

Keynote Address			
Session Chair: Prof. Dr. Gokarna Bahadur Motra			
S.N.	Keynote Speaker	Title	Page
K1	Prof. Dr. Padma Bahadur Shahi, Chairman, Nepal Engineering Council	Integrating Components: an Approach to Transforming Public Transport: Case of Kathmandu Valley	2
K2	Prof. Dr. M. L. Kansal, IIT Roorkee	Water & Society	3
K3	Hon. Er. Shri Ram Neupane, MP	Engineering, Energy & Nation Building	4
K4	Er. Krishna Singh Basnet, President, SEANep	Building Resilient Cities: From Risk to Readiness	6
K5	Prof. Dr. Netra Prakash Bhandary Ehime University, Matsuyama, Japan	Earthquake-induced disasters in Japan and recent advances in earthquake alerts, evacuation drills, and risk management	7

Table of Contents

Oral Presenters (Theme 1: Smart, Sustainable & Resilient Built Environment)			
Session Chair: Er. Thakur Prasad Sharma, Chairman, SCAEF			
S.N.	Presenter	Title	Page
O1.	Sangina Lamichhane, Shreeyash Acharya, Rishikesh Yadav, Dr. Gokarna Bahadur Motra, Khem Raj Shrestha	Enhancing the Strength of Recycled Aggregate Concrete Incorporating Nanosilica Synthesized from Rice Husk Ash	9
O2.	Priza Neupane, Sunita Sharma, and Krishna Ram Bhandari	Exploring Architectural Characteristics and Spatial Transformation of Tharu Dwellings in Western Terai: A case study of Dangaura Tharu Dang	10
O3.	Rajan Prasad, Kinda Khalaf, Mohammad I. Awad, Sunil K. Agrawal, and Marwan El-Rich	Influence Of Cable Routing on Cable Driven Lower Limb Rehabilitation Exoskeleton (C-LREX)	11
O4.	Pooja Sapkota, Sujana Nepali, Nitesh Shrestha	Comparative study of RCC building as per IS 1893:2016, NBC 105:2020 and NBC 105:2025	12

O5.	Shreeyash Acharya, Rishikesh Yadav, Sangina Lamichhane, Dr. Gokarna Bahadur Motra, Dr. Khem Raj Shrestha	Mechanical and Physical Performance Evaluation of Laboratory-Scale LDPE- Sand Composite Modified with Rice Husk, Rice Husk Ash and Biochar	13
O6.	Gaurabh Basnet	Application of green walls for the Sustainable Urban Development in Kathmandu	14
O7.	Awahan Ale, Sakshyam Baskota, Abhyudaya Bhandari, Sandeep Pandit, Aryan Bhattacharai, Sudeep Lama, Bed Prakash Gupta	Experimental Investigation On Mechanical Properties Of Concrete With Polyester, Steel Fiber And Pine Fiber	15
O8	Narad Prasad Joshi, Jay Ram Panthi, Trilok Chandra Bist	Evaluating and Comparing the Quality of Clay Bricks in Building Construction: A Case Study of Bheemdatt Municipality, Nepal	16
O9.	Prasanna Aryal, Sanjaya Updety, and Inu Pradhan Salike	Impact of Rise in Atmosphere Temperature on a Residential Building's Energy Consumption in Biratnagar	17
O10.	Karphu Ram Ranjitkar, and Ajay Kumar Jha	Investigation of Winter Comfort Temperature in Naturally Ventilated Classrooms of an Academic Building: A Case of Pulchowk Campus	18
O11.	Aditya Shah and Nitesh Shrestha	A Construction Technology Adaptations in Composite RCC–Pre- Engineered Residential Buildings: A Case Study from Kathmandu Valley	19
O12.	Rishikesh Yadav, Shreeyash Acharya, Sangina Lamichhane, Gokarna Bahadur Motra, Khem Raj Shrestha	Performance Evaluation of M20 Concrete with RH-Derivatives	20

O13	Sagar Dahal, Prem Khatri, Govinda Gaure, Hari Krishna Neupane, Santosh KC., Narayan Prasad Adhikari	Comparative analysis of structural, electronic, magnetic, and transport properties of 'Ga' filled and unfilled IrP ₃ skutterudite material.	21
Oral Presenters (Theme 2: Innovations in Geotechnical & Underground Transport System) Session Chair: Dr. Hare Ram Shrestha, President, SOTEN			
O14	Aanchal Tiwari, Ram C. Tiwari, Prabhat K. Jha, Niraj Chapagain, Samyak Shrestha, Prasant Bist, Mahesh Khanal, Mohammad Miya, Manoj Mukhiya	Development of Soil-Nailing Handbook Based on FEM-Based Parametric Optimization for Slope Stability and Deformation Control	23
O15	Himal Bhandari, Jarman Rai, Prabesh Poudel	Landslide susceptibility mapping in the Eastern Nepal Himalaya using Frequency Ratio and Weights-of-Evidence models with remotely sensed data and GIS: A comparative study	24
O16	Aanchal Tiwari, Ram C. Tiwari, Prabhat K. Jha, Dhanapati Dhakal, Bijaya Bhusal, Kabin Lamichhane, Bijaya Bhattarai, Diwas K. Chhetri	Research and Development of Geosynthetic Applications for Flexible Pavement Systems: Numerical Modeling, Field Validation, and Design Catalog	25
O17	Ramchandra Timilsina and Tanka Nath Dhamala	Optimization of Evacuation Reroute Under the Network Disruption	26
O18	Madhusudan Ghimire, Dr. Ram Chandra Tiwari	Micropiles-Reinforced Foundations in Kathmandu Soft Soils: Bearing Capacity Assessment Using Finite Element Modelling	27
O19	Roshani Tamang, Asmita K.C., Bidhya Pandey, Priyanka Kumari Singh, Bigisha Shrestha	Performance Evaluation and Improvement Strategies: A Case Study of Lainchaur Intersection, Kathmandu	28
O20	Roshan Adhikari, Dr. Sunil Thakur, Dr. Anjay Kumar Mishra	Assessment of Risk Factors Leading to Quality Control in Road Projects in Nepal	29

Oral Presenters (Theme 3: Resilient Hydropower & Climate Smart Infrastructure) Session Chair: Dr. Subarna Das Shrestha, Environment & Hydropower Expert			
O21	Suwaj Aryal, Ram Krishna Regmi	Suspended Sediment Concentration and Load Prediction in Highly Variable Himalayan River System: A Comparative Study of Machine Learning Approaches	31
O22	Sujata Dhungana, Subodh Bidari, Ashesh Maharjan, Purna Kumari Dhakal, Prayash Karmacharya, Deepak Kumar KC, Prashant Neupane	Assessing Hydropower Potential in Nepal's Babai River Basin: An Integrated GIS and SWAT Hydrological Modeling Approach	32
O23	Samyog Bhandari, Rupesh Baniya, Ram Krishna Regmi	Applicability of Environmental Flow Techniques in Himalayan Hydropower Considering Hydrologic and Energy Perspective	33
O24	Ishwor Kumar Shrish and Mukesh Raj Kafle	Optimization of Cascade Reservoir Operations in the Koshi Basin Using the Non-Dominated Sorting Algorithm	34
O25	Bhimlal Pandey, Ram Krishna Regmi	Modeling Runoff Components and Assessing Future Water Availability Due to Climate Change in the Karnali Basin Using the SPHY Model	35
O26	Khuwa Prasad Paudel, Shankar Lamichhane, Rabi Marasini, Sunil Paudel, Indra Prasad Timilsina	Risk Analysis of Existing Hydropower Based on Future Climate Change Scenario	36
O27	Tejendra Bist, Mukesh Raj Kafle	Homogeneity Testing and Quantile Regression for Regional Flood Estimation in the Narayani Basin, Nepal	37
O28	Sakshyam Banjade	Leveraging Nepal's Hydropower Potential for Green AI Data Center Development	38

O29	Jay Prakash Singh, Prof. Dr. Jiba Raj Pokhrel, and Sarita Khanal	Evaluating the impact of Climate Change on Stormwater Drainage System of an urban town: A case study of Flood Resilience Assessment of Katahariya Municipality	39
O30	Sadikshya Ghimire, Ram Krishna Regmi	Estimation of Sediment Load and Spatial Distribution of Sediment Yield in the Marsyangdi River Basin, Nepal	40
O31	Saroj Pandit	Susceptibility Mapping of Glacial Lakes in Solukhumbu District, Dudh Koshi River Basin: A Remote Sensing Approach	41

Oral Presenters (Theme 4: Integrated Water, Sanitation & Environmental System) Session Chair: Er. Sharad Prasad Adhikari, Chairman, SOPHEN			
O32	Sophie Vo	Geospatial Analysis of Contaminant Inflows Affecting River Health in Kathmandu	43
O33	Nicole L. Yap, Sojen Pradhan	Bridging the Implementation Gap: Technical Sophistication, Stakeholder Engagement, and Adaptive Capacity in Geospatial Water Management Research	44
O34	Ramji Kshetri	Identification of Groundwater Recharge Potential Zone Using Remote Sensing and GIS Techniques in Bharatpur Municipality, Chitwan, Nepal	45
O35	Ram Chandra Poudel	Household Water Treatment, Safe Storage Practices and Diarrheal Disease A Case Study of Rural Sindhupalchok, Nepal	46
O36	Sagar Shrestha , Aayush Koirala, Hritik Tiwari, Shivam B.K, Sandesh Ale, Ayush Budha	Water Quality Investigation, Pollution Sources Identification, and Impact Mapping within the Kathmandu Valley	47
O37	Kanchan Kumari Sah	Carbon Footprint Analysis of Kathmandu Metropolitan City: Identifying Major Greenhouse Gas Emission Sources and Mitigation Strategies	48

O38	Bhuwan Shrestha, Robert Dongol	Sustainability Analysis of Lift Drinking Water Supply Systems: A Case of Purbakhola Rural Municipality-5, Birkot, Palpa	49
O39	Pawan Baral	Food Waste Management in Pokhara: Pathways Toward Achieving Sustainable Development Goal 12.3	50

Conference Schedule

26th April, 2026		
Time	Opening Ceremony, Brihaspati Sadan, NASC, Jawalakhel, Lalitpur, Nepal	
8:00 -9:00	Registration and Breakfast	NASC, Jawalakhel
9:00-10:00	Inaugural Program	Seating on the dais and Welcome with Khada National Anthem Welcome address by Er. Romharsh Oli HOD, Dept. of Civil Engineering, EEC Inauguration by the Chief Guest Address by Mr. Arun Kumar Bhandari, CEO, EEC Address by distinguished guests
	Inaugural Remarks	Chief Guest, Prof. Dr. Bed Raj KC, VC, Pokhara University
	Closing Remarks	Conference Chair, Prof. Dr. Hari Krishna Shrestha
Keynote session		
Session Chair: Prof. Dr. Gokarna Bahadur Motra		
10:00-10:25	Keynote Speaker-I	Prof. Dr. Padma Bahadur Shahi, Chairman, Nepal Engineering Council
10:25-10:50	Keynote Speaker-II	Prof. Dr. M. L. Kansal, IIT Roorkee
10:50-11:15	Keynote Speaker-III	Hon. Er. Shri Ram Neupane, MP
11:15-11:40	Keynote Speaker-IV	Er. Krishna Singh Basnet, President, SEANep
11:40-12:05	Keynote Speaker-V	Prof. Dr. Netra Prakash Bhandary Ehime University, Matsuyama, Japan
12:05-1:00	Lunch Break	
1:00- 5:20 Technical Sessions	Theme 1: Smart, Sustainable & Resilient Built Environment	
	Theme 2: Innovations in Geotechnical & Underground Transport System	

	Theme 3: Resilient Hydropower & Climate Smart Infrastructure
	Theme 4: Integrated Water, Sanitation & Environmental System
5:20- 5:40	Tea Break
5:40-7:00	Closing Ceremony

Schedule: Technical Sessions

Theme 1: Smart, Sustainable & Resilient Built Environment

Venue: Brihaspati Sadan

Time: 1:00- 5:20

Session Chair: Er. Thakur Prasad Sharma, Chairman, SCAEF

S.N.	Time	Title of the paper and Authors	Paper Presenter
1.	1:00-1:20	Exploring Architectural Characteristics and Spatial Transformation of Tharu Dwellings in Western Terai: A case study of Dangaura Tharu Dang <i>Priza Neupane, Sunita Sharma, and Krishna Ram Bhandari</i>	Priza Neupane
2.	1:20-1:40	Influence Of Cable Routing on Cable Driven Lower Limb Rehabilitation Exoskeleton (C-LREX) <i>Rajan Prasad, Kinda Khalaf, Mohammad I. Awad, Sunil K. Agrawal, and Marwan El-Rich</i>	Rajan Prasad
3.	1:40-2:00	Comparative study of RCC building as per IS 1893:2016, NBC 105:2020 and NBC 105:2025 <i>Pooja Sapkota, Sujan Nepali, Namita Joshi, Nitesh Shrestha</i>	Pooja Sapkota, Sujan Nepali
4.	2:00-2:20	Enhancing the Strength of Recycled Aggregate Concrete Incorporating Nanosilica Synthesized from Rice Husk Ash <i>Sangina Lamichhane, Shreeyash Acharya, Rishikesh Yadav, Dr. Gokarna Bahadur Motra, Khem Raj Shrestha</i>	Sangina Lamichhane

5.	2:20-2:40	Mechanical and Physical Performance Evaluation of Laboratory-Scale LDPE-Sand Composite Modified with Rice Husk, Rice Husk Ash and Biochar <i>Shreeyash Acharya, Rishikesh Yadav, Sangina Lamichhane, Dr. Gokarna Bahadur Motra, Dr. Khem Raj Shrestha</i>	Shreeyash Acharya
6.	2:40-3:00	Application of green walls for the Sustainable Urban Development in Kathmandu <i>Gaurabh Basnet</i>	Gaurabh Basnet
7.	3:00-3:20	Experimental Investigation On Mechanical Properties Of Concrete With Polyester, Steel Fiber And Pine Fiber <i>Awahan Ale, Sakshyam Baskota, Abhyudaya Bhandari, Sandeep Pandit, Aryan Bhattarai, Sudeep Lama, Bed Prakash Gupta</i>	Awahan Ale
8.	3:20-3:40	Evaluating and Comparing the Quality of Clay Bricks in Building Construction: A Case Study of Bheemdatt Municipality, Nepal <i>Narad Prasad Joshi, Jay Ram Panthi, Trilok Chandra Bist</i>	Jay Ram Panthi
9.	3:40-4:00	Impact of Rise in Atmosphere Temperature on a Residential Building's Energy Consumption in Biratnagar <i>Prasanna Aryal, Sanjaya Uprety, and Inu Pradhan Salike</i>	Prasanna Aryal
10.	4:00-4:20	Investigation of Winter Comfort Temperature in Naturally Ventilated Classrooms of an Academic Building: A Case of Pulchowk Campus <i>Karphu Ram Ranjitkar, and Ajay Kumar Jha</i>	Karphu Ram Ranjitkar
11.	4:20-4:40	A Construction Technology Adaptations in Composite RCC–Pre-Engineered Residential Buildings: A Case Study from Kathmandu Valley <i>Aditya Shah and Nitesh Shrestha</i>	Aditya Shah

12.	4:40-5:00	Performance Evaluation of M20 Concrete with RH-Derivatives <i>Rishikesh Yadav, Shreeyash Acharya, Sangina Lamichhane, Gokarna Bahadur Motra, Khem Raj Shrestha</i>	Rishikesh Yadav
13.	5:00-5:20	Comparative analysis of structural, electronic, magnetic, and transport properties of 'Ga' filled and unfilled IrP ₃ skutterudite material. <i>Sagar Dahal, Prakash Khatri, Govinda Gaire, Hari Krishna Neupane, Santosh K.C, Narayan Prasad Adhikari</i>	Sagar Dahal

Schedule: Technical Sessions

Theme 2: Innovations in Geotechnical & Underground Transport System

Venue: Narayani Hall

Time: 1:00- 3:20

Session Chair: Dr. Hare Ram Shrestha, President, SOTEN

S.N.	Time	Title of the paper and Authors	Paper Presenter
1.	1:00-1:20	Development of Soil-Nailing Handbook Based on FEM-Based Parametric Optimization for Slope Stability and Deformation Control <i>Aanchal Tiwari, Ram C. Tiwari, Prabhat K. Jha, Niraj Chapagain, Samyak Shrestha, Prasant Bist, Mahesh Khanal, Mohammad Miya, Manoj Mukhiya</i>	Ram C. Tiwari
2.	1:20-1:40	Landslide susceptibility mapping in the Eastern Nepal Himalaya using Frequency Ratio and Weights-of-Evidence models with remotely sensed data and GIS: A comparative study <i>Himal Bhandari, Jarman Rai, Prabesh Poudel</i>	Himal Bhandari
3.	1:40-2:00	Research and Development of Geosynthetic Applications for Flexible Pavement Systems: Numerical Modeling, Field Validation, and Design Catalog	Aanchal Tiwari

		<i>Aanchal Tiwari, Ram C. Tiwari, Prabhat K. Jha, Dhanapati Dhakal Bijaya Bhusal, Kabin Lamichhane, Bijaya Bhattarai, and Diwas K. Chhetri</i>	
4.	2:00-2:20	Optimization of Evacuation Reroute Under the Network Disruption <i>Ramchandra Timilsina and Tanka Nath Dhamala</i>	Ramchandra Timilsina
5.	2:20-2:40	Micropiles-Reinforced Foundations in Kathmandu Soft Soils: Bearing Capacity Assessment Using Finite Element Modelling <i>Madhusudan Ghimire, Dr. Ram Chandra Tiwari</i>	Madhusudan Ghimire
6.	2:40-3:00	Performance Evaluation and Improvement Strategies: A Case Study of Lainchaur Intersection, Kathmandu <i>Roshani Tamang, Asmita K.C., Bidhya Pandey, Priyanka Kumari Singh, Bigisha Shrestha</i>	Roshani Tamang, Asmita K.C., Bidhya Pandey
7.	3:00-3:20	Assessment of Risk Factors Leading To Quality Control In Road Projects In Nepal <i>Roshan Adhikari, Dr. Sunil Thakur, Dr. Anjay Kumar Mishra</i>	Roshan Adhikari

Schedule: Technical Sessions

Theme 3: Resilient Hydropower & Climate Smart Infrastructure

Venue: Mechi Hall

Time: 1:00- 4:40

Session Chair: Dr. Subarna Das Shrestha, Environment & Hydropower Expert

S.N.	Time	Title of the paper and Authors	Paper Presenter
1.	1:00-1:20	Suspended Sediment Concentration and Load Prediction in Highly Variable Himalayan River System: A Comparative Study of Machine Learning Approaches <i>Suwaj Aryal, Ram Krishna Regmi</i>	Suwaj Aryal

2.	1:20-1:40	Assessing Hydropower Potential in Nepal's Babai River Basin: An Integrated GIS and SWAT Hydrological Modeling Approach <i>Sujata Dhungana, Subodh Bidari, Ashesh Maharjan, Purna Kumari Dhakal, Prayash Karmacharya, and Deepak Kumar Kc</i>	Sujata Dhungana
3.	1:40-2:00	Applicability of Environmental Flow Techniques in Himalayan Hydropower Considering Hydrologic and Energy Perspective <i>Samyog Bhandari, Rupesh Baniya, Ram Krishna Regmi</i>	Samyog Bhandari
4.	2:00-2:20	Optimization of Cascade Reservoir Operations in the Koshi Basin Using the Non-Dominated Sorting Algorithm <i>Ishwor Kumar Shrish and Mukesh Raj Kafle</i>	Ishwor Kumar Shrish
5.	2:20-2:40	Modeling Runoff Components and Assessing Future Water Availability Due to Climate Change in the Karnali Basin Using the SPHY Model <i>Bhimlal Pandey, Ram Krishna Regmi</i>	Bhimlal Pandey
6.	2:40-3:00	Risk Analysis of Existing Hydropower Based on Future Climate Change Scenario <i>Khuwa Prasad Paudel, Shankar Lamichhane, Rabi Marasini, Sunil Paudel, Indra Prasad Timilsina</i>	Khuwa Prasad Paudel, Sunil Paudel
7.	3:00-3:20	Homogeneity Testing and Quantile Regression for Regional Flood Estimation in the Narayani Basin, Nepal <i>Tejendra Bist, Mukesh Raj Kafle</i>	Tejendra Bist
8.	3:20-3:40	Leveraging Nepal's Hydropower Potential for Green AI Data Center Development <i>Sakshyam Banjade</i>	Sakshyam Banjade
9.	3:40-4:00	Evaluating the impact of Climate Change on Stormwater Drainage System of an urban town: A case study of Flood Resilience Assessment of Katahariya Municipality <i>Jay Prakash Singh, Prof. Dr. Jiba Raj Pokhrel, Sarita Khanal</i>	Jay Prakash Singh

10.	4:00-4:20	Estimation of Sediment Load and Spatial Distribution of Sediment Yield in the Marsyangdi River Basin, Nepal <i>Sadikshya Ghimire, Ram Krishna Regmi</i>	Sadikshya Ghimire
11.	4:20-4:40	Susceptibility Mapping of Glacial Lakes in Solukhumbu District, Dudh Koshi River Basin: A Remote Sensing Approach <i>Saroj Pandit</i>	Saroj Pandit

Schedule: Technical Sessions

Theme 4: Integrated Water, Sanitation & Environmental System

Venue: Bheri Hall

Time: 1:00- 3:40

Session Chair: Er. Sharad Prasad Adhikari, Chairman, SOPHEN

S.N.	Time	Title of the paper and Authors	Paper Presenter
1.	1:00-1:20	Geospatial Analysis of Contaminant Inflows Affecting River Health in Kathmandu <i>Sophie Vo</i>	Sophie Vo
2.	1:20-1:40	Bridging the Implementation Gap: Technical Sophistication, Stakeholder Engagement, and Adaptive Capacity in Geospatial Water Management Research <i>Nicole L. Yap, Sojen Pradhan</i>	Nicole L. Yap, Sojen Pradhan
3.	1:40-2:00	Identification of Groundwater Recharge Potential Zone Using Remote Sensing and GIS Techniques in Bharatpur Municipality, Chitwan, Nepal <i>Ramji Kshetri</i>	Ramji Kshetri
4.	2:00-2:20	Household Water Treatment, Safe Storage Practices and Diarrheal Disease A Case Study of Rural Sindhupalchok, Nepal <i>Ram Chandra Poudel</i>	Ram Chandra Poudel

5.	2:20- 2:40	Water Quality Investigation, Pollution Sources Identification, and Impact Mapping within the Kathmandu Valley <i>Sagar Shrestha , Aayush Koirala, Hritik Tiwari, Shivam B.K, Sandesh Ale, Ayush Budha</i>	Sagar Shrestha, Aayush Koirala
6.	2:40- 3:00	Carbon Footprint Analysis of Kathmandu Metropolitan City: Identifying Major Greenhouse Gas Emission Sources and Mitigation Strategies <i>Kanchan Kumari Sah</i>	Kanchan Kumari Sah
7.	3:00- 3:20	Sustainability Analysis of Lift Drinking Water Supply Systems: A Case of Purbakhola Rural Municipality-5, Birkot, Palpa <i>Bhuwan Shrestha, Robert Dongol</i>	Bhuwan Shrestha, Robert Dongol
8.	3:20- 3:40	Food Waste Management in Pokhara: Pathways Toward Achieving Sustainable Development Goal 12.3 <i>Pawan Baral</i>	Pawan Baral

KEYNOTE SESSION

Integrating Components: an Approach to Transforming Public Transport: Case of Kathmandu Valley

Prof. Dr. Padma Bahadur Shahi,

Chairman, Nepal Engineering Council

pb_shahi@yahoo.com

ABSTRACT

The rapid urbanization of the Kathmandu Valley has outpaced the development of its transport infrastructure, resulting in fragmented service delivery, severe congestion, and deteriorating air quality as well as the congestion in major junctions. This study highlights the urgent need for a paradigm shift from conventional "supply-side" engineering to a Safe System Approach that integrates multi-modal components into a unified, sustainable network.

The keynote highlights the strategic integration of three core pillars: Physical Infrastructure (dedicated lanes and at-grade intersection optimization), Digital Integration (Intelligent Transport Systems and unified e-ticketing), and Institutional Reform (transport service management and establishment of a dedicated public transport service institution). By analysing current bottlenecks, such as the high density of low-capacity vehicles and the lack of pedestrian-centric design, promoting the public transport becomes an urgent issues for the urban as well as the central government.

Transport sector as one of the major component of the sustainable urban development shall always reflect the issues sustainability approaches in its functional for service oriented such as comfortable, affordable, safe and convenient to the public. Furthermore, it shall be focusing on reducing the carbon footprint of the transport sector through electrification. The "Kathmandu Case" serves as a critical lens for discussing how engineering innovation can bridge the gap between chaotic urban mobility and a structured, efficient, and inclusive public transport ecosystem in metropolitan Cities like Kathmandu.

KEYWORDS: Safe System Approach, Physical Infrastructure, Digital Integration, Institutional Reform

Water & Society

M. L. Kansal

Professor (HAG) & Ex-HoD

Water Resource Development & Management, IIT Roorkee

mlk@wr.iitr.ac.in

ABSTRACT

Water is fundamental to the survival of all living organisms and is intrinsically linked to human health, agricultural productivity, and overall socio-economic development. In this context, it is estimated that nearly 80% of all diseases and over one-third of deaths in developing countries are water-related, while approximately one-tenth of an individual's productive time is lost to water-related challenges, underscoring the critical need for sustainable water management. This concern is further intensified by the fact that around 2.7 billion people experience water scarcity for at least one month annually, nearly one in six individuals lack access to safe drinking water, and about 2.4 billion people remain exposed to cholera and other water-borne diseases, resulting in approximately 0.6 million child deaths each year due to diarrheal illnesses. Within this global context, India faces a particularly acute challenge, as it supports the world's second-largest population with only about 4% of global potable water resources. Furthermore, nearly 54% of the country is experiencing high to extremely high levels of water stress. Consequently, rapid urbanization has exacerbated the degradation of water resources, necessitating urgent and strategic interventions to ensure water security. In response, this study emphasizes both the significance of and pathways toward achieving water security through the integration of water-sensitive society and water-sensitive environment frameworks, aligned with the principles of the Sustainable Development Goals (SDGs). Furthermore, the study highlights the need to adopt integrated water resources management (IWRM), supported by technological innovation and participatory governance, to address the multifaceted challenges of water management effectively. In this regard, river health assessment is identified as a critical tool for maintaining the dynamic equilibrium between water systems and society, employing multidimensional indicators that capture anthropogenic pressures, governance mechanisms, and socio-economic drivers. Complementing these approaches, the ongoing digital transformation of the water sector is advancing real-time monitoring, improved water quality management, enhanced disaster preparedness and response, and the development of resilient and sustainable water infrastructure. Overall, the study concludes that achieving long-term water sustainability requires a holistic and multidisciplinary approach that integrates engineering, environmental science, policy frameworks, and active societal engagement to ensure resilient, equitable, and future-ready water systems.

KEYWORDS: Digital transformation, India, River health, Sustainable Development Goals, Water-sensitive society

Engineering, Energy & Nation Building

Hon. Er. Shri Ram Neupane

Member of Parliament, Nepal

ABSTRACT

Nepal stands at a critical crossroads- rich in natural resources yet constrained by economic challenges, youth outmigration, and policy instability. Despite possessing immense hydropower potential, a strategic geographic position, and a vibrant young workforce, the nation has yet to fully translate these strengths into sustainable development. The central paradox remains: Nepal has significant potential, but limited utilization.

This presentation explores how engineering- particularly in the energy sector- can serve as a transformative force for nation building. It highlights hydropower as the backbone of Nepal's future economy, not only as a source of clean and renewable energy but also as a catalyst for industrialization, employment generation, and regional energy trade with neighboring countries.

Using the powerful "Water as Youth" analogy, the presentation connects Nepal's flowing rivers with the untapped energy of its young population- both abundant, both underutilized, and both capable of driving national progress if properly harnessed. It further examines the key structural challenges, including policy ambiguity, bureaucratic delays, fragmented institutions, and investment barriers that have hindered progress in the energy sector.

To address these issues, the presentation proposes forward-looking solutions such as a One Door Policy for project approvals, the establishment of a unified Energy Authority, digital governance through paperless systems, and fast-track mechanisms for infrastructure development. It emphasizes the evolving role of engineers- not just as technical experts, but as leaders, innovators, and nation builders.

There is big challenge in bridging Theory and Practice in Engineering Education. A clear gap exists between engineering theory and real-world practice, limiting graduates' readiness for industry. This gap can be reduced through internships, practical-oriented curricula, and industry visits. Such approaches help students gain hands-on experience and align education with national development and energy sector needs.

With a bold 10-year vision of generating over 10,000 MW of electricity, fostering an export-driven economy, and creating large-scale employment, the presentation calls for coordinated action among government, private sector, engineers, and citizens. It also

underscores the importance of youth engagement, innovation, and entrepreneurship in shaping Nepal's future.

Ultimately, the message is clear: Nepal's prosperity is flowing through its rivers. The responsibility now lies in converting that flow into energy, opportunity, and national progress.

KEYWORDS: Hydropower Renaissance, Water-to-Wealth, Energy Nation Building, Untapped Potential, Youth & Energy Synergy

Building Resilient Cities: From Risk to Readiness

Er. Krishna Singh Basnet

President, Structural Engineers' Association Nepal

krishnasinghbasnet@gmail.com

ABSTRACT

Building resilient cities begins with resilient buildings, and at the heart of resilient buildings lies the discipline of structural engineering. In earthquake-prone regions such as the Kathmandu Valley, structural engineering plays a critical role in safeguarding lives by ensuring that buildings are designed, assessed, and retrofitted to withstand seismic forces. However, strengthening individual structures alone is insufficient to ensure urban safety; resilience must extend beyond buildings to the scale of neighborhoods and urban systems.

Historic core settlements in the valley present unique challenges due to dense urban fabric, aging infrastructure, narrow alleys, and interconnected courtyard-based housing patterns. In many cases, access to multiple houses depends on a single structurally vulnerable entry building, meaning that even structurally safe houses may become inaccessible after a major earthquake. Lessons from the 2015 Nepal earthquake clearly demonstrated that limited evacuation routes and a lack of accessible open spaces significantly increased risk in traditional urban areas.

This keynote highlights the importance of integrating structural engineering interventions with spatial planning strategies, including locality-level retrofitting prioritization, escape-route optimization, identification and preservation of emergency open spaces, and improved accessibility for emergency response systems. Structural assessment supported by spatial data mapping can help identify critical weak links within neighborhoods and guide targeted upgrading efforts.

The presentation argues that resilient city development requires a coordinated approach in which structural engineering, urban planning, and emergency infrastructure planning work together to ensure that residents are not only protected within earthquake-resistant buildings but also able to evacuate safely and access emergency support when disasters occur. Strengthening cities, therefore, means strengthening both structures and the spatial systems that connect them.

KEYWORDS: Structural engineering, Seismic-resistant design, Retrofitting strategies, Structural assessment, Spatial data mapping, Escape-route optimization, Emergency infrastructure planning

Earthquake-induced disasters in Japan and recent advances in earthquake alerts, evacuation drills, and risk management

Prof. Dr. Netra Prakash Bhandary

Graduate School of Science and Engineering

(Civil and Environmental Engineering)

Ehime University, Matsuyama, Japan

netra.prakash_bhandary.my@ehime-u.ac.jp

ABSTRACT

Japan is probably the most earthquake-prepared nation in the world, yet it remains perpetually vulnerable to high intensity ground shaking and earthquake-induced hazards like tsunamis, landslides, and urban fires. This presentation traces the evolution of Japan's disaster management philosophy especially from the 1995 Kobe Earthquake—a brutal wake-up call on infrastructure fragility—to the most recent mega earthquake of 2011 East Japan, which exposed fatal gaps in coastal area and nuclear power safeties and the 2024 Noto Peninsula Earthquake.

It also explores the Japan Meteorological Agency's next-generation Earthquake Early Warning (EEW) system, which uses dense heavy duty sensor networks and machine learning tools to reduce false alarms and extend lead times for distant epicenters. Moreover, it introduces a paradigm shift in evacuation drills: the move from static paper maps to dynamic, agent-based modeling that accounts for tsunami vertical evacuation, nighttime evacuation scenarios, scenarioless evacuation, and increased evacuation support to vulnerable populations such as people with physical disabilities, elderly people, foreign residents and short-term tourists, etc.. This includes case studies of smart city drills in a few urban areas of Japan.

Finally, it reviews cutting-edge risk management strategies in Japan, including probabilistic seismic hazard assessments integrated with real-time building telemetry, and the rollout of decentralized “disaster-resilience hubs” in aging neighborhoods. Despite these advances, critical challenges remain—public complacency, the limits of alert dissemination during infrastructure failure, and the looming Nankai Trough earthquake. Japan's true innovation lies not in technology alone, but in the relentless integration of hard science with community-centered behavioral design, offering a replicable model for other high-risk zones worldwide.

KEYWORDS: Probabilistic Seismic Hazard Assessment, Disaster Resilience, Earthquake Early Warning System, Agent-based Modeling

THEME ONE

**SMART, SUSTAINABLE & RESILIENT BUILT
ENVIRONMENT**

Enhancing the Strength of Recycled Aggregate Concrete Incorporating Nanosilica Synthesized from Rice Husk Ash

Sangina Lamichhane¹, Shreeyash Acharya¹, Rishikesh Yadav¹, Dr. Gokarna Bahadur Motra^{2,3}, Khem Raj Shrestha²

¹Msc Student, IOE Pulchowk Campus

²Department of Applied Science and Chemical Engineering, IOE Pulchowk Campus

³Department of Civil Engineering, IOE Pulchowk Campus

Corresponding author: Dr. Gokarna Bahadur Motra (gmotra@ioe.edu.np), Khem Raj Shrestha (chemkhem@gmail.com).

ABSTRACT

Environmental and sustainability issues have transpire as a result of the fast population increase, ascending construction and demolition activities so there is a need for new materials and construction waste management. This study investigates the use of nanosilica extracted from rice husk ash and recycled aggregates (RA) extracted from demolition sites. RA mechanical qualities were assessed and nanosilica made from rice husk ash is added to concrete with different nanosilica dosages (0.4%, 0.8%, and 1.2%) along with 50% and 100% recycled aggregate substitution. Tests of compressive strength revealed that nanosilica greatly increased the strength validating RA as a workable and sustainable substitute material also rice husk can be a precursor for nanosilica production promoting reuse and sustainability in construction.

KEYWORDS: Compressive strength, Nanosilica, Recycled Aggregate, Ricehusk, sustainable

Exploring Architectural Characteristics and Spatial Transformation of Tharu Dwellings in Western Terai: A case study of Dangaura Tharu Dang

Priza Neupane¹, Sunita Sharma¹, and Krishna Ram Bhandari¹

¹ Department of Architecture, Nepal Engineering College, Pokhara University, Nepal
Corresponding author: Krishna Ram Bhandari (krishnarb@nec.edu.np), Author: Sunita Sharma (sunitaasharma75@gmail.com), and Priza Neupane (prizaneupane@gmail.com)

ABSTRACT

This study explores the architectural features and the contemporary changes in traditional Dangaura Tharu dwellings in Western Terai. The study follows a mix method of research where data were collected through questionnaire survey, ethnography and focus group discussion. The study identifies a robust vernacular system based on climatic adaptation, material pragmatism and socio-cultural structure whereby the vernacular structures are elongated linear forms, courtyard-oriented planning, raised plinths, and mud-based load-bearing construction. Field findings reveal that mud mortar masonry and traditional housing typology are still predominant which proves that the indigenous building practices still have their structural and cultural value. Simultaneously, as measured by the study, there is a quantifiable material shift expressed in hybrid houses, cement mortar masonry, and limited reinforced concrete cement structures. The causes of this change are interrelated with socio-economic and environmental forces, such as out-migration, aspirations for modern permanence, shifts in material and demand, earthquake-awareness of structural viability, and general developmental changes. The study concludes that the ongoing change represents an adaptive negotiation rather than a rupture from tradition, emphasizing the need to critically understand and guide this transition to sustain the architectural identity of Dangaura Tharu vernacular dwellings.

KEYWORDS Dangaura Tharu, Indigenous Construction Techniques, Material Transition, Vernacular Architecture

Influence Of Cable Routing on Cable Driven Lower Limb Rehabilitation Exoskeleton (C-LREX)

Rajan Prasad¹, Kinda Khalaf¹, Mohammad I. Awad², Sunil K. Agrawal³, and Marwan El-Rich¹

¹Khalifa University, Abu Dhabi, United Arab Emirates

²Abu Dhabi University, Abu Dhabi, United Arab Emirates

³Columbia University, New York, USA

Corresponding author: Rajan Prasad (e-mail: rajanprasad460@hotmail.com).

ABSTRACT

Cable driven rehabilitation devices (CDRD) are known for facilitation of remote actuation, lightweight design, and negligible inertia and inertial vibration on the impaired limb and are hence preferred over link-driven rehabilitation devices. However, the majority of CDRDs use cable routing via hinges placed in proximity of the joints which may cause vibration of long cables, such as attaching the hip and the inferior leg (close to the ankle joint). In this work, we quantified the effects of adding intermediate hinges (that allows guided movement of cables) between the insertion (hip) and origin (inferior leg) hinges on the required cable tension and hip and knee joint forces in a cable-driven lower limb rehabilitation exoskeleton (C-LREX).

KEYWORDS Rehabilitation robotics, exoskeleton, cable-driven, lower limb, stroke, indirect actuation.

Comparative study of RCC building as per IS 1893:2016, NBC 105:2020 and NBC 105:2025

Pooja Sapkota¹, Sujan Nepali¹, Namita Joshi¹, Nitesh Shrestha²

^{1,2}Everest Engineering College, Sanepa, Lalitpur, Nepal

Corresponding author: Nitesh Shrestha (e-mail: nitesh.shrestha@eemc.edu.np).

ABSTRACT

Reinforced concrete structures are analyzed using seismic design codes under seismic loading to ensure the safety and optimal performance of the structures. The major aim of the study is to investigate and compare the effects of different seismic design codes on the seismic behavior of RCC structures. In this study, a G+4 commercial Reinforced Cement Concrete building situated in soil type D is modeled and analyzed using the response spectrum method of analysis. ETABS (version 22) is used to analyze the seismic characteristics of reinforced concrete buildings under NBC 2020, NBC 2025 (ULS & SLS), and IS 1893:2016, as per codal guidelines, and their results are interpreted. In this study, drift, displacement, and base shear are taken as the comparison parameters, and the corresponding findings are compared. In NBC 2025 (ULS), the drift and displacement are observed to be decreased slightly by around 7% compared to the 2020 version, while SLS witnesses a remarkable reduction of nearly 30%. Among all the results, the value obtained from IS 1893:2016 is the lowest, reflecting the reduction in drift and displacement by more than 50%. As the base shear remained the same for NBC 2020 and NBC 2025 ULS (Reduction by approximately 4% from NBC 2025 SLS), in contrast, the results from IS 1893:2016 experienced a significant fall (by nearly 30%). These results suggest that the revised versions have greater control over deformation while maintaining the structural strength.

KEYWORDS Base shear, Displacement, Drift, Indian Standard (IS), Nepal National Building Code (NBC), Response spectrum, Serviceability Limit State (SLS), Ultimate Limit State (ULS)

Mechanical and Physical Performance Evaluation of Laboratory-Scale LDPE-Sand Composite Modified with Rice Husk, Rice Husk Ash and Biochar

Shreeyash Acharya¹, Rishikesh Yadav¹, Sangina Lamichhane¹, Dr. Gokarna Bahadur Motra^{1*}, Dr. Khem Raj Shrestha^{1*}

¹Pulchowk Campus, IOE, Lalitpur, Nepal Corresponding author: Dr. Gokarna Bahadur Motra (gmotra@ioe.edu.np), Dr. Khem Raj Shrestha(chemkhem@gmail.com).

ABSTRACT

The growing amount of plastic waste and agricultural leftovers has serious environmental issues, especially in developing countries like Nepal. This study investigates the development of plastic sand composite bricks using low-density polyethylene (LDPE) as a binding material and sand as the main aggregate. Along with the control mix, modified composites using rice husk, ash and Biochar were prepared as partial replacement of sand to see how they affect material properties. Laboratory scale samples measuring 100 × 50 × 50 mm were fabricated using a base mix ratio of 30:70 (plastic to sand) by weight with 10% sand replacement for additive based samples. The prepared composites were tested for compressive strength, water absorption and physical characteristics along with FTIR analysis for chemical assessment. The results showed that the sample with rice husk ash had the highest average compressive strength of 19.34 MPa while the rice husk sample had the lowest strength of 15.56 MPa due to its porous nature. Biochar sample showed moderate performance. FTIR analysis confirmed that bonding in the composite is mainly physical. This study shows that LDPE-Sand composites with suitable additives can work as sustainable construction materials while promoting effective waste utilization.

KEYWORDS Biochar, FTIR, LDPE, Sustainable construction, Waste utilization.

Application of green walls for the Sustainable Urban Development in Kathmandu

Gaurabh Basnet

Hillside College of Engineering, Balkumari Kathmandu, Nepal
(e-mail: bgaurabh@gmail.com)

ABSTRACT

Kathmandu Valley, home to around 85 lakh inhabitants and the major city in every way for the beautifully rich country Nepal. Though urbanization has also caused rapid development of Kathmandu valley. It has also caused the rapid Increase in air pollution, decrease in biodiversity, and reduces the greenery of the valley. As an effective solution, green walls are an effective and sustainable solution for improving environmental conditions in Kathmandu. They help reduce pollution, lower temperature, and enhance biodiversity in urban areas where space is limited and trees cannot be planted. It is recommended that urban planners and engineers promote the use of green wall systems in future infrastructure projects to support sustainable development. Major areas and junctions like asan bazaar, new road where plantation of trees is never an option due to dense population and unmanaged urbanization. While conducting the study of this topic certain methods like surveys and data analysis, key parameters such as air quality index, temperature and humidity is to be observed and suitable species of plant is to be selected. After certain time interval, important changes will be noticed as we are able to implement the concept, the visible effect will be rapid increase in air quality, Temperature regulation in plantation area. Beautification of the ultimately result in positive and psychological benefits in residents of asan area. So I think if the asan area implementation of Green walls on the urban infrastructure will play an undeniably important role in sustainable environmental development and positive environmental balance in Kathmandu

KEYWORDS: green walls, urban planning, sustainable development, beautification, environmental balance

Experimental Investigation on Mechanical Properties of Concrete With Polyester, Steel Fiber And Pine Fiber

**Awahan Ale¹, Sakshyam Baskota¹, Abhyudaya Bhandari¹, Sandeep Pandit¹,
Aryan Bhattarai¹, Sudeep Lama¹, Bed Prakash Gupta^{2*}**

Everest Engineering College, Sanepa, Lalitpur, Nepal

Corresponding Author: Bed Prakash Gupta (bedp.gupta@eemc.edu.np)

ABSTRACT

Concrete is one of the most widely used construction materials; however, its relatively low tensile strength and brittle nature often result in early cracking and reduced durability. This study explores the improvement of concrete's mechanical properties through the incorporation of steel, polyester, and natural pine fibers. An experimental approach was adopted, where concrete specimens were prepared using Ordinary Portland Cement (OPC 43 grade), fine and coarse aggregates, and different proportions of fibers, while plain cement concrete was used as the control mix. Standard laboratory tests, including slump, compressive strength, split tensile strength, and flexural strength tests, were carried out in accordance with relevant Indian Standard codes. The specimens were cured for 7 and 28 days, and the results were analyzed comparatively. The findings indicate that fiber reinforcement enhances the overall performance of concrete. Steel fibers showed the greatest improvement in tensile and flexural strength, polyester fibers improved crack resistance with minimal impact on compressive strength, and pine fibers provided moderate strength enhancement along with sustainability benefits. However, higher fiber content led to reduced workability. Overall, fiber-reinforced concrete demonstrated better mechanical performance than conventional concrete.

KEYWORDS: Compressive Strength, Fiber Reinforced Concrete, Flexural Strength, Pine Fiber, Polyester Fiber, Split Tensile Strength, Steel Fiber

Evaluating and Comparing the Quality of Clay Bricks in Building Construction: A Case Study of Bheemdatt Municipality, Nepal

Narad Prasad Joshi¹, Jay Ram Panthi¹, Trilok Chandra Bist¹

¹School of Engineering, Far Western University, Nepal

Corresponding author: Jay Ram Panthi (e-mail: jayram.panthi21@fwu.edu.np)

ABSTRACT

This study evaluates and compares the quality of clay bricks used in building construction within Bheemdatt Municipality, Nepal. A mixed-method approach was employed, combining laboratory testing of physical and mechanical properties with a user survey. Brick samples were collected from five administrative wards and tested for compressive strength, water absorption, porosity, bulk density, efflorescence, impact resistance, and dimensional accuracy. Results were compared with Nepal Standard (NS) and Indian Standard (IS) specifications. Findings indicate that while compressive strength and efflorescence met standard limits across all brick classes, dimensional consistency, water absorption, and porosity varied significantly. First-class bricks exhibited superior performance, with compressive strength ranging from 12.04–19.66 MPa, porosity between 17.04–24.93%, and water absorption below 20%. User surveys revealed that 98% of consumers prefer first-class bricks, with strength being the primary selection criterion (78% of respondents). The study recommends stricter quality control at kilns, routine on-site testing, and public awareness programs to ensure the use of quality bricks in construction.

KEYWORDS: brick quality, Bheemdatt Municipality, compressive strength, clay bricks, construction materials, water absorption

Impact of Rise in Atmosphere Temperature on a Residential Building's Energy Consumption in Biratnagar

Prasanna Aryal¹, Sanjaya Uprety², and Inu Pradhan Salike³

¹Department of Architecture, Pulchowk campus, IOE, Tribhuvan university, Nepal

Corresponding author: Prasanna Aryal (e-mail:

080mseeb013.prasanna@pcampus.edu.np).

ABSTRACT

Climate change and rising atmospheric temperatures significantly impact the energy performance of residential buildings in hot, humid regions such as Biratnagar, Nepal. This study evaluates the effects of increasing temperature on indoor thermal comfort and energy consumption, with a focus on passive cooling strategies. Climatic data, including temperature and relative humidity, were obtained from the Department of Hydrology and Meteorology and combined with field survey data from thirty residential buildings to determine baseline characteristics and energy use patterns. A representative building model was developed using Design Builder to simulate present thermal performance. The results show that indoor thermal comfort is achieved for only 32-33% of the annual hours, indicating insufficient comfort conditions. Further analysis reveals that the roof contributes approximately 62% of the total heat gain, making it the most critical component affecting cooling loads. Simulation of passive measures demonstrates that roof shading using metal trusses can reduce cooling demand by about 21%, while the application of insulation in walls and roofs results in a total reduction of approximately 43%. These findings highlight the importance of passive design strategies in improving thermal comfort and reducing energy consumption in residential buildings under rising temperature conditions.

KEYWORDS Building Energy Performance, Design Builder, Energy Consumption, Thermal Comfort, Passive Design

Investigation of Winter Comfort Temperature in Naturally Ventilated Classrooms of an Academic Building: A Case of Pulchowk Campus

Karphu Ram Ranjitkar¹, and Ajay Kumar Jha²

¹Department of Architecture, Pulchowk campus, IOE, Tribhuvan university, Nepal

²Department of Mechanical and Aerospace Engineering, Pulchowk campus, IOE, Tribhuvan university, Nepal

Corresponding author: Karphu Ram Ranjitkar (e-mail: 080mseeeb008.karphu@pcampus.edu.np).

ABSTRACT

Thermal comfort in classrooms is vital for student well-being and performance, yet in Nepal's naturally ventilated academic buildings winter conditions often fall below acceptable levels. Due to the lack of thermal comfort guidelines in Nepal, this study establishes a baseline approach and highlights the necessity of the future longitudinal researches in this field. This study at Pulchowk Campus surveyed over 600 students across six blocks, combining indoor temperature and humidity measurements with thermal sensation and preference votes which show integration of objective environmental measurements with the subjective occupant survey. Results showed 44.5% of students felt "Slightly cold" and nearly 58% reported cold discomfort, while 60.16% preferred "A bit warmer," confirming widespread dissatisfaction. Comfort temperature was estimated at 20.15 °C using regression analysis and 22.49 °C using Griffiths' method showing some deviations. The findings highlight the inadequacy of existing thermal environments and the need for passive design improvements such as insulation and better window systems, alongside adaptive strategies. By establishing locally validated comfort thresholds, the study provides a foundation for adaptive comfort models tailored to Nepal's climate, supporting energy efficiency, improved learning environments, and enhanced student well-being during winter seasons.

KEYWORDS: Academic building, Comfort temperature, Naturally ventilated, Thermal sensation

A Construction Technology Adaptations in Composite RCC–Pre-Engineered Residential Buildings: A Case Study from Kathmandu Valley

Aditya Shah¹ and Nitesh Shrestha^{1,*}

¹Everest Engineering College, Sanepa, Lalitpur, Nepal

*Corresponding author: Nitesh Shrestha (e-mail: nitesh.shrestha@eemc.edu.np).

ABSTRACT

The 2015 earthquake significantly influenced Nepal's construction practices, accelerating a shift toward resilient and modern systems, particularly in the rapidly expanding settlements of Kathmandu Valley. In this context, steel and composite RCC–Pre-Engineered Building (PEB) construction has gained popularity due to its efficiency and structural advantages, although limited studies address practical on-site adaptations in constrained urban environments. This paper presents a case study of a 12 m high, three-and-a-half-storey residential building that integrates RCC columns of 500×500 mm and 600×600 mm, a midbay PEB steel frame, 2ISMC 300 columns above the RCC column at the top floor, composite slabs of 150 mm thickness with decking sheets and shear studs, and combined footings with anchor bolts, along with an RCC lift pit provision. Field documentation and site observations revealed that conventional crane mobilization was impractical, leading to the adoption of pulley-based erection methods anchored to RCC columns, which ensured safe and efficient lifting of steel beams. Analytical evaluation of load distribution and safety factors confirmed that these adaptations — pulley systems, integration of RCC and steel members, and optimized detailing — systematically addressed site constraints while maintaining structural safety. The study demonstrates that such practices are replicable and context-specific, bridging theoretical design with practical execution, and offering valuable insights for resilient construction technologies in Nepal's evolving infrastructure sector.

KEYWORDS Composite slab; Composite structures, Construction technology adaptation; Erection methods, RCC–PEB integration, Urban construction

Performance Evaluation of M20 Concrete with RH-Derivatives

Rishikesh Yadav¹, Shreeyash Acharya¹, Sangina Lamichhane¹, Gokarna Bahadur Motra^{2,3*}, Khem Raj Shrestha^{2*}

¹MSC Students, Pulchowk Campus, IOE, Lalitpur, Nepal

²Department of Applied Science and Chemical Engineering, IOE, Pulchowk Campus, Lalitpur, Nepal

³Department of Civil Engineering, IOE, Pulchowk Campus, Lalitpur, Nepal

Corresponding author: Dr. Gokarna Bdr. Motra (gmotra@ioe.edu.np), Dr. Khem Raj Shrestha (Chemkhem@gmail.com)

ABSTRACT

In the context of Nepal, rice producing generates considerable amounts of agricultural-wastes, notably rice husk. This study inspects the performance of M20 grade concrete incorporating rice husk and its derivatives, such as rice husk ash (RHA) and rice husk biochar (RHB), as partial replacement of cement by weight. A replacement level of 5% for each material was selected to evaluate its effect on the workability and mechanical properties. The slump test analysis revealed that a minimal decline in workability due to the porous nature and water absorption capacity of the materials. The mechanical strength (compressive) results at 28days exhibited the incremental improvement for mixes containing 5% RHA (28.1MPa) and 5% RHB (26.9 MPa) compared to the control mix (26.4 MPa), while a minimal reduction was noticed for the combined mix as 15% in total replacement of cement by RH-derivatives (23.7MPa). The development in the strength is assigned to the pozzolanic reaction of amorphous silica present in RHA, which assist to the formation of additional calcium silicate hydrate (C-S-H) gel. Fourier Transfer Infrared Spectroscopy (FTIR) analysis confirmed the presence of Si-O-Si bonds, pointing out silica contribution during hydration. The study clarifies that the rice husk -derivatives can be effectively utilized as supplementary cementitious materials (SCMs), promoting the sustainable construction and efficient agricultural-waste management.

KEYWORDS FTIR, rice husk, rice husk ash, rice husk biochar, sustainable construction concrete

Comparative analysis of structural, electronic, magnetic, and transport properties of ‘Ga’ filled and unfilled IrP_3 skutterudite material.

Sagar Dahal¹, Prakash Khatri², Govinda Gaire¹, Hari Krishna Neupane¹, Santosh K.C³, Narayan Prasad Adhikari¹

¹Central Department of Physics, Institute of Science and Technology, Tribhuvan University (TU),

Kritipur, Kathmandu, Nepal, 44600

²Department of Physics, Siddhanath Science Campus, Tribhuvan University, Nepal, 44600

³San Diego State University, 5500 Campanile Drive, San Diego, CA 92182-7455,

United States Corresponding emails: sagar.805711@iost.tu.edu.np ,
narayan.adhikari@cdp.tu.edu.np

ABSTRACT

IrP_3 is a promising skutterudite thermometric material due to its diverse electronic, magnetic, and transport properties originating from the partially filled orbitals of Ir and P atoms. Filling IrP_3 with Ga leads to the formation of GaIrP_3 , where Ga-4p states play a significant role in tuning these properties. Void filling is an effective approach to reduce thermal conductivity while preserving electronic transport performance. In this study, first-principles calculations based on density functional theory using the Quantum ESPRESSO package are employed to compare pristine and Ga-filled IrP_3 . The calculated lattice parameters agree well with previous reports, and both systems are found to be thermodynamically stable. The band structure and density of states analyses reveal that both compounds exhibit metallic and nonmagnetic behavior. Ga atoms occupy the 2a Wyckoff positions, leading to slight modifications in lattice structure and electronic features. Transport calculations indicate a moderate power factor, suggesting favorable thermometric performance. Overall, Ga filling effectively tunes the structural and electronic properties without degrading transport characteristics.

KEYWORDS: DFT, Quantum ESPRESSO , Skutterudite material, thermometric materials, and transport properties

THEME TWO

**INNOVATIONS IN GEOTECHNICAL &
UNDERGROUND TRANSPORT SYSTEM**

Development of Soil-Nailing Handbook Based on FEM-Based Parametric Optimization for Slope Stability and Deformation Control

Aanchal Tiwari¹, Ram C. Tiwari¹, Prabhat K. Jha², Niraj Chapagain¹, Samyak Shrestha¹, Prasant Bist¹, Mahesh Khanal¹, Mohammad Miya¹, Manoj Mukhiya¹

¹Pulchowk Campus, Institute of engineering, Tribhuvan University, Lalitpur, Nepal

²Ministry of Physical Infrastructure and Transport (MoPIT), Government of Nepal

Corresponding authors: Aanchal Tiwari (e-mail:

079mstre001.aanchal@pcampus.edu.np) and Ram C. Tiwari (e-mail:

rct2075ce_rctiwari@pcampus.edu.np).

ABSTRACT

This handbook presents a database-driven FEM-based parametric optimization framework for driven soil-nailed slope systems using PLAXIS 2D with the Mohr–Coulomb constitutive model. A Python-based automation approach generated 38,880 numerical simulations, of which approximately 17,587 models were successfully evaluated after applying geometric and performance-based filtering. The results quantify the influence of key parameters on slope stability and deformation behavior. Nail length shows a consistent improvement in both Factor of Safety (FOS) and displacement reduction, increasing FOS by up to ~10–11% and reducing deformation by ~12–13% for a 30% increase in length. Backfill angle significantly affects stability, with a +30% increase reducing FOS and increasing displacement by approximately 40–45%, indicating strong deformation sensitivity. Face angle has negligible impact on FOS ($\pm 1\%$) but reduces displacement by up to ~14% with increasing steepness. Excavation depth is identified as the most critical parameter, causing up to ~10% reduction in FOS and an exponential increase in displacement of nearly ~120% for a +30% change. Overall analysis shows that deformation governs design more critically than FOS in driven soil nail systems, with approximately 1,100 models governed by displacement criteria compared to ~350 governed by FOS alone. The study consolidates these results into a structured parametric database and performance-based design charts, forming the basis of a practical soil-nailing handbook for slope stability and deformation control.

KEYWORDS Driven soil nailing; Finite Element Method, Parametric optimization, PLAXIS 2D, Slope stability.

Landslide susceptibility mapping in the Eastern Nepal Himalaya using Frequency Ratio and Weights-of-Evidence models with remotely sensed data and GIS: A comparative study

Himal Bhandari¹, Jarman Rai¹, and Prabesh Poudel²

¹Madan Bhandari college of Engineering, Urlabari -3, Morang, Nepal

²Oxford College of Engineering, Gairidhara -2, Nawalpur, Nepal

Corresponding author: Himal Bhandari (e-mail: himal.bhandari.284@gmail.com)

ABSTRACT

Landslides in Nepal's mid-hills represent a recurrent and devastating natural hazard, threatening lives, infrastructure, and agricultural land. This study aims to produce a robust landslide susceptibility zonation (LSZ) map for the landslide-prone Mai Khola watershed in Ilam District, Nepal, by applying Frequency Ratio (FR) and Weight of Evidence (WoE), within a Geographic Information System GIS-based comparative approach. A comprehensive, multi-temporal landslide inventory of 300 historical events was compiled from satellite imagery and field surveys to serve as the dependent variable. Eleven conditioning factors influencing slope stability elevation, slope angle, aspect, curvature, Topographic Wetness Index (TWI), geology, soil type, Normalized Difference Vegetation Index (NDVI), mean annual rainfall, and proximity to roads and rivers were derived from ASTER DEM (30 m resolution), Landsat imagery processed in Google Earth Engine, and Department of Hydrology and Meteorology (DHM) rainfall data (2001–2024). The landslide inventory data were randomly divided, with 80% used for training the models and 20% reserved for validation. The resulting susceptibility maps were categorized into five hazard levels using the natural breaks method. Both models performed robustly, as confirmed by ROC curve analysis, though the Weight of Evidence (WoE) model demonstrated superior predictive accuracy (AUC = 0.866) compared to the Frequency Ratio (FR) model (AUC = 0.854), and provided a sharper spatial definition of high-risk areas. The WoE model also classified a larger portion of the watershed (24.64%) as High/Very High susceptibility compared to the FR model (14.40%). The analysis identified geology, NDVI, slope angle, and soil type as the most significant causative factors, with high-risk hotspots consistently located along steep valley slopes, river corridors, and near roads.

KEYWORDS Frequency Ratio (FR), Geographic Information System (GIS), Hazard Mapping, Landslide Susceptibility Zonation (LSZ), Statistical Modelling, Weight of Evidence (WoE).

Research and Development of Geosynthetic Applications for Flexible Pavement Systems: Numerical Modeling, Field Validation, and Design Catalog

**Aanchal Tiwari¹, Ram C. Tiwari¹, Prabhat K. Jha², Dhanapati Dhakal³,
Bijaya Bhusal³, Kabin Lamichhane³, Bijaya Bhattarai³, and Diwas K. Chhetri³**

¹Pulchowk Campus, Institute of engineering, Tribhuvan University, Lalitpur, Nepal

²Ministry of Physical Infrastructure and Transport (MoPIT), Government of Nepal

³Thapathali Campus, Tribhuvan University, Kathmandu, Nepal

Corresponding authors: Aanchal Tiwari (e-mail:

079mstre001.aanchal@pcampus.edu.np) and Ram C. Tiwari (e-mail:

rct2075ce_rctiwari@pcampus.edu.np).

ABSTRACT

This handbook presents a comprehensive study on the application of geosynthetics, particularly geotextiles and geogrids, in flexible pavement systems. The research integrates numerical modeling, empirical approaches, and field validation to evaluate pavement performance under varying loading and subgrade conditions. Advanced Finite Element Method (FEM) simulations using PLAXIS 3D were conducted to analyze geogrid-reinforced pavements under both static and moving axle loads. The results demonstrate significant reductions in vertical compressive strain at the subgrade layer and horizontal tensile strain at the top of the base layer, confirming improved load distribution and structural performance. Geogrid inclusion significantly enhances pavement behavior by reducing deformation and strain at critical layers, with performance influenced by pavement thickness, geogrid stiffness, and placement location within the base structure. Optimal placement at the subbase–subgrade interface resulted in reductions in vertical strain (3.61%–19.52%) and horizontal strain at the asphalt–base interface ranging from 18.72% to 41.08%. Pavement thickness reduction ranged from 15 mm to 170 mm for traffic loading conditions between 5 and 30 Million Standard Axles (MSA) and subgrade CBR values from 5% to 12%. Field validation using strain gauges and earth pressure sensors under vehicle loading (Tipper and Ford trucks) supports the numerical findings. The handbook further provides material specifications and a design catalog, enabling cost-effective and sustainable pavement solutions.

KEYWORDS Finite Element Method (FEM), Flexible Pavement, Geogrid Reinforcement, Geosynthetics, Pavement Design.

Optimization of Evacuation Reroute Under the Network Disruption

Ramchandra Timilsina¹ and Tanka Nath Dhamala²

¹University of Hamburg, Hamburg, Germany

²Tribhuvan University, Kirtipur, Kathmandu, Nepal

Email: ramchandra.timilsina@studium.uni-hamburg.de

ABSTRACT

In a dynamic world, science and technology have achieved remarkable feats. However, we are not free from disasters, whether natural or man-made. Rescuing people during disaster is an open and demanding challenge. Evacuation models and their solution approaches have huge application in disaster science and management. These models help to find the optimal route for the evacuation that reduces the clearance time. In this study, we have already an optimal evacuation plan and we address the problem that during the evacuation process, if some unexpected incidents occur such as accidents, bridge collapse, traffic congestion, or any type of incidents where the road may not be accessible to reach the destination (safe zone) and our initial plan fails. In this situation, we have to find another optimal path immediately to avoid any human loss. We developed an algorithm that finds the best possible path(s) from the incident starting nodes to sink nodes to send the number of evacuees blocked at the incident starting node. We used the Preflow-push algorithm to find the maximum flow in the evacuation network and Lexicographic maximum flow algorithm in a single source, multi-sinks network where sinks are prioritized by nearest distance from the incident starting node. We implemented this algorithm on a sample evacuation network. The main purpose of this study is to provide the alternative path(s) in real time during evacuation process when evacuation is affected by an incident.

KEYWORDS Network Optimization, Disaster Management, Evacuation Planning

Micropiles-Reinforced Foundations in Kathmandu Soft Soils: Bearing Capacity Assessment Using Finite Element Modelling

Madhusudan Ghimire¹, Dr. Ram Chandra Tiwari¹

¹Department of Civil Engineering, Pulchowk Campus, IOE, Tribhuvan University, Nepal

Corresponding author: e-mail:080msgte009.madhusudan@pcampus.edu.np, rct2075ce_rctiwari@pcampus.edu.np.

ABSTRACT

Micropiles, as an emerging foundation technology, offer a promising solution due to their effectiveness in improving both axial and lateral load capacities, making them particularly suitable for underpinning foundations. The soft, lacustrine soils of the Kathmandu Valley create major geotechnical problems because they have low bearing capacity and high compressibility. This often results in excessive settlement and structural damage in raft foundations. This study looks at how effective micropile underpinning is as a solution, using finite element modeling. The Mohr-Coulomb constitutive model was used to simulate soil behavior, and we validated the model against full-scale axial load test results in the research article to ensure it was reliable. The research evaluates how micropiled rafts perform under combined vertical loading. The results show that micropile underpinning significantly improves bearing capacity and controls settlement within the permissible limit by transferring structural loads to deeper, stable layers. Based on the findings from the parametric study, micropiled rafts are recommended as a practical and efficient foundation system for new constructions in Kathmandu's challenging soil conditions.

KEYWORDS Micropile, Underpinning, Bearing capacity, Settlement control, Soft soils, Finite element analysis.

Performance Evaluation and Improvement Strategies: A Case Study of Lainchaur Intersection, Kathmandu

**Roshani Tamang¹, Asmita K.C.¹, Bidhya Pandey¹, Priyanka Kumari Singh¹,
Bigisha Shrestha¹**

¹Everest Engineering College, Sanepa, Lalitpur, Nepal

ABSTRACT

Traffic congestion at many intersections in the Kathmandu Valley remains severe despite various traffic control and management measures, and the Lainchaur Intersection, a three-legged junction, is one of the most affected. The congestion is mainly due to uneven traffic distribution, vehicle composition, and the absence of signal control. This study evaluates the operational performance of the intersection using microscopic simulation in PTV VISSIM based on traffic data collected over four days in July. Peak-hour morning traffic data (9:00-11:00 AM) were obtained through videographic surveys and observed traffic volumes were converted into Passenger Car Units (PCU) in accordance with Nepal Road Standards (2070). The simulation was conducted for all four days, with three days used for calibration and one day for validation to ensure reliability and accuracy. Performance was assessed using queue length, vehicle delay, stop delay, and Level of Service (LOS). Results indicate severe congestion (LOS F) on major approaches, while minor movements operate under relatively better conditions (LOS A-C). As an improvement measure, fixed-time signal control based on the Webster method was evaluated under multiple cycle lengths (60 s, 80s, 150 s, and 300 s), showing partial but inconsistent improvements due to unbalanced traffic flows. A future scenario with 7% annual traffic growth indicates further deterioration, suggesting that fixed-time signal control alone may not be sufficient under future demand conditions, and adaptive or actuated signal control should be considered for improved operational efficiency.

KEYWORDS Level of Service, Microscopic simulation, Operational performance, Passenger Car Units, PTV VISSIM, Traffic congestion.

Assessment of Risk Factors Leading to Quality Control in Road Projects in Nepal

Roshan Adhikari¹, Dr. Sunil Thakur², Dr. Anjay Kumar Mishra³

¹ Ph. D Scholar, Civil Engineering, Noida International University, Greater Noida, U.P, India

² Professor, Department of Mechanical Engineering, Noida International University, Greater Noida, U.P., India

³ Dean, Madhesh University, Birgunj, Nepal

Corresponding author: Roshan Adhikari (e-mail: roshan.adhikari972@gmail.com).

ABSTRACT

Quality related issues can come from a number of risk factors that emerge during the design and construction stages of road infrastructure projects in Nepal. In addition to identifying and ranking the many risk variables affecting quality performance in road projects, this study aims to examine existing risk management practices from the perspectives of contractors and clients. The primary objective of the analysis is to identify significant risks related to labor, supply, quality control methods, and project management strategies. Quantitative and qualitative methodologies were used in a mixed-method approach. Primary data was collected through field observations, interviews, and structured questionnaires with clients, consultants, and contractors. Risk factors were ranked and assessed using analytical techniques like the Relative Importance Index (RII) and severity analysis in addition to evaluating risk allocation across stakeholders. The results indicate that, from the contractor's perspective, the most significant risks are low-quality materials, inexperienced labor, and ineffective quality control, with severity scores of 18.20, 15.41, and 12.55, respectively. Other issues including insufficient testing facilities, rework, a lack of soil investigation, and a lack of quality assurance techniques also worsen quality degradation. Poor quality materials (11.67), reworking errors (12.66), and quality control problems (13.08) are the main risks from the client's perspective, suggesting a higher level of concern for management and control systems. Research on risk distribution indicates that, while some risks are shared, consumers usually pass major risks to contractors, such as poor supplies and inadequate investigations. On the other hand, risks related to materials and site procedures are usually accepted or shared by contractors. The study comes to the conclusion that inadequate technical ability, poor stakeholder coordination, and a lack of systematic quality control are the main causes of low-quality outcomes in road projects in Nepal. It emphasizes how the absence of proactive risk management frameworks and inefficient risk allocation exacerbate these issues. Based on the results, the report makes recommendations for strengthening quality assurance and control processes, ensuring suitable material testing and site investigation, increasing contractor capacity through training, and creating clear risk allocation plans. Road infrastructure projects in Nepal must employ a methodical, risk-based quality management approach to increase its durability, effectiveness, and sustainability.

KEYWORDS Quality Control, Risk Allocation, Risk Factors, Risk Severity, Road Construction Projects

THEME THREE

**RESILIENT HYDROPOWER & CLIMATE
SMART INFRASTRUCTURE**

Suspended Sediment Concentration and Load Prediction in Highly Variable Himalayan River System: A Comparative Study of Machine Learning Approaches

Suwaj Aryal¹, Ram Krishna Regmi¹

¹Institute of Engineering, Pulchowk Campus, Pulchowk, Lalitpur, Nepal

Corresponding author: Suwaj Aryal (Suwajaryal2016@gmail.com)

ABSTRACT

Accurate prediction of suspended sediment concentration is essential for reservoir sedimentation management and hydropower turbine design in Himalayan river basins. This study evaluates six machine learning models, Artificial Neural Network, Long Short-Term Memory, Multilayer Perceptron, Extreme Gradient Boosting, Random Forest, and Support Vector Regression, for daily Suspended Sediment concentration and sediment load prediction in the West Rapti River basin, Nepal. Input features include discharge, rainfall, temperature, grain size, antecedent precipitation indices, Normalized Difference Vegetation Difference, soil moisture, hydrological flashiness indicators, and autoregressive sediment lags. Data spanning eight years (2016–2023) were split, with 2023 as the independent test year. Results show that tree-based and kernel models achieved the highest test-phase performance for SSC prediction, with Random Forest ($R^2 = 0.65$, $NSE = 0.62$) and SVR ($R^2 = 0.64$, $NSE = 0.62$) marginally outperforming deep learning approaches. For sediment load estimation, SVR demonstrated superior accuracy ($R^2 = 0.91$, $NSE = 0.90$, $RMSE = 6,980$ t/day). The Long Short Term Memory model exhibited the lowest bias among all models ($PBIAS = -0.69\%$ for sediment concentration), indicating strong mass balance preservation despite moderate correlation. SHapley Additive explanations analysis revealed that autoregressive SSC lags dominated feature importance across all model architectures, while multi-day rainfall accumulation and discharge dynamics served as secondary drivers. The moderate R^2 ceiling (~ 0.65) across fundamentally different model types suggests that Suspended Sediment Concentration predictability in this basin is constrained by input data availability rather than model complexity, highlighting the need for sediment supply indicators in future studies.

KEYWORDS ANN, LSTM, Machine Learning, Random Forest, Suspended Sediment, SVR, West Rapti River

Assessing Hydropower Potential in Nepal's Babai River Basin: An Integrated GIS and SWAT Hydrological Modeling Approach

Sujata Dhungana^{1*}, Subodh Bidari¹, Ashesh Maharjan¹, Purna Kumari Dhakal¹, Prayash Karmacharya¹, and Deepak Kumar Kc¹, Prashant Neupane¹

¹Everest Engineering College, Sanepa, Lalitpur, Nepal

Corresponding author: Sujata Dhungana (e-mail: sujata.dhungana_22@eemc.edu.np).

ABSTRACT

Nepal has great potential for hydropower development because of its steep landscape, many rivers, and favorable climate. This study examines the run-of-river (RoR) hydropower potential of the Babai River Basin using a combined approach of Geographic Information System (GIS) tools and the Soil and Water Assessment Tool (SWAT) model. The basin was divided into 59 sub-basins using a 30 m resolution Digital Elevation Model (DEM), and important data such as soil, land use/land cover, slope, and weather records were used in the analysis. The SWAT model was calibrated for the period 1990–2000 and validated for 2000–2006 using the SUFI-2 method in SWAT-CUP, and its performance was evaluated using R^2 , Nash–Sutcliffe Efficiency (NSE), and Percent Bias (PBIAS). The results showed a strong agreement between observed and simulated flows during calibration and a satisfactory match during validation. Hydropower potential was estimated using simulated river discharge and available head at different flow levels, and the total potential of the basin was found to be about 80.3 MW at Q40. Two suitable sites were also identified, with estimated capacities of around 8.3 MW and 4.8 MW. Overall, the study shows that the Babai River Basin has good potential for small- to medium-scale hydropower development, as long as environmental flow and irrigation needs are properly managed, and it provides a practical method for hydropower planning in regions with limited data.

KEYWORDS Hydropower potential, GIS, SWAT model, Run-of-river, Babai River Basin

Applicability of Environmental Flow Techniques in Himalayan Hydropower Considering Hydrologic and Energy Perspective

Samyog Bhandari¹, Rupesh Baniya², Ram Krishna Regmi^{3*}

¹Graduate Student, MSc in Hydropower Engineering Program, Department of Civil Engineering, Pulchowk Campus, Institute of Engineering, Tribhuvan University, Lalitpur, Nepal; samyogbhandari@gmail.com

²Department of Civil Engineering, Pulchowk Campus, Institute of Engineering, Tribhuvan University, Lalitpur, Nepal; rupesh.baniya480@gmail.com

³Department of Civil Engineering, Pulchowk Campus, Institute of Engineering, Tribhuvan University, Lalitpur, Nepal; rkregmi@pcampus.edu.np

*Correspondence: Ram Krishna Regmi; rkregmi@pcampus.edu.np, ORCID: <https://orcid.org/0000-0002-8219-2127>

ABSTRACT

Environmental flow (e-flow) management is a critical issue in Himalayan river basins, particularly in the context of rapid hydropower development. The prevailing practice of maintaining a uniform, year-round static e-flow release (typically 10% of the minimum monthly flow) is often inadequate to sustain riverine ecological health while balancing hydropower generation objectives, especially during the dry season. This study evaluates the applicability of various e-flow assessment methodologies by integrating hydrological reliability and hydropower generation impacts. Different e-flow methods are assessed in terms of hydrologic failure and the resulting alterations in energy production. Results showed that method-wise variability in e-flow demand does not differentiate between rain-fed and snow-fed hydrological characteristics. Annual Distribution Method (ADM), Department of Electricity Development (DoED) guideline, and Modified Minimum Flow Method (MMFM) exhibit negligible hydrological failure rates. However, while ADM and MMFM demonstrate relatively lower impacts on annual and dry-season energy generation, they may pose risks of ecological degradation. In contrast, more conservative approaches such as the Variable Monthly Flow (VMF), Tessmann, and Tennant methods show lower hydrological reliability and significantly higher impacts on energy generation. The findings highlight the need for a comprehensive evaluation of dynamic e-flow strategies to support sustainable planning and operation of hydropower projects in the Himalayan region.

KEYWORDS: DoED, Environmental Flow (E-flow), Hydropower, Hydropower Generation; Run-of-River (RoR)

Optimization of Cascade Reservoir Operations in the Koshi Basin Using the Non-Dominated Sorting Algorithm

Ishwor Kumar Shrish¹ and Mukesh Raj Kafle¹

¹Pulchowk Campus, Pulchowk, Lalitpur, Nepal

Corresponding author: Ishwor Kumar Shrish

(e-mail: 070bce064ishwor@pcampus.edu.np).

ABSTRACT

The formidable Himalayan topography of Nepal presents a sophisticated paradox for water resource management: immense hydropower potential existing alongside a volatile monsoon regime that demands a delicate balance between dry-season energy reliability and wet-season safety. Current research regarding the region's cascading systems often exhibits a critical gap, frequently relegating flood attenuation to a secondary constraint rather than treating it as a primary performance metric within powercentric models. This article addresses this technical oversight by introducing a multi-objective framework tailored for the Koshi Basin. The study evaluates a comprehensive strategic cascade of six major reservoirs—Sunkoshi-1, Sunkoshi-2, Sunkoshi-3, the Dudhkoshi Dam, the Tamor Storage Dam, and the terminal Saptakoshi High Dam—while uniquely incorporating the complex operational hydraulics of the Sunkoshi-Kamala and Sunkoshi-Marin inter-basin water transfer projects. By integrating flood attenuation as a concurrent primary objective alongside firm power and total energy generation, the model establishes a synergistic operational logic. This optimization approach yields substantial improvements in energy reliability and total annual generation while simultaneously achieving a meaningful reduction in peak flood discharge compared to historical baselines. Spatial analysis indicates a longitudinal gradient in efficiency, where downstream terminal dams capture the most significant benefits of coordinated flow.

KEYWORDS Energy, Power, Flood, Hydropower, Inter-basin, Koshi, Optimization.

Modeling Runoff Components and Assessing Future Water Availability Due to Climate Change in the Karnali Basin Using the SPHY Model

Bhimlal Pandey¹, Ram Krishna Regmi²

¹Graduate Student, MSc in Hydropower Engineering Program, Department of Civil Engineering, Pulchowk Campus, Institute of Engineering, Tribhuvan University, Lalitpur, Nepal; pbbhimlal@gmail.com

²Department of Civil Engineering, Pulchowk Campus, Institute of Engineering, Tribhuvan University, Lalitpur, Nepal; rkregmi@pcampus.edu.np

*Corresponding Author: Ram Krishna Regmi; rkregmi@pcampus.edu.np,

ORCID: <https://orcid.org/0000-0002-8219-2127>

ABSTRACT

This study investigates the hydrological processes controlling runoff generation and examines the potential impacts of climate change on water availability and seasonal flow dynamics in the Karnali River Basin (KRB) of western Nepal. Historical hydro-climatic records were analyzed, and an ensemble of climate projections was prepared to represent future climatic conditions. The Spatial Processes in HYdrology (SPHY) model, a distributed hydrological model capable of simulating snow and glacier dynamics, was applied to assess basin-scale hydrological responses. Model calibration (2005–2014) and validation (2015–2022) were conducted using mean daily discharge data from the Chisapani station. The model demonstrated satisfactory performance, with calibration results showing $R^2 = 0.79$, $NSE = 0.78$, and $PBIAS = 7.19$, while validation produced $R^2 = 0.84$, $NSE = 0.83$, and $PBIAS = -5.10$, indicating reliable simulation capability. The results reveal that rainfall-driven runoff dominates basin hydrology 52%, followed by snowmelt 28%, base flow 16%, and glacier melt 4%. Future hydrological simulations were carried out for mid-century (2040–2070) and late-century (2070–2099) periods under SSP2-4.5 and SSP5-8.5 scenarios. Projections indicate an overall increase in annual discharge under both scenarios relative to the baseline period (1985–2014). However, seasonal variations are evident, including declining post-monsoon flows and an increasing contribution from snowmelt processes. These projected changes may significantly influence water resource availability, with implications for agriculture, hydropower production, and ecosystem sustainability. The study highlights the importance of adopting adaptive and integrated water management strategies to address future hydrological uncertainties in Karnali River Basins.

KEYWORDS: Cryosphere; Climate change; SPHY; Water availability; Snowmelt; Glacier melt

Risk Analysis of Existing Hydropower Based on Future Climate Change Scenario

**Khuwa Prasad Paudel^{1*}, Shankar Lamichhane¹, Rabi Marasini¹, Sunil Paudel¹,
Indra Prasad Timilsina¹**

¹School of Engineering, Pokhara University

*Corresponding author: Khuwa Prasad Paudel (e-mail: kppaudel912@gmail.com).

ABSTRACT

Climate change has interrupted the global hydrological cycle affecting water resource management and hydropower production. This study conducts a quantitative risk analysis of the Modi Khola Hydroelectric Power Plant. The study analyzes risks on existing hydropower potential for the duration of 2026 to 2100 due to climate change. From eight selected coupled model inter comparison project phase 6 global climate models representing four extreme climate corners, under moderate Shared Socioeconomic Pathways (SSP) 2-4.5 and high emission SSP 5-8.5 scenarios by using advanced envelope method, future streamflow projections at the dam site were adapted. The baseline energy potential of 92.50 GWh and 81 GWh was utilized to identify the energy production risk. Energy generation, compared with 92.50 GWh, shows declines by 0.41% to 16.16%, except NESM3 increases from 5.57% to 7.73% and with 81 GWh baseline, improves from -4.26% to 23.03%. The risk rises with higher energy production, particularly under SSP 5-8.5, however SSP 2-4.5 consistently reveals lower risk for the tenure. The greatest significant risks are seen during near future then slightly declines by the mid and far future. The quantitative risk analysis shows that at 81 GWh production target, failure risk ranges from 6% to 38% across scenarios, with SSP 5-8.5. At 92.50 GWh target, risk increased drastically to 53% to 86%. The 81 GWh level generally represents moderate to significant risk, whereas 92.50 GWh target represents the significant risk category across all future periods and models.

KEYWORDS: Climate change, Modi River Basin, Hydropower Production, Risk Analysis.

Homogeneity Testing and Quantile Regression for Regional Flood Estimation in the Narayani Basin, Nepal

Tejendra Bist¹, Mukesh Raj Kafle¹

¹Institute of Engineering, Pulchowk Campus, Lalitpur, Nepal

Corresponding author: Tejendra Bist

E-mail: 080mshpe024.tejendra@pcampus.edu.np

ABSTRACT

Regional flood estimation in Nepal is challenged by short, uneven, and spatially sparse hydrometric records, particularly in Himalayan basins where strong physiographic and hydroclimatic contrasts make regional pooling difficult. This study examines the combined use of homogeneity testing and quantile regression for regional flood estimation in the Narayani Basin, Nepal. Annual maximum discharge records from gauged stations, together with selected catchment descriptors, were analyzed within an L-moment framework to evaluate regional homogeneity and identify a pooling group suitable for regional analysis. Quantile regression models were then developed to estimate flood quantiles directly from catchment descriptors and limited annual maximum series. The results show that achieving strict homogeneity in the Narayani Basin is difficult without substantially reducing the available station-year data, reflecting the marked variability of the basin. However, homogeneity screening allowed the identification of a defensible pooling group for regional flood estimation. The quantile regression results indicate that the method makes effective use of limited regional information and provides reasonable flood estimates for low to moderate return periods, with stable performance up to about the 50-year return period. Uncertainty increases for rarer events, and the reliability of regional estimates declines. The study shows that Hosking–Wallis homogeneity assessment combined with quantile regression provides a practical basis for estimating design floods in data-scarce Himalayan basins.

KEYWORDS: Data-scarce Basin, Design Flood, Homogeneity Testing, Narayani Basin, Quantile Regression, QRT, Regional Flood Estimation.

Leveraging Nepal's Hydropower Potential for Green AI Data Center Development

Sakshyam Banjade¹

¹Department of Computing, TechSpire College, Asia Pacific University of Technology & Innovation, Kathmandu, Nepal

Corresponding author: Sakshyam Banjade

(e-mail: sakshyam.banjadesp25@cps.edu.np)

ABSTRACT

Rapid growth in AI workloads has intensified global data center energy demand, creating an urgent need for renewable-powered infrastructure. Nepal holds over 83,000 MW of theoretical hydropower potential, a naturally cool Himalayan climate, and strategic positioning between India and China—yet remains an unexplored candidate for green AI data centers. This paper proposes a hydropower-to-data-center integration framework, develops a techno-economic cost model demonstrating effective energy costs of USD 0.022–0.048/kWh, which is 70–85% below global averages, and identifies key infrastructure and policy barriers. Findings indicate Nepal can achieve near-zero carbon emissions alongside globally competitive Power Usage Effectiveness, positioning the country as a replicable model for renewable-powered digital infrastructure in hydropower-rich developing nations.

KEYWORDS: AI data centers; green computing; hydropower; Nepal energy; sustainable infrastructure
AMS Subject Classification (2020): 68T01 · 90B18 · 91B76

Evaluating the impact of Climate Change on Stormwater Drainage System of an urban town: A case study of Flood Resilience Assessment of Katahariya Municipality

Jay Prakash Singh¹, Prof. Dr. Jiba Raj Pokhrel¹, and Sarita Khanal²

¹IOE, Pulchowk Campus, Lalitpur, Nepal

²Lumbini International Academy of Science and Technology, Lalitpur, Nepal

Corresponding author: Jay Prakash Singh (e-mail: 079msccd.jay@pcampus.com).

ABSTRACT

Urban flooding is one of the most frequently occurring consequences of climate change. The impact due to urban flooding is minimized mostly by storm water drainage system. Here a case study of Katahariya Municipality is used to evaluate the impact of climate change on hydrology and subsequent resilience of an urban town against flooding. This research assesses the adequacy of an existing storm water drainage and examines whether the conventional drainage-based solution is sufficient to mitigate urban flood risks due to climate change. Hydrological analysis was performed using available rainfall data with Intensity-Duration-Frequency (IDF) relationships developed using Gumbel distribution and a model using Hydrological Calculation System (HYKAS) to simulate runoff and to evaluate the performance of the model under present scenario. The results illustrated that the existing drainage systems are not adequate to accommodate the peak runoff which occur more frequently due to climate change suggesting that the reliance on conventional storm water drainage alone may not be sufficient to build a resilient urban townbut incorporation of nature-based solution and sustainable planning is needed.

KEYWORDS Climate Change, HYKAS, Storm water management, Urban Flooding, Urban Resilience

Estimation of Sediment Load and Spatial Distribution of Sediment Yield in the Marsyangdi River Basin, Nepal

Sadikshya Ghimire¹, Ram Krishna Regmi¹

¹Institute of Engineering, Pulchowk Campus, Lalitpur, Nepal

Corresponding author: Sadikshya Ghimire (e-mail:

080mshpe015.sadikshya@pcampus.edu.np).

ABSTRACT

Himalayan river basins are characterized by exceptionally high sediment loads driven by active tectonics, glacial influence, steep terrain, and intense monsoon precipitation, yet quantitative estimates of spatially distributed sediment generation remain scarce in Nepal. This uncertainty constrains the sustainable planning and operation of run-of-river hydropower projects, where excessive sediment loads increase turbine abrasion, maintenance costs, and production losses. This study applied the Soil and Water Assessment Tool to estimate sediment yield and sediment concentration in the Marsyangdi River Basin, Nepal, a 2,944 km² glaciated tributary of the Gandaki River system hosting three operational run-of-river hydropower stations with a combined installed capacity of 189 MW. The model was calibrated for 2012–2014 and validated for 2015, yielding satisfactory sediment performance during calibration with NSE = 0.605 and R² = 0.612 and acceptable validation results with NSE = 0.566 and R² = 0.578. Simulation for 2012–2024 indicated that about 89% of total basin sediment generation originates from five southern sub-basins characterized by intense orographic precipitation and steep slopes, whereas northern rain-shadow sub-basins contribute only marginally. Average annual sediment export at the basin outlet was estimated at 9.42 Mt/yr, with mean sediment concentration of 1,385 mg/L and peak concentration of 55,983 mg/L. About 73% of annual sediment load occurred during the monsoon season, highlighting a distinct period of elevated hydropower operational risk and the need for targeted monitoring and watershed management.

KEYWORDS Hydropower, Marsyangdi River Basin, Monsoon, Nepal, Sediment Concentration, Sediment Yield, Soil and Water Assessment Tool, Watershed Management.

Susceptibility Mapping of Glacial Lakes in Solukhumbu District, Dudh Koshi

River Basin: A Remote Sensing Approach

Saroj Pandit

Department of Civil Engineering, Pulchowk Campus, Institute of Engineering
Corresponding author (email: 074bce147.saroj@pcampus.edu.np)

ABSTRACT

Glacial Lake Outburst Floods (GLOFs) poses a significant risk to downstream communities and infrastructure in the High Asia Region, specially in the Solukhumbu District of the Dudh Koshi River Basin. This study presents a detailed multi - criteria susceptibility mapping of glacial lakes using a remote sensing approach, focusing on key topographic and climatological parameters. Critical factors including type of dam, outflow channel slope, glacier, and lake, mean slope of the area, dam erodibility, and potential for rapid mass movement were rigorously analyzed for each lake. High resolution satellite imagery and Digital Elevation Models (DEM) were employed to extract topographic data, and a multi- criteria assessment framework was applied to evaluate GLOF susceptibility. Along with the slope other climatological parameters such as rate of change of area, temperature and snow cover in the particular coordinates makes the research strong in the susceptibility analysis of the glacial lakes in Dudh Koshi river basin. The results reveal that lakes with moraine dams, steep slopes, and high erodibility with less snow cover in melting season, approximate high rise in temperature and high rate of increase in glacial lake area are most susceptible to GLOF events, with several lakes identified as high risk due to their proximity to active glaciers and steep terrain. This GLOF susceptibility mapping provides a reliable baseline for hazard prioritization and supports the development of targeted early warning systems and disaster risk reduction strategies in the region. The study implies the importance of integrating remote sensing and field-based data for accurate GLOF hazard assessment in high Asia mountains.

KEYWORDS: GLOF, GLOF Susceptibility, Hazard, Remote sensing

THEME FOUR
**INTEGRATED WATER, SANITATION &
ENVIRONMENTAL SYSTEM**

Geospatial Analysis of Contaminant Inflows Affecting River Health in Kathmandu

Sophie Vo

University of Technology Sydney, Broadway, NSW 2007, Australia

Email: vosophie04@gmail.com

ABSTRACT

Over recent decades, rapid urbanisation has significantly transformed the physical and sociocultural landscape of Kathmandu. Through an interdisciplinary lens, this study investigates the deterioration of river water quality across the Kathmandu Valley and the effects on local communities. At various sampling points, water samples were collected from Bagdwar, Balkhu, Tukucha, Bishnumati, Bishnudwar, Dhobi Khola, Manohara, and Nakhu, and the mixing points with the Bagmati River, and analysed at the Nepal Academy of Science and Technology to assess physical, chemical, and microbiological characteristics. Substantial risks to public health were detected in prominent rivers, including high concentrations of E.coli at levels unsafe for direct human contact. The results revealed a trend in which water quality significantly declines as sampling proximity approaches densely populated areas with strong anthropogenic influence, including agriculture, industrial, and residential activities. Compared with quantitative data from local stakeholder interviews, a comprehensive understanding of the persistent water quality crisis was developed. The integration of scientific data and lived experience enables a nuanced approach that links numerical patterns to human practices. The project translates key findings into effective community education through an educational documentary targeted for school-aged children. Serving as a triangulation of results, the documentary serves a dual purpose: academic dissemination and community engagement to enhance the potential for environmental and behavioural outcomes. Hence, a call to action is established on a community level to work towards achieving United Nations Sustainable Development Goals 6 (Clean Water and Sanitation), 3 (Good Health and Well-Being), and 11 (Sustainable Cities and Communities).

KEYWORDS: E. coli, environmental management, groundwater, Kathmandu Valley, public health risk, river pollution, rapid urbanisation, water quality.

Bridging the Implementation Gap: Technical Sophistication, Stakeholder Engagement, and Adaptive Capacity in Geospatial Water Management Research

Nicole L. Yap¹, Sojen Pradhan¹

¹University of Technology Sydney, Sydney, Australia

Corresponding author: Nicole L. Yap (e-mail: layim.yap@student.uts.edu.au).

ABSTRACT

Despite widespread adoption of geographic information systems and remote sensing in water management research, their translation into sustained community-level implementation remains poorly understood. We conducted a systematic literature review of 33 peer-reviewed studies (2015 - 2025) to quantify the integration of geospatial technologies with stakeholder engagement and adaptive management in community water and sanitation contexts. Following PRISMA 2020 guidelines, we coded studies across 3 domains: technical - analytical capacity, stakeholder engagement, and community adaptive capacity. Results reveal a critical implementation gap. While all 33 studies (100%) achieved strong technical performance, including machine learning models with predictive accuracy exceeding 0.75, only 9 studies (26%) incorporated meaningful stakeholder engagement, and zero achieved complete adaptive management cycles with post-implementation monitoring. Machine learning applications exhibited 60% non-participatory rates, while basic GIS applications showed 67% participation rates. We identify 3 structural barriers: funding timelines (1 - 3 years) mismatched to engagement requirements (4 - 5 years), disciplinary incentives privileging algorithmic sophistication over implementation outcomes, and absent continuity mechanisms beyond project completion. Closing this gap requires systemic reforms including extended funding cycles, mandatory engagement budgeting, and publication criteria recognising implementation outcomes alongside technical rigor.

KEYWORDS Community-based water management, Geographic Information Systems, implementation outcomes, remote sensing, stakeholder engagement, systematic review

Identification of Groundwater Recharge Potential Zone Using Remote Sensing and GIS Techniques in Bharatpur Municipality, Chitwan, Nepal

Ramji Kshetri

Hof University of Applied Science, Hof, Germany

Corresponding author: Ramji.Kshetri@hof-university.de

ABSTRACT

Groundwater is a primary water source in Bharatpur municipality, which contributes to water supply for various purposes including drinking, irrigation, sanitary, and industrial. Bharatpur has become an attractive place to live due to the availability of educational, medical, and employment amenities. These facilities are contributing to the rapid growth of population and infrastructure expansion over the municipality. Consequently, the rapidly increasing population leads to the need for more groundwater withdrawal to fulfill the water demand, decreasing the recharge area due to concrete cover and increasing the flooding problem during the monsoon season. As a result, these consequences are altering the ecosystem of groundwater and affecting the sustainability of the water supply system in the municipality. Despite the risk of lacking water supply problems in the municipality, there has been little scientific research on sustainable groundwater management. In response, this study seeks to categorize and delineate potential groundwater recharge zones using remote sensing and geographical information system approaches. By employing these advanced methodologies, the study expects to deliver practical insights for long-term groundwater management practices. The analytical hierarchy process (AHP) is a widely accepted multi-criteria decision analysis (MCDA) method for groundwater assessment and other scientific investigations. In this paper, the author analyses key influencing factors for groundwater recharge and utilizes GIS software to create thematic layers of maps for each factor. These factors include physiography, parent soil, land use and land cover, drainage density, lineament density, slope, and proportion of clay. By integrating these thematic layers of maps using the AHP and WOA methodologies, the study aims to identify possible groundwater recharge zones in the Bharatpur municipality, Chitwan, Nepal. The findings reveal that a significant portion of the region has a moderate to high potential for groundwater recharge in the southern part and the northern part was found to be below potential for groundwater recharge. Additionally, the derived potential groundwater recharge map has the potential to offer invaluable support to urban planners and policymakers. Identifying places suitable for groundwater recharge allows for more informed decision-making to protect groundwater resources and the surrounding ecosystem. This proactive approach is consistent with the larger goal of achieving sustainable development in the study region, which promotes an equilibrium between urbanization and environmental conservation.

KEYWORDS AHP · Overlay analysis · Physiography · Parent soil · Drainage density · Lineament density · Slope · Clay content · Land use

Household Water Treatment, Safe Storage Practices and Diarrheal Disease A Case Study of Rural Sindhupalchok, Nepal

Ram Chandra Poudel¹

¹Corresponding author: Ram Chandra Poudel (e-mail: evergreenrcp@gmail.com).

ABSTRACT

Diarrheal diseases remain a leading cause of morbidity and mortality in low and middle income countries, particularly among children under five years of age. Household water treatment and safe storage (HWTS) interventions are widely promoted to reduce microbial contamination of drinking water at the point of use. However, the effectiveness of specific treatment methods and the role of knowledge regarding safe water storage vary across settings. This case study studies the use of Household Water Treatment methods preferred by citizens of rural village not connected to centralized water treatment system from Sindhupalchok, Nepal. People were asked about average household members, preferred household water treatment solutions among but not limited to boiling, use of chlorine, cloth filter, SODIS and others. Self-reported knowledge of people regarding safe storage of drinking water and self-reported incidence of occurrence of diarrheal disease has been contrasted. Impact of availability of pure drinking water on water intake and self-disclosed prevalence of diseases related to drinking water intake has been reported. Study revealed that despite absence of reliable access to centralized water treatment and supply system, there was huge reluctance to use household water treatment methods and the associated reason for this was confidence of user based on appearance of water, which roots to lack of awareness. Insights from the study provides the snapshot of typical rural village in Nepal and serve as a baseline for intervention planning during epidemics.

KEYWORDS diarrheal disease, household water treatment, HWTS, safe storage.

Water Quality Investigation, Pollution Sources Identification, and Impact Mapping within the Kathmandu Valley

Sagar Shrestha¹, Aayush Koirala¹, Hritik Tiwari¹, Shivam B.K¹, Sandesh Ale¹, Ayush Budha¹

¹Everest Engineering College, Sanepa, Lalitpur, Nepal

ABSTRACT

The Bagmati River, the heart of the capital has been degrading substantially challenging public health, environmental health and entire ecological system. Identification of the pollution in the river helps to find the river ecosystem. This study highlighted temporal variations in water quality of the Bagmati River and its major tributaries within the Kathmandu Valley. Using the secondary data analyzed for key physicochemical and microbiological parameters including BOD, COD, DO, fecal coliform, pH, phosphate, TDS, TSS and turbidity, results indicate severe declination in urban stretches, with DO constantly falling below 2 mg/L and BOD values exceeding 300 mg/L in densely populated areas. During the study seasonal trends were analyzed and it was found that pollution hotspots were concentrated during winter due to low discharge. The water quality in more than 80% of sampling locations was found as 'heavily polluted' making it not suitable for aquatic ecosystems. However, only the upstream headwaters with good water quality could be found. In this regard, the tributaries such as Bishnumati, Dhobi Khola, Hanumante, and Tukucha are major tributaries in conveying pollutants into Bigamti River system. The result showed that there was an inverse correlation between BOD and DO, where the high value of BOD accounted for almost 62% variations of dissolved oxygen. Through principal component analysis, four primary pollution sources were detected: sediment laden runoff, organic and nutrient enrichment from sewage, fecal contamination, and untreated urban wastewater inputs. The study shows the urgent need for proper river basin management, better treatment of wastewater, strict laws for environmental protection, and intervention at community levels. The results of this study might offer an effective, scientific framework for effective restorative efforts to ensure sustainable management of water resources in the valley.

KEYWORD GIS mapping, Potential Pollution sources, Spatio-temporal analysis, Water quality assessment

Carbon Footprint Analysis of Kathmandu Metropolitan City: Identifying Major Greenhouse Gas Emission Sources and Mitigation Strategies

Kanchan Kumari Sah

M.Sc. Environmental Management, School of Environmental Science and Management (SchEMS), Pokhara University, Kathmandu, Nepal.

Corresponding Author: sahkanchankumari821@gmail.com

ABSTRACT

This case study evaluates the carbon footprint of Kathmandu Metropolitan City, Nepal, identifying primary greenhouse gas (GHG) emission sources within a rapidly urbanizing landscape. As urbanization and demographic shifts accelerate, this research quantifies emissions across critical sectors: urban construction, energy consumption, waste management, and the transportation sector. By assessing these contributors, the study underscores the environmental externalities of rising carbon levels, particularly concerning urban air quality and regional climate change impacts. To mitigate these effects, the research proposes specific strategies, including the adoption of renewable energy technologies, the expansion of mass transit infrastructure, and the implementation of integrated waste management systems. These findings emphasize that sustainable urban development and carbon-neutral policies are vital for reducing ecological impacts and ensuring long-term environmental resilience in the Kathmandu Valley. This analysis provides a baseline for local policymakers to implement targeted emission reduction strategies and climate action plans.

KEYWORDS: Carbon Footprint, Emission Reduction Strategies, Greenhouse Gas (GHG) Emissions, Integrated Waste Management, Kathmandu Valley, Sustainable Urban Development, Transportation Sector, Urban Air Quality.

Sustainability Analysis of Lift Drinking Water Supply Systems: A Case of Purbakhola Rural Municipality-5, Birkot, Palpa

Bhuwan Shrestha¹, Robert Dongol¹

¹Nepal Engineering College-Center for Postgraduate Studies, Prayagpokhari, Lagankhel

Corresponding author: Robert Dongol (E-mail: robert@nec.edu.np)

ABSTRACT

The study compares the sustainability of two rural water supply systems in Nepal's hilly regions: Padhera Khola Lift Khane Pani (PKLKP) and Syaphat Bahundi Lift Khane Pani (SBLKP) located in Purbakhola Rural Municipality. This is due to growing apprehension regarding the long-term performance and effectiveness of rural lift drinking water systems. The study looks at four key aspects of the overall sustainability: technical, social/environmental, financial, and institutional. The study followed a mixed-method approach, combining field observations, key informant interviews, household surveys, and project document review. A collection of sustainability indicators was used to assess the financial viability, governance structure, and system performance for each dimension. The data were analyzed both qualitatively and quantitatively to gain comparative insights. The sustainability varies even though water access has greatly improved under both PKLKP and SBLKP. Technical dependability and institutional management were higher for PKLKP, whereas community involvement and environmental compatibility for SBLKP. Both systems need to deal with long-term funding and system maintenance. A priority gap analysis of these water supply systems to identify areas required improvements for long-term sustainability found that the priority gaps have a strong correlation between the systems. The study found that every system needs to be technically viable, environmentally sound, financially sustainable, and have a strong institution. System operators also need to receive regular and appropriate training. In similar geographic and socioeconomic contexts, these findings can assist local governments, non-governmental organizations, and community-based organizations in enhancing the sustainability, operation and planning of lift water supply systems.

KEYWORDS: Palpa, Purbakhola Rural Municipality, Sustainability, Water supply system,

Food Waste Management in Pokhara: Pathways Toward Achieving Sustainable Development Goal 12.3

Pawan Baral

School of Engineering, Pokhara University, Kaski , Nepal

Corresponding Author: Pawan Baral (e-mail: pawanbaral235@gmail.com)

ABSTRACT

Food waste is a critical global challenge with profound environmental, economic, and social consequences. This research investigates the specific context of food waste management in Pokhara, Nepal, a rapidly urbanizing metropolitan and tourism hub. The study employs a mixed-methods approach, combining a review of existing literature with a targeted quantitative survey of university students to provide an empirical analysis of waste generation patterns and existing management practices. The findings reveal a high degree of awareness and a strong willingness among the student population to adopt sustainable practices, with a significant portion already engaged in composting and food redistribution. However, the current municipal waste management infrastructure remains predominantly linear, focused on centralized collection and disposal in landfills, which lacks the capacity for organic waste processing. This paper argues that Pokhara is at a unique inflection point, possessing the opportunity to bypass traditional linear waste models and directly adopt circular economy principles. Based on this analysis, the study proposes a multi-pronged strategy including the establishment of municipal-level composting, formal food redistribution partnerships, and targeted public awareness campaigns. These recommendations provide an evidence-based roadmap for local policymakers and businesses to enhance sustainable urban management and directly contribute to the global mandate of halving food waste by 2030, as outlined in Sustainable Development Goal 12.3.

KEYWORDS: Circular economy, food waste management, Pokhara, sustainable development goals, waste reduction