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Editorial

Civil engineering infrastructure is generally the most costly to create and develop, and thus an invaluable national asset for any country. In Canada, for example the estimated value of the country's infrastructure system is about $2 trillion. Significant and sustained investment in the infrastructure system is, however, essential if a country is to have high Quality of Living at home, at work and in leisure activities. A sound, efficient and effective infrastructure system is fundamental to economic prosperity and political stability.

There have been in the last few years substantial evidence in published literature, to show that our infrastructure systems, all over the world, are deteriorating at an alarming rate. The first conclusive evidence of this process of deterioration, and the need for rehabilitation comes from the infrastructure assessment carried out by the ASCE in 1998, which estimated a 5-year total investment need of US $1.3 trillion, just to restore the roads, bridges, dams, drinking water and other infrastructure systems to good serviceability and operating conditions. The overall average state of America's infrastructure was at that time given a grade of D^- i.e. Poor. As a specific example, some 40% of the nation's stock of more than 500,000 highway bridges were rated as structurally deficient or functionally obsolete. Some $100 billion was the estimated investment needed to eliminate all the backlog of bridge deficiencies alone, and to maintain repair levels. The New Civil Engineer State of the Nation Report in 2000, on the other hand, graded the quality of the UK's infrastructure from B(Fair) to D^+ (Poor) with an average overall grading of C.

ASCE's Report in 2001 on America's Infrastructure showed that conditions had changed little over the three years, although the cumulative grade of D^+ in 2001 was slightly up from D^- in 1998. ASCE again estimated an investment need of $1.3 trillion over the next five years to remedy the problems identified in the second report. Lack of adequate investment, and lack of effective partnership involving society, local and national government were often the impediments in trying to reverse the downward trends in the state of the infrastructure. For example, whilst some $112 billion was needed in 1998 to remedy the problems of construction and maintenance of schools, this had increased to $127 billion in 2001.

In the UK, the most recent State of the Nation Report—the ICE's annual critique of UK Infrastructure—gave the overall grade from B^+ (B—Fair) for the water and wastewater sector to D (D—Poor) for energy and waste. The report identified "waste" as the most critical ticking "time bomb" of the nation's infrastructure. The total waste produced in the UK last year amounted to about 430 Mt, of which about 24% or 103.2 Mt was from the construction industry. With the European Landfill Directive taking effect from July 2004, and disposal facilities becoming acute and overstretched, waste management has become the top priority for the nation as a whole.

Compare these infrastructure problems of the rich nations of the world with those of the poor. In many of the poor countries, infrastructure facilities are often virtually non-existent, and where they exist, poverty, human conflict and the effects of global warming continue to destroy the remaining fabrics of infrastructure. Hurricane Mitch, for example, destroyed about 70% of the infrastructure of the Honduras where 70% of the people are estimated to live in poverty. The infrastructure rebuilding is estimated to cost $3.6 billion—the debt per capita in 1997 of the country was $767, whereas the GDP per capita was $657!

When we look at the global scenario of infrastructure and affordable housing needs of the poor and developing areas worldwide, certain inescapable and undeniable facts emerge. There is in these countries a woeful lack of technological skills and economic clout to exploit their natural resources, and the advances in science and technology that the rest of the world has seen and benefited from. Some 25% of the world population live in the industrialised world, and they account for nearly 75% of the global energy consumption. More than 100 million people in the world's poorest countries survive on $1 a day. The UN Human Development Report of 1999 highlights the differences between the rich and the poor in their share of world GDP—the richest

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20% took 86%, and the middle 60% took 13% whilst the poorest 20% had a 1% share. A recent IMF Report shows that the African share of world trade has dropped sharply in the past 20 years from about 3.5% to just above 1%. It needs no special analysis to realise and know why when things go bad, they go bad for the poorest people first.

It is in this context that the civil engineering and construction industry community need to critically evaluate its contribution to the delivery of the 8 UN Millennium Development Goals. The most pressing problem of the poor and developing areas worldwide is the Regeneration and Rehabilitation of their Infrastructure. This needs vast amounts of low cost, durable, eco-friendly building materials—and an equally important need is the preservation of the life-sustaining environment of the planet Earth. The greatest threat is the uncontrolled use of materials, and uncontrolled creation of waste, and pollution of our environment. "Engineering Without Frontiers" or "Engineering Without Borders" should aim far, far beyond a "Voluntary Service Overseas" attitude and approach if we are to ensure any effective change to the state of infrastructure, and diminish the global divide between the rich and the poor. What the developed world owes to the poor and developing areas worldwide is a massive economic and technical "Master Plan" to regenerate and rehabilitate their infrastructure and affordable housing needs—to provide those basic amenities of life that we all take for granted. This also would need a total reassessment of the education and training of "civil engineers", and an entirely new, innovative materials research basis to reflect the needs and demands of the 21st century. The world we live in now is very different to the world that we inherited at the beginning of the twentieth century. The materials we use, the structures we design, and the construction technology techniques that we adopt must reflect the vast range of rich and inexhaustible, renewable sources of construction materials that these countries have at their disposal—earth, timber, bamboo, vegetable fibres, and rice husk ash—just to mention a few. Bamboo, for example, is the fastest-growing and highest-yielding renewable construction material available to mankind. We have now access to very advanced materials science microstructural research techniques and methodologies, and low energy cement production technologies that should enable us to develop and produce cost-effective, environmentally friendly and low energy consuming building materials that will use much less energy, conserve resources and reduce environmental pollution. The fact that some of the most easily and readily replenishable earth's resources can be used to alleviate one of the most acute forms of human deprivation is a challenge to the science and engineering skills of advanced technologies. Here is an opportunity for the civil engineering community to make "Engineering Without Frontiers/Borders" a bold, dynamic and human step forward that will ensure that planet Earth survives providing a high quality of life for all mankind.