater chance of a successful classification, which could be advantageous for the detection process. Without gaining a larger dataset, it would expedite the execution of early control measures to stop the infestation from spreading and minimize the time required for sampling.

Keywords: Bagworm infestation; pest; machine learning; SMOTE; oversampling

CARBON EMISSION & BIODIVERSITY CCGR30

Estimated Revenue Characteristics Focused on the Long-term Benefits of Greening

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The SDGs were adopted by all 193 member states at the Sustainable Development Summit held at the United Nations in September 2015, and urban greening is gaining momentum around the world. For example, Bosco Verticale in Italy and Azabudai Hills in Japan are examples of proactive urban greening around the world. Urban greening, as described above, makes a significant social contribution in terms of combating global warming and contributing to community building, but private developers need to secure profits while promoting urban greening. The benefits of greening for private developers can be divided into immediate and long-term benefits. The immediate benefit is that greening allows for a reduction in the floor-area ratio, while the long-term benefit is that the attractive nature of greening, such as its healing effect on building users, contributes to lower vacancy rates and higher rents. On the other hand, one of the disadvantages of greening is that it requires running costs as well as initial costs. It is expected that actual development is carried out while comprehensively taking into account the immediate advantages described above, long-term advantages that are difficult to convert into economic terms, and disadvantages as well. In this study, we assume a situation in which a private developer is trying to determine the greening ratio in a development case where Tokyo's system for urban development is applied, while comprehensively taking into account the income and expenditure over a 10-year period. The study will analyze the profit characteristics of the long-term benefits obtained by the private developer. This study is expected to provide a new perspective for evaluating the greening efforts of private developers in development and the institutional design of greening by the government.

Keywords: Urban greening, global warming, community building

CARBON EMISSION & BIODIVERSITY CCGR75

Estimation of Carbon Stock in Tree Seedlings of a Restoration Forest by Using Biomass Conversion and Expansion Factor

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The study presents a volume projection model designed to estimate tree volumes and extend it to assess carbon sink capacity. Conducted across five forest plots in Sabal Forest Reserve, Sarawak, Malaysia, each measuring 20m x 20m plot, the research examines the potential for forests to act as carbon sinks. Data collected from the plots includes tree species, diameter at breast height (DBH) and tree height, which were used to calculate tree volume, biomass, and carbon sequestration of CO_2. The results show varying carbon sequestration capacities, with Plot 1 having the highest at 0.034 tons of CO_2 and Plot 5 the lowest at 0.001 tons. The findings emphasize the importance of site-specific factors such as species composition, tree density, and environmental conditions in determining carbon sequestration potential. The model's scalability makes it suitable for broader forestry applications, including afforestation programs and climate change mitigation. The model's accuracy can be further enhanced by integrating species-specific growth characteristics and drone technology. This study demonstrates that even small, fragmented forests can play a significant role in carbon storage, contributing to global efforts to mitigate climate change. Future refinements to the model, including incorporating dynamic environmental factors, will further improve its utility in sustainable forest management and global carbon neutrality strategies.

Keywords: Volume Projection, Carbon Sink Capacity, CO_2 Sequestration, Forest Plots, Biomass

SMART CITIES & TRANSPORT USDM31

Optimal Location of Wireless Power Transfer Systems for Urban Resilience and Sustainable Transportation

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As cities worldwide strive towards sustainability and resilience, urban transportation systems face mounting pressure to adapt to emerging challenges, including environmental impact and disaster preparedness. Electric Vehicles (EVs) are a critical component of sustainable urban mobility, but limitations in driving range and charging infrastructure continue to hinder widespread adoption. In this study, we present an innovative approach to addressing these challenges through the strategic location of in-motion wireless power transfer systems (WPTSs) to enhance both urban resilience and the operational viability of EVs. By applying Mixed-Integer Programming (MIP) models and integrating real-world geographical and traffic data, we developed a framework to determine optimal WPTS locations in urban and regional settings. Our research primarily focuses on high-density urban areas, where infrastructure must support not only the daily demands of transportation but also withstand environmental risks such as climate change and natural disasters. Specifically, we explore how WPTSs can be deployed in disaster-prone regions to ensure continuous operation of critical transportation networks during emergencies. In the context of a typical medium-sized Japanese city, we demonstrate that a small fraction of total road infrastructure needs WPTS coverage to achieve “infinite drive” capabilities, minimizing the need for traditional charging stations. This approach reduces the strain on urban power grids, particularly during peak disaster recovery periods, while supporting long-term goals of carbon reduction and green recovery. Our findings also highlight the potential for integrating WPTSs with smart city technologies and autonomous vehicle networks, enhancing urban safety and disaster response. The flexibility in WPTS location not only optimizes energy efficiency but also supports adaptive disaster mitigation strategies, allowing for the seamless distribution of power across vulnerable areas. This research offers a new paradigm for urban mobility, promoting resilience and sustainability through advanced technological integration. It provides a blueprint for future cities to incorporate innovative EV infrastructure while addressing pressing concerns related to climate change and public safety.

Keywords: Wireless Power Transfer, Sustainable Transportation, Urban Resilience, Disaster Preparedness, Smart Cities

SMART CITIES & TRANSPORT USDM56

Impact Assessment of Fare Increases and Consciousness of Railway Users' Regarding the Hokuriku Shinkansen Tsuruga Extension

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The Hokuriku Shinkansen is one of Japan's five high-speed railway lines. It serves as a crucial transportation route that starts in Tokyo, Japan's capital, and passes through the Hokuriku region, which includes major cities such as Nagano, Toyama, and Kanazawa, before finally reaching the Kansai region, including cities like Kyoto and Osaka. The construction of the Hokuriku Shinkansen is important not only for reducing travel time and increasing the number of people traveling and interacting, but also for strengthening transportation networks as a countermeasure against disasters and providing alternative emergency transport route. The extension of the Hokuriku Shinkansen between Kanazawa and Tsuruga opened on Saturday, March 16, 2024. This extension, which has shortened travel times, is expected to significantly increase the number of people traveling between the Hokuriku region and other areas. However, the opening of Tsuruga Station has required passengers to transfer to a local railway line when traveling to the Kansai and Chukyo regions, reducing transportation convenience due to the closure of direct through operations. Additionally, fares have increased by 1,950 yen compared to before the Tsuruga extension, which has become a burden for passengers and raises important questions about how this increase affects users' willingness to travel. In this study, a questionnaire survey was conducted to collect data on the awareness and behavior of high-speed railway users in Ishikawa and Fukui prefectures and to determine the factors behind fare increases due to the extension of the high-speed railway to Tsuruga. Furthermore, factors contributing to decreased usage and changes in transportation mode choice among high-speed railway users were analyzed using survival analysis. The purpose of this study is to explore appropriate fare levels to better understand the status of fare setting that promotes the use of the Hokuriku Shinkansen. Additionally, this study provided insights into the impact of fare increases on users' intentions to travel and identified which fare levels were most effective in encouraging the use of the Hokuriku Shinkansen.

Keywords: Hokuriku Shinkansen Tsuruga extension, questionnaire survey, Fare increase, survival analysis

SMART CITIES & TRANSPORT USDM28

Research on Appropriate Use of Demand Cabs for Transportation Purposes

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Demand cabs are widely used as a means of supplementing transportation in areas with transportation gaps. Demand cabs are cab services that are operated according to user demand with advance reservations and have a flexible operation format that differs from that of route buses and conventional cabs. Higashimatsuyama City in Saitama Prefecture began operating the service in a form similar to cabs in order to reduce initial costs and increase usage. However, the system is still used mostly by the elderly for hospital visits, making it difficult for other modes of transportation to be included as an option. This same trend has been reported in other municipalities. In order to improve the sustainability of demand cabs, this study will examine whether excessive use is being made of them using actual usage data. In particular, we will focus on usage patterns after hospital visits and before and after shopping and evaluate whether other means of public transportation (e.g., buses) are being used appropriately; we will utilize GIS and other tools to analyze the impact of geographical factors on usage behavior and explore the optimal form of operation of demand cabs. The results of this research will contribute to the efficient operation of demand cabs and the realization of sustainable regional transportation.

Keywords: Demand cabs, elderly, hospital visits, sustainable regional transport

SMART CITIES & TRANSPORT USDM71

A Basic Analysis to Identify the Dynamics of Public Transport in Dili, Democratic Republic of Timor-Leste

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The city of Dili, the capital of the Democratic Republic of East Timor, has a shared-ride bus-like of public transportation called a microlet. There are 12 microlet routes, they operate on fixed routes in a circular manner. The fare is 25 cents per ride, making it very affordable. Microlets play an important role as a means of daily transportation for the people of Timor-Leste and are an essential means of public transportation for many citizens. However, there are several issues with microlets. There are no specific stops or timetables, making it difficult for one to proactively control their own schedule. In addition, the route may change suddenly according to weather or time of the day, creating an unpredictable operational pattern. There is also no official documentation on microlets, and their actual status is not well understood. In this study, we analyzed the dynamics of microlets using GPS loggers. The purpose of this study was to clarify the dynamics of microlets that operate as a basis for the livelihood of the people of Timor-Leste. We measured the speed and location of the microlets by placing GPS loggers on them. As a result, the study identified locations where microlets often stop. And the study also identified trends in the frequency of operations for 12 routes. The results of this study provided insight into the previously undocumented operational patterns of microlets, which had not been previously understood, and contributing to the development of public transportation in Timor-Leste.

Keywords: Timor-Leste, transportation, GPS, Microlet

SMART CITIES & TRANSPORT USDM34

Investigating the Relationship Between City Compactness and Livability in Japan

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Japan faces significant challenges such as population decline, an aging population, environmental issues, disaster risks, and aging infrastructure. One proposed solution to these social issues is the concept of the compact city. Previous studies have demonstrated that compact cities offer advantages in terms of living convenience, environmental sustainability, financial efficiency, and public health, making them a promising model for sustainable urban development. However, as the compact city is a relatively new city concept, many aspects remain unexplored. In particular, understanding the relationship between city compactness and livability is crucial for promoting compact city policies, yet this impact remains largely unknown. This study aims to investigate the relationship between city compactness and livability, focusing on the 47 prefectural capitals of Japan since 2005. First, we develop an index of city compactness based on population distribution to quantitatively measure changes in compactness over time. We then examine the relationship between this compactness index and the results of a large-scale survey on livability. Additionally, to understand changes in human behavior associated with city compacting, we analyze the relationship between city compactness and changes in human flows. Given the limited availability of direct human flow data, we use satellite-observed nighttime light data as a proxy to estimate human activity in the target areas. This study is significant as it analyzes the impact of urban compacting on livability and human flow in Japanese cities where compact city policies have been implemented for some time. The findings will provide valuable insights for future city planning and policymaking.

Keywords: Aging population, compact cities, livability

SMART CITIES & TRANSPORT USDM41

Proposal of Base Loop Strategy for Multi-Retailer and Multi-Customer Delivery Service by Automated Delivery Robots

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With the growing prevalence of autonomous delivery robot experiments worldwide, autonomous delivery robots are expected to become common in services like Uber Eats. This study proposes Base Loop, governing the strategy for autonomous delivery robot waiting locations in a multi-retailer, multi-customer service. Base Loop is a generalized concept of a waiting hub, characterized by an infinitely dense distribution of waiting points along a circumference. In conventional delivery services, such as Domino's Pizza, delivery personnel use the store as their base and simply travel back and forth between the base and customers. In Uber Eats, there is no designated base, and delivery personnel move independently without cooperating with others. In the delivery service considering BaseLoop, an automated delivery robot receives the order and travels the shortest distance from the BaseLoop to the retailer, from the retailer to the customer, and from the customer to BaseLoop. It differs from conventional delivery services in that there is a base of automatic delivery robots and the automatic delivery robots that have not received orders move in a coordinated manner to cover the pickup area of the automatic delivery robots that have received orders. Base Loop hypothesis assumes an infinite, dense distribution of waiting points on the circumference for cooperative operation among robots. This study assumes the deployment of N autonomous delivery robots to provide a multiretailer, multi-customer delivery service. For simplification, a circular city is assumed, where retailers and customers are uniformly distributed within a circumference of radius R, and we consider the radius r of Base Loop that minimizes the total travel distance of the autonomous delivery robots for both single and multiple-order deliveries. Base Loop has demonstrated effectiveness in reducing the travel distance of autonomous delivery robots for single-order deliveries.

Keywords: Base Loop Strategy, Delivery Robots, multi-retailer

SMART CITIES & TRANSPORT USDM54

Estimation of Ground Deformation in Suzu City with SAR DATA and RTK-GPS Data

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This study estimates earthquake-induced ground deformation in Suzu City using Interferometric Synthetic Aperture Radar (InSAR) and validates the results with Real-Time Kinematic GPS (RTK-GPS) data. First, SAR images from the ALOS-2 satellite, taken before and after the earthquake, were analyzed using InSAR techniques to assess surface uplift, subsidence, and other deformation patterns. To validate the accuracy and reliability of the InSAR data, field sampling was conducted in areas with significant deformation using RTK-GPS, collecting high-precision elevation data. Finally, residual analysis was employed to compare RTK-GPS data with the InSAR results, evaluating the effectiveness of InSAR in monitoring ground deformation. The findings provide valuable data for monitoring topographic changes caused by seismic events and offer critical insights for disaster recovery and future disaster response strategies.

Keywords: Ground deformation, InSAR, RTK-GPS, earthquake, ALOS-2

SMART CITIES & TRANSPORT USDM72

Analysis of the Measurement of Population Flow Based on Non-contact Sensing Devices in Phitsanulok Province, Thailand

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Phitsanulok Province, located in the northern part of Thailand, is vulnerable to various kinds of natural disasters such as floods and earthquakes. The Naan River, which flows through Phitsanulok Province, experienced a major flood in 2011, and an earthquake of magnitude 4.5 occurred in 2023. These disasters severely affected many residents, most of whom were forced to evacuate. To effectively select evacuation routes and avoid congestion during evacuation in event of a disaster, it is essential to understand the population flow. Therefore, in this study, non-contact sensing devices were set up at about 15 locations in the center of Phitsanulok Province on September 17th,19th, and 20th, 2024, to investigate the population flow. This survey collected several hundred thousand pieces of data per day and analyzed in detail the actual situation of population flow in the center of Phitsanulok Province. As a result, patterns of the population flow were highlighted, and basic data on how people move were obtained. The points where people stay and the duration of stay at each point were clarified, and the points where congestion tends to occur were identified. In addition, as the center of Phitsanulok Province is currently serving as a connection point for various commercial facilities and public transportation systems, many people pass through the area daily. Therefore, the population flow changes greatly depending on the time of day and the day of the week. By not only understanding the characteristics of the population flow itself, but also comparing and figuring out how the flow changes based on the date and time of day, we gained new insights that can help improve evacuation strategies during a disaster. In addition, we were able to obtain important basic data for urban planning.

Keywords: Thailand, Phitsanulok, disaster, evacuation, non-contact sensing device, movement

INNOVATIVE SYSTEMS IMSBE55

Sustainable Built Development and Climate Change Adaptation: A Case Study from Leh, Ladakh, India

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One of the greatest challenges of the twenty-first century is climate change, which has negative effects on the environment, human health, and the economy. The most prominent effects of climate change include: an increase in extreme weather events like droughts, hurricanes, heat waves, heavier rainfall events leading to flooding and landslides; rise sea level etc. Due to climatic instability, climatic variables like wind, precipitation, solar irradiance, and humidity vary a lot. Intergovernmental Panel on Climate Change (IPCC) confirms that the main causes of climate change are the emissions of anthropogenic greenhouse gases (GHG), which include nitrous oxide, methane, and carbon dioxide (CO_2). The major impact of climate change on buildings are thermal discomfort, increase in heating-cooling demand, and/or GHG emissions. Buildings' heating and cooling requirements are increasing significantly because of climate change, with geographical and climatic variations determining the amount of increase. The global share of buildings and construction in the final energy and emissions in 2019 accounts to around 38% as per the GlobalABC report 2020. As an initiative against the climate change 196 countries have come together and agreed to a common goal of maintaining the global average temperature increase to preferably 1.5^{o}C through the Paris Agreement in COP21 with Nationally Determined Contributions. According to the UNEP Emissions Gap report, to reach the target of 1.5oC, the world must reduce its carbon emission by 50% by 2030 and focus on achieving carbon neutrality by 2050. India has pledged to achieve the target of Net-Zero by 2070. Hence, there is an urgent need to aggressively reduce energy demands in the built environment. Thus, proper building envelope design combined with passive building designs will ensure better performance of the structures. To provide an accurate representation of the functionality of a climate-responsive structure, full-scale field testing must be conducted. Also, in a climate responsive building, energy utilization can be thought of as a possible cost savings. Solar energy is ideal because it is clean, renewable, and sustainable. Further, in some of the parts of India, it is feasible to provide a hybrid solution (wind and solar) to meet the minimum electricity need in the building. The building energy audit is also important to determine the energy demand and provide an assist for the energy efficient building design. The case study of Leh town, in the Indian Himalaya, is the focus of this research, which examines the proper design and choice for system integration.

Key words: Climate Change, Climate Resilient Building Design, Sustainable Built Environment

INNOVATIVE SYSTEMS IMSBE85

Non-Chlorinated Cellulose Extraction from Agricultural Biomass and its Potential Application as Packaging Materials

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The conversion of untapped agricultural biomass into value-added products has a huge potential particularly due to its lignocellulosic component which makes its suitable as a raw material in various field such as textile industry, biomaterials composite, and food packaging. Due to the high demand of cellulose materials, it is crucial to explore new sources of cellulose and its effective extraction process. Currently, cellulose is extracted using mechanical and chemical processes which high energy consumption is needed and cause leakage especially us using chlorine method which is corrosive. Chlorine is known for its toxicity and harmful to the health and environment. In addition, inappropriate extraction process may cause disruption of the cellulose structure, making it not suitable for further application.

Keywords: Cellulose, non-chlorine, agricultural biomass, nitric acid, starch, packaging

INNOVATIVE SYSTEMS IMSBE52

Seismic Resilient & Sustainable Construction Utilising Stones & Woods in Kath Kuni Construction Style

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The Himalayan region poses many threats to its occupants, such as Earthquakes, Heavy Rainfall, and extreme climatic conditions. To sustain all this, a unique construction style "Kath Kuni" was developed, which had sufficient rigidity and ductility to withstand harsh seismic & climatic conditions. Simultaneously it also had the characteristic of providing thermal comfort to the occupants. This traditional construction style utilized Stones & wood, two local materials that were available in abundance in this region. The most amazing feature of this style is that it does not utilize any kind of mortar for the construction purpose rather in the walls are constructed by laying two wooden beams longitudinally parallel to each other, with a space in between that is filled with rubble stones. The two wooden beams are securely connected to each other through a wooden spacer termed Maanvi (Dovetailed wooden connector) and the edges of the beams are secured by Kadil (wooden nails). The wooden beams provide sufficient ductility to handle the seismic forces, whereas the stone provides sufficient thermal mass for thermal comfort. However, with the passage of time, people have shifted from traditional construction style to modern construction materials & systems such as Bricks & RCC; which is neither energy-efficient nor sustainable. The work herein tries to showcase that a seismic resilient, sustainable, economical, and aesthetically appealing construction is possible, even with naturally available construction materials such as Wood and stone, if designed and implemented properly.

Keywords: "Kath Kuni", seismic and climatic, stones and wood, sustainable

INNOVATIVE SYSTEMS IMSBE20

Automated Extraction and Segmentation of Tunnel Utilities Using 3D LiDAR Data for Enhanced Damage Detection

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Highway tunnels frequently suffer damage, requiring timely monitoring and maintenance to ensure safety and structural integrity. In countries like Japan, with an aging workforce, monitoring many tunnels is challenging, highlighting the need for fast and automated methods. The use of 3D LiDAR has grown due to its ability to capture detailed spatial data. However, handling unstructured point cloud data for damage detection remains difficult, especially in tunnels filled with various utilities. This paper presents a method that utilizes geometric features of point clouds, such as curvature, reflection intensity, and point density, to extract tunnel utilities. Curvature values were first computed using an eigenvalue-based method, and utilities were initially extracted by setting thresholds for curvature and reflection intensity. When some utility points remained, a second extraction phase used point density, focusing on points with lower values. However, some tunnel lining points were mistakenly extracted, which could disrupt damage detection. To resolve this, a two-step curve fitting approach based on the tree-bagger algorithm was applied. The first step refined the tunnel data from the previous extraction, removing noise, while the second step generated a curve fitting model from this refined data to estimate elevations in the original point cloud. Using distance thresholds, utility points were separated from the main tunnel lining. The extracted utilities were then segmented into clusters and classified based on their dimensional features. The algorithm was tested on three tunnels and successfully extracted all utilities without affecting the main tunnel surface. This approach enhances tunnel utility inspection and maintenance, paving the way for easier and faster damage detection. Future work will focus on automated damage detection, offering a practical solution for managing aging infrastructure with limited resources.

Keywords: 3D LiDAR, tunnel utilities extraction, point cloud segmentation, damage detection

INNOVATIVE SYSTEMS IMSBE27

Testing The Effectiveness of An Incentive-Based Bicycle Reallocation Approach in A Shared Cycle System

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In recent years, the use of bicycles has been promoted in Japan. In particular, bicycles are attracting attention as an environmentally friendly means of transportation, and efforts to reduce CO_2 emissions and ease traffic congestion in urban areas are on the rise. In addition, as a solution to the last mile problem, demand for shared bicycles, which are convenient for short-distance travel from train stations and bus stops to destinations, is increasing every year. A shared cycle service is a place where multiple bicycles can be rented or borrowed (hereafter: “ports”), and users can freely drop off their bicycles. While it has become a popular means of transportation in urban areas in recent years, an imbalance in supply among ports has arisen due to uneven demand. Specifically, when rental demand is concentrated at a particular port, the port is empty for a certain period, while when return demand is concentrated, the capacity of the port is exceeded, and it becomes impossible to park bicycles. To avoid this spatial mismatch in supply, operators use trucks to relocate bicycles, but this operation accounts for a large portion of operational costs. This study examines the effectiveness of a mechanism that provides incentives to users to direct bicycles to ports where they are in short supply, thereby eliminating the need for truck-based relocation. Specifically, we will analyze the impact of this approach on operational costs using multi-agent simulation.

Keyword: share bicycle, relocation, incentive, multi-agent simulation

INNOVATIVE SYSTEMS IMSBE76

The Study of Potential Phosphate Reduction in Synthetic Wastewater by Using Calcined Crushed Waste Concrete

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Over the past few decades, the reduction of phosphate (PO_4^{3-}) in wastewater has received great attention from researchers due to its significant contribution to the eutrophication phenomenon. Another problem is that construction and demolition waste (CDW) production by waste concrete keeps increasing dramatically in Malaysia. Therefore, the adsorption of PO_4^{3-} onto optimised calcined crushed waste concrete (CCWC) was investigated in a batch system. CCWC was obtained after treating the natural waste concrete at 550°C for 15 minutes. The lab work started with CCWC characterisation by an X-ray fluorescence (XRF) spectrophotometer to observe changes in its chemical composition after the calcination process and evaluate its potential in adsorbing PO_4^{3-}. Then, the performance of CCWC and raw CWC (RCWC) as PO_4^{3-} adsorbent were compared and followed by finding the best heating period (5, 10, 15, 30, 45, and 60 minutes) for the calcination process to monitor the early performance of the calcined sorbent. The batch adsorption experiment was conducted using several variables, such as contact time, particle size, dosage of adsorbent, and initial PO_4^{3-} concentration. PO_4^{3-} removal was tested at various contact times, starting from 1 hour to 7 hours, until it reached equilibrium. The particle size and dosage of adsorbent used were 0-2 mm, 2-5 mm, and 5-10 mm with 1 to 20 g of adsorbent, whereas initial PO_4^{3-} ranged from 0.1 to 15 mg/L. Results obtained showed that the early performance of CCWC was much better than that of RCWC, with 73% PO_4^{3-} removal in only 2 hours compared to 21% by RCWC. Calcination of CWC observed had successfully increased its specific surface area and pore volume as well as the metal oxides composition present in the adsorbent, which are magnesium oxide (MgO), calcium oxide (CaO), and aluminium oxide (Al_2O_3). From the batch adsorption test on CCWC, more than 90 % of PO_4^{3-} removal was achieved with a short equilibrium time of 5 hours only. Optimum adsorption was also obtained by utilizing 2-5 mm of 10 g CCWC with 2 mg PO_4^{3-}/L of initial PO_4^{3-}concentration. The experimental data obtained best fitted with the Langmuir isotherm model (R^2=0.9995) with maximum adsorption capacity reaching up to 29.76 mg/g and the Pseudo-second-order kinetic model (R^2=0.9932). The research adsorption isotherm and kinetic results suggested that the PO_4^{3-} removal mechanism by CCWC was based on the physical electrostatic attraction with monolayer sorption followed by the chemisorption process. Results demonstrated that calcined CWC could be used as an adsorbent at a low cost for efficient PO_4^{3-} removal and is much better than raw CWC.

Keywords: Eutrophication, crushed waste concrete, phosphate, calcination, adsorption

INNOVATIVE SYSTEMS IMSBE44

Influence of Mix-Constituents on the Printability and Compressive Strength of Binary and Ternary Cementitious Composite made of Agro-Industrial Waste

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In today's world, three-dimensional (3D) concrete printing (3DCP) technology has seen increased popularity owing to its improved advantages, such as rapid construction, better structural efficacy etc., over conventional concrete. However, the lack of understanding about designing a concrete mix with respect to both printability performance and hardened mechanical properties is one of the barriers behind its large community acceptance. Moreover, if such 3D printable concrete mix with desired properties can be designed in an environment friendly manner, that would further enlighten the potential of 3D printing in construction. Hence, in this study, bagasse ash (BA) and fly ash (FA) are utilized and sustainable, greener, 3D printable binary (OPC and BA) and ternary (OPC, BA and FA) concrete mixes are designed with a targeted concrete of grade M30. Consequently, various trial mixes are designed incorporating different proportions of BA, FA along with the combination of other components such as superplasticizer (SP), viscosity modifying admixture (VMA), and retarder with the objective to achieve maximum cement replacement while maintaining the desired printing performance and hardened properties of the developed binary and ternary cementitious binder. With respect to different printing parameters and hardened properties, respective tests are conducted to determine the pumpability, extrudability, buildability, open time and compressive strength of the various designed mixes. The results demonstrated that up to 40% of the cement can gainfully be replaced with BA in fabricating 3D printable binary binder for a targeted compressive strength of concrete of M30 grade. Whereas, in the case of ternary mix with cement: BA: FA in 60:20:20 (in mass proportions) is found to have better extrudability and buildability than the binary mix for the same compressive strength.

Keywords: 3D concrete printing, bagasse ash, printability, open time, compressive strength

DISASTER & POST DISASTER USDM11

Analysis of What Should Be Done After a Disaster and The Current Situation in Japan Where This is Difficult to Do

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After a disaster or other emergency situation has occurred and crisis management has been implemented to deal with it, what should be done after the situation is under control is to prepare for a new crisis in case a similar situation occurs next time, and for this purpose, it is important to analyze the state of preparedness for the emergency situation that has occurred and whether the crisis management response to the situation that has occurred was sufficient. It is important to analyze and verify whether the preparedness for the emergency and the crisis management response to the incident were sufficient, to derive lessons for reflection and to prepare for the next crisis. However, in Japan, although recovery and reconstruction activities are carried out after a crisis has occurred, there is little analysis, verification and extraction of lessons for reflection on whether these crisis preparations and responses were sufficient, what was missing, if anything, and what should be done to prepare for new crises in the future. Very little is done. This is a more pronounced trend than in other countries, but this report analyzed what should be done and why this is not being done and identified the problems.

Keywords: disaster, crisis management

DISASTER & POST DISASTER USDM40

Comprehensive Assessment of The Pernote Landslide, Ramban District, Jammu and Kashmir Union Territory (India)

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Due to the changing climate and precipitation patterns in recent times, the Himalayan states of Indian territory is facing a variety of extreme disaster events. One such event occurred in the evening of April 25th, 2024, at approximately 5:00PMin the Ward No.3 (Nemnar) of Pernote-A Gram Panchayat of the Ramban district of Jammu and Kashmir, Union Territory. The residents of Pernote noticed distress on the ground in the form of cracks and disturbances in the sub-soil of their houses. Through discussions with officials and the local affected community, it was informed that the disaster incident was visibly apparent in the evening of April 25th and continued until May 1st,2024. As the landslide struck around 5. 00PM, the first signs of impending disaster were cracks emerging on the floors and walls of local homes. Faced with the sudden realization of imminent danger, residents had no choice but to flee for their lives, leaving behind their property and possessions. Prolonged antecedent rainfall in the area led to an increase in the pore water pressure and the active stress component, resulting in reduced shear parameters of slope-forming material. This led to the loose unconsolidated thick overburden material predominant with clay content lying on the slopes leading to failure in flow-like manner on the onset of unfavourable conditions like over saturation due to antecedent rainfall and sub-surface natural springs, impounding pore pressure, lack of proper surface and sub-surface drainage network, etc. The area comprises of alternating layers of permeable sandstone and weak impermeable clay and silt. Dominant clay is inherently weak and incompetent in nature and quickly swells due to the absorption and retention of water, which adds to the rise in piezometric pressure level on the free face of the slope leading to a mud flow type landslide on surpassing the threshold level. Other contributing factors included moderate average slope angle in the range of 30° - 40°, presence of sub-surface natural springs, inadequate surface and sub-surface drainage systems in the habitat area which make the area susceptible to such type of landslide. It could be ascertained that with impounding pore pressure beyond threshold limit of the dominantly clayey overburden deposit, the landslide process started occurring gradually in the form of a slow-moving mud flow and continued for a few days. As informed, the ground cracks in different cultivated areas and other terrace deposits occurred and subsequently get widened with passing of time. This process has developed cracks in the building clusters scattered all around the affected slope and with time the buildings got completely damaged. As informed, some buildings got crumpled slowly with the landslide process and in some 3-storeyed buildings, 2 storeys got submerged in the mud with only the damaged top storey visible on the ground. As observed, the landslide is still active with high risk without visible movement. The incident has totally damaged houses belonging to 28 families including one ashram building, agricultural fields and orchards. Critical infrastructures such as 1.2km Annexure-b section of the Ramban-Gool Road of the Border Roads Organisation, 0.3km section of the Pernote-Thalwa village link road, 400 KV transmission line, four transmission towers (three completely destroyed and one partially damaged), a power grid station, and water supply pipelines have suffered damages as well. Houses of around 54 families in the near vicinity surrounding the landslide were assessed to be under risk by the District Administration; and hence were evacuated and shifted to temporary shelters such as the Panchayat Ghar and tents provided by the District Administration. The width of the landslide area is about 1.5 km and height from the northern side river towards the southern side crown line is approximately 3 km; therefore, the approximate coverage of the landslide affected area is 4.5sq km. Based on the field observations and remote sensing image interpretation, the present paper discusses the causative factors for the landslide occurrence, future impeding hazard and risk scenario and possible immediate and short-term disaster risk reduction measures.

Keywords: Landslide, Indian Himalaya, Risk Assessment, Field Observation

DISASTER & POST DISASTER USDM89

GIS Characterisation for Fire Weather Index (FWI) in Peatland Forest

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This study presents a Geographic Information System (GIS) framework integrated with the Fire Weather Index (FWI) for enhanced fire risk assessment within peatland ecosystems, specifically targeting the Raja Musa Forest Reserve in Kuala Selangor. The GIS system leverages Ground Water Level (GWL) and Land Use and Land Cover (LULC) mapping to create a real-time dashboard. Using an Internet of Things (IoT) network and LoRaWAN technology, GWL data is collected from sensor nodes and processed through Inverse Distance Weighting (IDW) interpolation to predict spatial GWL variations. This interpolation approach allows for continuous GWL surface visualization, thus informing fire risk levels classified as low, moderate, high, and extreme. The resultant GIS-based dashboard enhances user interaction and decision-making by categorizing fire risk based on vegetation density and proximity to sensor nodes. This system supports sustainable peatland management, contributing to global efforts in climate change mitigation by providing an efficient, scalable model for early fire detection and response in peat swamp forest.

Keywords: GIS, FWI, IoT, LoRaWAN technology

DISASTER & POST DISASTER USDM69

An Analysis of Evacuation Factors for Families with Infants and Toddlers Considering Privacy in Evacuation Shelters-A Study Assuming a Large-Scale Earthquake Disaster

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In the Tohoku and Kumamoto earthquakes, many people who are generally regarded as people in need during disasters, such as infants, the elderly, and people with disabilities, were affected. Among them, infants particularly lack the ability to make decisions on their own, making it essential for them to receive support from a third-party during evacuation. It is also important to consider the privacy of families supporting infants. In fact, many privacies related issues for families with infants and toddlers in evacuation centers were reported in the Tohoku and Kumamoto earthquakes. In this study, we focus on privacy factors in evacuation shelters, aiming to clarify the privacy items that families with infants consider important in evacuation shelters, and calculate the probability of evacuation considering these items. This analysis is based on data obtained from a questionnaire survey. The questionnaire was distributed to parents of infants aged 0 to 4 years old conducted with the cooperation of kindergartens and nursery schools throughout Japan. We used a conjoint card-based questionnaire to assess both the importance of privacy items for families with infants and to calculate the evacuation probability. This was done through choice-based conjoint analysis, a method that utilizes a conditional logit model. The results revealed which of the seven factors (presence/absence of partitions, presence/absence of people in the surrounding area, gender of the shelter management staff, presence/absence of a nursing room, presence/absence of a consultation room, presence/absence of a security buzzer, and presence/absence of privacy for laundry) were considered important by families with infants and toddlers, and the influence of each item on the probability of evacuation was also calculated. The effect of the parameters of each item on the probability of evacuation was also calculated.

Keywords: infants, shelter, large-scale disasters, conjoint Analysis

DISASTER & POST DISASTER USDM65

Analysis of Cruise Ship Passengers' Behavior During Earthquake Disaster: Case Study of Kanazawa Port

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Since November 2002, Japan has resumed receiving international cruise ships. In 2023, the total number of cruise ship calls by both Japanese and foreign vessels reached 1,854, which is approximately 63% of the peak before COVID-19. The tonnage of cruise ships departing from and arriving at Japanese ports tends to increase year by year. Under these circumstances, when cruise ships call, the area around the port is expected to be more visited by tourists. On the other hand, characteristics of cruise ship passengers are high average age, leaving much of their luggage on board, and sightseeing with a minimum of luggage. This makes them particularly vulnerable to earthquake disasters that may occur during sightseeing. When an earthquake occurs, cruise ship may evacuate to safer areas, leaving their passengers in the sightseeing area. If the main route to the ship is damaged by the earthquake, passengers may need to give up on returning to the ship and instead evacuate to nearby evacuation centers. Consequentially, the local government may have to accommodate a large number of tourists in these evacuation centers. Understanding in advance how cruise ship passengers may react to such events and developing plans to assist them is very important. In this study, a questionnaire survey was conducted on passengers of cruise ships calling at Kanazawa Port to identify evacuation sites in the event of an earthquake during sightseeing. As a result, this study was able to identify how the choice for evacuation destination changes regarding the accessibility to Kanazawa Port. The study found that if transportation is disrupted or if the elderly are affected, they aim to evacuate to a shelter. The results also provide basic knowledge for facilitating cooperation between cruise ships and local governments in such situations.

Keywords: cruise ship, earthquake, disaster, questionnaire survey

DISASTER & POST DISASTER USDM68

The Current Status of Resident Displacement in the Noto Peninsula Earthquake-stricken Area in 2024-Time series observation using KDDI Location Analyzer

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On January 1, 2024, the epicenter of the Noto Peninsula earthquake of 2024 occurred in the Noto region of Ishikawa Prefecture. The Noto region is a mountainous peninsula, and the affected areas are geographically isolated from each other, making the road transportation network more vulnerable than that in the plains. In fact, when the earthquake struck, roads were cut off in many places, leaving many villages isolated, and evacuation and rescue vehicles were concentrated on roads connecting the Noto Peninsula to the outside world, causing serious traffic congestion. These transportation disruptions are prolonged as relief efforts are delayed, delaying the transportation of human and material resources and becoming a major obstacle to rebuilding livelihoods in the affected areas. As the rebuilding of livelihoods drags on, the extensive out-migration of the population in the affected areas has become an issue, and it has become necessary to quickly assess the demographic trends in the affected areas. On the other hand, surveys based on statistical data, questionnaires, and interviews require a large amount of manpower, and it is difficult to quickly grasp population flows in the affected areas with these methods. In this study, we estimate the population flow in the affected area before and after the disaster using the KDDI Location Analyzer, a tool that enables the acquisition of population data from cell phone location big data. The purpose of this study is to estimate the resident population in the disaster area through the analysis of nighttime population trends. The results of this analysis show that it is possible to visualize the evacuation, regression, and out-migration of residents living in the affected urban areas after the earthquake, and to understand the post-disaster population dynamics based on location-based big data.

Keywords: Location-based big data, earthquake, Wajima City, Ishikawa Prefecture population movements

DISASTER & POST DISASTER USDM39

Field Investigation of the 30th July 2024 Wayanad Debris Flow of Western Ghat, India

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On 30 July 2024, a catastrophic debris flow occurred in the Wayanad region of the Western Ghats, Southern India, resulting in the tragic loss of over 200 lives. The debris flow impacted 3 villages Punchirmattam, Mundakkai and Chooralmala and destroyed many houses and other infrastructures. The major triggering factor of this debris flow was extreme rainfall, and the total runout length of the debris flow was approximately 8 km. The debris flow initiates as a landslide and the release areas are the part of Meppadi forest range (South Wayanad division) under Vellarimala vested forest. The landslide mobilized material including rainwater, spring water, uprooted trees, tree logs, rock boulders, and debris from the release area along the channel. During its flow, entrainment along the channel and bank erosion contributed significantly to the huge quantity of material mobilization. The Chooralmala bridge initially blocked the debris, where the phase transition occurred, and the debris flow converted into hyper concentrated flow/flash flood. The present study deals with the detailed field investigation and observation of this debris flow. The study reveals that the debris flow entrained a huge number of materials during the flow and the possibility of damming can't be ignored. The phase transition also occurred at the Chooralmala bridge. This debris flow highlights the importance and the need of the debris flow hazard indication mapping in such sensitive debris flow susceptible zones.

Keywords: Debris flow, Western Ghat, Rainfall, Entrainment

INFRASTRUCTURE MANAGEMENT IMSBE3

Study on an Early Warning System for Disaster Mitigation Using Ground-Based SAR

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Currently, we are increasingly threatened by various natural disasters due to climate change, including severe rainfall events, super typhoons, and large-scale volcanic eruptions. These disasters can lead to slope-related hazards such as landslides posing serious threats to vulnerable communities. Addressing these slope disaster risks effectively and building an adaptive and resilient society is an urgent global challenge. To advance this effort, it is essential to develop practical and highly accurate early warning systems. In early warning systems, instruments like extensometers and GPS devices, which are typically installed directly on the target to obtain displacement data during sliding are commonly used. However, installing these instruments in area that risk of collapse poses significant danger. Instead, we present an early warning system utilizing synthetic aperture radar (SAR) technology to measure ground surface displacement. Specifically, we introduce ground-based SAR (GB-SAR), which allows for the estimation of target displacement with high temporal sampling, and hence near real-time capability. In this presentation, we will introduce the latest developments of the GB-SAR technique and monitoring campaigns in Japan.

Keywords: Disaster mitigation, Ground-based SAR

INFRASTRUCTURE MANAGEMENT IMSBE5

Effect of Mixing with Steel Slag on Modification of Simulated Under-Sieve Residue

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Among the large amount of disaster waste generated due to natural disasters, under-sieve residue contains a lot of fine wood chips that are difficult to remove. Because of the unknown mechanical properties of under-sieve residue, a large portion of it is disposed of without effective utilization, such as in landfills. This not only puts pressure on waste disposal sites after a disaster, but also hinders post-disaster recovery and reconstruction. The aim of this study was to develop a new high-quality geomaterial using under-sieve residues, thus making effective use of it. Previous research has primarily focused on the properties of wood chips used to simulate under-sieve residues and has investigated the geotechnical engineering properties of the mixture of wood chips and slag. However, wood chips have been unable to represent under-sieve residues because actual under-sieve residue is sediment including wood chips. In the present study, wood chips and sandy soil to simulate under-sieve residues and mixed them with steel slag for solidification were used. Unconfined compression tests were performed on the mixed materials with different soil types (inland sand and silica sand), mixing ratios, and curing periods (7 and 28 days). The mechanical properties of the mixed material were investigated. The study revealed that the under-sieve residue simulated with sandy soil and wood chips, and those simulated with wood chips only in the previous study, have similar mechanical properties. Furthermore, it was found that the unconfined compression strength and the failure strain of the materials increased when added sandy soil to them. This means that adding sandy soil into the mixture of wood chips and slag can strengthen the mechanical properties of the mixed materials as a geomaterial.

Keywords: Steel slag, under-sieve residue, wood fiber

INFRASTRUCTURE MANAGEMENT IMSBE37

Accurate and Fast Estimation of Damage Thickness and Depth of Rebar in Concrete Using Smartphone-Equipped Handheld GPR

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Currently, infrastructure inspection mainly relies on close visual inspection, which requires significant effort and cost, making it burdensome. To prevent unnoticed internal cracks from growing larger and causing major accidents, it is necessary to detect these invisible internal cracks at an early stage using non-destructive testing. We focus on smartphone-equipped handheld GPR, which allows us to obtain explicit depth information about the internal structure while irradiating and measuring electromagnetic waves (EMW). We will develop algorithms and software that quantitatively estimate the presence, thickness, and depth of internal damage and cover thickness of rebar using this device. The wavelength of the EMW used is low resolution, making it extremely difficult not only for quantitative estimation but also for visual detection of damage in the received images. In response to this challenge, we attempted to solve it through an approach based on digital signal processing, which is a representative of analytical processing. By capturing the slight behavior of the amplitude spectrum dependent on crack thickness, we successfully achieved high-speed processing at 0.001 seconds per data point for the quantitative estimation of damage thickness in the millimeter range. The electromagnetic wave radar measures the round-trip time T[s] of propagation between the antenna and the target, and the observed signal does not directly represent the true depth distribution. To obtain the spatial depth D[m] from the observed signal, it is essential to determine the value of the relative permittivity of the medium. In response to this challenge, we constructed a propagation model for EMW by rigorously optimizing the distance between the transmitting and receiving antennas and fitting the theoretically generated hyperbola with the response from the rebar. This revealed that it is possible to estimate cover depth with millimeter accuracy, a topic that has not been discussed in previous research.

Keywords: Concrete, Smartphone-equipped handheld GPR, Damage thickness estimation, Depth of rebar estimation, Hyperbolic curve fitting, Spectral pattern matching

INFRASTRUCTURE MANAGEMENT IMSBE66

Analysis of Satisfaction Evaluation of Foreigner to Japan at Restaurants in Regional Sightseeing Cities-Study of Using Review Data from Travel Information Websites

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In Japan, the tourism industry is positioned as a major pillar of the GDP growth strategy, and efforts are being made to promote to it through three pillars: sustainable tourism, increasing consumption, and promoting local tourism. In particular, by capitalizing on growing global tourism demand, the industry is expected to revitalize local economies and create jobs. In the tourism industry, “food” plays an important role in the decision-making process for traveling destinations of international traveler, and Japanese cuisine is particularly well-regarded by foreign to Japan. Therefore, understanding the factors that contribute to improving satisfaction with “food” among foreign visitors to Japan is important for future inbound tourism in Japan, as it may help increase the number of repeat visitors, attract new visitors by word of mouth, and contribute to the sustainable development of the local economy through increased tourism income. The recent popularization of SNS has made it easier for foreign visitors to share their experiences at restaurants in real time, providing a valuable source of data for the tourism industry. Therefore, in this study, among the experiences and impressions of restaurants on SNS, we focus on highly rated reviews posted on travel information sites about restaurants, where data acquisition is possible, large amounts of data are available, and satisfaction factors can be observed. By collecting this user-generated content and applying topic model in natural language processing, a method used to extract hidden topics from large datasets, the findings of this study reveal these satisfaction factors and highlight regional differences in foreign visitors’ perceptions of restaurants in Japan’s tourist destinations.

Keywords: Inbound, restaurant, review data, natural language processing, satisfaction factors

INFRASTRUCTURE MANAGEMENT IMSBE23

Estimating Pavement Condition Using Publicly Available Satellite Imagery for Data-Driven Road Maintenance Planning

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Road infrastructure plays a critical role globally, becoming increasingly vital as societies develop, with substantial investments made by governments each year. However, roads deteriorate over time due to aging and various factors affecting pavement condition, necessitating effective maintenance strategies. Among various factors, pavement age is a crucial component in data-driven maintenance planning, as it is necessary for the prediction of deterioration, prioritization of interventions, resource allocation, and lifecycle cost analysis for road infrastructure. A key challenge in data-driven maintenance planning, however, is the absence of historical pavement age data, such as the year of the last rehabilitation or construction. This research explores the potential of using publicly available satellite imagery, such as that available in Google Earth Engine (GEE), to estimate the paving year (age) of roads. Sentinel-2 satellite data, which offers RGB bands with a spatial resolution of 10 meters, was utilized in this study. Focusing on road networks in Kenya, with data from 3,348 road sections, the study investigates the relationship between collected optical data, such as the pavement surface color, and the Pavement Condition Index (PCI). The analysis aimed to determine whether a statistical correlation exists between PCI and the RGB values from satellite imagery, which reflects the pavement's visual appearance. The results found no clear correlation between PCI and RGB values from GEE data. However, further research is needed to explore other pavement condition indices using satellite imagery, which holds significant potential for enhancing road infrastructure management.

Keywords: Satellite imagery, GEE, Sentinel-2 satellite, pavement, road infrastructure

INFRASTRUCTURE MANAGEMENT IMSBE17

Potential Assessment of Vertical Solar PV Systems for Power Production and Thermal Performance in Tropical Building Envelopes

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In tropical regions with warm and humid climates, balancing thermal comfort with energy efficiency presents a challenge due to the high cooling demands. Strategies to reduce energy use and integrate renewable energy (RE) into building design have been studied over the years, focusing on self-sufficient buildings. The United Nations' Sustainable Development Goals (SDGs), particularly SDG 7, emphasize universal access to sustainable energy, while SDG 13 advocates for a shift to clean energy to combat negative impacts of climate change. Solar photovoltaic (PV) technology offers a practical solution to address both SDGs, especially in energy-intensive urban areas. Therefore, it is important to assess how solar PV panels installed on building envelopes can maximize local energy generation while minimizing thermal gains. While roofs receive significant solar radiation, space is limited by infrastructure. Meanwhile, vertical walls offer increasing potential for installation area as buildings grow taller and reduce the effects of dust deposition on solar panels. This study aims to evaluate how vertical solar PV systems can meet cooling energy demands in buildings in the tropical zone. The proposed methodology includes building model generation using LiDAR-derived normalized Digital Surface Model (nDSM) data, solar surface irradiance modeling via ray tracing, thermal loads calculation, estimation of solar PV power potential of facade panels, and evaluation of cooling load reduction on selected buildings at the University of the Philippines Diliman. Results showed that while roofs consistently receive the highest sunlight concentration annually (38.41% monthly exposure), east-facing walls receive the most irradiance in the morning (60.28% at 8:00 AM), with west-facing walls receiving maximum value (58.98%) in the afternoon (4:00 PM). With solar irradiance levels reaching up to 1036.61 W/m2, vertical solar PV systems offer a promising option for RE systems in tropical urban environments.

Keywords: Vertical solar PV systems, GIS, tropical buildings, clean energy, thermal comfort

INFRASTRUCTURE MANAGEMENT IMSBE63

Impact Assessment of Fare Increases and Consciousness of Railway Users' Regarding the Hokuriku Shinkansen Tsuruga Extension

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The Hokuriku Shinkansen is one of Japan's five high-speed railway lines. It serves as a crucial transportation route that starts in Tokyo, Japan's capital, and passes through the Hokuriku region, which includes major cities such as Nagano, Toyama, and Kanazawa, before finally reaching the Kansai region, including cities like Kyoto and Osaka. The construction of the Hokuriku Shinkansen is important not only for reducing travel time and increasing the number of people traveling and interacting, but also for strengthening transportation networks as a countermeasure against disasters and providing alternative emergency transport route. The extension of the Hokuriku Shinkansen between Kanazawa and Tsuruga opened on Saturday, March 16, 2024. This extension, which has shortened travel times, is expected to significantly increase the number of people traveling between the Hokuriku region and other areas. However, the opening of Tsuruga Station has required passengers to transfer to a local railway line when traveling to the Kansai and Chukyo regions, reducing transportation convenience due to the closure of direct through operations. Additionally, fares have increased by 1,950 yen compared to before the Tsuruga extension, which has become a burden for passengers and raises important questions about how this increase affects users' willingness to travel. In this study, a questionnaire survey was conducted to collect data on the awareness and behavior of high-speed railway users in Ishikawa and Fukui prefectures and to determine the factors behind fare increases due to the extension of the high-speed railway to Tsuruga. Furthermore, factors contributing to decreased usage and changes in transportation mode choice among high-speed railway users were analyzed using survival analysis. The purpose of this study is to explore appropriate fare levels to better understand the status of fare setting that promotes the use of the Hokuriku Shinkansen. Additionally, this study provided insights into the impact of fare increases on users' intentions to travel and identified which fare levels were most effective in encouraging the use of the Hokuriku Shinkansen.

Keywords: Hokuriku Shinkansen Tsuruga extension, questionnaire survey, Fare increase, survival analysis

INFRASTRUCTURE MANAGEMENT IMSBE49

Effective Use of Tunnel Face Observation Records During Tunnel Construction for Renewal of Abandoned Tunnel

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This paper describes a case study in which a three-dimensional ground model was created using the face observation records from the construction of a tunnel in service (Phase I line) and used for the reconstruction design of an adjacent abandoned tunnel to be utilized as a Phase II line. The procedure for utilizing the three-dimensional ground model was as follows: (1) The pre-construction geological longitudinal profile of the Phase I line currently in service was revised based on the face observation records at the time of construction. (2) The 3D geological model was created by interpreting and setting the strata boundaries based on the 3D arrangement of the revised longitudinal geological profile of the Phase I line and photographs of the face at the time of construction. (3) A geological longitudinal profile of the Phase II line was created using the 3D geological model created. This made it possible to study the reconstruction design and support pattern for utilizing the adjacent abandoned tunnel as the Phase II line without conducting a large-scale additional investigation. Thus, reinforcing and renewing abandoned tunnels for effective utilization is an initiative that should be recommended in terms of environmental issues such as CO_2 reduction and consumption of construction materials, compared to new tunnel construction. In addition, the design of the renewal of the abandoned tunnels without large-scale additional investigations by making effective use of the face observation records from the construction of the tunnels, which had been discarded and not used after the completion of tunnel construction, was also considered to have contributed to environmental issues. This effort is considered to have established a method to develop the observation records of tunnel face into a new tunnel design in the vicinity. In the future, we would like to increase the number of case studies.

Keywords: Tunnel reconstruction design, Face observation records, 3D ground model

CLIMATE CHANGE & WATER RESOURCES CCGR57

Droughts and Deluges: Navigating Water Resource in SDG perspective and Saving Water Resource Using IOT

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In the development arena, economic growth and environmental sustainability must go hand in hand. Among all natural resources, water remains a critical input for the survival of all living beings. There are two forms of water resources viz., surface water and groundwater, for both rainfall is the base. Both forms of water resources are inevitable for two livelihood protection areas viz., agricultural food grain production and drinking water for the survival of living beings. These two areas, concerned with human development activities, presume significance for further discourse from the perspective of Sustainable Development Goals (SDGs) viz., No poverty (1). Zero hunger (2). Clean water and sanitation (6). Decent work and economic growth (8). Groundwater remains a demand driven social good providing safe drinking water for ensuring improved standard of living (outcome) in rural habitation. However, private people through bore wells in their land, use groundwater for agricultural purposes. Despite realizing positive returns from water resources, the question is how and how much to protect the environment without pollution and wastage that threaten sustainable well-being to all living beings in the planet? Here, in the case of water resources what are the key areas of public policy for adherence of an efficient execution of supply and distribution of water ensuring environmental safeguard in terms of avoiding wastage and pollution at grass root level? This paper attempts to answer these issues based on field studies.

Keywords: Economic growth, environmental sustainability, water resources, rural habitations, public policy

CLIMATE CHANGE & WATER RESOURCES CCGR74

Exploring the Surface Water Status of AWD Irrigated Rice Paddy Fields Integrating SAR-UAV and IoT to Climate Change Mitigation

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Alternate wetting and drying (AWD) are a proven technique to reduce irrigated water, and methane emissions without yield reduction of rice cultivation. The effective and efficient ways to monitor paddy field surface water are significant to successfully implementing AWD to reduce water use and methane emissions. The aim of the study is to monitor AWD water status of rice paddy fields with remotely sensed data, Unnamed Aerial Vehicle (UAV) and IoT based low-cost water level monitoring devices. The experiment fields design with installation of IoT based water level devices and periodically UAV flight at the selected six plots in Bangladesh. The Sentinel-1time series of VV and VH polarization backscatter intensities are averaged over the designed rice paddy fields during the Boro season. Then, the time series for each field, the statistics and metrics, including the mean value, the variance of the signal, the correlation length, and the fractal dimension, are analyzed. With the Support Vector Machine (SVM), the classification of irrigated condition and non-irrigated condition is performed with the metrics vector. The results derived from the SVM are validated with UAV data and IoT based sensors data with a good overall accuracy. This study provides a new paradigm for monitoring the water status of rice fields, which will be key to the precision irrigation of paddy fields in large regions in the future. As well as the accurate irrigated and non-irrigated conditions of rice paddy fields will help to monitoring AWD implantation and greenhouse gasses emission.

Keywords: Synthetic Aperture Radar, time series, backscatter, machine learning, Bangladesh

CLIMATE CHANGE & WATER RESOURCES CCGR78

The Potential of Land Use/Cover Changes Associated with the InVEST Habitat Quality Model for Habitat Quality Analysis in River Basins

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The importance of biodiversity is a rising topic among human survival, welfare, and the global economy, however, the anthropogenic impacts as the threats to natural habitats have been an unavoidable challenge for comprehensive and sustainable natural resources management. This study aims to classify the habitat quality in a river basin area to detect habitat suitability, its change, and the correlation with impact factors from 2000 to 2020. The InVEST habitat quality model was utilized for the spatiotemporal change analysis of habitat quality from different land-use types within the Johor River Basin in the southern part of Peninsular Malaysia. The recent advancement of remote sensing technologies offers significant potential for assessing river basins' ecosystems therefore remote sensing derived land use/land cover changes data were analyzed. Six threat sources associated with estimation for their maximum impact distance, mode of decay, and sensitivity for each land use/land cover type were also conducted for the model input. The model shows that habitat quality within the Johor River Basin has decreased slowly over the last two decades, from 0.2474 (2000) to 0.2417 (2020). Among the different types of land use/land cover, water (0.72), forest (0.56) and mangrove (0.32) contributed to the top three land covers delivering the highest habitat quality within the Johor River Basin. The elevation, population density, slope, and building extent significantly correlated with the distribution of habitat quality. The slow habitat degradation within the river basin during the past two decades suggested that the conservation strategies applied in the Johor River Basin ecosystem were effective. To conclude, the habitat quality assessed from remote sensing technologies are essential tools for river basin managers as they provide coherent context to incorporate stakeholders involving policymakers, researchers, and practitioners. It also helps to identify the conflicts between biodiversity conservation and economic development.

Keywords: Habitat Quality, River Basins, Malaysia

CLIMATE CHANGE & WATER RESOURCES CCGR25

Correlation and Timing Between Regional Water Stress Factors and Oil Palm Yield Using 22-Year Satellite Data in Malaysia and Indonesia

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Palm oil is globally used in various products and industries, mostly produced in Malaysia and Indonesia across millions of hectares. However, climate change is projected to have negative impacts on oil palms due to water stress. The impacts of water stress vary among regions because multiple climate factors, not only precipitation but also soil moisture, can contribute to stress. The timing of stress is also an influential factor for oil palms to form fruits. Since it is important to take adaptation actions locally, identifying region-specific influential factors can contribute to developing strategies. Models have been developed to predict suitable areas for oil palm cultivation in the future or palm yield with climate factors. However, these models do not consider such heterogeneity or are of coarse resolution. Therefore, this study investigated seven potentially influential water components and their crucial timing in states or provinces in Malaysia and Indonesia using satellite dataset from 2002 to 2023 and yield statistical data. The correlation coefficient between annual yield and each water component with a time lag from 0 to several months was plotted for each region to identify important water components and their crucial timing. Additionally, water components in years of high yield and low yield were plotted and compared to investigate the different statuses of water components for both years in each region. It is expected from existing studies that the states in Malaysia may show high importance of precipitation in boreal fall and winter, and a precipitation deficit in this season causes low yield. This estimation is assessed at the state level in Malaysia and the provincial level in Indonesia. This study is important to reveal regional variations in climate factors for oil palm production and can contribute to ensuring sustainable palm oil production under climate change.

Keywords: palm oil, climate change, water stress, regional variability, satellite data analysis

CLIMATE CHANGE & WATER RESOURCES CCGR103

Adapting to Climate Change: Mitigative and Adaptive Approaches in Indonesia's Palm Oil Industry

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The palm oil industry is a cornerstone of Indonesia's economy, contributing approximately 11% of national export earnings and supporting millions of livelihoods. However, this sector faces mounting challenges due to climate change, which threatens its productivity and long-term viability. Rising global temperatures, more frequent extreme weather events, and shifting rainfall patterns are disrupting the growth cycles of oil palms and increasing vulnerability to pests and diseases. The industry is also under scrutiny for its environmental footprint, as it accounts for 12% of Indonesia's GHG emissions, primarily through land-use changes, deforestation, fertilizer application, and methane emissions from POME. Addressing these challenges requires a dual approach that integrates mitigation and adaptation. Mitigation strategies aim to reduce emissions and environmental impacts, while adaptation measures focus on enhancing the sector's resilience to climate variability. This paper explores these strategies, supported by empirical research and case studies, to outline a sustainable path forward for Indonesia's palm oil sector.

Keywords: Sustainable palm oil, climate resilience, emission reduction

CLIMATE CHANGE & WATER RESOURCES CCGR15

What Drivers the Eutrophication Evolution of Lakes in China: Climate Change of Human Activities?

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There exist 2693 natural lakes with areas of over 1.0 km^2. With increasing economic development and climate change, the lake water is becoming eutrophication. And there are even cyanobacteria blooms starting in the end of spring and the beginning of summer. Both eutrophication and blooms are highly variable in both time and location, and greatly restricts the sustainable development of water resources. The lack of national eutrophication evaluation for multi-scale lakes limits the pertinent governance and sustainable management of water quality. We developed a remote sensing approach to capture 40-year dynamics of trophic state index (TSI) for nationwide lakes in China. 32% of lakes (N = 1925) in China were eutrophic and 26% were oligotrophic, and a longitudinal pattern was discovered, with the 40-year average TSI of 62.26 in the eastern plain compared to 23.72 in the Tibetan Plateau. A decreasing trend was further observed in the past four decades, which was mainly discovered in the Tibetan Plateau lakes. The contribution of climate change and human activities was quantified and varied between lake zones. Anthropogenic factors playing a dominant role in the east plain lakes and large lakes are subject to a more complex driving mechanism. The study expands the spatiotemporal scale for eutrophication monitoring and provides an important base for strengthening lake management and ecological services.

Keywords: climate change, eutrophication, sustainable management, trophic state index (TSI)

CLIMATE CHANGE & WATER RESOURCES CCGR95

Future Water Availability for Rice Irrigation: The Role of Machine Learning and Global Climate Models in Water Resource Management

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The irrigation of rice granaries, heavily reliant on river basin water resources, is fundamental to sustaining Malaysia's rice production, which covers up to 690,000 hectares. Climate change and rising water demands necessitate innovative strategies to predict and manage future water availability for rice irrigation. Machine learning (ML), an emerging branch of artificial intelligence, has demonstrated significant potential in agro-hydrological modeling due to its ability to analyze vast datasets and account for nonlinear processes efficiently. Coupling ML with Global Climate Models (GCMs) leverages both local streamflow data and global climate projections, enhancing the predictive accuracy of water resource availability for rice irrigation. This approach facilitates the timely adaptation of irrigation strategies to shifting climate conditions and water resource constraints. Employing this predictive model can support food security, climate change adaptation, water resource management, economic stability, and environmental sustainability. Despite challenges inherent in hydrological modeling, such as seasonal variability and data stochasticity, the integration of ML with GCMs presents a pathway toward resilient rice production and sustainable water management in Malaysia and other rice-dependent regions.

Keywords: irrigation, rice, machine learning, climate change, Global Climate Models (GCMs)

CLIMATE CHANGE & WATER RESOURCES CCGR19

Horizontal and Vertical Migration of Cyanobacterial Blooms in Two Eutrophic Lakes Observed from the GOCI Satellite

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Under the variations of natural conditions (temperature, wind speed, light, et al.) and self-regulation of buyocancy, cyanobacterial blooms can change rapidly in a short time. The Geostationary Ocean Color Imager (GOCI) can provide hourly monitoring of the dynamics of algal blooms (eight times per day) and has potential in observing the horizontal and vertical movement of cyanobacterial blooms. Based on the fractional floating algae cover (FAC), the diurnal dynamics and migration of floating algal blooms were evaluated, and the horizontal and vertical migration speed of phytoplankton was estimated from the proposed algorithm in two eutrophic lakes, Lake Taihu and Lake Chaohu in China. The locations, number, and area of algal bloom patches showed the hotspots and horizontal movement of algal bloom patches. The spatial and seasonal variations of the vertical velocities indicated that both the rising and sinking speed were higher in summer and autumn than those in spring and winter. The factors affecting diurnal horizontal and vertical migrations of phytoplankton were analyzed. Diffuse horizontal irradiance (DHI), direct normal irradiance (DNI), and temperature had significant positive relationships with FAC in the morning. Wind speed contributed 18.3% and 15.1% to the horizontal movement speed in Lake Taihu and Lake Chaohu, respectively. The rising speed was more related to DNI and DHI in Lake Taihu and Lake Chaohu with contributions of 18.1% and 16.6%. The horizontal and vertical movement of algae provide important information for understanding phytoplankton dynamics and the prediction and warning of algal blooms in lake management.

INTERNATIONAL PUBLIC HEALTH RESEARCH IN ASIA IPHRA32

Pattern Analysis of Changes in Production Activities in Thai Industrial Complexes Using Alternative Data

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The COVID-19 pandemic has forced changes in our socio-economic activities and compelled us to adapt to the unparalleled risk. In Thailand's industrial complexes, which are home to multiple manufacturing sectors, tenant companies faced significant challenges in maintaining business continuity and fulfilling their supply responsibilities to customers while ensuring the safety and security of their employees and adjusting production activities to cope with a shrinking supply chain. Although changes in work styles, such as the adoption of remote work, and production management systems after the pandemic have been well-documented, there is still a lack of comprehensive studies that specifically describe how production activities in industrial complexes have changed or adapted. Capturing the state of tenant companies' activities through business data or management resource utilization data is not realistic due to data confidentiality and limited accessibility. Therefore, this study aims to explain changes and adaptations in the activities of industrial complexes caused by the pandemic using alternative data instead of those business data, based on the hypothesis that time-series changes in air quality, such as carbon and nitrogen compounds over the industrial complexes, reflect the state of production activities. Specifically, the study focuses on industrial complexes in Thailand, extracting time-series patterns of nitrogen dioxide (NO_2) and PM2.5 concentrations from Earth observation satellite data. By using wavelet coherence analysis to patternize continuous time-series data of multiple air quality indices, the study compares the concentration patterns among various industrial estates. Through this comparative analysis of time-series concentration patterns, the study aims to capture how production activities in industrial complexes have changed post-COVID-19 and identify key characteristics of industrial estates—such as industry type and production scale of tenant companies—that influence the extent of change and adaptation.

Keywords: alternative data, COVID-19, Industrial complexes, wavelet coherence analysis, air quality

INTERNATIONAL PUBLIC HEALTH RESEARCH IN ASIA IPHRA7

The Status of Psychological Distress, Coping Skills and Health-related Quality of Life in Relation to Religious Practices Among University Students in Malaysia.

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Stress, anxiety and depression are common forms of psychological distress that significantly impact individuals who are exposed to constant pressure, particularly students. Although living under stressful conditions is common in human populations, we are built with the ability and capacity to adapt in challenging and stressful situations through various coping mechanisms. The ability to balance stress and the coping mechanisms is known to improve quality of life. Positive coping strategies, such as religious practices, have been shown to alleviate stress. The Quran practices activities such as listening to, reciting and memorizing is known to enhance mental health by relieving depression, reducing anxiety, and promoting relaxation. Thus, the aim of the study is to determine one's psychological distress, coping abilities and health-related quality of life in relation to Quran practices among the university students. Specifically, it seeks to determine whether students who engage in Quran practices exhibit lower levels of psychological distress and enhanced coping mechanisms, which in turn may contribute to better overall quality of life. This preliminary study involved undergraduate students from various higher educational institutions in Malaysia in diverse background. Participants were assessed on their Quran practices, psychological distress (Depression, Anxiety, Stress Scale-21), coping abilities (Brief-COPE), and health-related quality of life (SF-36). Statistical analyses were conducted using Statistical Package for the Social Sciences (SPSS), with T-tests and ANOVA used to compare data across sociodemographic factors such as gender, religious practices, and Quran memorization levels. Pearson correlation was employed to explore the relationship between psychological distress, coping skills, and Quran memorization in relation to quality of life. The findings from this study are expected to contribute valuable insights into the role of religious practices in managing psychological distress and improving well-being among university students, potentially informing future interventions and support programs within educational institutions in improving the psychological status and their quality of life.

Keywords: psychological distress, coping skills, quality of life, Quran memorization, university students

INTERNATIONAL PUBLIC HEALTH RESEARCH IN ASIA IPHRA67

Analysis of Future Estimation of pharmaceutical Demand During Large-Scale Earthquake Disaster: Case Study of Small Rural City in Japan Using Medical Big Data

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Japan faces a high risk of natural disasters, particularly earthquakes, which can lead to a surge in demand for pharmaceuticals and potential shortages of medical resources. In situations where pharmaceutical supply fails to meet the needs of affected regions, disaster victims may not receive sufficient medical care, risking a deterioration in their health, especially for patients with chronic illnesses who rely on regular medication. Therefore, it is essential to estimate the pharmaceutical demand for these patients during non-disaster periods to ensure adequate preparedness. Additionally, Japan is experiencing depopulation and an aging society, particularly in rural areas, which will likely shift pharmaceutical demand. This study focuses on estimating the regular prescription volume for nine essential pharmaceuticals used by chronic disease patients, utilizing National Health Insurance data from Hakui City in Ishikawa Prefecture, the target region of this research. Given the area's rapidly aging population, the importance of this study is heightened compared to other regions in Japan. The city's 68 districts have been categorized into ten areas, and we have analyzed prescription trends over the past decade. Furthermore, we will forecast prescription trends for the next five years using the SARIMA model, a well-established tool for time-series forecasting. By comparing historical prescription data with projected figures, this study aims to highlight fluctuations in pharmaceutical demand across different regions. The analysis indicates that, over the 180-month period from June 2012 to May 2027, many areas in Hakui City are experiencing a decreasing trend in prescription volumes for various pharmaceuticals, while some regions show an increase. Notably, prescriptions for anti-Parkinson’s medications are projected to rise in seven out of the ten areas, suggesting a future increase in demand for these drugs.

Keywords: Medical big data, future projection, pharmaceutical demand, large-scale earthquake

INTERNATIONAL PUBLIC HEALTH RESEARCH IN ASIA IPHRA48

What SDGs Don't Measure: Non-Actionable Urban Well-being Factors Through GIScience

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As global urbanization surpasses 50%, urban sustainable development and well-being have become crucial for humanity, especially in the Global South where the urbanization process burgeons. While the UN Sustainable Development Goals (SDGs) provide a common framework for urban development dialogue, their design principles of global-facing actionable goals inevitably ignore elements resistant to direct policy intervention. Our study searches for critical non-actionable factors influencing urban well-being that are overlooked. Through a multi-disciplinary literature review spanning health science, psychology, and environmental research that goes beyond the traditional scope of urban studies, we identify key omissions in the SDG framework, including climate patterns, natural landscape features, cultural infrastructure, and food systems. Employing meta-analysis, statistical and semantic analysis, we systematically categorize and rank non-actionable factors based on their prevalence in literature, impact magnitude, and geospatial measurability. Our work lays the foundation for a more holistic urban well-being evaluation system, particularly relevant for assessing and guiding development in the Global South.

Keywords: Urban livability, public health, Sustainable Development Goals (SDGs), urbanization, multi-disciplinary approach, spatial data science

INTERNATIONAL PUBLIC HEALTH RESEARCH IN ASIA IPHRA73

Equalizing Better Healthcare

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The world is getting flatter. What happens in one corner of the globe is known in seconds at the opposite end. However, bringing the benefits of cutting-edge health technology to developing countries has always been a challenge. Technology created in countries with advanced economies is frequently not appropriate for developing countries. Why? To create or increase access to such advanced technologies we need to adapt the deployment and manner we introduce them in developing countries. Why? This challenging implementation is tied up with cost and recovery of cost. It is also a mindset. Why are we frequently willing to pay more for “banded” Chocolate Chip Frappuccino than a Covid test today? Why do we have trouble paying for expensive medications developed by Big “Greedy Pharma?”. In the meantime, how do we serve our healthcare needs? People deserve better!

INTERNATIONAL PUBLIC HEALTH RESEARCH IN ASIA IPHRA86

Total Carbon Stock Estimation for Rubber Plantation Using Unmanned Aerial Vehicle Imagery

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The establishment of rubber plantation has been proposed as an option to improve physical and chemical properties of the soil by protecting the soil from erosion and recycling nutrients through leaf litterfall. These plantations, as a monoculture or combined with other crops in agroforestry systems, may also sequester carbon from the atmosphere. Plant biomass estimates in rubber tree plantations of different ages and grown in potentially dissimilar conditions in Malaysia and Asia have revealed a large range of Aboveground carbon accumulation rates, from 1.4 to 6.7 Mg C ha-1 yr-1. However, fewer studies have investigated changes in the Total carbon accumulation rates in rubber plantations. Estimating Total Rubber Biomass (TRB) is the key factor for calculating the Total Rubber Carbon Stock (TRCS). Based on the previous studies conducted to measure TRB via remote sensing, it was found that there is still a requirement to establish quick, reliable, and more precise approaches for quantifying the TRB and TRCS. The utilization of 3D data from images obtained by Unmanned Aerial Vehicles (UAVs) in the calculation of TRCS has indicated great potential for cost reduction and estimates enhancement. Many studies have been done in estimating Aboveground Rubber Biomass estimation using remote sensing data while limited numbers of research have used UAV data and compared its accuracy with other remote sensing data to assess TRB and TRCS in Malaysia. The UAV-based estimation of TRCS relies on the availability of accurate Digital Terrain Models (DTMs). The primary aim of this research is to illustrate the application of 3D data generated from UAV imagery in the calculation of TRCS and to evaluate the impacts of produced DTMs based on different approaches and parameters on developed models. The expected result will be to develop a statistic model and produce TRB and TRCS maps accurately.

Keywords: Lidar, rubber plantations, drone, remote sensing

INTERNATIONAL PUBLIC HEALTH RESEARCH IN ASIA IPHRA100

Rust Appearance Evaluation System for Non-uniform Corrosion Condition of Weathering Steel Using Deep Learning

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Weathering steel is a material with great potential, with the unique characteristic of controlling rust with rust. In a suitable corrosive environment, weathering steel sufficiently reduces the corrosion rate due to the rust layer that forms on the surface, making it possible to use this material without painting when used in steel structures. Typical inspections of painted steel bridges focus on the condition and degree of deterioration of the coating and whether rust has developed. On the other hand, inspections of weathering steel bridges should evaluate the condition of rust. The basic method is to evaluate in five grades from the rust appearance and thickness. Grades 3 to 5 are good and require no additional action, but grades 2 and 1 require observation and immediate action, respectively, so accurate judgment is required. This method is a standard evaluation method that has been used for a long time, but it does not necessarily provide quantitative criteria, so even experts are sometimes at a loss to make a judgment. In this study, a system to determine the rust appearance grade of non-uniformly corroded weathering steel is attempted to construct by utilizing deep learning to address this issue. Specifically, the objective is to detect rust in images of non-uniformly corroded weathering steel using Yolov8, an object detection algorithm, and to assign a grade according to the rust condition. The system was developed using image data of weathering steel surfaces that had been previously graded by experts. In the evaluation of the system, the developed model was applied to non-uniform corrosion images of actual weathering steel bridges to verify whether the system could accurately detect grade 1 and grade 2 rust conditions.

Keywords: Weathering steel, rust appearance evaluation, object detection, deep learning

STRUCTURAL VULNERABILITY USDM101

Tsunami Evacuation Risk Changes in Banda Aceh after 2004 Indian Ocean Tsunami

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In Banda Aceh, which suffered the most severe damage from the 2004 Indian Ocean tsunami, the city has undergone changes during the reconstruction process to reduce future tsunami damage by constructing tsunami evacuation buildings and installing tsunami warning systems. On the other hand, the population is also increasing. In this study, we look back at the progress of risk reduction measures related to post-disaster evacuation, quantitatively evaluate the tsunami evacuation risk as of 2023, approximately 20 years after the tsunami, from the perspectives of population changes and evacuation time, and evaluate future measures. The issues related to tsunami evacuation in Banda Aceh were clarified. As a result, it was confirmed that (1) there was a population increase in low-risk areas and a population decrease in high-risk areas. (2) The construction of tsunami evacuation buildings significantly shortened evacuation time and significantly improved the evacuation completion rate, demonstrating the significance of tsunami evacuation buildings. (3) The deficiencies of using only the tsunami evacuation building and the effects of using other existing buildings were quantitatively demonstrated.

STRUCTURAL VULNERABILITY USDM53

Predicting Building Risk in Land Subsidence-Prone Areas: The Role of Decision Tree Regression Model in Urban Safety

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Urban safety and disaster mitigation are critical challenges, particularly in regions susceptible to land subsidence, such as Joshimath, Uttarakhand. This study focuses on assessing structural damage and predicting building vulnerability using machine learning models, including Decision Tree Regression, for effective disaster management. The assessment of 2,364 buildings in Joshimath reveals significant damage patterns, with 1% categorized as demolished, 20% as unusable, 42% requiring further assessment, and 37% deemed safe. The town's construction typologies consist of 44% masonry, 42% RCC, and 14% hybrid structures, with 99% of these buildings being non-engineered and non-compliant with the National Building Code of India 2016. In this study, the Decision Tree Regression model was employed to predict building risk scores, providing key insights into structural vulnerabilities. For RCC buildings, the model achieved a training MSE of 0.0385 and a testing MSE of 0.0402, with an R-squared value of 0.9098 for training and 0.8645 for testing. Similarly, masonry buildings yielded a training MSE of 0.0359 and a testing MSE of 0.0361, with a train R-squared of 0.9111 and Test Rsquared of 0.8545. The model also demonstrated promising results in terms of RMSE and MAE, with RMSE values for RCC and masonry buildings standing at 0.2006 and 0.1899, respectively, and MAE values at 0.175 and 0.1481. These results underscore the model's efficacy in identifying and quantifying building damage, facilitating risk mapping, and targeted interventions for urban safety. The findings contribute to disaster mitigation strategies, providing valuable data for urban planners and decision-makers to enhance community resilience in subsidence-prone areas.

Keywords: Land subsidence, structural damage, urban planning, disaster mitigation, predicting building vulnerability

STRUCTURAL VULNERABILITY USDM42

Simplified Vulnerability Assessment for Masonry Buildings using Fragility Curve

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Masonry has been and still is the most used material for low rise buildings due to several merits. However, masonry suffers drawbacks – distinct directional properties; poor strength of masonry units, mortar; non-uniform thickness of mortar joints; low interfacial bond strength; arrangement of bricks, workmanship etc., which leads poor seismic performance. Unreinforced masonry (URM) buildings have proven to be vulnerable in seismic events with significant building damage and numbers of fatalities. Conversely, the Building Census Data reveals that the proportion of URM buildings is increasing over the years and calls for a simplified seismic vulnerability assessment method with wide range of variable parameters. The current work attempts to generate fragility curves using probabilistic framework for URM buildings in Indian context, with wide varying range of parameters. The uncertainty related to the strong ground motion parameters and building are considered. The curves were calibrated using data related to the structural characteristics of Indian URM buildings. A validation exercise has been performed to compare the vulnerability curves. The preliminary results showed good agreement with Indian URM buildings. The outcome of the present study has been implemented for a town in high seismic zone to assess the vulnerability of different URM buildings for risk assessment studies.

Keywords: Unreinforced masonry buildings, vulnerability assessment, fragility curves

STRUCTURAL VULNERABILITY USDM64

Development of a Potential Index for Utilization of Vacant Houses Considering Disaster Risk-A Case Study of Hatoyama Town, Saitama Prefecture

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In recent years, Japan has seen a rapid increase in vacant houses due to population decline. The government is actively implementing policies and subsidies to solve this issue and promote the reuse of vacant houses. When utilizing vacant houses, it is essential to consider the characteristics of each region and the preferences of the owners. Therefore, local governments need indicators to determine which vacant houses are suitable for utilizing. However, many houses in Japan were built without adequate planning, placing them near active fault lines or on slopes, resulting in a great number of homes with significant disaster risks. If vacant houses are utilized without considering these risks, there could be severe human and financial consequences in the event of a disaster. In today's context of increasing vacant houses, promoting sustainable utilizing is critical. Prioritizing vacant houses with lower disaster risks and encouraging the long-term use of these properties is crucial. This study focuses on Hatoyama Town in Hiki District, Saitama Prefecture. We conducted a survey of vacant houses to examine their characteristics and developed an index that also considers disaster risks, particularly from earthquakes, to assess the ease of utilizing. As a result, we successfully created an index that local governments can use as a guideline when utilizing vacant houses. Moreover, by considering both the characteristics and disaster risks of these properties, we were able to evaluate how suitable each vacant house is for utilizing. This index will help municipalities make better decisions about the safe and sustainable utilization of vacant houses while minimizing potential disaster risks.

Keywords: Vacant house, disaster risk, Saitama prefecture, slope

STRUCTURAL VULNERABILITY USDM6

DEM study on the stress distribution of muck and foam in the EPB shield chamber

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The Earth Pressure Balance (EPB) shield machine finds extensive application in the urban underground tunnel excavation, primarily owing to its safety, efficiency and minimal environmental impact. But it often faces the problem of uneven mixing of excavated soil and additives in the working chamber, which can block the muck discharge system and hinder machine operation. The incorporation of foam and other additives is common practice to enhance soil fluidity and maintain equilibrium between tunneling face and chamber board. But due to the concealment in the chamber and the dynamic behavior of the mixture, the direct visual observation of the clogging is limited. And the monitoring elements that track stress distribution are often positioned on the edges of the chamber, which limits the ability to detect clogging by traditional monitoring methods. In addition, shield machine operators often rely heavily on their own experience to judge the use of additives, but it is not feasible and cost-effective in different geotechnical conditions. Therefore, this study intends to use the Discrete Element Method (DEM) to investigate the stress distribution of muck and foam in the EPB shield chamber and evaluate the mixing effect. The Particle Flow Code PFC 6.0 commercial software was employed to construct a mixture model of muck and foam and a slump test model to calibrate parameters. The adhesive rolling resistance linear model was used to accurately describe the contact behavior between foam and foam, foam and soil particles. A comprehensive analysis integrating various influencing factors such as foam content, muck properties and shield machine operating parameters was conducted by monitoring the stress distribution, coordination number and the mixing degree during mixing process. The simulation results can provide crucial insights into the mixing mechanism of muck and foam, which are essential for optimizing the operation of EPB shield machine.

Keywords: DEM simulation, EPB shield, muck and foam, PFC

STRUCTURAL VULNERABILITY USDM43

Robustness of Traffic Networks: Analyzing Damage and Recovery Process Against Repeated Disasters

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Disruptions to transportation networks caused by natural disasters occur frequently, making it crucial to evaluate network structures that can maintain functionality and recover quickly during such events. In recent years, delays in the recovery of transportation networks have become more common due to factors such as a shortage of construction workers and the increased frequency of disasters. If the recovery of a disruption takes a long time, the likelihood of new disruptions occurring before the full recovery of the entire network increases. To address such situations, it is necessary to evaluate not only the network's functionality at the time of a disruption but also its recovery process. In contrast, previous studies have proposed various methods for quantitatively evaluating network robustness, such as treating link failures caused by disasters as probabilistic events and evaluating network functionality in terms of topology at the time of the disaster. In addition to topological evaluations, other methods have assessed simultaneous, widespread disruptions while considering the spatial relationships of network paths. However, these models do not consistently address the recovery process, and few examples exist that quantitatively evaluate network robustness by considering both the occurrence of multiple widespread disruptions and the recovery process. Therefore, this study attempts to construct a model that integrates both a model for quantitatively representing the recovery process, including the time required for recovery, and a model for widespread disruption occurrence. Specifically, we assume earthquake disasters in Japan and evaluate the robustness of transportation networks by mathematically describing the recovery process for each disruption, treating the timing and extent of each disruption as probabilistic events. This approach is expected to clarify the characteristics of transportation networks that are resilient to recurring disasters and reveal how the limited disaster response resources in affected regions impact network robustness.

Keywords: robustness, traffic network, recovery process, multiple damages

STRUCTURAL VULNERABILITY USDM47

Detection of Millimeter-Scale Deformations in Jatiluhur Dam Using Persistent Scatterer InSAR (PS-InSAR)

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Jatiluhur Dam, one of Indonesia's oldest and largest concrete-faced earth-filled dams, plays a crucial role in water resource management, flood control, irrigation, aquaculture activities, and hydroelectric power generation. However, like all infrastructure, the dam is subject to risks including potential failures caused by geological activity, natural disasters, design and construction errors, and insufficient maintenance. Periodic and comprehensive monitoring is essential to ensure its long-term stability and functionality. This study aims to enhance the structural health monitoring of Jatiluhur Dam using Interferometric Synthetic Aperture Radar (InSAR) time-series. Persistent Scatterer InSAR (PS-InSAR) techniques were employed using 64 Sentinel-1 SAR images collected between 2019 and 2024 in ascending orbit direction. Persistent Scatterer (PS) candidates were identified by setting a threshold on the Amplitude Stability Index, based on analyzing stable electromagnetic signatures within the interferometric phase. For the selected points, which are characterized by their high phase stability and high temporal coherence, height and displacement were then estimated. Deformation time series were subsequently reconstructed to analyze the temporal evolution of surface movement. We are utilizing Continuously Operating Reference Stations (CORS) GNSS to calculate daily coordinate solutions over a three-year observation period. The validation process will involve comparing the selected PS displacement with GNSS-derived displacements to assess the stability and accuracy of the PS points. This approach allows the detection of millimeter-scale deformations over time, providing insights into displacement trends such as subsidence or uplift. The analysis focuses on examining temporal and spatial deformation patterns to reveal potential structural issues. Significant deformation patterns, especially subsidence in certain areas, are expected to be observed and possibly linked to sediment accumulation and land-use changes. These findings underscore the importance of InSAR in predictive maintenance and the early detection of potential failure risks in dam infrastructure.

Keywords: Infrastructure, Dams, SHM, InSAR, Persistent Scatterer

STRUCTURAL VULNERABILITY USDM81

Out-of-Plane Behaviour of Masonry Wall Strengthen using Textile Reinforcement

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This article presents an experimental study on the out-of-plane behaviour of masonry wall strengthened with textile reinforcement. Unreinforced masonry structures have demonstrated their vulnerability during earthquake due to the absence of box action. The in-plane and out-of-plane behaviour of masonry walls plays a crucial role in ensuring structural integrity. Strengthening existing buildings with external reinforcement can enhance their seismic resistance by improving both the in-plane and out-of-plane performance. This study discusses the use of textiles as reinforcement materials in upgrading the out-of-plan action of masonry walls. Instead of using conventional steel wire mesh, textile grid having different strength is used. This reinforcement has been used externally with proper anchorage and cement plaster. The results of the study indicate that grid reinforcement provides better resistance to applied loads, particularly in terms of bending, and exhibits improved post-peak performance. Geo-grid, a geosynthetic material traditionally used to reinforce soil, was found to be highly effective from an economic standpoint. The experimental results show that the use of geo-grid is very effective in terms of economic aspects, and it significantly improves the inelastic behavior and offers better ductility and energy dissipation.

Keywords: Textile strengthening, geo-grid, masonry wall, out-of-plane behaviour, bending

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- Enhancing quality of plantation crops through efficient production system and good agricultural practices
- Bio-economy and bio-based products with wide range of applications to boost economy
- Development of agricultural mechanization systems and model for a modern, high technology farm production structure
- Development of reliable monitoring and management systems using remote sensing, smart sensors, IoT and Artificial Intelligence
- Bio-sensing and instrumentation on production technologies focusing on harvesting, grading, processing and storage of plantation products
- Development of safer food products from plantation crops using environmmentally friendly technology
- Production of green industrial products using renewabale energy dan industrial microbiology

OUR GOALS

- To conduct fundamental and applied research in upstream and downstream activities of plantation industry
- To produce competitive postgraduate in plantation studies
- To provide consultancy services to the plantation sector
- To provide continuous Professional Development (CPD) to plantation executives
- To commercialize research findings and technology relevant to plantation industry

ADMISSION REQUIREMENT

MASTER BY RESEARCH PROGRAM

The applicant should possess:

- A Bachelor's degree with a minimum CGPA of CGPA 2.750 in a relevant field; *or*
- A Bachelor's degree in a relevant field with CGPA of 2.500-2.749 can be accepted subject to rigorous internal assessment by Faculty/School/Institute; *or*
- A Bachelor's degree or equivalent in a relevant field with CGPA 2.000-2.499 shall have a minimum of 5 years working experience in a relevant field and pass an internal assessment; *or*
- Candidates without relevant qualifications or working experience but meet the minimum CGPA of 2.00 must pass an internal assessment and required to take appropriate prerequisite course(s).

DOCTORAL DEGREE PROGRAM (PhD)

The applicant should possess:

- A Master's degree with research/course work in a relevant field; *or*
- Other equivalent qualifications with a Master's degree recognized by the Malaysian government; *or*
- Candidates without relevant qualifications or working experience must pass an internal assessment and required to take appropriate prerequisite course(s); *or*
- A Bachelor's degree in the field or related fields with first-class or its equivalent and pass an internal assessment.

FIELD OF STUDY

IKP offers both Master and Doctoral degree programme with thesis in the respective fields of study based on the three laboratories:

Laboratory of Sustainable Agronomy and Crop Protection (SACP)

1. Pest Management
2. Plant Pathology
3. Plant Biotechnology
4. Sustainable Plantation Management
5. Agribusiness
6. Agricultural Economics
7. Agricultural Genomics
8. Bioinformatics and System Biology
9. Molecular Biology and Genetic Engineering
10. Molecular Biotechnology

Laboratory of Plantation System Technology and Mechanization (PSTM)

1. Agricultural Mechanization and Automation
2. Agricultural Process Engineering
3. Agricultural Technology
4. Plantation Technology
5. Smart Farming Technology

Laboratory of Processing and Product Development (PPD)

1. Chemical Engineering
2. Green Engineering
3. Energy
4. Catalysis
5. Environmental Biotechnology
6. Industrial Biotechnology
7. Microbial Biotechnology
8. Microbiology

INDUSTRY LINKAGES

- Malaysian Palm Oil Board (MPOB)
- Malaysian Rubber Board (MRB)
- Rubber Industry Smallholders Development Authority (RISDA)
- Sime Darby Plantation Berhad (SDPB)
- FGV R&D Sdn. Bhd.
- IBG Manufacturing Sdn. Bhd.
- Top Fruits Sdn. Bhd.
- MYEDU Training Centre
- Nutrition Technologies Sdn. Bhd.
- Wilmar-Agrifert Marketing Sdn. Bhd.
- Advanced Agriecological Research Sdn. Bhd.

For further details on Postgraduate Programmes at IKP and information regarding available financial assistance, please contact

Postgraduate Unit
Institute of Plantation Studies
Universti Putra Malaysia
43400 UPM Serdang, Selangor

603-9769 4260

ikp.upm.edu.my

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