Available online at www.sciencedirect.com
SCIENCE DIRECT®
Cement & Concrete Composites 28 (2006) 1–2
Cement & Concrete Composites
www.elsevier.com/locate/cemconcomp

Editorial

Whether we believe in Global Warming or not, and whether the hurricanes and other extreme weather changes that we have witnessed over the last nearly two decades are the result of increasing levels of carbon dioxide in the atmosphere and rising global temperatures, one fact is absolutely certain. This is the devastation and destruction brought about by climate changes, hurricanes and other natural disasters on civil engineering infrastructure. Extreme weather events and climate change have now become almost regular events in our life scenario, and there is clear evidence that no part of this planet is immune from the ripple and domino effects of global warming and globalisation. There is also no doubt that there is a strong link between our life style, human activities, man-made pollution and rising ocean temperatures, and the frequency, the severity and the destructive nature of hurricanes.

Apart from the death and destruction brought about by these hurricanes and extreme weather events, they also become very costly natural occurrences. The total cost of the storms in Britain and France in October 1987, for example, was reported to be about $5bn, whereas hurricane Andrew that hit Florida in 1992 cost some $22bn. The four storms that ravaged Florida again during last year cost some $28bn in total. It is predicted that hurricane Katrina—should we call it hurricane Kyoto?—and hurricane Rita, the second big storm to hit the American Gulf states in the space of a month, will together bring the total cost of reconstruction and rehabilitation of these devastated areas to some $80–100bn. Looking at the occurrence of all these extreme weather events in our planet as a whole, one wonders if this is a wake-up call to all humanity that Global Warming is a reality, and is here to stay—whether or not we fully understand the precise scientific links between emission of greenhouse gases, rising ocean temperatures, and the frequency and destructibility of hurricanes.

But these hurricanes and extreme weather events pose the greatest challenge to material scientists and civil engineers. How can we reduce the severity of destruction of our infrastructure, and how can we ensure that the materials we use and the structures we design can withstand the large and unforeseen dynamic forces unleashed by these extreme weather events? It would perhaps be interesting to take a brief look at some of the extreme climate changes that have occurred in the last few months, since June of 2005, and reflect on the damage and destruction they have impacted on our infrastructure. June of this year witnessed one of the worst flash floods wreaking havoc in the North Yorkshire of England. Some 68 mm of rainfall was recorded in approximately two hours—the equivalent of a month's rain. The road surfacing for many kilometres was torn up by raging torrents of water, forcing itself between the sub-base and the bituminous surface layer. It was reported that one bridge was washed away whilst another had had its concrete deck smashed; and a third was severely damaged by debris and floating matter. The repair bill for the Yorkshire flash flood damage is now expected to be about £2 m for bridges and £1.75 m for roads.

The summer rainy season also brought severe floods and landslides in China where, in addition to wide ranging damage to infrastructure, some 550 people lost their lives. In contrast, Mumbai in India suffered one of the heaviest downpours recorded in its history. Some 650 mm of rain fell within 24 h in July causing one of the worst floods, and widespread damage to the city's already inadequate infrastructure.

In August a tornado hit Birmingham in England, and winds of about 200 km/h blew roofs off houses causing severe structural damage to many properties. The total cost of the tornado damage is estimated to reach as high as about £40 m.

August also saw some very heavy flash floods and mud slides in Switzerland, Germany, Austria, Romania and Bulgaria in Europe whilst uncontrollable forest fires raged in nearby Portugal and Spain. To add fuel to the fire, both Portugal and Spain have also been experiencing severe and extreme drought, whilst in Western France water levels were at their lowest since about 1975. Most droughts recorded over the past few decades seem to have lasted between 4 and 6 years, and the record breaking droughts being witnessed now are now suspected to last longer. These severe droughts have brought in their wake extensive water rationing, and in parched Spain, plans are afoot to ship water to coastal areas.

It is clear that, environmentally speaking, we live in a rapidly changing world. Climate change has become a fact of almost daily life. It is true that the world has been

0958-9465/$ - see front matter
doi:10.1016/j.cemconcomp.2005.10.004

getting warmer for the last 10,000 years or so. It is equally true that there has also been normal long-term cyclic variations of climate change which have occurred ever since the creation of this planet. But human activity had very little, if anything, to do with either in those early days. The question is to what extent is the present day accelerated rate of meteorological events the result of the complex interaction of weather, climate change, human activities and man-made pollution? The increasing rate of climate change and its dire consequences on human life and infrastructure is there for everyone to see. The increasing impact of man's pollution of the environment, however, may not be so directly and readily visible. Can we nevertheless fully comprehend the ecological catastrophe that is being imposed on this planet? Can we keep our planet's climate safe and suitable for life of all mankind? It is reported, for example, that Europe's great heat wave of 2003 brought about some 35,000 lost lives and cost some £7bn altogether in economic damage in the continent. All climate change events pose severe challenges to civil engineering and the construction industry, and we need to reflect deeply as to how we can accommodate the consequences of climate change and minimize the severity of their impact on the quality of life of all mankind. We seem to be involved in a global experiment with the planet as the laboratory. But the sad truth is that when these experiments go wrong, they always seem to go bad for the little and poor peoples first! It has been reported recently that only a third of the promised £1.95bn aid to Indonesia after the Boxing Day tsunami has been delivered. The Aceh province was the region worst affected by the tragedy in which some 135,000 people died, and the region's infrastructure totally and completely obliterated. There is no doubt that mankind as a whole has to face many social and engineering challenges if we are to minimise the consequences of the adverse effects of climate change.