Proceedings ICCESD 2016

3rd International Conference on Civil Engineering for Sustainable Development 12 - 14 February 2016, Khulna, Bangladesh

Edited by

Dr. Quazi Hamidul Bari *Professor, Department of Civil Engineering, KUET*

Dr. Kh. Md. Shafiul Islam *Professor, Department of Civil Engineering, KUET*

Dr. Muhammad Harunur Rashid *Professor, Department of Civil Engineering, KUET*

Dr. Khondoker Mahbub Hassan *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. Kazi ABM Mohiuddin Associate 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 2016

ICCESD 2016, the 3rd 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 2016 Department of Civil Engineering Khulna University of Engineering & Technology Khulna-9203, Bangladesh Tel: 880-41-769468, Ext. 200, Fax: 880-41-774780 E-mail: <u>editor@iccesd.com</u> Website: <u>www.iccesd.com</u>

The contents of the proceedings may be reproduced by individual/governmental/nongovernmental 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: 978-984-34-0264-6 (Printed Proceedings of Executive Summary) 978-984-34-0265-3 (CD-ROM proceedings of Full Paper)

Executive Summaries are available in printed proceedings (300 Copies) Full papers are available in CD-ROM proceedings

Cover Design Dr. Muhammad Harunur Rashid, Mr. Md. Kamrul Ahsan & Mr. Sagar Ghos Khulna University of Engineering & Technology, Bangladesh

Page Layout Dr. Abu Zakir Morshed, Dr. Kazi ABM Mohiuddin, Mr. Ismail Saifullah & Mr. A.S.M. Riyad Khulna University of Engineering & Technology, Bangladesh

ICCESD 2016

3rd International Conference on Civil Engineering for Sustainable Development

Chairman of the Conference

Dr. Md. Keramat Ali Molla Professor Department of Civil Engineering Khulna University of Engineering & Technology, Bangladesh

Secretary of the Conference

Dr. Abu Zakir Morshed Professor Department of Civil Engineering Khulna University of Engineering & Technology, Bangladesh

International Advisory Board

Prof. Dr. Md. Keramat Ali Molla (Bangladesh), Prof. Dr. Muhammed Alamgir (Bangladesh), Prof. Dr. A.M.M. Safiullah (Bangladesh), Prof. Dr. Md. Monowar Hossain (Bangladesh), Prof. Dr. Md. Delwar Hossain (Bangladesh), Prof. Dr. Tarif Uddin Ahmed (Bangladesh), Prof. Dr. Akhtarul Islam Chowdhury (Bangladesh), Prof. Dr. Raffaello Cossu (Italy), Prof. Dr. Yixin Shao (Canada), Prof. Dr. Wan Hashim Wan Ibrahim (Malaysia), Prof. Dr. Worsak Kanok Nukulchai (Thailand), Prof. Dr. Tamon Ueda (Japan), Prof. Dr. Takashi Hosoda (Japan), Prof. Dr. Jun Nakajima (Japan), Prof. Dr. Teruyuki Fukuhara (Japan), Prof. Dr. Toshinori Sakai (Japan), Prof. Dr. Masahiko Sekine (Japan), Prof. Dr. Paulo B. Lourenco (Portugal), Prof. Dr. Umamahesh V Nanduri (India), Dr. Ichiro Kimura (Japan), Dr. Md. Ataur Rahman (Australia), Dr. Md. Asadul Haque (Australia), Dr. Sk. Faiz Uddin Ahmed (Australia), Dr. Oskar Modin (Sweden), Dr. Md. Zahid Hossain (USA).

Scientific & Technical Committee

Prof. Dr. Md. Keramat Ali Molla, KUET (Bangladesh), Prof. Dr. Md. Monjur Hossain, KUET (Bangladesh), Prof. Dr. Md. Abul Bashar, KUET (Bangladesh), Prof. Dr. Quazi Hamidul Bari, KUET (Bangladesh), Prof. Dr. Quazi Sazzad Hossain, KUET (Bangladesh), Prof. Dr. Kh. Md. Shafiul Islam, KUET (Bangladesh), Prof. Dr. Md. Saiful Islam, KUET (Bangladesh), Prof. Dr. Muhammad Harunur Rashid, KUET (Bangladesh), Prof. Dr. Kh. Mahbub Hassan, KUET (Bangladesh), Prof. Dr. Md. Shahjahan Ali, KUET (Bangladesh), Prof. Dr. S.M. Moniruzzaman, KUET (Bangladesh), Prof. Dr. Md. Rokonuzzaman, KUET (Bangladesh), Prof. Dr. Abu Zakir Morshed, KUET (Bangladesh), Dr. Kazi ABM Mohiuddin, KUET (Bangladesh), Dr. Md. Jahir Uddin, KUET (Bangladesh), Prof. Dr. Md. Rezaul Karim, IUT (Bangladesh), Prof. Dr. Jun Nakajima, Ritsumeikan University (Japan), Prof. Dr. Pere Roca Fabregat, UPC (Spain), Prof. Dr. Raquib Ahsan, BUET (Bangladesh), Prof. Dr. Md. Saiful Islam, CUET (Bangladesh), Prof. Dr. Abul Kalam Azad, KU (Bangladesh), Prof. Dr. Ali Gul Qureshi, Kyoto University (Japan), Prof. Dr. Md. Niamul Bari, RUET (Bangladesh), Prof. Dr. S. Onda, Kyoto University (Japan).

Organizing Committee

Prof. Dr. Md. Keramat Ali Molla, KUET, Prof. Dr. Md. Monjur Hossain, KUET, Prof. Dr. Md. Abul Bashar, KUET, Prof. Dr. Quazi Hamidul Bari, KUET, Prof. Dr. Quazi Sazzad Hossain, KUET, Prof. Dr. Kh. Md. Shafiul Islam, KUE), Prof. Dr. Md. Saiful Islam, KUET), Prof. Dr. Muhammad Harunur Rashid, KUET, Prof. Dr. Kh. Mahbub Hassan, KUET, Prof. Dr. Md. Shahjahan Ali, KUET, Prof. Dr. S.M. Moniruzzaman, KUET, Prof. Dr. Md. Rokonuzzaman, KUET, Prof. Dr. Abu Zakir Morshed, KUET, Dr. Kazi ABM Mohiuddin, KUET, Mr. Md. Ataur Rahman, KUET, Mr. Md. Humayun Kabir, KUET, Dr. Md. Jahir Uddin, KUET, Mr. Mir Abdul Kuddus, KUET, Mr. H.M. Iqbal Mahmud, KUET, Dr. Md. Rafizul Islam, KUET, Mr. Md. Atiqul Islam, KUET, Mr. Ismail Saifullah, KUET, Mr. Grytan Sarkar, KUET, Mr. Md. Kamrul Ahsan, KUET, Mr. Md. Shafiqul Islam, KUET, Mr. Sagar Ghos, KUET, Mr. Mahmudul Hasan Mizan, KUET, Ms. Bayshakhi Deb Nath, KUET, Mr. A.S.M. Riyad, KUET, Mr. Sheikh Shakib, KUET.

Preface

The Civil Engineering Department, Khulna University of Engineering & Technology (KUET) Khulna, Bangladesh is organizing the third international conference on Civil Engineering for sustainable Development (ICCESD 2016). 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 build an effective forum where Researchers, Scientists, Engineers and Scholars in all the areas of Civil Engineering will have the opportunity to present and share their views, ideas and experiences on recent developments and engineering needs of Civil Engineering.

The conference is now going to be held during February 12-14, 2016 at KUET campus, Khulna, Bangladesh. At the conference, lecture will be delivered and contributed papers will be presented on the broader areas of Civil Engineering. It is hoped that the conference will open a window of exchanging the scientific and technical information among all the participants from home and abroad. At the same time, it is expected to create a common platform for sharing the ideas among the Engineers and Academicians from the developed and developing 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 technology in all the branches of Civil Engineering with respect to global warming and climate change. The theme of this conference includes the contributions from Environmental, Geotechnical, Structural, Transportation and Water Resources Engineering as well as Construction Materials and Management.

After a three-step review process a total of 159 technical papers have been selected for publication in the proceedings. Some of the papers have been lightly edited to homogenize 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. In this proceedings only the executive summary of the papers are printed and hence published. However, full papers are available in a CD-ROM enclosed with the proceedings.

I would like to express the gratitude to the reviewers for their careful reviews and constructive comments and suggestions to improve the manuscript. I would also like to thank all our colleagues for their supports and encouragements. The sponsoring facilities offered by KALINDEE RAIL NIRMAN (ENGINEERS) LTD, SEVEN RINGS CEMENT and MAX GROUP are highly appreciated and acknowledged. Finally, I am very much thankful to the editorial team of ICCESD-2016.

We hope that this initiative will be continued in the next editions of this conference.

On behalf of the Organizing Committee,

Prof. Dr. Md. Keramat Ali Molla Conference Chair, ICCESD-2016 Department of Civil Engineering Khulna University of Engineering & Technology Khulna-9203, Bangladesh