Editorial

by G. Somerville

Sustainability—its implications for concrete research

The most commonly quoted definition of the sustainability is ‘development that meets the needs of the present, without compromising the ability of future generations to meet their own needs’. In the DETR consultative papers in 1998, this translated into four broad objectives:

- (a) Social progress, which recognises the needs of everyone;
- (b) Effective protection of the environment;
- (c) Prudent use of natural resources; and
- (d) Maintenance of high and stable levels of economic growth.

No one would quarrel with any of that, although speculation is possible on the difference between needs and expectations. Also, the potential scale of the problem in the future is brought home with the prediction that the world population will increase tenfold in the next 50 years.

Since there is evidence that we are rapidly using up the earth’s finite non-renewable resources even now, there is obvious cause for concern—and action. The question is: what action? What contribution can the construction industry—and concrete in particular—make, to help solve the problem?

While the concept of sustainability is reasonably well understood in broad terms, its implications for the industry are not. We are aware of progress on certain facets of sustainability: the measurement of energy usage and steps taken to reduce it; reductions in the production of toxic gases and dust; the minimisation of waste; the increased use of waste and recycled materials. These are important pieces of sustainability jigsaw—

and much work remains to be done in these areas, for concrete—but they do not represent the total picture.

A perspective of work to date, on environmental and sustainability issues, might be that we have only tackled the clearly identifiable and relatively easy factors. In establishing indicators and setting targets, we are working at the most basic level, in addressing issues linked to material production and use. Even here, we can get our priorities wrong; on energy, for example, most work has been on embodied energy, although energy consumption in use is very much greater (but more difficult to quantify).

We need to raise our sights and look at the bigger picture. The output from the construction industry is effectively a complete cycle—(definition of need → design and construction → maintenance in use → demolition)—and not just a linear element involving only design and construction. To emphasise that point, 50% of the output in the UK is already on maintenance and upgrading work—and rising. This means that the industry concerns have to be extended from design and construction to embrace in-service performance and a maintenance and management strategy. The most dominant consequence of that is the introduction of the TIME factor into our deliberations.

All infrastructure has a function; that function can change in time. Future obsolescence is therefore an issue. In addition, the function should not be unduly interrupted, by the significant deterioration in time of the structures we produce. Put another way, there should not be any large unexpected bills! It is not sustainable, if our structure fails to meet owners’ operational requirements; we are having to use scarce re-

sources prematurely. On the other hand, if we overdesign or over-specify, this is also unsustainable since we are using more resources than are really needed.

All of this means that we need to create a better fit with what owners really need. This is not easy, since owners themselves are not always sure, and projecting ahead for 100, or even 50, years is difficult, without a very clear crystal ball! Nevertheless, to be more sustainable in what we do, we have to address these issues, and become time-conscious.

What can we do? As a lead-in to considering needs in concrete research, we must first take a general look at the current design process. Where are we over-designing?—possibly in resisting imposed loads. What are we under-designing—in the past, possibly in terms of durability, but now we may be over-compensating, since the full benefit of the mass of research in this field has not been digested and taken properly into practice. That needs to be done.

Following on from that, for concrete research in particular, what is needed most is focus. We need not only to strive for better or more economic solutions to meet current performance criteria, we need to research the criteria themselves—and to do that in a time context. This is part of the ‘better fit with owner needs’ mentioned earlier; we need to persuade and help owners to define their needs in more detail. The effect of this is to create targets which provide a common base for novel, and often varied, solutions. Nowhere is this more needed than in durability design, when specifiers have no common denominator, in choosing from a range of options championed individually.

The shift towards maintenance and upgrading work also requires focus—well beyond the current interest in researching repair systems, and using recycled materials. In particular, practice needs guidance on structural assessment of existing structures, as a basis for sensible decision making. When is action necessary, and what should it be? One could argue that this is already done, using new tools such as whole life costing, risk assessment, value engineering and probabilistic methods. But the basis for this is weak, because the input is deficient; what is the real strength of real structures in real situations—we just do not know.

These are perhaps the major areas—new build and refurbishment—in terms of modifying the current supply chain, with sustainability and the time factor in mind; there, we need research on methods and systems, probably more than on technology and behaviour. However, once we have a better idea of what is really needed in time-related performance terms, there are opportunities for more-focused technical development. We already have that to some extent, e.g. in new strengthening systems, and the coming of self-compaction and reactive powder concretes. But we need more, and the catalyst of sustainability gives us new opportunities as researchers.

We have become too predictable, in trying to super-refine existing ideas. We need a completely fresh look at what we do, and why we are doing it. More focus. More innovation. Better links between the research world and practice, which would generate more motivation for research—and more resource.