International Conference on Natural Science and Engineering

ICNSE 2024

Fostering Science, Technology and Innovation for Sustainable Development in Lao PDR and Beyond

Available online

Abstract Book

November 4-6, 2024
Faculty of Engineering, National University of Laos

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Keynote Speakers

Prof. ABE Naoya

Professor, School of Environment and Society
Institute of Science Tokyo

Topic:

Fostering Science, Technology, and Innovation for Sustainable Development in Lao PDR and Beyond

Keynote Speakers

Vannapha PHOMMATHANSY

Deputy Director General, Digital Government Center
Ministry of Telecommunication and Information Technology

Topic:

Lao digital Transformation: Policy Outlook

The presentation outlines the Lao PDR's comprehensive approach to digital transformation across government services, economic sectors, and society. It introduces the nation's Digital Transformation Plan, which operates on three main pillars: Digital Government, Digital Economy, and Digital Society. Emphasizing streamlined government administration, improved public services, and data interoperability, the plan includes measures like establishing a national committee for oversight and fostering public-private collaboration.

Key highlights include digital infrastructure development, legal reforms, and platforms to support e-governance, such as e-Office, digital identity, and data exchange systems. The strategy also prioritizes digital inclusion, cybersecurity, and sustainable development. By leveraging digital technologies, Lao PDR aims to enhance economic productivity, improve governance, and cultivate a digitally skilled society.

Biography:

Vannapha has been with the Ministry of Technology and Communications since 2014, and she is currently Deputy Director General of the Digital government Center, where she oversees digital government policy, standards, coordination, and management division. Her current project focuses on the formalization of the Digital Government Strategic Plan 2035, drafting Decree on digital transformation, she is secretariats to Lao National digital transformation committee led by Prime Minister of Laos , her works also involve in designing the digital government roadmap based on whole government approach and serving as the Lao focal point for the ASEAN Digital Data Governance Working Group. Prior to this position, in 2009 she worked as a core network manager for Millicom Laos (Tigo) and invited lecturer at the national university of Lao - Engineering Faculty. In 2014, she began working with the department of telecommunications (MPT) on WTO Lao entry (on telecommunications). She was appointed as the national focal person for the ASEAN Digital Minister Sectoral Body (Director of ASEAN and Regional Cooperation) in 2016 and serves in that capacity until 2022.

On education profile: Vannapha is a Fulbright scholar who completed her postgraduate studies in 2013 at the University of Illinois at Chicago, USA, with MSc. Electrical and Computer Engineering.

Keynote Speakers

Assoc. Prof. Dr. Khampaseuth THEPVONGSA

Vice Dean, Faculty of Engineering.
National University of Laos

Topic:
Strategy plan for research and industrial cooperation at faculty of engineering, National University of Laos 2025-2030

The Faculty of Engineering at the National University of Laos (NUOL) plays a pivotal role in advancing science, technology, and innovation to support sustainable development in Lao PDR. As Laos aspires to build a knowledge-based economy, our faculty has undertaken strategic initiatives that align with national priorities, aiming to address critical socio-economic challenges through education, research, and industry collaboration. This presentation outlines our strategic plan for 2025-2030, which focuses on enhancing research excellence, strengthening industrial partnerships, and fostering innovation among students and faculty members.

Our approach emphasizes developing research clusters in key areas such as sustainable infrastructure, renewable energy, smart industry practices, and advanced technology. By building capacity in these emerging fields and securing sustainable funding sources, we seek to bridge the skills gap, drive technological advancements, and produce graduates who are equipped to lead in both local and regional contexts. Furthermore, collaboration with industry and government is essential to translate academic research into practical solutions that address real-world challenges.

This strategic vision not only positions NUOL as a catalyst for innovation within Laos but also enhances its role in regional scientific and technological development. By fostering a collaborative ecosystem for science, technology, and innovation, we aim to unlock Laos's potential, driving sustainable progress and positioning our country as a leader in the region. Our graduates will emerge as skilled, innovative problem-solvers, ready to tackle complex challenges and contribute to a brighter, sustainable future for Laos and beyond.

Biography

Dr. Khampaseuth Thepvongsa is an accomplished professional in the field of civil engineering and architecture. His educational background includes a Bachelor's degree in Civil Engineering from the National University of Laos, a Master's degree, and a Doctorate degree in Civil & Structural Engineering from Kyushu University in Japan. His academic journey began with a strong foundation at the National University of Laos, where he graduated with first-class honors.

Dr. Thepvongsa's career in academia has been impressive, serving as a lecturer and the head of the Civil Engineering Department at the Faculty of Engineering, National University of Laos since 2005. His commitment to teaching and his dedication to the field are evident in his role as an Associate Professor leading a Research Group on Sustainable Infrastructure Planing and Design (SIPD-Lab) and Vice-dean at the Faculty of Engineering.

Beyond his academic pursuits, Dr. Thepvongsa is one of the Co-founders and senior adviser of Archineer Associates Co., Ltd., a leading consulting firm in Lao PDR, specializing in architecture, urban planning, infrastructure, and hydropower projects. His consultancy services have been sought after for various government, local, and international projects, highlighting his expertise and knowledge in the field.

Dr. Thepvongsa is actively involved in professional associations and organizations. Holding positions such as President of the Lao Association on Dams and Vice President of the Association of Lao Architects and Civil Engineers showcases his leadership and commitment to the industry. Additionally, his recognition as a Fellow of the ASEAN Academy of Engineering & Technology, a Fellow of The Academy of Engineering and Technology of the Developing World (AETDEW) and membership in the ASEAN Chartered Professional Engineer further exemplify his stature in the profession.

Throughout his career, Dr. Thepvongsa has been acknowledged for his outstanding contributions. Certificates of appreciation from institutions and governments, both within Laos and ASEAN, reflect the value of his work and his impact on the industry.

Dr. Thepvongsa's research and publications add further weight to his expertise. Covering various topics such as pavement roughness, water distribution network analysis, stability analysis of dams, bridge behavior, self-compacting concrete, and wind loads on structure, bamboo as sustainable structure materials, his research papers have been published in reputable journals and presented at international conferences.

Agenda

ICNSE 2024 Session

Faculty of Engineering (Sokpaluang Campus)
DAY-1 (5th of November 2024)

13:00-13:30	**Registration**	
13:30-13:40	**Brief Explanation of the Conference**	
13:40-13:45	**Make the Opening Remarks**	**Assoc. Prof. Dr. Dexanourath SENEDUANGDETH** Acting President, National University of Laos
13:45-14:15	**Invited Talk 1:** Fostering Science, Technology, and Innovation for Sustainable Development in Lao PDR and Beyond	**Prof. ABE Naoya** Institute of Science Tokyo
14:15-14:45	**Invited Talk 2:** Strategy Plan for Lao Digital Transformation	**Ms. Vannapha Phommathansy** Deputy Director General, Digital Government Cnter, Ministry of Technology and Communications, Lao PDR
14:45-15:15	**Invited Talk 3:** Strategy Plan for Research of FEN	**Assoc. Prof. Dr. Khampaseuth THEPVONGSA** Vice Dean, Faculty of Engineering, National University of Laos
15:15-15:45	**Q & A + Panel Discussion**	
15:45-16:00	**Group photo and closing remark for day 1**	

ICNSE 2024 Presentation session
Faculty of Engineering (Sokpaluang Campus)
DAY-2 AM (6th of November 2024)

08:30 – 09:00	**Registration**	
09:00 – 12:00	**Parallel Presentation Session**	**Location:**
	Group 1:	
	- Key theme 1: Sustainable Infrastructure Development	LAB 1&2, IT department
	Group 2:	
	- Key theme 2: Renewable Energy and Energy Efficiency - Key theme 4: Advanced Materials and Manufacturing	LAB 3&4, IT department
	Group 3:	
	- Key theme 3: Climate Change and Environmental Sustainability	A308, ET department
	Group 4:	
	- Key theme 5: Smart Technology and Digital Transformation - Key theme 6: Science, Technology, Engineering, and Mathematics (STEM) Education	Conference Room, IT department

ICNSE 2024 Roundtable Discussion and Workshop Session
Faculty of Engineering (Sokpaluang Campus)
DAY-2 PM (6th of November 2024)

13:30-16:00	**Parallel Session no. 1** Roundtable report outcomes of discussions and research, future plan. By: all chairman and moderator from faculty of engineering.	**Location:** Conference Room, IT department
	Parallel Session no. 2 Lao-CCG Workshop on Introduction to CCG Tools and Basic of Energy Engineering. By: CCG Committee	A308, ET department
16:00-16:10	**Closing Remarks/Dean, Faculty of Engineering**	A308, ET department

Abstracts key theme 1: Sustainable Infrastructure Development

ID05	A Potential Development on Laos-Thailand Border Checkpoints
ID06	A Study on the Logistics and Multimodal Transportation System Connecting Lao PDR and Neighboring Countries Under the "Belt and Road Initiative: BRI" Strategy
ID12	Stability Analysis of Earth-Filled Dam in Emergency Overflow Conditions: Case Study of Houy Lamphan Downstream Hydropower Dam, Lao PDR
ID13	Testing and Evaluation of Existing Bridge Strengthening by Steel Truss
ID21	improvement of Sub base materials with a California Bearing Ratio (CBR) lower than 25% by mixing the lime stone powder (CaCo3)
ID22	Feasibility study to use crushing stone filler instead of sand for low strength concrete
ID23	Predicting soaked and un soaked California Bearing Ratio Using Simple and Multiple Linear Regression Model Base on soil index properties
ID26	The Settlement Analysis of NT1HPP Roller Compacted Concrete Dam
ID34	The Properties of Geopolymer Lightweight Cellular Concrete Using Fly Ash from Hongsa Power Plant
ID36	The construction management difference between Laos and China: the three dimensions model of Glonda and mobile accounting

Paper ID: ID05

A Study of Potential Development on Laos-Thailand Border Checkpoints

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Abstract

This Reach of factors in the development of warehouses To accommodate goods between borders PDR. he And Thailand is a case study of all borders To study factors in the development of warehouses To support trade between Laos and Thailand In the area where all men walk To study the way of development And Improve operational efficiency in warehouses to support cross - border trade between Laos and Thailand in the border area Find a way to propose a development model And Improve the operational efficiency of warehouses in border areas for units And Related parties.

The purpose of this study is to develop and improve efficiency Warehouse to increase the support of goods between Laos - Thailand border by introducing the form of warehouse management And The use of technology in the management of work To manage and manage the space used to store goods efficiently by employees who can know their positions And each type of merchandise correctly Including giving priority to moving goods in and out to ensure safety within the warehouse.

Paper ID: ID06

A Study on the Logistics and Multimodal Transportation Systems Connecting Lao PDR and Member Countries Under the "Belt and Road Initiative: BRI" Strategy

Anousone OUTHAILATSADY

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Abstract
This research has two objectives: 1) to study the current operating model and demand for multimodal transport on routes that can connect Lao PDR and member countries under the strategy "Belt and Road Initiative: BRI" and 2) to suggest strategies for developing logistics systems to support multimodal transport on routes that can connect Lao PDR and member countries under the strategy "Belt and Road Initiative: BRI". The operation is divided into 7 main steps consisting of 1) reviewing relevant literature and theory, 2) collecting data and in-depth interviews, 3) analyzing logistics linkages, 4) analyzing cause and effect maps, 5) recommending development strategies logistics system 6) organizing seminars to listen to opinions and 7) summarizing research results and recommendations. The study found that future freight and passenger transport in Lao PDR can be linked to China through rail transport infrastructure under the strategy "Belt and Road Initiative: BRI". Using the route of the Laos-China railway project as a result, operators and passengers will have more opportunities to switch modes of transportation and travel from road to rail. However, Lao PDR's land transportation is currently unable to travel to member countries on the New Eurasian Economic Corridor under the strategy "Belt and Road Initiative: BRI" which consists of Kazakhstan, Russia, Belarus, Poland, Germany and the Netherlands. Therefore, Lao PDR should improve its logistics operations plan to be suitable for multimodal transport on routes that can connect Lao PDR and member countries under the strategy "Belt and Road Initiative: BRI". In addition, logistics infrastructure and technology should be developed and supported to increase operational efficiency. This will reduce transportation costs for operators and support Lao PDR to compete effectively with other countries.

Paper ID: ID12

Stability Analysis of Earth-Filled Dam in Emergency Overflow Conditions: Case Study of Houy Lamphan Downstream Hydropower Dam, Lao PDR

K. Thepvongsa[1], A. Manivong[2], A. Dethphachanh[3], S. Simixay[4], P. Yaovalath[5]

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Abstract
The Houy Lamphan Hydropower Dam, an earth-filled structure in Xekong Province, Lao PDR, is a critical infrastructure asset that provides hydropower, flood control, and water storage. However, it faces significant stability challenges due to increasing extreme weather events, such as prolonged heavy rainfall and rapid drawdown, exacerbated by climate change. This study investigates the dam's stability under emergency overflow conditions, focusing on the downstream and upstream slopes' response to intense rainfall and rapid water level changes. Using the Finite Element Method (FEM) and PLAXIS 2D software, we modeled three scenarios: baseline (normal conditions), emergency overflow (extreme rainfall), and rapid drawdown. Geotechnical and hydrological data, including soil cohesion, internal friction angle, and permeability, informed the modeling of pore pressure, effective stress, and potential failure mechanisms.

The results showed that in all conditions, the dam maintained very low Factor of Safety (FoS), indicating there is inaccuracy on somewhere. We assume the blunders occur from uncertain material parameters and insufficiently clear on dam materials. However, the range of FoS is only 1.07 to 1.05 with displacements reaching up to 3 mm near the crest on rapid drawdown scenario, suggesting shallow slip potential. These findings emphasize the need for adaptive management strategies to systematically gather pertinent data to facilitate rigorous analysis for doing a re-examination and specify potential failure mechanism.

Keywords
Earth-filled dam, emergency overflow, slope stability, rapid drawdown,
Houy Lamphan Hydropower Dam, FEM, climate resilience, pore water pressure,
Factor of Safety.

Paper ID: ID13

Testing and Evaluation of Existing Bridge Strengthening by Steel Truss

D. Dounsuvanh[1], P. Mounnalath[2], K. Ounmany[3], T. Maungkhod[4]

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Abstract
At the present time, there are many mega projects that have been popularly constructed in Laos such as Mining, Hydropower Dam Projects, wind power, etc. Which these projects require to transportation heavy equipment crossing many existing old bridges along national roads. However, most of bridges are old, low design loading, moreover there are damage by over loading and environment. Therefore, bridge inspection and maintenances are very important to prevent successive damage and collapse to bridge structure. This study in Testing and Evaluation of Existing Bridge along national road No.9, with selected Xechanphone Bridge to be case study. The bridge is steel I-Girders bridge, consists of 4 spans with total length is 100m. The maximum span is the first span with 31m in span length, and this span has strengthening by steel truss to be additional support of two I-girders for improve bridge capacity. In this testing, the two steel strain gages have been attached at bottom I-Girder, and other two steel strain gages on truss members to measure strain occurring at both structures. The actual loading testing is using twelve wheels truck with known loading for testing the bridge in two cases, statics and dynamic cases to observe loading proportion to I-Girders, and Steel truss. After that the testing ting case are also compare to analytical model. The result shown that in the static case I-girder carry the load 56.3%, steel truss 43.7%, and in dynamics case I-girder carry the load 57.7%, steel truss 42.3%. From this study it is evident that steel truss can strengthening carrying the apply load up 42.3%.

Keywords
Truckload, bridge, Strain, Bridge strengthening.

Paper ID: ID21

Improvement of the Sub-Base Material with a CBR Lower than 25% by Mixing the Lime Stone Powder (CaCo3)

VERNSONE PHENGSOULITH[1], KHAMSEUM SOURIYAMATH[1], PHOUTHONE SAIYASENH[1], ART MALAVONG[1]

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Abstract
Sub base is the layer of aggregate material laid on the subgrade, on which the base course layer is located. It may be omitted when there will be only foot traffic on the pavement, but it is necessary for surfaces used by vehicles. The sub base material shall consist of hard durable particles or fragments of granular aggregates. Sub base mobilization by using limestone (CaCO3) is intended to determine the change of the bearing capacity of the soil as California Bearing Ration (CBR) with a mixture of lime. Soil behavior is strongly influenced by the moisture or water content. According the requirements of pavement design, CBR of sub base materials must be greater than 25 to support the load from traffic vehicles that's the reason it is really rare to be able to find from natural borrow pits to meet the requirements. ASTM standard was applied for lab activities. The results found that the plastic index (PI) was decreased and influenced to the increasing of CBR by amount of lime powder adding. From lab result shown that the PI of soil sample is 15% and CBR is 10, 12 and 14% at 95%, 98% and 100% of maximum dry density (OMC=14.2%; MDD=1.806kg/cm2) respectively. To meet the requirements of Sub Base material, lime was added (5%, 10% and 20%) to minimize the PI and strengthening the bearing capacity and found that the PI was decreased to 13%, 9% and 9% while CBR value were increased to 13, 16 and 18% when compacted at 95%, 98% and 100% of MDD respectively. The PI was continuously reduced to 9% when 10% of lime was added and CBR were increased to 20, 24 and 27% when compacted at 95%, 98% and 100% of MDD respectively. 20% of lime was applied and influenced the PI decreased to 9% and increased the CBR to 40, 51 and 59% when compacted at 95%, 98% and 100% of MDD respectively. From the result of the research adding from 10% of lime powder was near accountable to the requirements of sub base material from this sample.

Keywords
Soil Modification, Sub Base Course, lime powder, Water Content, Plastic Index, California Bearing Ratio

Paper ID: ID22

Feasibility Study to Use Crushing Stone Filler Instead of Sand in Low Strength Concrete

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Abstract
Concrete is one of main materials for construction industries especially in construction of road, bridge, housing, irrigation, tunnel, terminal, airport, port, retaining wall and other civil works. The main components of concrete includes cement, sand, stone (gravel) and water while in the northern region of Laos is really lack of sand and costly to transport of milestone through mountainous road in the north. Sand resources in Oudomxay province is mostly imported from Pakbeng district (150km to central of the province) to support the construction industry in the province and waste more cost. However, Oudomxay province is plenty of stone resources and there are many crushing stone plants in the vicinity the town and many amount of crushed stone filler wasting around the crushing plants This research was focused concrete mixed design without fine aggregate or sand by using those crushing stones in 3 plants named 1) Angnumhin pit located 6km away from city, B. Konkane Pit, 18km away from city along with National Road No. 2W and Mueang Lha Pit, 11km from city along with National Road No. 2E to possibly mix the low strength concrete for specific purposes of construction. From the results shown that the general properties of filler is accountable to be mixed in low strength concrete (<25MPa) while cleaning was required where the high dust remaining. Filler from B. Konkane Pit is the best from 3 sampled sources in this study to use filler instead of sand to mix the low strength concrete.

Keywords
Construction Material, Concrete, Compressive Strength, Concrete Mix Design.

Paper ID: ID23

Predicting Soaked and Unsoaked California Bearing Ratios Using Simple and Multiple Linear Regression Models Based on Soil Index Properties

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Abstract
Subgrade soil is essential for the design of road structures, whether they are flexible or rigid pavements. As the foundational layer, it supports the weight of the road and the axial loads from vehicles that are considered in the design process. Additionally, a crucial aspect of road design is the investigation of subgrade soil properties. This includes sieve size analysis (% passing through the No. 200 sieve), liquid limit (LL), plastic limit (PL), plasticity index (PI), optimum moisture content (OMC), maximum dry density (MDD), and California Bearing Ratio (CBR). As we know, conducting laboratory experiments to determine subgrade soil properties is time-consuming and costly, particularly when assessing the California Bearing Ratio (CBR) value. This study aims to develop correlation formulas between soil index properties and both soaked (CBRS) and unsoaked (CBRUS), as well as the correlation between CBRS and CBRUS at 95% of MDD, using simple and multiple linear regression analysis models (SLRA and MLRA). The results indicate that, after soaking for four days at 95% of maximum dry density (MDD), the subgrade soil exhibits good to excellent properties, with CBR values ranging from 7% to 20%. In contrast, the other case shows CBR values ranging from 17% to 32%. Furthermore, the results of the simple and multiple linear regression models show strong correlations between index properties and both soaked (CBRS) and unsoaked (CBRUS) values at 95% of MDD. The correlation coefficients (R^2) range from 0.71 to 0.919 for SLRA and from 0.820 to 0.936 for MLRA, indicating good to excellent correlation.

Keywords
Subgrade soils, regression analysis models, SLRA, MLRA, CBRS, CBR_{US}.

Paper ID: ID26

The Settlement Analysis of NT1 HPP Roller Compacted Concrete Dam

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Abstract
This paper presents the analysis of the settlement of roller compacted concrete dam for Nam Theun 1, Nam Theun 1 main dam is constructed by roller compacted concrete which built for each block, and based on monitoring for 2 years after the first impounding, block 16 located in the middle of the dam has more settlement than other block. The assumption was drawn that because of the 1st layer under block 16 is the soil (clay and sand). Then this paper will analyse the value of settlement each year and prediction using the properties of soil. The properties of the rock in pre-construction to be used in this study are the elastic modulus (E), Poisson's ratio (ν), unit weight (γ). The calculation is based on the static elastic settlement method considering layer of properties of soil and rock at the only middle of the dam. Forces affecting settlement include both vertical and a bit of horizontal, this paper will focus on vertical only. The period of prediction of the settlement in this study is 100 years from the 1st year of operation to the 100th year. Results show that settlement occurs immediately after construction is completed because the foundation of the dam is located on rock with a relatively low modulus of elasticity, the rock with this property is often easily compressed when the weight of the dam is forced. The maximum settlement value is predicted as 1.38 m for 100 years and the actual settlement value obtained from the measurement with the instrument installed in the dam site showed the closed value to the analysis results which corresponds to the accuracy of the calculation of the settlement of the dam.

Keywords
elastic, prediction, vertical force, behaviour, concrete property

Paper ID: ID34

The Properties of Geopolymer Lightweight Cellular Concrete Using Fly Ash from Hongsa Power Plant

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Abstract
This study investigates the properties of geopolymer lightweight cellular concrete (GLCC) utilizing class F fly ash sourced from the Hongsa Power Plant in Laos. The research highlights currently, lightweight geopolymer cellular lightweight concrete are gaining more attention in the construction industry worldwide because of their environmentally friendly properties and ability to reduce greenhouse gas emissions compared to conventional concrete. In addition, the development of production technology and the use of recycled waste materials have also increased the efficiency and reduced the cost of producing this type of concrete. Two mix proportions, 1:1 and 2:1, were evaluated, focusing on compressive strength, density, and water absorption over 14 and 28 days of curing. According to Thai standards, GLCC shall achieve a compressive strength of 5 MPa at 28 days, with a density of 1400 kg/m³ and a water absorption rate of 23%, the study results showed that, the average weight of blocks with a total density of 1250 kg/m³ which is lighter than standard and the absorption of water is only 9.6%. Results indicated that GLCC exhibited promising properties, including lower density and water absorption compared to traditional concrete while also providing sound insulation and fire resistance. Recommendations for optimizing curing techniques and enhancing material properties for future applications in construction are discussed to further reduce reliance on conventional cement.

Keywords
Geopolymer, Lightweight, cellular, concrete, Mix design, Fly ash, Alkaline solution, Compressive strength

Paper ID: ID36

The construction management difference between Laos and China: the three dimensions model of Glonda and mobile accounting

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Abstract
This study introduces the integration of mobile Internet finance with cost accounting systems introduces a transformative approach to financial management and cost transparency in project management. This study explores the application of mobile Internet finance in a small-scale project to enhance financial accessibility and efficiency for business owners, project managers, and partners. By enabling real-time access to profit and loss statements, detailed accounting entries, and cost verification through mobile devices, mobile finance bridges the gap between financial data and operational decision-making. Additionally, it supports transparent financial practices crucial for collaborative partnerships. Despite its potential, the adoption of mobile Internet finance among private enterprises remains minimal, with less than 1% of surveyed firms implementing this technology, as most rely on traditional PC-based systems.

The research further emphasizes the direct and indirect benefits of mobile finance, such as timely bookkeeping and improved communication between executives and accounting staff. Moreover, mobile finance fosters better integration of cost and financial accounting, facilitating performance-based project incentives that are more challenging to implement with PC-based systems. A detailed setup of financial subjects, such as material costs for rebar and other essential components, provides project managers with accurate, real-time monitoring of resources, allowing discrepancies to be swiftly addressed.

The study concludes that mobile Internet finance enables a comprehensive view of project expenses, labor costs, and subcontracting arrangements, offering valuable insights into project profitability and operational efficiency. By simplifying data accessibility and fostering transparency, mobile finance provides a scalable solution that enhances cost management practices and supports sustainable growth in project-based industries.

Keywords
Construction management, Mobile accounting, Real-time access.

Abstracts key theme 2: Renewable Energy and Energy Efficiency

ID01	A Smart Lighting System in a Corridor for Effectively Energy Efficiency
ID02	Design and Modeling the Energy Consumption Monitoring of the Irrigation Pumping Controller by Using IOT
ID17	Study the utilization of biochar derived from sugarcane waste combined with zero valent iron to enhance the biogas efficiency during the anaerobic digestion process for treating pig farm wastewater
ID18	Bioethanol production from spoilage rice
ID35	Energy Increase through regulated Hybrid Production – Case study of Namkhan 3 Hydropower Plant

Paper ID: ID01

A Smart Lighting System in a Corridor for Effectively Energy Efficiency

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Abstract
Building, walkways and some specific places need an efficient lighting system especially for humankind safety at night. On the other hand, there is a need of energy management with efficient lighting systems while in conjunction with lighting standards. In this case, the implemented smart lighting system is designed for working both automatically and non-automatically. In automatic mode, the system is processed by a Microcontroller Unit (MCU) that receives signals from light sensors and PIR sensors, then sends commands to control the brightness of the dimmable LED. In addition, to prove the management of energy consumption, the research includes a comparison of the energy consumption between the existing lighting system and the smart lighting system.

Keywords
Lighting in a corridor, smart lighting system, energy efficiency, energy conservation.

Paper ID: ID02

Design and Modeling the Energy Consumption Monitoring of the Irrigation Pumping Controller by Using IOT

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Abstract
This study intends to use an Internet of Things (IoT) system to monitor the energy consumption of the irrigation pumping system. In this project, the Node MCU Esp8266 D1 Mini board was programmed using Arduino software. After then, data collection and monitoring are done via the application Blynk. The project is used to track voltage, current, power and energy consumption of the irrigation pumping. This tool will transmit current, voltage, and wattage data to the database, where it will be converted to kWh. This system uses a smartphone or computer to regulate the irrigation pumping system's ON and OFF settings within a specific range. Two modes are used to analyze the system's performance: auto, and manual modes. Based on the overall test findings, the system may be classified as performing well, making it practical to deploy in the farmer for savings in the usage of power.

Keywords
Irrigation Pumping, Energy Consumption, Internet of Things, Smart phone, Application Blynk.

Paper ID: ID17

Study the utilization of biochar derived from sugarcane waste combined with zero valent iron to enhance the biogas efficiency during the anaerobic digestion process for treating pig farm wastewater

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Abstract
This project aims to study the use of biochar (Biochar, BC) from sugarcane trash through the pyrolysis process at different temperatures of 300℃, 400℃, 500℃, 600℃ and 700℃. Then add BC and zero iron (nZVI) in different proportions to the Anaerobic Digestion (AD) system of wastewater from pig farms, then analyze the characteristics of wastewater and the amount of biogas obtained before and after treatment and to study the characteristics of decomposition, biogas formation, and the reduction of organic matter in wastewater (COD).

From this experiment, it can be concluded that all 6 systems are generating biogas, such as: the normal system and the system with BC filling at different burning temperatures: 300℃, 400℃, 500℃, 600℃ and 700℃ in the amount of 0.4g into the system. .64%, 46.13%, 51.90% and 65.98% respectively. From the experiments of all systems, it is observed that the system filled with BC at a temperature of 700℃ is able to produce biogas the best because the high burning temperature will cause the electrons of the charcoal to break up easily and cause more pores to become a habitat for microbes, so that microbes can grow well. A comparison of the conventional system and adding biochar with the same amount but different temperature into the airless sewage treatment system can be concluded that the conventional system is the generation of biogas is still low efficiency and the BC filling system at the temperature of 300℃, 400℃, 500℃, 600℃ in the same amount. Notice that the generation of biogas is higher in order and the filling of BC at the temperature of 700℃ is able to produce biogas higher than other systems. So then take this system to the next stage of testing with the following conclusions: The experiment is to introduce a system with biochar filling at a temperature of 700℃ together with steel containing zero. There will be 3 systems in total. There will be 3 systems that will have biochar filling in different amounts: 0.2g:0.2g, 0.4g:0.2g, 0.5g:0.5g and the normal system to compare the efficiency of biogas production or COD removal from pig farm sewage. This experiment can conclude that the system filled with bio charcoal and nZVI 0.2g:0.2g can remove COD by 93.54%, the system filled with bio charcoal and nZVI 0.4g:0.2g can remove COD up to 97.56%, the system filled with biological base and nZVI 0.5g:0.5g is able to remove COD 95.52% and the conventional system without biochar and nZVI is removed COD by 58.24%. each system is run for 48 hours.

Keywords
Biochar, Sugarcane trash, Piggery wastewater, Biogas and Anaerobic digestion.

Paper ID: ID18

Bioethanol Production from Spoilage rice

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Abstract
Biofuels are currently one of the alternatives to fossil fuels. Generally, fermentation is a bio-chemical process that decomposes biological materials. During this biochemical, sugar compounds such as sucrose, fructose, glucose and lactose are converted into the ethyl ethanol (ethanol) and carbon dioxide (CO2) as by-product of fermentation. In this study, spoilage rice is identified as one of the agricultural products affected by disasters such as floods. Spoilage rice is used as a source of sugar in the production of ethyl alcohol (Ethanol). The raw material of spoilage rice is treated with sulfuric acid to accelerate the hydrolysis reaction of the spoilage rice under heat and reflux by using three different concentrations of sulfuric acid: 6%, 8% and 10% by volume respectively. The ethanol fermentation reaction is conducted in batch mode using Saccharomyces cerevisiae yeast. The bioethanol produced can be further purified through a fractional distillation process. The results of the experiment indicate that the hydrolysis of rice seeds using 6 percent concentrated sulfuric acid yields as the following: the pH is measured at 5, the concentrate of reducing sugars is 0.14±0.04mg/mL, and the residual sulfur dioxide (SO2) is recorded at 1.85±0.21 mg/L. Additionally, the concentration of the solution is determined to be 81 percent at a temperature of 20°C.

Keywords
Spoilage rice, Hydrolysis, Reducing sugar and Bioethanol.

Paper ID: ID35

Energy Increase through regulated Hybrid Production – Case study of Namkhan 3 Hydropower Plant

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Abstract
The power production in Laos is merely depicted by hydropower plants with and without storage capacity namely reservoir and runoff river types. Moreover, some of the power plants are cascaded. That is, the outflow or discharge of the upper plants is used by the lower ones. Nevertheless, the yearly demands cannot be made particularly during the dry season. Through the combination of hydropower plants and variable renewable energy (VRE) e.g. PV power plants (hybrid), the production can meet the demands while maintaining grid stability. That is, while deploying PV power plants the inflow and discharge of the hydropower plants can be regulated to meet demands in a more effective and timely manner. This study will consider the use of solar power to improve the power generation of hydropower dams for better efficiency by considering the time allocation of solar power to help improve the power generation of hydropower dams. In the study, a total of 4 events and 12 sub-cases were considered.

In the 1st, 2nd and 3rd events the electric energy obtained from PV power, Nam Khan 3 hydropower plant considering the designed, the actual inflow in 2021 and 2018 respectively. In each event, 3 case studies are assumed: 1) All of the electricity being produced can be supplied to EDL grid, 2) Not all of the electricity being produced can be supplied to EDL grid and 3) The amount of water being saved by the reduced electricity production can be allocated for later uses. (The amount of water saved by reducing the production capacity from July to October is used during the period November – June). The 4th event considers adding 2 more small generators to the hydropower plant in addition to 2 existing larger units. For this event, only two first case studies being conducted in the first 3 events are considered.

From the study of the 1st event and all 3 cases, it was observed that there is an increase of energy when comparing the hydropower production to that of the hybrid (hydro and PV) one namely from 247.72 to 332.09 GWh or 34%, 306.86 GWh or 24% and 313.24 GWh or 26% respectively. The study results of the 2nd event in all 3 cases indicate also a rise from 141.94 to 226.30 GWh or 59%, 201.07 GWh or 42% and 205.27 GWh or 45% respectively. A similar increase trend in energy production can also be found in all cases of the 3rd event study namely from 159.02 to 243.38 GWh or 53%, 234.57 GWh or 48% and 312.24 GWh or 96% respectively. In the 4th event study, the first case performs slightly better while the second case experiences less production than the 3rd event. That is, there is an increase from 159.02 to 246.567 GWh or 55% and 219.85 GWh or 38% respectively. In all, the first and third case of the 1st, 2nd and 3rd events can yield better energy production.

Keywords
Variable Renewable Energy, Regulated inflow/discharge, Hybrid production

Abstracts key theme 3: Climate Change and Environmental Sustainability

Paper ID: ID08

Study on the Process of Coconut Shell, Bamboo and Mixed Charcoal Briquettes

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Abstract
The application of biomass waste to produce energy is an alternative to dispose of wastes and also prevent the environment, charcoal briquette is an important energy and possible choice to practice in households, restaurants, markets and other cooking activities, because, it is very easy and suitable to use. The objective of this study is to investigate on calorific value of charcoal briquettes in various different material. Thus, according to the experiments found that, the calorific value results of coconut shell briquettes (CBr1), bamboo charcoal briquette (CBr2), mixed charcoal briquette (CBr3) are 6,682 MJ/kg, 4,880MJ/kg and 5,433 MJ/kg, and remaining ashes are 77 g, 100 g and 250 g, respectively. Apparently, the coconut shell briquette is more preferable and less remaining ashes on environment than other materials.

Keywords
bamboo, coconut shell, calorific value

Paper ID: ID19

Removal of Lead from Synthesized Aqueous Solutions Using Bioadsorbents Derived from Anagricultural Waste

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Abstract
Lead contamination in aqueous systems poses significant environmental and health risks, necessitating effective remediation strategies. This study evaluates the efficacy of bioadsorbents from locally agricultural waste in Laos, specifically comparing banana peels and cassava rhizomes for lead removal. Batch adsorption experiments assessed the impact of contact time and pH solution on lead ion (Pb^{2+}) removal, with an initial lead concentration of 2.5 mg/L. Optimal conditions were identified as 120 minutes contact time and a pH of 9, yielding removal efficiencies of 96.92% for banana peel and 92.64% for cassava rhizome. Adsorption data fitted the Langmuir model, indicating monolayer adsorption. Quantitative analysis showed banana peel had a higher adsorption capacity (0.11083 mg/g) compared to cassava rhizome (0.1022 mg/g). These results highlight the potential of using wastes as cost-effective and eco-friendly materials for lead remediation.

Keywords
Bioadsorbents, Banana peel, Cassava rhizome, Lead removal, Adsorption, Langmuir model, Low-cost, Eco-friendly materials.

Paper ID: ID28

Personal Exposure of $PM_{2.5}$ and PM_1 among University Students and Researchers in Bangkok, Thailand by Using Low-cost Sensor

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Abstract
The exposure and detrimental effects of particulate matters in individual level can vary depending on both the duration of exposure and source characteristics. Low-cost sensing devices provide close-to-reality exposure concentration, and detail information for the variation in individual level. The study aimed to characterize the concentration of $PM_{2.5}$ and PM_1 personal exposure among university students and researchers in Bangkok. Seven non-smoking post-graduate students and researchers participated in the study. Low-cost sensing device (AS-LUNG-P) that calibrated with reference-grade monitor (Grimm 1.109) applied to measure for 48 hours continuously including both working days and weekends in May and June, 2024. Sociodemographic conditions and time-activity diaries were collected by using google forms. There were 5 males and 2 females participated, average age and BMI were 34 years (28-44 years) and 22.83 (17.7-26) respectively. Significant variation occurred with ambient concentration, and depending on different microenvironments, ventilation statuses, activities and sources. The participants spend their time mostly in residential and work indoor. Indoor dust, vehicle emissions and outdoor dusts were the sources that mostly encountered. The mean concentration for $PM_{2.5}$ and PM_1 for all participants in 48-hours monitoring period were 10.9 (±28.17) $\mu g/m^3$ and 6.82 (±14.24) $\mu g/m^3$, meanwhile the maximum concentrations were 1397 $\mu g/m^3$ and 348 $\mu g/m^3$ respectively. The highest mean concentration occurred in restaurant indoor, and the traffic-related vehicle emission source. The results revealed that low-cost-sensing devices can assess the close-to-reality exposure, and the findings can be applied for calculating health risk assessment in specific microenvironments.

Keywords
$PM_{2.5}$ and PM_1, Personal Exposure, Low-cost sensor, Time-activity diary

Paper ID: ID29

Air Quality, Climate Change issues: Challenges to Sustainability

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Abstract
Air pollution and climate change are critical issues worldwide, there is a link between air pollution and climate crisis. Both aspects are now becoming of the biggest problems at a global level and were addressed and connected to a sustainable society. The emission of carbon dioxide to the atmosphere was figured out as the contributor to climate change. Pollution from other gases were detected and needed to be aware for our future environment. The pollution control technologies with environmentally friendly are raised for the sustainability. The United Nation launched the SDGs program with 17 targets including climate action since 2015. The SDGs was proposed to end in 2030 with the goals, however, it has been implemented at the mid-term period. Many targets were achievable while some are slow growth, stagnant and some are regression. It is our challenge for the remaining period to achieve sustainability.

Keywords
Air quality, Climate Change, Sustainability.

Paper ID: ID30

Environmental Heat Stress and Labor Productivity: A Case Study of Cambodian Construction Workers During Hot Months

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Abstract
This study investigates the impact of heat stress on labor productivity, the Perceptual Strain Index (PeSI), and work intensity among rebar and molding construction workers in Phnom Penh, Cambodia. Thirty-four healthy workers aged 18 to 54 volunteered during the hot months from March to June 2023. Using on-site measurements, environmental heat stress was assessed with the Wet Bulb Globe Temperature (WBGT), while physiological responses were monitored through heart rate and the percentage of maximum heart rate (%HRmax). Perceptual responses were evaluated using PeSI. Productivity was measured by the percentage of time workers dedicated to direct tasks. ANOVA and correlation analysis examined the effect of WBGT on labor productivity, PeSI, and %HRmax. Results indicate that higher WBGT (Wet-Bulb Globe Temperature) levels significantly reduce construction labor productivity. The average productivity declines from 74% to 48% as WBGT increases from 26℃ to 35℃. Heat stress is positively correlated with PeSI and %HRmax, indicating increased heart rates and perceived strain with rising temperatures. Despite stable physical effort, productivity declines due to physiological or psychological factors linked to heat exposure. These findings suggest that workers' perceived exertion intensifies as heat stress risk levels increase, negatively impacting well-being and productivity. This study provides valuable insights into the challenges faced by construction workers during Cambodia's hot months and emphasizes the need for strategies to mitigate heat-related impacts and enhance productivity in the construction sector.

Keywords
Construction Labour; Heat Stress; Hot Season; Phnom Penh; Productivity; Tropical Region; WBGT.

Paper ID: ID31

Transition to Electric Mobility in Laos: A stated choice experiments to analyse willingness to pay and elasticity of EV demand

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Abstract
Transition to electric mobility is crucial to reduce CO2 emissions, as transport has a high reliance on fossil fuels and counts more than 20% of global energy-related CO2 emissions. With an ambitious goal to achieve 30% EV penetration rates by 2030, Laos has already adopted policies to prioritise the use of EVs, including removing EV import limits and reducing road use fees(Laos News Agency, 2023). Currently, Laos have more than 3 million vehicles registered while only 4631 sold are electric vehicles including 2,592 electric cars and 2039 electric motorcycle (ASEANstats, 2024; Meadley, 2023). To further promote the use of EVs, there is a strong motivation to investigate the barriers of EV adoption in Laos.
This research is going to analyse how EVs fit Laos customers' travel demand and their willingness to pay for EVs, including Electric four Wheelers (E4W) and Electric two Wheelers (E2W). A stated choice experiment is designed to quantitatively analyse factors influencing customers' choices, including purchase price, range, charging infrastructure availability, fuel prices, electricity prices, maintenance costs, subsidies and discounts. An example of the scenarios is shown in the following figures.

	Vehicle A Car 	Vehicle B Electric Car 
Purchase Price	20000 USD	85000 USD
Range	500km	300km
Recharging/refuelling time	5min	4hour
Charging Infrastructure availability	Access to 100% of charging stations in 15 min	Home charging + access to 50% of charging stations in 30 min
Fuel price	30000 KIP/Litre (Cost per 100km: 210000 - 270000 KIP, assuming 7-9 litres/100km)	400.00 KIP/KWh (Cost per 100km: 6000 - 8000 KIP, assuming 15-20 kWh/100km)
Maintenance Cost(annual)	100 USD	300 USD
Subsidies and Discounts	0% Discount: 0 USD Final Price: 20000 USD	40% Discount: 34000 USD Final Price: 51000 USD

Figure 1 Example of Electric-Four Wheelers Stated Choice Experiments

The main contribution of this paper is threefold:

1. Firstly, a comprehensive data collection process is going to be conducted in Laos. The survey covered various households across different segments and areas, which will provide a landscape of existing travel patterns to further explore the role of electric mobility within the wider mobility needs.
2. Secondly, quantitative evidence will be provided for stakeholders and policers to understand the influence of different factors, such as purchase price, range, and charging infrastructure availability, on customers' choices of EVs.
3. Thirdly, Laos customers' willingness to pay and the elasticity of EV demand will be calculated, which can be future used to evaluate the influences of different policies on EV penetration rate

Acknowledgement (if any)

This study has been produced under the Climate Compatible Growth programme, which is funded by the UK Foreign, Commonwealth and Development Office (FCDO). The views expressed in this paper do not necessarily reflect the UK government's official policies.

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Paper ID: ID32

Descriptive Analysis on the Impact of Thermal Environment on Construction Labor Productivity in Cambodia

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Abstract
This study investigates the impact of climatic heat stress, work intensity, and perceptual strain on the productivity of rebar workers in Cambodia's construction sector. Using on-site measurements, data were collected for wet bulb globe temperature (WBGT), work intensity (%HRmax), and perceptual strain index (PeSI) among sixteen rebar workers. Labor productivity was measured as the percentage of time devoted to direct work activities. A linear mixed-effect model was used to evaluate how climatic heat stress, work intensity, and perceptual strain influence productivity. The findings show that workers maintained a light work intensity throughout the day, with an average %HRmax below 55%. The peak %HRmax values aligned with the highest WBGT readings (about 32oC), occurring between 13:30 and 15:30. Work intensity levels were predominantly light (80.6%), followed by moderate (17.4%) and heavy (1.9%). Productivity was higher in the morning session (9:15 am to 10:15 am), with mean productivity exceeding 80.0%, while productivity declined in the hotter afternoon period. The mixed-effect model analysis indicated that workers engaged in moderate-intensity work or working during cooler morning hours (9:00 to 11:00) showed significantly higher productivity, whereas WBGT and PeSI had limited effects on productivity. These findings suggest that while climatic heat stress has some influence, the limited physical demands of rebar work in hot environments may mitigate its impact on productivity. This study offers valuable insights for researchers and practitioners into optimizing workforce scheduling and managing site activities efficiently in hot climates. Further research with a larger sample size is recommended to clarify these relationships.

Keywords
Climatic Heat Stress; Construction Labour Productivity; Direct Work Time, WBGT, perceptual strain index.

Paper ID: ID33

A Smart Lighting System in a Corridor for Effectively Energy Efficiency

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Abstract
The Government of Laos seeks to expand its hydropower capacity, aiming to boost the economy by leveraging its abundant resources. However, the national energy company faces challenges such as profitability and limited negotiation ability due to international power projects. For sustainable growth, it is necessary to advance the local industry and diversify beyond electricity exports, which have proven to be a loss for Laos. A viable strategy involves producing green hydrogen via electrolysis, using Laos's abundant water resources and renewable generation potential. Spatial-temporal optimisation is used to identify the least-cost sites for green hydrogen production by partitioning the country into hexagonal units, as defined in the GeoH2 model. In each hexagon, an algorithm identifies suitable areas for PV panels and wind turbines. Subsequently, these identified sites contribute to the optimisation of the power system to meet the annual urea demand of Laos while minimising the overall system cost and the Levelised Cost of Hydrogen (LCOH). The model has been tailored to Laos, incorporating the integration of hydropower with a unique hydraulic head calculation along with a comprehensive selection of potential sites suitable for renewable energy sources based on slope. Laos can produce green hydrogen at an LCOH of 2.18 $/kg by 2030, positioning it as a competitive participant on the international market. This depends highly on the availability of hydropower, but a production output of almost 1 million tons is achievable post-2030.

Abstracts key theme 4: Advanced Materials and Manufacturing

Paper ID: ID09

Study the effectiveness of briquetted biochar for wastewater treatment Case study: wastewater from Khouvieng drainage canal

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Abstract
This research studied on the efficiency of briquetted biochar by charcoal briquettes with motor compressor (hot pressing) and this will take the scrap wood from building place and Tiw scrap wood 2000g, powder 200g and water 1000g by use the scrap wood from building place and Tiw scrap wood is main raw material and then, we mixed crushed charcoal, powder and water to complete. After that we use lump charcoal to wastewater treatment Khouvieng drainage canal.

This study has studied about how to use the briquetted biochar to wastewater treatment Khouvieng drainage canal.in study the efficiency of Briquetted biochar was produced in lap room of Environmental Engineering department at located, Sokpaluang Village, Sisattanak District, Vientiane Capital and this has been studied real data with the data that we have by studied the source of wastewater, collect wastewater samples and T°C, pH, COD, BOD, DO, TDS, TSS, EC test, Turbidity and smell to effectively monitor water quality.

Paper ID: ID14

Epoxy Coatings for Corrosion Protection of Steel rebar used in Reinforced Geopolymer Concrete

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Abstract
Corrosion is a pervasive and costly issue with significant economic and environmental implications. Corrosion protection coatings play a vital role in safeguarding various industries against the detrimental effects of corrosion. In this study, reinforcing steel bars with four types of epoxy coating (thickness range (1.00 – 1.350 mm) then embedded in concrete and then the samples were carried out of corrosion potentials, corrosion current density, coating adhesion tests, chloride content. Results revealed that under the studied conditions the CR did not provide total protection of steel reinforcement in cracked concrete. Their use however, tended to reduce significantly the damage caused by the chloride-induced corrosion when compared with the uncoated bars embedded in concrete with similar characteristics.

Keywords
Epoxy Coating, Corrosion, Rebar steel, Reinforced concrete and Geopolymers.

Paper ID: ID24

Characterizations and Electrospinning of PLMC/Fe_3O_4 Nanofibrous Composites for Biomedical Applications

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Abstract
In recent study, porous scaffolds of polylactide-co-trimethylene carbonate (PLMC) and highly flexible iron (III) oxide (Fe_3O_4) piezoelectric composites nanofibrous mats were fabricated via one step electrospinning method for magnetic sensing at room temperature. The samples were analyzed by scanning electron microscopy (SEM) for morphological analysis of the electrospinning nanocomposites and Fourier transform infrared (FT-IR) was used to determine functional groups of the PLMC, and Fe_3O_4 materials in the electrospinning nanocomposites. Effects of concentration percentage of Fe_3O_4 on SEM and FT-IR have been analyzed the relation of fibrous structures with different Fe3O4 concentration percentage. Effect of PLMC solution with different Fe3O4 concentrations on PLMC/Fe3O4 nanofibrous composite scaffolds was studied. Evaluating all the morphological findings, the 3wt% Fe3O4 is the most promising sample in this study for biomedical applications due to its high surface to volume ratio among others with their thinnest nanofibers and low frequency of bead-like structures and the FT-IR spectra was affects the vibration peaks of PLMC observed in all composite sample.

Keywords
Nanofibrous scaffold; Electrospinning; Biomedical engineering; PLMC; Fe_3O_4; nanocomposite.

Abstracts key theme 5: Smart Technologies and Digital Transformation

Paper ID: ID03

Strengthening the ICT Skill for Academic Staff of Public Schools in Vientiane Capital, Lao PDR

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Abstract
This project is the results of a survey of basic knowledge related to Vientiane ICT, such as the knowledge of the use of ICT in the teaching-learning process of all 45 teachers, 24 females, who are teaching in various schools in Vientiane, with a comparison of the data before and after the training to indicate the requirements, necessity and duration of training related to ICT. On the other hand, it is also an indicator of the effectiveness of the training, as information, as a reference, as an inspiration for the board, the board of directors and other teachers who are interested, have the initiative to update the knowledge of ICT to apply it in the teaching work to be more modern and more effective

Strengthening the ICT Skill for Academic Staff of Public Schools in Vientiane Capital, Lao PDR (SICTASPS) is focused on the need to collect data, analyze data (to find the problem-causes and ways to solve the problem) and evaluate the data covering 4 main tasks: 1. General document management tasks, 2. Teaching and learning schedule design tasks, statistical calculation and ranking, 3. Information presentation work or creating teaching materials, and 4. Information security work. Which is based on the collection of actual data from interviews, and actual observation, the 4 tasks mentioned above are urgent tasks and must be improved and developed to improve the balance.

Technically, our data collection survey is based on the distribution of questionnaires with 30 multiple-choice questions and 02 open-ended questions, totally 32 question, and 02 sets of questions before and after the training, with the content of the questions differing only in the open-ended section. The purpose is to look up at the basic knowledge, problems, needs, vision, and future goals related to the 4 main tasks mentioned above of the sample group teachers.

This report presents the results of a systematic evaluation based on the standard criteria of project evaluation for consistency, evaluation of effectiveness, efficiency, and real impact,Moreover, this report also explains about other environments that will become challenges or the possibility of creating sustainability for the project.

Keywords
ICT, IT Essential**,** Ms office, Cyber security.

Paper ID: ID04

Vientiane wardriving for Improving ICT Security and Safety Touristic Route in Urban

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Abstract
Laos has made significant progress in both urbanisation and tourism such as infrastructure development, a population growth, an economic growth, tourism growth, and future prospects which COVID-19 post-pandemic recovery is expected to bring renewed interest in Lao PDR as a world ranked travel destination. In this research we propose the Vientiane urban Wifi density website to support safety tourism for foreigners as well as give significant reference for business and urban planning of the local people and government by using Wardriving technique and GPS tracking tools. The research data also analyzes cybersecurity issues and solutions related to current Wifi security management compared to the trend of cyberattacks from a variety of data types including SSID, BSSID, timestamp, location, encryption, authentication, channel and signal strength. Furthermore, we intend a future plan system to detect urban disasters like power outages and flooding in urban areas.

Keywords
WiFi security, Cybersecurity, GPS tracking, Urbanisation.

Paper ID: ID15

Design and Validation of Wireless Soil Monitoring System for Precision Crop Management

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Abstract
Precision crop management is essential for optimizing agricultural productivity and sustainability. This study presents the development of a multi-parameter soil wireless sensor monitoring system designed for real-time data collection to support precision agriculture. The system consists of sensor nodes that measure key soil parameters such as moisture, temperature, electrical conductivity (EC), pH, and nutrient levels (Nitrogen, Phosphorus, and Potassium). These sensor nodes, built with Arduino and Dragino LoRa Shields, communicate wirelessly via LoRa technology to a central gateway based on an ESP32 microcontroller. The gateway processes and forwards the collected data to a cloud server using the MQTT protocol. The cloud server, hosted on a Raspberry Pi, integrates InfluxDB for time-series data storage and Grafana for real-time data visualization, enabling farmers to access soil health information remotely. This architecture is optimized for low power consumption, long-range communication, and scalability, making it suitable for large agricultural fields. The system provides a cost-effective and efficient tool for monitoring soil conditions, enhancing resource management, and promoting sustainable farming practices by improving crop yield and reducing environmental impact.

Keywords
Precision Agriculture, Wireless Sensor Network, LoRa, Soil Monitoring, Cloud Sever.

Paper ID: ID16

Application of RTK-GNSS Network in Position Tracking of Seeding Robot

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Abstract
Precision farming is increasingly important due to its potential to increase agricultural productivity, optimize resource use, and reduce environmental impact. By utilizing precision farming techniques such as GNSS-guided machinery, remote sensing, and data analytics, farmers can improve the efficiency and accuracy of their operations, leading to higher yields and better-quality produce. Additionally, it can help reduce the use of fertilizers and pesticides, leading to cost savings and a more sustainable approach to agriculture. Therefore, this paper aims to apply the RTK-GNSS network to the seeding robot for precision position tracking. The parkFun ZED-F9R GPS pHAT with GNSS L1/L2 Multi-Band Antenna is mounted on the seeding robot for position tracking. The GUI is published to monitor and log tracked data. The accuracy and latency of position tracking are examined by letting the robot move following the marked points in the map. The tracking error is delivered by comparing the tracked position to the marked potion. The results show that the positioning accuracy and latency are approximately 0.25 m and 2.11s, respectively. These results are fascinating in a further study of the precision guidance of a self-driving robot.

Keywords
RTK-GNSS network, Seeding Robot, Precision Position Tracking, Evaluation of Position Tracking Accuracy and Latency.

Paper ID: ID25

The Proposal of the performance of Web3JS and EtherJS base on Private Blockchain

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Abstract
This paper presents a comparative analysis of the performance of Web3.js and Ether.js in the context of a private blockchain network. As blockchain technology continues to evolve, developers often rely on JavaScript libraries like Web3.js and Ether.js to interact with Ethereum-based blockchain networks. However, choosing the appropriate library can significantly impact the efficiency, scalability, and responsiveness of decentralized applications (dApps), particularly in private blockchain environments where performance optimization is crucial. To address this, the study implements both Web3.js and Ether.js on a private Hyperledger Besu network, simulating typical blockchain operations such as transaction handling, contract deployment, and data retrieval. Various metrics, including transaction speed, gas usage, and network load, are examined to determine how each library performs under controlled conditions. By conducting these tests in a private network setting, the paper offers insights into the practical trade-offs between Web3.js and Ether.js in terms of speed, resource consumption, and ease of integration. The results of this study aim to guide developers in making informed decisions when selecting a blockchain interaction library, particularly for private networks where performance is a key concern. The findings also contribute to the broader understanding of how different Ethereum libraries perform outside the constraints of public networks.

Keywords
Hyperledger Besu, Web3JS, EtherJS.

Paper ID: ID27

Educational and Cultural Engagement in a Virtual Campus Metaverse

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Abstract
The Metaverse represents an evolving platform with immense potential to transform education and engagement through immersive technologies. This paper presents the development of a "Metaverse of Virtual Campus" for the Faculty of Engineering, National University of Laos, which integrates virtual classrooms, meeting spaces, campus tours, and a historical exhibit of the Patuxay Monument. The project aims to enhance the educational experience for students and provide a rich interactive environment for guests and lecturers. By combining education, navigation, and cultural history, this virtual ecosystem fosters engagement and collaboration through Virtual Reality (VR) technology.

Keywords
Metaverse, Virtual Reality, Virtual Campus, Education, Campus Tours, Patuxay Monument, Immersive Learning, Cultural Engagement.

Abstracts key theme 6: Science, Technology, Engineering, and Mathematics (STEM) Education

ID20 The Potassium Salt (KCL) Exploration by Using the Electrical Resistivity Tomography (ERT) Survey at Nongbok District, Khammuan Province, Lao PDR

Paper ID: ID20

The Potassium Salt (KCL) Exploration by Using the Electrical Resistivity Tomography (ERT) Survey at Nongbok District, Khammuan Province, Lao PDR

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Abstract
The purpose of this project was to evaluate the usefulness and suitability of electrical resistivity tomography (ERT) method for mapping subsurface structures (Phengnaone, Arjwech, & Everett, 2019) in area nearby potassium salt mine to estimate the possibility of potassium salt dome. Surveys were conducted at, and nearby, old mine areas at Ban Nongsaphang-Mor, Nongboke district, Khammuan province.

The project area is setting in the Korat Plateau margin that is one of the most promising targets for exploitation of potassium salts (Shen & Siritongkham, 2020). The surrounding area have varied of potassium salt mine including of the biggest potassium salt mine in Lao PDR in present day. The three survey lines were designed in N-S direction with length of 3,000 m, and three survey lines direction from the E-W with length of 2000m. The total length of ERT survey line is 15,000m (15km).

The ERT survey method was successful to image the structure of potassium salt dome by selected pole-dipole electrode configuration. From six survey lines of ERT showed low resistivity value ranges from 0-1030 Ohm-meter. The potassium salt layer was interpreted by very low resistivity at the range lower than 15 Ohm-meter. All the results are shown significantly related. Finally, each 3 lines of ERT were combined to create a 3-D model for interpreting and estimate the distribution of potassium salt between survey lines.

Keywords
Potassium salt (KCl), Electrical Resistivity Tomography, Poel-Dipole configuration, 3-D model.

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