NEWSLETTER

January, 2024

Indian Institute of Technology Madras

Technologies for Low-Carbon and Lean Construction

The TLC2 team with invited speakers at IIT Madras during TLC2 Workshop 2024 (January 28-31) organized in association with RILEM

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3rd International Workshop on Technologies for Low-Carbon and Lean Construction

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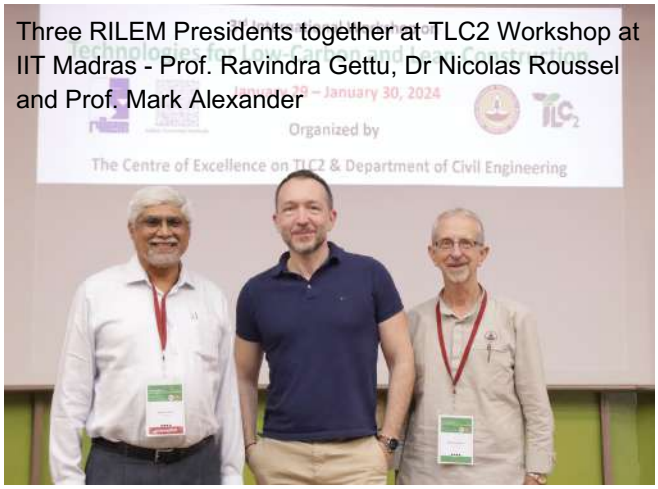
Greetings from TLC2 @ IIT Madras

The 3rd International Workshop on Technologies for Low-Carbon and Lean Construction (TLC2) was organized by the Centre of Excellence on TLC2 in association with RILEM from January 28th - 31st, 2024, at the Indian Institute of Technology Madras. The TLC2 Week witnessed the enthusiastic participation of more than 250 participants from Industry, Academia, Government organizations and the student community. The event aimed to disseminate the recent findings and identify new challenges in the areas of TLC2 through interactions with relevant national and international stakeholders working in these areas. The week-long programme included the following:

DAY 1: Young Researchers' Symposium (YRS)

DAY 2 & 3: Two-Day TLC2 Workshop

DAY 4: One-Day Workshop on Realizing Sustainability-Role of Contract and Law in Indian Construction



Three RILEM Presidents together at TLC2 Workshop at IIT Madras - Prof. Ravindra Gettu, Dr Nicolas Roussel and Prof. Mark Alexander

Find us: https://tlc2.iitm.ac.in/

BSB 205, Department of Civil Engineering, Indian Institute of Technology Madras, Chennai - 600036, India

YOUNG RESEARCHERS' SYMPOSIUM (YRS)

The Young Researchers' Symposium (YRS), is a premium forum for promoting and supporting young researchers working on TLC2 areas. After rigorous scrutiny of applications received after a global call, 14 young researchers, mainly senior Ph.D. scholars and recent PhD graduates, were invited to present their work.

The YRS event started with welcome address by Prof. Ravindra Gettu. Eleven young researchers presented their research story related to TLC2 themes. Dr. Nicolas Roussel, RILEM President delivered a talk on "About RILEM". Prof. Mark Alexander, former RILEM President (2013-2015) headed the jury for selecting the best YRS speaker who receives the prestigious Surendra P. Shah Award on Technologies for Low-Carbon and Lean Construction (TLC2) – 2024.

Dr. Purnima Dogra, a recent PhD graduate from Thapar Institute of Engineering and Technology, India was adjudged as the best young researcher for his research and recommended by the Jury for the Surendra P Shah Award 2024. Her research on "Inhibition Mechanism of Amino Acids against Carbonation-Induced Corrosion in Reinforced Concrete" highlights that amino acids are efficient in inhibiting steel against a carbonated corrosive environment owing to their migration ability through PPC concrete. She concluded that Pore solution testing and migratory test results can be employed for the selection of organic compounds as SACoI to control corrosion induced by carbonation.

The YRS event includes a poster presentation session for MS & PhD students working in TLC2 areas. The Best Poster Award went to Ashutosh Dwivedi, a PhD student from Indian Institute of Science (IISc).

Young Researchers' Symposium travel grant was awarded to the following PhD researchers:

- Ervin Tiu Shan Khai from Monash University, Malaysia with topic "Evaluation of the Influence of Coal Combustion Products on the Pozzolanic and Hydration Reactions of Cement-Based Composites"
- Moro Sabtiwu from University of Leeds, UK with topic "Long-term performance of composite Portland-slag-limestone concretes"
- Ali Rakhsh Mahpour from UPC, Universitat Politècnica de Catalunya, Spain with topic "Durability, Sustainability, Adhesion and Mechanical Characterization of new Non-Woven Fiber-Reinforced Lime Composite for Masonry construction"
- Satyanarayana Rao Narneni from University of Toronto, Canada with topic "Macro- and Microstructural Effects of Combined Exposures of Alkali-Silica Reaction with Carbonation, Freeze-Thaw and Chloride Ingress on Concrete Deterioration".

Prof. Mark Alexander, Prof. Taehwan Kim, Dr. Keerthana Kirupakaran and Dr. Nikhil Bugalia, members of the distinguished Jury for the selection of the Surendra P Shah Award 2024, shared their thoughts on the exceptional talent and dedication displayed by the young and intelligent speakers at YRS. Dr. Nikhil Bugalia added that it's indeed a great opportunity to hear from the young researchers as they focus in innovative research on construction materials, management and process to address the global issue of Net Zero emissions by 2050.

Prof. Mark Alexander (first from the left), Prof. Ravindra Gettu (first from the right) and Prof. Manu Santhanam (second from the left) with YRS finalists; Dr. Purnima Dogra, winner of the Surendra P. Shah Award with her PhD supervisor Dr. Shweta Goyal (at the centre)

WORKSHOP ON TECHNOLOGIES FOR LOW-CARBON AND LEAN CONSTRUCTION (TLC2)

The workshop was organized by CoE on TLC2 and IIT Madras in association with RILEM, Primekss, L&T Construction and Indian Concrete Institute (ICI). The workshop was inaugurated by Prof. Manu Santhanam, Dean IC & SR, IIT Madras who briefly spoke on the initiatives planned by CoE on TLC2 for the present year. Prof. Benny Raphael, Head of the Department of Civil Engineering welcomed the participants with a brief speech on the overall progress of Civil Engineering Department at IIT Madras. Prof. Ashwin Mahalingam, Director of School of Sustainability, IIT Madras, spoke about new initiatives on sustainability.

The 2-days TLC2 workshop were planned to cover basic research on concrete from the molecular scale to the macroscopic scale to more applied problems on materials & management to essentially address the circular economy in construction and sustainability. Six sessions were organized on the following themes:

- Computational Materials Modelling of Cementitious Systems
- Rheology and 3D Printing of Concrete
- Technologies for Built Environment Sustainability
- Low Carbon Construction Materials
- Durability and Sustainability
- Life Cycle Analysis / Industrial Ecology

Eminent speakers and researchers from 20 universities across the globe were invited for the TLC2 workshop. They shared their knowledge and expertise towards low carbon construction ecosystem and talked on the various relevant research initiatives taken in different parts of the globe. The primary focus of carbon-neutral constructions is reducing the use of cement in constructions, and hence, fundamental insights into the constituent phases in cement microstructure, specifically for using alternative binders and admixtures is warranted. Even, use of artificial intelligence has been found as a promising option to predict clinker phases and emissions from different sources of cement. Thermodynamic modelling is also a powerful tool to understand and optimize binders of the future as it gives indications on expected phase assemblages of the binder and helps to understand novel reaction mechanisms. Experts unanimously emphasized that the success of 3D printing concrete depends on developing sustainable binders for 3D Printing Concrete and finding efficient strategies to incorporate coarse aggregate in the mixture and reinforcement in the printable concrete. In this regard, automation and robotics significantly help to monitor quality of printable concrete. The use of technological advancements such as digital twins, AI, Machine learning, IoT, carbon capture and similar others need to be embraced to achieve built environment sustainability. Multi-Criteria Decision-Making Framework based on Life cycle analysis & durability indicators need to evaluated and estimation of carbon budget for any project should be made mandatory.

The workshop had an overwhelming participation of more than 250 participants from 20+ industries (private & public), 80+ IITs/NITs and other CFTIs, Government organizations, and the student community.Centre of Excellence on TLC2 wholeheartedly thank the sponsors PrimeKss Group Latvia and L&T – Heavy Civil Infra IC for sending delegates and supporting the TLC2 Workshop 2024. Mr. Ivo Erglis – Kupins from Primekss delivered a talk on “GHG emission reduction in construction by utilising self-stressing steel-fibre reinforced concrete (SSSFRC) technology”.





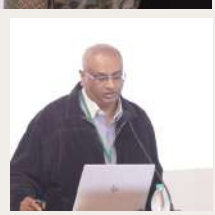










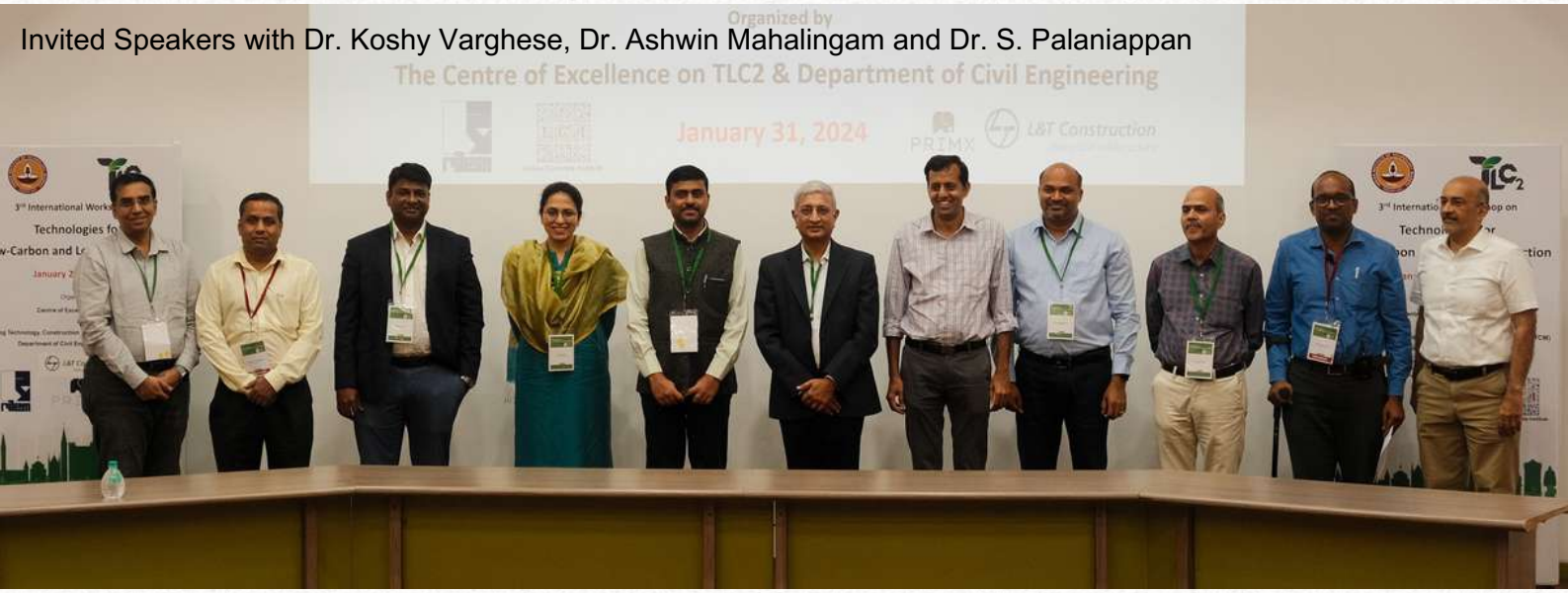



WORKSHOP ON REALIZING SUSTAINABILITY-ROLE OF CONTRACTS AND LAW IN INDIAN CONSTRUCTION

The workshop had interesting sessions by academicians and practitioners working in different areas with a common goal of implementing sustainable construction practices. In addition to the deliberations on understanding the role of law and contracts in implementing sustainable construction practices, this workshop had expert talks on related topics about the legal viewpoint of sustainability and expanding the horizons of lean construction beyond the traditional waste paradigm.

Key takeaways from the workshop:

1. Implementing sustainable and lean construction practices needs strong and committed leadership. In construction projects, when an informed owner demands sustainable practices and also takes ownership to meet technical expectations, it instills confidence in the entire supply chain, and sustainable and lean practices can be seamlessly integrated with the existing processes.
2. To bring innovation into practice, there is a requirement for an 'ecosystem transformation' that includes people, processes, and product contextualization in India.
3. Implementing sustainable practices is easier when the positive impacts of such practices can be quantified and integrated with the contractual technical specifications of materials and the standard schedule of rates.
4. While drafting the construction contracts and specifications, if employers can come up with clauses that will promote sustainable construction practices, it will go a long way in triggering stakeholders to move towards sustainable construction.
5. A very important aspect of sustainable cities and built environment is empowered citizenry and community involvement.
6. It is also important to start thinking beyond sustainability towards regenerative practices wherein we seek to restore and rejuvenate communities, ecology, and economy.
7. Artificial Intelligence (AI), specifically Language Model-based natural language processing tools, can be very useful in reviewing construction contracts to understand the extent to which the drafted clauses promote (or hinder) sustainable and lean construction practices.
8. Future research on implementing sustainable practices can focus on case studies to capture the mechanism of sustainable procurement practices in construction, modifications required in the public procurement guidelines (from a sustainable practices viewpoint), objective criteria for prequalification (PQ) to bring in sustainability-conscious contracting and subcontracting firms, and behavioural transition of officials involved in procurement towards sustainability.



Invited Speakers with Dr. Koshy Varghese, Dr. Ashwin Mahalingam and Dr. S. Palaniappan