Dear Reader

The ICJ Team wishes you a very Happy New Year 2020. Throughout the year 2019, we endeavoured to propogate knowledge about the latest developments in cement, concrete and construction practices. Aligned to this, with remarkable support from academia and professionals alike, we had well-researched papers, thought provoking 'Point of Views', published editions on emerging themes such as Construction and Demolition Waste, Sustainable Engineered Cementitious Composites, and more. The year closed with unveiling of the ICJ December edition at the recent NCB International Seminar in Delhi. We thank our readers for their steadfast support and all our authors, reviewers and Guest Editors for their contributions. We are confident that, with all your support and contribution, the ICJ will achieve greater heights.

With the above note, we bring to you a sequel edition on Construction and Demolition Waste. This edition has been guest edited by Dr Sivakumar Kandasami. He is a trained concrete technologist with the Construction Division of Larsen & Toubro. He has done full-time Ph.D. on a prestigious merit scholarship at the University of Dundee, UK, in the area of concrete durability. His expertise is frequently sought for mega projects designed to last an intended service life. He takes keen interest in developing robust solutions for concreting challenges at site, trains engineers on concrete technology matters, involves in R&D efforts within Larsen & Toubro and regularly reviews manuscripts for scholarly journals.

The Institution of Civil Engineers (ICE), UK awarded him the MCR PRIZE 2012 for the best paper published in the Magazine of Concrete Research. He is an Editorial Board Member of reputed international journals like Construction Materials (ICE, UK) and the Journal of Testing and Evaluation (ASTM, USA). He is a Fellow of the Institute of Concrete Technology (UK) and the Institution of Engineers (India).

Production Editor
Indian Concrete Journal

Dear Colleague

I wish you a Happy New Year and it is indeed great to be back writing the Editorial for the opening issue of Volume 94 of the Indian Concrete Journal (ICJ). This issue is a sequel to the September 2019 issue themed on construction and demolition (C&D) waste in concrete construction, made possible by the overwhelming response from experts across the world. If both the issues could improve "Engagement, Communication and Co-operation" (ECC) among various stakeholders in the concrete ecosystem, in all humility it would be a great achievement indeed. This issue contains papers from Europe, China and India, with a blend of viewpoints, hardcore research and practice aspects, all united in their outlook to make construction with C&D waste possible as we move towards a zero-carbon world. As ever I am grateful to all the authors, reviewers and the production team for making this issue very special to address the needs of materials sustainability and respond to the drastic environmental concerns such as climate change.

The leader point of view article by Basuyau (2020) is written by a senior official of the EU Commission and deals with the long-term trends and challenges ahead in Europe. Having a long experience in the construction industry with considerable exposure to aggregate market, the author has taken great efforts to prepare this article, backed by meticulous research and careful compilation of data and figures. According to the author, the EU policy and directives have helped achieve resource efficiency for enabling circular economy in construction. The economic viability of C&D waste has been illustrated in detail and the ecological paradox encountered in EU is something similar to that seen in India where "Not in My Back Yard" (NIMBY) syndrome generally prevails. Unfortunately, NIMBY syndrome in India drives the C&D waste towards backfilling activities without realising its full value. However, the EU has successfully navigated this hurdle by adopting total quality management to build confidence in recycled aggregate and thereby promoting its use in building products. The author concludes by advocating consideration of C&D waste use in the design stage itself so that the concepts of durability, adaptability and efficiency in resource utilisation will become integral to the entire construction industry.

The following article by Minson (2020) introduces a strong viewpoint on how circular economy should shape up globally and deals with details on the steps taken by the Global Cement and Concrete Association (GCCA) to embrace the broader sustainability agenda. For the benefit of our readers, GCCA is a unified stakeholder voice from members across the world comprising chiefly of cement, aggregate and concrete producers. Coming from someone with a long track record of promoting sustainability in concrete construction, this article

captures the Organisation for Economic Co-operation and Development (OECD) business models for circular economy, their impacts and the advocacy of GCCA in promoting concrete as a sustainable material of choice. The author highlights the difficulty OECD faced in suggesting use of life cycle assessments and the frequent questions he faced in an earlier role centred on the potential for earning brownie points with recycled materials. It has to be pointed out that despite such prevalent skepticism, a third of the aggregates used by the UK precast concrete industry comes from recycling concrete debris. With 3D printing becoming popular and offsite construction based on the concept of design for manufacture and assembly gaining momentum, the author stresses the fact that concrete is indeed designed for disassembly (DfD) i.e. DfD is a closed resource loop. Hence, recycling of C&D waste in concrete construction should be a natural occurrence.

Can we use aluminium instead of steel for reinforcing concrete? The opening paper by Justnes (2020) answers a rather unusual question by an unconventional approach and 'dares to see' (DARE2C) the possibility of using aluminium reinforcement for fully utilising recycled C&D waste material. Currently under development, in DARE2C project concrete made of calcined clay clinker and reinforced by a special form of aluminium having magnesium as an alloy was observed to have encouraging durability performance. This means concrete structures in the future could be designed with much lower cover than it is being done at present. Further, the author states a bare minimum cover of 20 mm is sufficient and infinite service life is virtually guaranteed. Such an intelligent combination of materials becomes even more effective with recycled C&D waste. Often the common sigh from researchers across the world is the reduction in compressive strength and poor resistance to durability. DARE2C project intends to prove this could be easily overcome with aluminium reinforcement and calcined clay. The author has successfully demonstrated the underlying potential with Mangalore tile debris. Probably this paper can provide a spark for researchers looking at various options to maximise the full potential of recycled C&D waste material.

The following paper by Arora and Singh (2020) takes a bold step by complete replacement of coarse natural aggregate with recycled C&D waste for assessment of flexural fatigue performance of concrete. This reflects the rise in confidence among researchers in India to fully exploit the potential of recycled C&D waste material in varied applications. By an extensive experimental programme, the authors have developed strength prediction models. While the reduction in compressive strength is obvious, the authors have used supplementary cementitious materials (SCM) to overcome it, and have identified applications such as concrete pavements, bridges and precast elements. This is a demonstration of new found confidence in recycled material that codal committees should take note of.

Similar to the previous paper, the paper by Sahoo et. al. (2020) reports on complete replacement of coarse natural aggregate with recycled C&D waste and the effect on engineering and durability properties of concrete. As is obvious with any research work, the authors too have observed reduction in compressive strength, but have seen the possibilities and suggested appropriate use in concrete where high strength is often not required. By using at low water-cement ratio of concrete, recycled C&D waste is found to satisfy certain durability parameters. The conclusions can be relied upon, as the authors have used processed recycled C&D waste in their study.

Finer fraction of the recycled C&D waste is often not considered in making concrete due to perceived risk of contamination. However, the authors Bashya et. al. (2020) of the following paper have made a brave attempt in using the finer fraction of the recycled C&D waste material obtained from the debris of a 30 year old building. A drop in compressive strength was noticed relative to control specimens. The performance in durability tests such as water and chloride permeability were also not at par with natural aggregate. But, this work could be extended further with use of other SCM. Nevertheless, in plain concrete applications and for manufacture of solid blocks, complete replacement with finer fraction of recycled C&D waste should not be a cause for concern and deserves complete utilisation.

Lei et. al. (2020) have done work on an interesting aspect of production process of concrete i.e. the mixing technology. If not properly processed, there could be loose mortar sticking to the recycled C&D waste aggregate, which tends to absorb additional water and this has to be taken care of during concrete mix proportioning. In the methodology suggested by the authors, part of the cement and water is mixed to create the paste, followed by feeding of the recycled C&D waste coarse aggregate and further mixing. Thereafter, the remaining cement and recycled C&D waste fine aggregate is added and at the end of the mixing process the remaining water is fed. The authors have observed improved performance in compressive strength and freeze-thaw resistance.

The issue closes with a "vade mecum" paper written by Hewlett (2020), an acknowledged global authority in cement chemistry and concrete technology, describing the various possibilities within the concrete ecosystem. I am grateful to the author for having prepared such an excellent article at a short notice. It gives a ringside view of the developments happening in the cement, concrete and construction industry sectors over the last 17 years. Coming from someone with a strong intellect in chemistry of the different constituents in concrete, this article reminds us that the drivers behind much of the research in cement and concrete technology is shaped by the twin guide rails of industry requirements and cost economics. This was the reason behind development of "Radical Concretes" to meet certain market needs and eventually had become routine

products in due course. In the section on recycled C&D waste, the author has emphasised legislation as an effective tool to drive the consumption of recycled C&D waste materials i.e. "value added materials". A well-researched paper with inputs drawn from carefully curated references, should be a useful read for young researchers and help them in framing of their research plans in the longer term.

The briefing note on a recent book by de Brito and Agrela (2020) is intended to give an overview on its contents, as it contains papers by several subject experts working on recycled C&D waste material.

Considering the vast body of research data available on recycled C&D waste, it is surprising to see the strong reticence on its use in construction (Kandasami, 2019). There could be some justification for fearing the unknown. But, with treasure trove of information readily available, use of recycled C&D waste material has unfortunately not gained traction in many countries including India. Due to deep bias and predisposition to prevailing market notions, some materials are often rated low without realising their intrinsic worth. Such a mistaken view is in part due to the failure in realising the various possibilities and more predominantly can be attributed to the lack of space for creativity and innovation in the construction industry. Hence, a huge shift in behaviour among clients and supply chain management is required. And, of course aided by ECC. Having said that, let us for once pledge to stop the concrete debris from ending up as landfill and together we can make sure that as a recycled material concrete can take many incarnations than one can possibly think of. Per the Japanese concept of ***Ikigai*** (***Iki*** means life; ***gai*** realisation of hopes and expectations), all the recycled materials have life and it is up to us for realising their full potential. I am reiterating this point at the start of this new year, perhaps you could include this as an important resolution among many to make and keep it sacred for implementing in the coming months. Hope you enjoy reading this issue.

Sivakumar Kandasami
Guest Editor for the Special Issue, ICJ

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