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Editorial

Now that the EU's carbon trading system is set to come into force on 1 January 2005, it is appropriate to look again at the impact of global warming on the construction industry. It is now recognised—almost universally—that the variations in the Earth's climate is no longer a mere academic or scientific debate. Climate change is now known to be the greatest long-term threat to our planet. It is beyond national security concerns, and beyond the attempt of nations to become "virtual fortresses" to prevent movements of peoples. It is a threat not only to national economies, and world economy as a whole, but to human survival and our planet's ability to sustain the lifestyle of our society, which has proved itself to be our own enemy. There is no doubt that we need to think globally, and act globally to reduce the rate of adverse climate change. The greatest effect of global warming is the damage and destruction caused to our infrastructure system—and it is here that the construction industry has a major and significant role to play—in counteracting and alleviating the consequences of climate changes all over the world.

It is now known that 2003 was an exceptionally hot summer across Britain and Europe. Scientists report that in the past 10 years, Europe has experienced the hottest summers since about 1500 AD. Records appear to show that Europe was, on average, about 2 °C hotter last summer than the average summer temperature over nearly the entire 20th century—while some parts were up to 6 °C hotter last summer. Whereas winters have become far more mild, it is predicted that by 2010, US and Europe will experience a third more days with peak temperatures above 90 °F.

The links between atmospheric temperature warmed by greenhouse gases, and the oceans is extremely complicated, but there is no argument that the rate of average annual warming is related directly to the dramatic global changes. It is reported that an average annual warming of 2.7 °C would result in the rate of melting of snow outpacing the annual snowfall. On the other hand, an average warming of 8 °C would mean that the oceans will start to rise by about 7 mm a year instead of the 2.5 mm a year as in the past.

A direct result of global warming is that many countries will be exposed to will be increasing and large-scale flooding. Rising sea levels will drown low-level coastlines, and some countries may become uninhabitable not only by rising sea-levels but also because of contaminated inland water supplies. The consequences of climate changes for some nations will thus be unbelievable and unthinkable. Widespread flooding such as those experienced recently in Haiti and the Dominican Republic will create upheaval for millions. Access to drinkable water may then become a major battleground. The destruction of world infrastructure through global warming and by human conflict and warfare may then dominate the fight for food, water and energy sources and supplies. If, as predicted, catastrophic shortages of water and energy supplies will confront the world within the next couple of decades, we may then be facing a world riven with water wars, famine, and an incompetent and unreliable infrastructure system.

Rising sea levels would need new protection systems for coastlines, and innovative flood relief schemes. Rivers would need to be managed throughout their length. Decaying and dilapidated drainage systems will be unable to cope with urban sprawl and heavy rain, whereas, countries with non-existent drainage systems, will pay a much heavier price. Where land cannot soak up rain, new constructions in flood plains will be vulnerable to regular and repeated inundation. On the other hand, desalinated seawater can become a viable water resource and primary source of potable water. Technological advances have now demonstrated the cost effectiveness of seawater desalination processes.

The fact that the earth is warming up is no longer in dispute—it is a human phenomenon. It is reported that householders are responsible for some 40% of energy emissions. As levels of carbon dioxide and other greenhouse gases increase, average temperatures also rise globally. The oceans then begin to expand—and their rise will be further if glaciers also melt. The resulting impact on increase in energy prices, construction materials and construction technology is inescapable. There will be not only carbon trading between nations, but also, probably

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inevitably, individual carbon taxes and/or carbon rationing.

All this complex scenario emphasizes the major changes needed in the construction industry. We need to rethink about the education and training of civil engineers, integrating civil engineering with architecture, building science and energy resources. We need to take a HOLISTIC approach to the use of construction materials and to the DESIGN of structures. Should we adopt a new design philosophy of designing structures for serviceability and checking for their ultimate strength? Buildings are estimated to consume some 40% of all energy produced in the world. We should perhaps be thinking of Zero Energy Structures—a vision of sustainable energy-efficient structures—made from recycled materials, self-sufficient in water and energy, and using energy from only renewable resources? Durability, Ductility, Sustainability and Environment should be the key words in the use of materials and in the design of structures, coupled with probabilistic assessment of their durability performance when exposed to aggressive environments. Our planet is in deep trouble—can we rise to the occasion?