

Proceedings

ICCESD 2020

5th International Conference on
Civil Engineering for Sustainable Development
7-9 February, 2020, Khulna, Bangladesh

Edited by

Dr. Quazi Sazzad Hossain

Professor, Department of Civil Engineering, KUET

Dr. Quazi Hamidul Bari

Professor, Department of Civil Engineering, KUET

Dr. Md. Shahjahan Ali

Professor, Department of Civil Engineering, KUET

Dr. Md. Rokonuzzaman

Professor, Department of Civil Engineering, KUET

Dr. Abu Zakir Morshed

Professor, Department of Civil Engineering, KUET

Dr. Sajal Kumar Adhikary

Professor, Department of Civil Engineering, KUET

Organized by

Department of Civil Engineering
Khulna University of Engineering & Technology (KUET)
Khulna-9203, Bangladesh

First published in February 2020

ICCESD 2020, the 5th International Conference on Civil Engineering for Sustainable Development was organized by the Department of Civil Engineering, Khulna University of Engineering & Technology, Bangladesh.

Published by

ICCESD 2020
Department of Civil Engineering
Khulna University of Engineering & Technology
Khulna-9203, Bangladesh
Tel: 880-41-769468~75 Ext. 200
Fax: 880-41-774780
E-mail : iccesd@kuet.ac.bd
Website: www.iccesd.com

The contents of the proceedings may be reproduced by individual/governmental/non-governmental organizations for non-commercial/academic/research purposes with appropriate acknowledgement. Any other form of reproduction, storage in a retrieval system or transmission by any means for commercial purposes requires prior permission from ICCESD.

Copyright © *ICCESD*
ISBN: 979-984-34-8763-6 (Printed Proceedings of Abstracts)
978-984-34-8764-3 (CD-ROM proceedings of Full Paper)

400 Copies
Full papers are available in CD-ROM

Cover Design
Dr. Muhammad Harunur Rashid, Mr. Md. Maruf Molla
Khulna University of Engineering & Technology, Bangladesh

Page Layout
Dr. Sajal Kumar Adhikary; Dr. Md Mahfuzur Rahman; Mr. Masum Shaikh, Mr. Sheikh Shakib;
Mr. Md. Maruf Molla; Mr Md. Abdur Rakib; Mr. Snahashish Paul
Khulna University of Engineering & Technology, Bangladesh

ICCESD 2020

5th International Conference on Civil Engineering for Sustainable Development

Chairman of the Conference

Dr. Muhammad Harunur Rashid

Professor

Department of Civil Engineering

Khulna University of Engineering & Technology, Bangladesh

Secretary of the Conference

Dr. Sajal Kumar Adhikary

Professor

Department of Civil Engineering

Khulna University of Engineering & Technology, Bangladesh

International Advisory Board

Prof. Dr. Quazi Sazzad Hossain (Bangladesh); Prof. Dr. Muhammed Alamgir (Bangladesh); Prof. Dr. Md. Ataur Rahman (Australia); Prof. Dr. Raffaello Cossu (Italy); Prof. Dr. Teriyuki Fukuhara (Japan); Prof. Dr. Ashim Das Gupta (Australia); Prof. Dr. Wan Hashim Wan Ibrahim (Malaysia); Prof. Dr. Takashi Hosoda (Japan); Prof. Dr. Umamahesh V Nanduri (India); Prof. Dr. A.M.M. Shafiullah (Bangladesh); Prof. Dr. Paulo B. Lourenco (Portugal); Prof. Dr. Toshinori Sakai (Japan); Prof. Dr. Md. Abdul Motin (Bangladesh); Prof. Dr. Jun Nakajima (Japan); Prof. Dr. Tarif Uddin Ahmed (Bangladesh); Prof. Dr. Masahiko Sekine (Japan); Prof. Dr. Md. Monowar Hossain (Bangladesh); Prof. Dr. Md. Delwar Hossain (Bangladesh); Prof. Dr. Tamon Ueda (Japan); Prof. Dr. Md. Rezaul Karim (Bangladesh); Dr. Md. Asadul Haque (Australia); Dr. Sk. Faiz Uddin Ahmed (Australia); Dr. Md. Zahid Hossain (USA); Dr. Khalid Moinuddin (Australia).

Scientific & Technical Committee

Prof. Dr. Muhammed Alamgir, KUET (Bangladesh); Prof. Dr. Quazi Hamidul Bari, KUET (Bangladesh); Prof. Dr. Md. Saiful Islam, KUET (Bangladesh); Prof. Dr. Muhammad Harunur Rashid, KUET (Bangladesh); Prof. Dr. Kh. Mahub Hassan, KUET (Bangladesh); Prof. Dr. Md. Shahjahan Ali, KUET (Bangladesh); Prof. Dr. S.M. Moniruzzaman, KUET (Bangladesh); Prof. Dr. Md. Rokonzaman, KUET (Bangladesh); Prof. Dr. Abu Zakir Morshed, KUET (Bangladesh); Prof. Dr. Kazi ABM Mohiuddin, KUET (Bangladesh); Prof. Dr. Md. Jahir Uddin, KUET (Bangladesh); Prof. Dr. Md. Ataur Rahman, KUET (Bangladesh); Prof. Dr. Md. Rafizul Islam, KUET (Bangladesh); Prof. Dr. H.M. Iqbal Mahmud, KUET (Bangladesh); Prof. Dr. Sajal Kumar Adhikary, KUET (Bangladesh); Md. Humayun Kabir, KUET (Bangladesh); Mir Abdul Kuddus, KUET (Bangladesh); Dr. Ismail Saifullah, KUET (Bangladesh); Dr. Md. Mahfuzur Rahman, KUET (Bangladesh); Dr. Md. Akhtar Hossain, KUET (Bangladesh); Dr. Md. Khalekuzzaman, KUET (Bangladesh); Prof. Dr. S. Onda, Kyoto Univesity (Japan); Prof. Dr. Raquib Ahsan, BUET (Bangladesh); Prof. Dr. Hasib Md. Ahsan, BUET (Bangladesh); Prof. Dr. Ayesha Akter, CUET (Bangladesh); Prof. Dr. Md. Niamul Bari, RUET (Bangladesh); Prof. Dr. Akhtarul Islam Chowdhury, SUST (Bangladesh); Dr. Shishutosh Barua, BoM (Australia); Dr. Md. Kamal Hossain (United Kingdom); Dr. Victor Rana Shindi, AIT (Thailand); Dr. Lubna Salem (Iraq); Dr. S.H.M. Fakhruddin, Tonkin & Taylor (New Zealand); Dr. Biplop Kumar Pramanik, RMIT (Australia); Dr. Tanvir Ahmed, BUET (Bangladesh).

Organizing Committee

Prof. Dr. Muhammad Harunur Rashid (Conference Chair); Prof. Dr. Sajal Kumar Adhikary (Conference Secretary); Prof. Dr. Muhammed Alamgir; Prof. Dr. Quazi Hamidul Bari; Prof. Dr. Quazi Sazzad Hossain; Prof. Dr. Kh. Md. Shafiul Islam; Prof. Dr. Md. Saiful Islam; Prof. Dr. Kh. Mahub Hassan; Prof. Dr. Md. Shahjahan Ali; Prof. Dr. S.M. Moniruzzaman; Prof. Dr. Md. Rokonzaman; Prof. Dr. Abu Zakir Morshed; Prof. Dr. Kazi ABM Mohiuddin; Prof. Dr. Md. Jahir Uddin; Prof. Dr. Md. Ataur Rahman; Prof. Dr. Md. Rafizul Islam; Prof. Dr. H. M. Iqbal Mahmud; Mr. Md. Humayun Kabir; Mr. Mir Abdul Kuddus; Dr. Ismail Saifullah; Dr. Md. Mahfuzur Rahman; Mr. Sk. Md. Kamal Uddin; Dr. Md. Akhtar Hossain; Ms. Mahzabin Afroz; Dr. Md. Khalekuzzaman; Mr. Masum Shaikh; Mr. Kamrul Ahsan; Mr. A. S. M. Riyad; Mr. Sheikh Shakib; Mr. Md. Maruf Molla; Mr. Md. Abdur Rakib; Mr. Mehedi Hasan; Mr. Sneathish Paul; Ms. Pingki Datta.

Preface

The Department of Civil Engineering, Khulna University of Engineering & Technology (KUET) has been successfully organizing the International Conference on Civil Engineering for Sustainable Development (ICCESD) in every even year from 2012. This time we are very pleased to organize fifth ICCESD 2020. The conference is now going to be held during February 7-9, 2020 at KUET campus, Khulna, Bangladesh. KUET is one of the leading public universities of Bangladesh, which is located at the southwestern coastal region. The overall goal of this conference is to create a successful forum where Academicians, Researchers, Scientists, Engineers and Scholars in all area of Civil Engineering will have the opportunity to present their views, ideas and experiences on developments and requirements in Civil Engineering and to contribute in shearing Civil Engineering knowledge.

In ICCESD 2020, key note lectures will be delivered and contributed papers will be presented on the broader areas of Civil Engineering. It is anticipated that the conference will open a window of exchanging the scientific and technological information among all the participants from home and abroad. Moreover, it is expected to build a common platform for sharing the ideas among the Engineers and Academicians from different countries in the world having different experiences in research skills, practices and standards. It is also expected that it would promote the international collaboration on sustainable technologies in all the branches of Civil Engineering with respect to climate change. The theme of this conference includes the contributions from Environmental Engineering, Geotechnical Engineering, Structural Engineering, Transportation Engineering, Fire Engineering, Water Resources Engineering and Construction Engineering and Management.

After a two-step review process a total of 200 technical papers, out of 267 full length papers, have been selected for publication in the proceedings. A number of the papers have been lightly edited to even out the style and to revise the contents based on reviewers' comments. However, the final responsibility for the contents, quality and the presentation of the paper is held by each individual author. The abstract of the papers are printed and hence published in this proceedings. However, full papers are available in a CD-ROM enclosed with the proceedings.

I would like to acknowledge the enormous efforts of the authors who have contributed by submitting their papers. I would like to express the gratitude to all reviewers for their careful evaluation, constructive comments and suggestions to improve the manuscript. Heartiest thanks to the Editorial Committee of ICCESD 2020 specially to Prof. Dr. Sajal Kumar Adhikary, Dr. Md. Mahfuzur Rahman, Mr. Sheikh Shakib, Mr. Md. Maruf Molla, Mr. Md Abdur Rakib, Mr. Snahashish Paul, who played a significant role in editing the proceedings including composing the text, figures, tables, and photographs, which is really a tedious job. Finally the professional encouragements and tireless supports of our all colleagues from all committees formed for ICCESD 2020 are gratefully acknowledged.

The sponsoring facilities offered by Saif Port Holdings Ltd., Wahid Construction Ltd., Seven Rings Cement, Bashundhara Cement and CRTS (Civil) are highly appreciated and acknowledged.

We hope that this initiative will be sustained in the next conference ICCESD 2020.

On behalf of the Organizing Committee,

Prof. Dr. Muhammad Harunur Rashid
Conference Chair, ICCESD 2020
Department of Civil Engineering
Khulna University of Engineering & Technology
Khulna-9203, Bangladesh