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Editorial

This will be my last contribution as Editor of this Journal. As from June of this year a new Editorial team under Prof. John Bolander will be in full control. It is over 27 years ago that the predecessor of this Journal was launched, much to the chagrin of some of the then self-appointed custodians of cement and concrete. Even within this short period of time, the world at large in general, and the cement and concrete industry in particular, have seen some major changes, some of which have been dramatic and spectacular.

Indeed we live in a rapidly changing world. The world at the end of the twentieth century was very different to that we inherited at the beginning of that century. All the present indications are that the twenty-first century will be the most challenging, in almost all aspects of human life on this planet, not only to humanity as a whole, but to engineers especially, and to material scientists and civil/structural engineers in particular.

So where do we go from here? The most direct and unquestionable evidence of the last two/three decades and the resulting challenge that confronts us, is the alarming and unacceptable rate at which our infrastructure systems all over the world are suffering from deterioration when exposed to real environments. What is most surprising is that this massive and horrendous Infrastructure Crisis has occurred in spite of the tremendous advances that have been made in our understanding of the science, engineering and mechanics of materials and structures. This is not a simplistic statement, but the evidence is there in black and white for us all to see. The crisis is world wide, and there is no doubt that this deterioration process has been fuelled by environmental disasters, human conflict, wanton destruction, and the increasing economic divide between the rich and the poor.

What does this state of affairs tell us? No doubt, it sends us many messages – but basically, the ultimate strength design approach to materials and structures is irrelevant, inappropriate, and indeed flawed for the construction industry in the 21st century. We seem to be obsessed with strength – and what experience has shown us is that the concept/philosophy of Durability through strength is simply invalid and unattainable. There is no simple or unique relationship between Strength and Durability; and it is clear that what we need to do is to Design for Durability in its widest sense, and check for Ultimate Strength. Such a Design approach has many implications – but most importantly, we should manufacture and produce materials for Durability and not for Strength.

The arguments for such a new "Design Code" are unchallengeable. The last few decades have shown us convincing proof that the construction industry is faced with two further challenges – Sustainability in Construction and Global Warming/Climate Change. Both have a direct and immediate impact on all aspects of civil engineering construction. We cannot achieve Sustainability in Construction if the materials we use and the structures we design and build cannot give durable service life. We cannot control environmental degradation or pollution, or conserve our material and energy resources if materials and structures have to be repaired and strengthened time and time again. The impact of global warming and Climate Change, on the other hand, on strength, safety and stability of structures shows us that we need to consider a new dimension to our conventional concept of Durability – that of Ductility. That is in more general terms, we need to think of Material Stability and Structural Integrity – which leads us to the Holistic Concept of Material and Structural Stability Design, i.e., Design for Structural Integrity, Design for the Environment and Design for the effects of Climate Change.

Global warming and climate change are now undeniable. Their most direct impact is in rising sea levels and rising global temperature. Rising sea levels will aggravate the destructive power of storm surges triggered by hurricanes such as katrina – and make them more devastating weather – related disasters. Increasing number of cyclones, droughts and floods will make life unviable in many parts of the world like the Oceanic region, in the coastal regions, and in many of the low lying countries of the world. Climate scientists now predict that if nothing is done to put the breaks on climate change, the melting of the large expanses of the polar ice will reach a point of no return – and will trigger dramatic rises in sea levels of up to one metre and beyond – with unimaginable consequences. Climate change is no longer a theory – it is a fact.

If we are to achieve sustainability in construction and in our living, we need to ask ourselves as to how we propose to meet our future energy requirements. Consumption

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without limit of energy, water and materials is not a right. Excessive consumption of the planet's resources must become socially unacceptable if our goal of sustainable technology is to be realised. New and refurbished structures should be designed as zero-energy structures – a vision of sustainable energy efficient structures – made from recycled materials, generating their own power, recycling and treating their own water and sewage. Recovering energy from waste must have top priority, with clear energy recovery targets and minimisation of pollutants. We need to rethink how to stop our profligate and unhindered consumption of energy.

Engineers can change society. We need to start thinking how to structure a new way of life, a new society. Construction industry points the way forward for a new world order where global economy can go hand in hand with sustainable economic progress. Civil engineering can deliver the three essential constituents of living – water, energy and housing. To be able to do this, we need to look beyond the conventional steel and concrete materials. There is a rich and vast range of non-conventional materials and technologies – natural, sustainable, renewable and low energy-consuming building materials – such as stone, clay, earth, timber, bamboo and vegetable fibres. Modern technologies have shown that earth building, for example, through rammed earth construction and pressed earth bricks, can offer a sustainable and low energy construction material which, with high quality workmanship and sound design, can produce durable, cost-effective and eco-friendly housing with character, charm and long life.

The recent UN Report Global Biodiversity Outlook 2 warns us of the almost unstoppable decline in all forms of life on earth. We appear to be wrecking our environment at a scale hitherto unknown not only for just human beings but for all forms and species of life. Are we tackling the planet's problems the right way?