

Research and Projects

We conduct research and consultancy projects in collaboration with national and international organizations on various aspects of disasters and focuses on urban safety, particularly in the areas of transportation and infrastructure, with the aim of improving the safety and resilience of cities. Some activities conducted by the BUET-JIDPUS in recent years:

Emergency Evacuation Planning of Metro Station: A Case Study of Agargaon Station

- The primary aim of this study is to devise a methodology for assessing evacuation times of a typical Mass Rapid Transit (MRT) station in Dhaka.



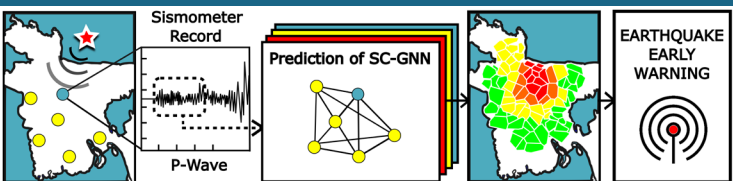
- In this project, a comprehensive model of the MRT station is constructed within a microsimulation platform that incorporates essential architectural features while delineating walking paths within the simulated environment. Latin hypercube sampling (LHS) and random forest analysis was conducted to classify the panic level.

Earthquake Early Warning System (EEWS) in Bangladesh¹

Funding Agency: Research and Innovation Centre for Science and Engineering (RISE), BUET

- We undertook a comprehensive multidisciplinary approach, including real data, soil dynamics, telecommunication, and artificial intelligence, to devise and pave the way for the deployment of an EEWS for Bangladesh.

- An SC-GNN algorithm for fast recognition of P-waves and intensity prediction is developed. A comparison with other neural network base algorithms showed better results. Study of telecommunication system for alarm detection, assessment of existing seismic detection systems in Bangladesh and analysis of wavefronts recorded in Bangladesh were conducted.



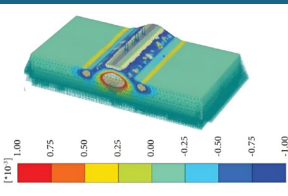
¹ Murshed, R. U., Noshin, K., Zakaria, M. A., Uddin, M. F., Amin, A. S., & Ali, M. E. (2024). Real-time Seismic Intensity Prediction using Self-supervised Contrastive GNN for Earthquake Early Warning. IEEE Transactions on Geoscience and Remote Sensing.

Analysis of Ballasted Rail Track and Behavior of Railway Embankment²

Funding Agency: Construction Supervision Consultant, Bangladesh Army

- The behavior of rail tracks on alluvial deposits of Ganges–Brahmaputra floodplain where cyclic expansion and contraction due to wetting and drying, soil accumulation, and erosion in each flood season is studied. The results provide insight into crucial parameters to be considered for the satisfactory performance and expansion of the rail network for future trade opportunities.

- Numerical analysis was done where the material model selected for the embankment and subsoil of this study is the HS-small model. This model works in the domain of elastoplastic range. Micro tremor device and data acquisition system were used to determine the dynamic properties of the sub-soil.



Feasibility Study and Detail Design for Permitting Locomotive and Coaches with Higher Axle Loads Over the Existing Kalurghat Bridge of Bangladesh Railway

Funding Agency: Bangladesh Railway

- The objective of the project is to ensure safe and speedy movement of passengers and goods trains with reduced travel-time across the Karnaphuli River.
- The project included a dedicated walkway for the pedestrians, enhancement of capacity for increasing load (Rail load, Pedestrian load and Vehicle load), night-time illumination for traffic and pedestrians, increasing sectional capacity for enhancing train operation capacity and scour protection.
- We conducted dynamic measurements on the bridge to assess the strengths and weaknesses of different structural members to strategize the rehabilitation. Image analysis and visual inspection were conducted.



Feasibility study of Urban Interchange Including Pedestrians Facility Improvements at Bijoy Sarani, Dhaka under DNCC

Funding Agency: Dhaka North City Corporation

- The objective of the project is to develop an urban interchange and improve pedestrian facilities at the Bijoy Sarani intersection.

- The project included topographic and aerial surveys, geotechnical investigations, traffic and pedestrian surveys, and environmental baseline surveys.
- We conducted simulation of future scenarios up to 2035 using the numerical model to optimize signal phase timings for implementing adaptive signal controls at six intersections including Bijoy Sarani for pedestrian movements and emergency evacuation scenarios in underpasses.



National Resilience Program: Vulnerability Assessment of Earthquake Risk at Ward level, developing Contingency Plans, Preparing Training Modules and imparting Training for Rangpur City Corporation and Tangail, Rangamati and Sunamganj Pourashavas

Funding Agency: UNDP

- The objective of the project is to prepare ward-based contingency plans for community-based earthquake risk reduction and management of twelve wards of Rangpur City Corporation, Tangail Pourashava, Sunamganj Pourashava, and Rangamati Pourashava.



- Contingency plan includes temporary shelter planning, emergency health facility planning, ward coordination center planning, and evacuation route planning.

- Seismic exposure assessment, structural vulnerability assessment and socio-economic vulnerability assessment were done.

Evaluation of Liquefaction potential index and severity mapping of Rangpur City Corporation

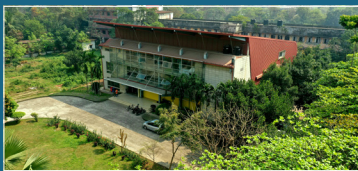
Funding Agency: Ministry of Science and Technology

- The objective of the project is to investigate the Liquefaction Potential Index (LPI) and preparing a liquefaction severity map of Rangpur City Corporation, Bangladesh in order to help the legislators and policymakers with informed land use planning as well as the development of the town.
- Under this project, Standard Penetration Test (SPT) and Microtremor test were done on the field based on the seismic soil profile and engineering geology reports available for Rangpur City Corporation. The Grain Size Distribution test and Liquefaction Potential Index (LPI) were determined for the collected samples in the laboratory and severity mapping was done.

Health Monitoring of the Bangabandhu Bridge

Funding Agency: Bangladesh Bridge Authority

- This project monitored the serviceability performance of the superstructure of the Bangabandhu Bridge by deploying sensors at strategic locations.
- A numerical analysis was done on acquired vibration data to identify the predominant natural frequencies of the deck system to assess the time dependent evolution of stiffness in the process of strengthening works.



BUET-Japan Institute of Disaster Prevention and Urban Safety (BUET-JIDPUS)

West Palashi Campus, Bangladesh University of Engineering and Technology (BUET), Dhaka-1000, Bangladesh

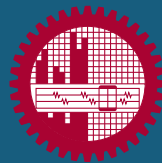
Email: jidpusinfo@jidpus.buet.ac.bd, Phone: +880255155198 (Direct)

PABX:+880255666000, 55666001, 55666002, Ext. 6591, Fax:+880258613046, 223365622 (Attn: BUET-JIDPUS)



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BROCHURE



BUET-Japan Institute of Disaster Prevention and Urban Safety

BUET-JIDPUS

West Palashi Campus

Bangladesh University of Engineering and Technology



Introduction

Every country faces the risk of natural or man-made disasters, which necessitates the development of effective strategies for disaster prevention and management. To address this, the BUET-Japan Institute of Disaster Prevention and Urban Safety (BUET-JIDPUS) was established by the on December 30, 2009, as a development project of the Government of Bangladesh. Over time, the project expanded its scope to include urban safety along with disaster prevention and management. In 2011, the project was upgraded to an institute. Its aim is to provide a hub for education, research and training in the field of disaster prevention and urban safety, with the goal of reducing the risk of disasters. The institute seeks to assist in properly managing calamities as well as enhancing and maintaining safety of the existing infrastructure. It works to raise both awareness and technical understanding on the reduction of risks posed by disasters. This institute also provides advising and consultancy services to public and private entities.

Messages

Vice-Chancellor



Disasters have a profound impact on our lives, often causing immense loss of life, property and national infrastructure. Disasters disrupt communities, destabilize economies, and leave behind scars that can last for generations. In response to this pressing challenge, BUET-JIDPUS was established in 2009 with the aim of meeting the critical need for proactive academic and research initiatives, post-credencial training, and industry engagement in the realm of disaster prevention and urban safety in Bangladesh. Since its establishment, the institute has made remarkable progress, leaving a lasting impact on society.

As we continue on this journey, I extend my heartfelt wishes for ongoing success and fulfilment to the institution. Together, let us advance towards the shared goal of building a much desired disaster-resilient nation and realizing the vision of sustainable cities and communities.

Our Vision

The vision of BUET-JIDPUS is to serve as a national reference center for teaching, learning, research and awareness development in the field of disaster risk reduction and urban safety assurance, complementing BUET's mission of contributing to national policymaking in the area leading to Bangladesh's socio-economic development.

Our Mission

- To strengthen the capacity of professionals in Bangladesh in the fields of
 - * Infrastructure management and structural health monitoring
 - * Disaster management and prevention
 - * Urban safety

Pro-Vice-Chancellor



Since the establishment, BUET-JIDPUS has remained steadfast in its commitment to excellence in education, research, and industrial engagement. Through its research and outreach programs, this institute is much empowering the local governments, civil society organizations, and other stakeholders with the updated knowledge and tools they need to build resilience and enhance preparedness in the face of disasters.

The institute places a strong emphasis on enriching professionals' capacity in disaster risk reduction, focusing on seismic and urban hazards, evolving constructional hazards, infrastructure management, and structural health monitoring. It is our sincere hope that through these collective efforts, we can make a positive impact on the safety and well-being of our society.

Director



BUET-JIDPUS remained unwavering in our dedication to nurturing relevant individuals and professionals, equipping them with the requisite skills, knowledge and expertise to effectively address the multifaceted challenges posed by natural and man-made disasters. We recently introduced three postgraduate degrees in Disaster Risk Reduction (DRR), aimed at cultivating human resources capable of reducing disaster risks and pushing the evolving boundaries of disaster management. Collaboration with various national and international entities enhances our capacity to address complex disaster challenges and fosters a collaborative approach to building resilient communities.

We would like to invite you to join us on this remarkable journey of academic and intellectual growth with much anticipated collaborations with the industry.

- To strengthen other local agencies on the mentioned fields through training and dissemination of information
- To promote collaboration with other national and international universities and research organizations
- To conduct research, testing and consultancy services in the field of disaster prevention and urban safety

Academics

Purpose and Scope

The purpose of BUET-JIDPUS is to undertake and promote research and teaching in the fields of disaster management and urban safety with particular emphasis on urban hazards like earthquake, cyclone and fire hazards. Additionally, the institute is committed to cultivating skilled professionals in the field of disaster management and urban safety, thereby contributing to the overall resilience and preparedness of the nation.

Education

The BUET-JIDPUS rolled out the following postgraduate degrees with 53 students from April, 2023: Master of Science in Disaster Risk Reduction Engineering, abbreviated as M. Sc. Engg. (DRR), Master of Engineering in Disaster Risk Reduction Engineering, abbreviated as M. Engg. (DRR), Master of Science in Disaster Risk Reduction Science, abbreviated as M. Sc. (DRR). This achievement has been the result of a remarkable journey, guided by the expertise and dedication of numerous professionals and academicians, aimed at nurturing future leaders and professionals in the field of disaster risk reduction. The curriculum of disaster risk reduction is focused on the following aspects:

- Fundamentals of disaster management knowledge
- Hazard analysis, assessment and mitigation
- Vulnerability assessment and risk reduction
- Geotechnical and structural aspects of disasters
- Tools and techniques



Training and Conference

One of the major aims of BUET-JIDPUS is to provide training and short courses to enhance the capabilities of target groups in order to effectively manage disasters and promote urban safety. Over the past few years, BUET-JIDPUS has consistently organized routine training sessions and conferences, which constitute significant academic endeavours.



Faculty Members



A. F. M. Saiful Amin
Professor and Director
dirjidpus@jidpus.buet.ac.bd



Ishika Nawrin Chowdhury
Assistant Professor [on leave]
ishika@jidpus.buet.ac.bd



Md. Aminul Islam
Assistant Professor [on leave]
mdaminul@jidpus.buet.ac.bd



Tasnim Tarannum Isaba
Assistant Professor [on leave]
isabatasnim@jidpus.buet.ac.bd



Shamontee Aziz
Assistant Professor [on leave]
shamonteeaziz@jidpus.buet.ac.bd



Iram Lamiya Hoque
Assistant Professor [on leave]
lamiyahoque@jidpus.buet.ac.bd



Joya Rani Mallick
Lecturer [on leave]
joyarani@jidpus.buet.ac.bd



Madeha Sattar Khan
Lecturer
madeha@jidpus.buet.ac.bd



Mushirah Tasnim
Lecturer
mushirah@jidpus.buet.ac.bd



Maria Mehrin
Lecturer
maria@jidpus.buet.ac.bd

Technical Personnel



Md. Jasim
Instrument Engineer
jasim@jidpus.buet.ac.bd



Azader Rahman
Senior Technical Officer Grade-1
azaderahman@jidpus.buet.ac.bd



Md. Haronor Rashid
Technical Officer
haronor01743@jidpus.buet.ac.bd

Laboratories

Non-Destructive Testing Laboratory

For existing condition assessment of structures without destruction, NDT instruments are useful. Testing instruments are used as follows:

- Detection of buried utilities
- Metallic and non-metallic targets in concrete structures
- Detection and positioning of reinforcement along with a crack's depth determination in slab, beam and column
- Detection of foundation thickness and reinforcement in foundation
- Dynamic property determination of soil and structures
- Vulnerability assessment and retrofitting of building
- Concrete strength determination
- Seismic micro zonation

Computational and Simulation Laboratory

It has the server version software for education, research and professional services (ArcGIS®, ETABS®, Kaleida Graph, Mathematica®, MATLAB®, Origin®, PLAXIS 2D and 3D®, SAP2000®, SCPT Bundle), with computers, multimedia facilities, broadband internet and networking.

Earthquake Engineering Laboratory

The dynamic testing facility has about 110 square metre of floor area and the most sophisticated testing facilities for structures and soil. The lab possesses an L-shaped reaction wall, 5 m reaction frame, strong floor, overhanging 10-ton crane facility and 8 m of free vertical space. The instruments of the laboratory are useful to simulate earthquakes and determine the dynamic properties of structures and soil. Testing capabilities are as follows:

- Static and dynamic structural simulation
- Artificial earthquake simulation
- Estimation of the dynamic properties of structures
- Soil liquefaction testing

Geotechnical and Geophysical Testing Laboratory

There are some sophisticated instruments for dynamic soil property determination. Equipment for basic soil property determination are also available. The testing capacities include:

- The geotechnical and engineering properties
- Soil stratigraphy
- Soil's dynamic properties
- Shear and compressional wave depth versus velocity profiles
- Gradation of soil
- Plastic limit and liquid limit