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nCRISP Thinkpieces

Delivering a Low Carbon Economy

nCRISP

Contents

Delivering a Low Carbon Economy: An nCRISP perspective

In August 2003 nCRISP invited 6 authors to write a 'thinkpiece' each with different sectoral perspectives that explored options for integrating buildings in a carbon-based economy over the next 20 years. The aim was to link these papers with the cross-departmental *Better Buildings Summit* organised by the ODPM, Defra and the DTI that was held in October 2003. The overall theme of the Summit, set by Government, was "*delivering better, greener buildings – faster*". Overlaying this was the message, based on the recent Energy White Paper, that the UK Government is seeking a partnership in the way we 'decarbonise' our building stock, involving all of the players in delivering greener, better buildings faster.

The Government's Energy White Paper, *Our energy future – creating a low carbon economy* (www.dti.gov.uk/energy/whitepaper), was published in February 2003. In practical terms, the target is to cut carbon by 15-25 Mt by 2020 through:

- Energy efficiency in households 4-6 MtC
- Energy efficiency in industry, commerce and the public sector 4-6 MtC
- Transport (voluntary agreements and biofuels) 2-4 MtC
- Increasing renewables 3-5 MtC
- EU carbon trading scheme 2-4 MtC

The White paper expects more than half the emissions reductions in its Climate Change programme (around 10 MtC pa by 2010 to come from energy efficiency). Buildings and infrastructure are targeted as the focus for the most significant cuts. The following papers represent a range of views and are presented as a basis for discussion.

The nCRISP thinkpieces seek to explore alternative and out-of-the-box approaches to address issues such as building design, fabric, services and investment, focussing on (but not limited to) particular perspectives. These are (with authors in brackets):

- Energy and Buildings (David Fisk)
- Low carbon design (Bill Gething)
- Material use and wastage (Val Lowman and Uly Ma)
- Buildings in use: A carbon-based approach for UK construction (Bill Bordass)
- The Built Environment and Global Warming: A property perspective (Christopher Morley)
- Building for corporate accountability (Peter Sharratt)

nCRISP invites feedback on the papers presented here. Note that these views are those of the authors and not necessarily nCRISP's or the organisations to which they are affiliated to or work for. All correspondence should be directed to nCRISP (not the authors) at:

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Energy and Buildings

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1 Introduction

Energy demand forecasts characteristically assume that the energy consumed by buildings will change only slowly with time. In fact, because building services are replaced so frequently, in the right context energy consumption patterns could change very rapidly. Two factors suggest that twenty to thirty years from now building energy consumption could be very different: consumer reactions to man made climate change and energy security. Both factors featured prominently in the recent Government White Paper on energy policy. The prospective changes might be so radical that services could even reach a tipping point to some entirely new servicing paradigms.

1.1 Client control

One further change could well be on the cards: clients taking a much stronger grip on the building design and construction process. It is difficult to believe that the current dysfunctional organisation of the construction process can struggle on for another 20 years destroying client value, when clients have to run their businesses in a globally competitive market. If this proves true, the response to the twin pincers of climate change and energy security could be expressed in the client's terms rather than the viewpoint of the professions. What might that mean? A client led change would mean less ephemeral green design novelty (which currently costs the client dear) and more substantive innovation (because informed first clients are a vital requirement for establishing a normal market for innovations). In client led innovation there is a clear trail following the famous S-shaped curve of innovation diffusion. Clients for prestige commercial buildings will have got their new ideas from successful industrial applications. Clients for prestige housing will have got their ideas from commercial buildings. Innovations in social housing would have been brought in from prestige housing. Thus, the wave of new technologies that will hit building services in the next twenty to thirty years are already in use somewhere in the industrial sector in 2000.

2 Future client concerns

Client control would have a major effect on the choices of future technology. Most clients worry about things other than simple cost-effectiveness, and the next step in this argument is to determine what are likely to be the major drivers.

2.1 The energy poor and energy rich

In the 19th century energy consumption was a 'normal good', the less used the richer the consumer felt. Today, some consumers still have energy costs that are a significant fraction of income and so closely manage its use. This category includes both households in fuel poverty and high energy industrial users like aluminium production. This section of the market makes energy choices in terms of cost-effectiveness and responds to economic instruments, such as a carbon tax, that might be imposed. However for most modern buildings, energy is a 'positional' good – the more consumers flaunt its consumption, the better they feel! Saving energy appears as poverty rather than wisdom. Arguably, this pattern of consumption began in the US in 1930's. Nothing suggests that most clients and occupiers in the future will take any more notice of energy prices than they do now. Their concern will be focussed primarily on the performance of the relevant energy service, its reliability of supply, and the status or esteem that conspicuous use conveys. It is hard to imagine now what it would 'feel' like in 2020 to be an energy user. There is no point supposing that social drivers for conspicuous consumption will have disappeared. However explicitly incurring greenhouse gas emissions to show status will by then look very, very non-U!

Over the next twenty to thirty years most of the uncertainty in climate change forecasting will have been eliminated. The climate models employed will have been trusted for normal inter-seasonal forecasts. The global average temperature will have been so elevated over pre-industrial levels that other 'contrarian' explanations have been exhausted. If there is a level of warming beyond which the climate descends into chaos, as some currently surmise, then the science will have identified it. In such a context, dramatically different from today's 'precautionary' approach to climate change, it is hard to see how conspicuous emission of carbon dioxide can retain its position as a positional good. If all this was not enough, pressures against fossil fuels could be reinforced by another coincidental pressure.

2.2 Energy security and fuel choice

While there is no global shortage of fossil fuels, at least by 2020, Europe will have a shortage of suppliers. This may be a serious European security issue, especially for transport, the most strategically important of all fuels (no point having a zero energy office if you can't get the petrol to commute to it!). By 2030, over 80% of the world's traded oil would be

coming from one part of the world, that is not currently politically stable. The UK will have long since been a net importer of fossil energy for the first time in its history. Energy security could then become another pressure on fuel type. In financial terms this may mean that energy prices are chaotic and spiky rather than uniformly high. From recent experience, efforts to keep electricity prices low through a large liberalised market appear to create power networks optimal in resource use but potentially low in resilience to failure. It seems that in the future, security of supply becomes a key issue for building occupiers.

Renewable energy is a coincidence between the need to avoid greenhouse gas emissions and the need to secure non-imported supplies. Because of the variability of the output of renewables, power suppliers will be developing new tariffs for interruptible supply tariffs.

3 Anticipating technologies

A typical service installation will have been replaced twice between now and 2020, so the existing building services capital stock is much more flexible than sometimes supposed, with plenty of opportunity for innovation. With stronger client control, the construction industry's conservatism is less likely to be a barrier. So we can legitimately follow marketing practice, and rank new technologies by their score against external drivers identified above, conspicuity of using emission free energy and the reliability in the face of external source disruption. What kind of pattern emerges for market driven innovation? In what follows, the argument draws on examples in the commercial building sector as a representative mid-point in the innovation diffusion curve.

3.1 Obvious winners

Any 'green' technology that out performs existing technology on service is a clear winner in this ranking. For example, high levels of thermal insulation in new housing will continue to be a market leader, simply because the dwelling is more comfortable, and more robust to supply disruption, not just because it is more economic. The more interesting issues are where new technology offers a different quality of service.

3.2 See It's Solar

Façade mounted photovoltaic cells could be the Rolex of conspicuous energy generation. This might be especially true if they explicitly 'excused' the less basic but very public energy uses like out of hours lighting. Industry is currently exploring new materials technologies for photovoltaic electricity. Some technologies offer higher efficiencies, though admittedly at higher cost, but others create modest power in cheaper materials, and so might easily create attractive cladding for the façade engineer. Naturally lit, naturally ventilated buildings score high, and are even more effective than powering the luminaries with PV power! The best naturally

ventilated buildings survived recent heat waves very well, and certainly better than poorly equipped air-conditioned buildings. In recent power disruptions, they did provide a degree of security, and they are conspicuously low energy. However, the skills for good design have been largely lost, especially for day lighting. A poorly designed poorly constructed 'natural building' would do little to satisfy client demands. Fortunately, there are new design techniques from the aerospace and process engineering that could recover lost knowledge. Getting daylight deep into buildings is another task for the new materials technology of photonics. Further, the naturally lit, naturally ventilated space comeback is supported by the prospective collapse in workspace energy consumption from new lighting and office machinery technology.

3.3 The end of adventitious gains?

LED lighting gains a high ranking against the two drivers of change. Clients will not necessarily have chosen LED's for their conspicuous low implied emissions of CO2. The dominant motive would probably be, as now in industrial applications, very long life and low maintenance cost. They are already in wide use in industrial applications such as car dashboards and signal lights. At the same time as the lighting load has disappearing, the new very low energy consumption PC's, derived from current laptop technology, would have swept away the old PC, with its noisy fans, and heavy standby power consumption into the scrap yard. May be the business process inefficiencies of email will have consigned it, and the 'always on' PC, to the same fate. So when the services engineer comes to replace the air conditioning, much of the lighting and equipment heat load will have disappeared. Both LEDs and ultra low power PC's are easier to protect against power disruption. Whether workers will have slipped back into cellular plan, or slipped in and then out again, is impossible to judge given the vagaries of management fashion.

3.4 Energy reliability and storage at the tipping point

Beyond a more intelligent use of ambient energy, energy reliability may be realised as more local investment in high efficiency standby plant, such as stationary fuel cells, or small combined heat and power units. These now have reliability to match large plant, and are naturally protected from the catastrophic failures that may be endemic in a power grid. The ranking of these options depend on whether other energy vectors than fossil fuels have been developed. But with such radical changes in building energy demand taking place, and with such a large increase in clean embedded generation, is not the whole paradigm close to an optimisation tipping point? Why in particular would future buildings be using 230V with all its IEE Regulations implications? Why not for the sake of argument the 'marine' standard of 24V, or perhaps even lower if PV's or fuel cells are to be the energy source? Just how much locally embedded generation is

installed before the role of the supply grid itself gets redefined as back up rather than main supply?

4 Off site energy generation

The electricity vector to a building will itself be subject to the twin pressures of climate change abatement and security. Liberalised electricity networks are regulated to behave as if classically 'energy poor', so nuclear, wind, tidal, biofuels, fossil fuels with carbon sequestration will all be fighting out the tariff wars, pushed along by carbon taxes and carbon trading schemes. The introduction of these sources reinforce the argument for micro-interruptible load to match variable supply with variable demand.

The power grid will be a very different beast, carrying significantly more indigenous non-fossil fuel sources and looking much more avidly than now for interruptible loads to manage its load profile. Currently load shedding is through removing large lumpy loads from the grid. By 2020 load shedding at the micro level seems likely to be commonplace through the use of communications technology. The recent spectacular regional blackouts would have been handled in 2020 by 'micro' shedding of local non-critical loads like domestic water heating. Automatic building management systems would be doing no more than a modern City computer does now, automatically bidding, selling and holding power. Buildings of all shapes and sizes could be net rather than gross consumers of electricity.

The Energy White Paper trails the concept of a new hydrogen energy vector that would provide storable fuel from non-fossil electricity generation or from fossil fuels stripped of their carbon. Hydrogen is usually discussed in the context of transport fuel and as an alternative to battery power, although it can power stationary fuels cells at high efficiency. Transport fuels may need diversification to secure security of supply. However, diversification of transport fuels may have an unexpected side effect for future buildings. Vehicles have a low utilisation factor, and spend most of their life parked in or next to a building. So any move in transport towards a fuel that could be equally used by buildings introduces new opportunities for linking transport energy storage to building energy use and the interruptiblity of loads. If fuel diversification also introduces electric traction, street noise declines significantly and natural ventilation becomes possible even at high densities. If the vehicle is using a fuel cell it may even be more resource efficient for the cell to continue to supply the building with power when it parks than let the cell cool down. For such buildings services design will truly have met a tipping point.

5 How does all this innovation come about?

Innovations do not just happen but require ideas, imagination and the ability to take risks. Within energy markets liberalised at national and European levels governments set broad policy frameworks, but take little part in these market processes. In most European countries, governments do not even purchase directly the energy used for public services. So the real action is likely to be with the private sector. If the EC has a regulatory role, the key according to the arguments here are placing performance limits on the 'prestige' energy consuming products, including building labelling, and encouraging private sector innovation risk taking. If national governments have a role it is keeping regulatory structures flexible enough to accommodate innovative approaches, ensuring that product markets have effective labelling, and that there is appropriate CPD ready to roll out behind every successful innovation. Innovation in building services has not had as powerful prospective market based drivers for innovation since the first oil crisis.. Rather than building services being a dull area with all the innovations in energy supply, given a clear run and involved clients and the Egan reforms, meeting the White Paper's targets could be an exciting time. It would be a pity if other countries got to the new technology first!

Design and the Low Carbon Economy

Bill Gething

RIBA President's Sustainability Advisor and Chair of the RIBA Sustainable Futures Committee.

To judge from the flood of media coverage, papers, strategies and seminars on sustainability with which we are currently bombarded, the issue of sustainability has become mainstream rather than the concern of a minority of bearded and sandaled eccentrics. It seems that no policy, company report or promotional material is complete without the 'S word', -although its meaning may encompass a significant range to suit the preoccupations of the particular interest group targeted.

It seems that there is general acknowledgement that there is a Problem, that the Problem is the consequence of mankind's collective actions and that significant steps towards solutions can only be made by collective action over a prolonged period.

Having said that, there is still a chasm between boardroom rhetoric or the actions of a few committed individuals and the necessary fundamental shift of our collective focus from the short term (the next election or the next set of profit figures) to one where we judge all our actions against a common belief that the Future is more important than the Present.

Perhaps the most fundamental difficulty facing us is not so much what to do but how to generate general support for the need for action. The optimist might say that education is the key – if people have the knowledge to understand the issues they will act themselves and will support, or even demand, action from their elected representatives, suppliers and employers. However, will this alone achieve results fast enough –in a society that has grown used to almost limitless choice fuelled by cheap energy?

A more pessimistic scenario might envisage some crisis occurring that had such a direct effect on us that it would prompt a radical change of focus akin to a war footing where decisions would be driven by the immediacy of survival, underpinned by sweeping powers of compulsion and rationing.

This paper takes the view that we will live up to our name of *Homo Sapiens Sapiens* to design our way out of the situation which we have created before we reach the point that Nature acts for us and designs us out of the Problem. By acting intelligently now we may be able to devise a comfortable lifestyle, and the built environment to support it, that is truly sustainable.

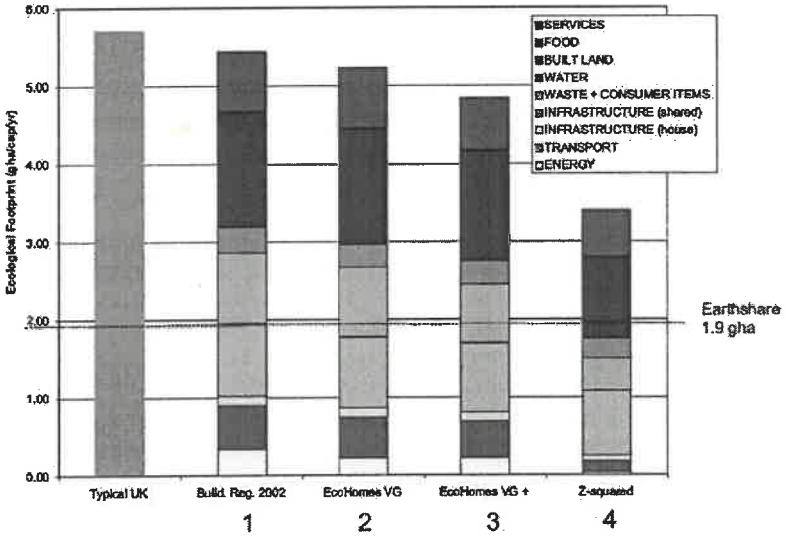
Design is the key – a process of thinking before we act - of testing ideas before putting them into practice -of analysing what we have done and using this experience in an iterative process of ordered progress – of balancing the practical issues of economic, social and environmental performance that together establish the Triple Bottom Line. This is a complex enough balancing act but designers must also remember that they are also the guardians of the Poetry in our built environment – something that lifts the spirits as well as meeting practical needs.

Given that action will be necessary over a prolonged period, we need a clear strategy that identifies where we need to get to and what steps we need to take in order to get there. What is less clear is where the expertise and organisational structures are to deliver such a plan. Where do the lessons learnt from post war reconstruction and the New Towns reside –good and bad?

To achieve this we need commonly agreed tools that underpin the strategy and will allow us to target the right issues, to evaluate proposals and to measure progress. Such tools are starting to become established and, while those that deal with particular issues are valuable, it is essential that we adopt overarching holistic approaches to develop balanced strategies.

One of the most promising broad based tools is the concept of ecological footprinting – a technique for evaluating the amount of bioproductive land and sea required to support a given lifestyle and comparing it with the total available to us on the planet. The results are described in terms of the number of planets needed to support that lifestyle – a simple, easily communicated message that focuses the mind on the fundamental issue while maintaining a global perspective to compare our lifestyle with others– we live at 3 planets in the UK - but we have only one planet to share... - our Earthshare.

Eco footprinting does not cover all aspects of the Triple Bottom line, most notably employment and social issues and toxicity, and the detail of the methodology behind it is evolving, however, it does deal with the environmental impacts of our lifestyle, and the built environment in particular, in a broad but structured way. The technique was used for the ground breaking BedZED project and has been used to compare scenarios of the effect of a range of approaches to development on their ecological footprint. The graph shows the range of approaches and the relative impact of the components that make up the footprint.



Ecological footprint per resident for a range of building standards – extract from 'One Planet Living in the Thames Gateway' a report for the WWF One Million Sustainable Homes Project by Bioregional Development Group and the Stockholm Environment Institute. Available from: http://www.bioregional.co.uk/

The analysis highlights three issues particularly: the first is that the basic energy consumption of a home can be very significantly reduced by intelligent design(and buildings account for around 50% of our total CO_2 emissions), the second is that individual lifestyle choices and actions can have a significant effect (for example in food, transport and waste) and the third is that there are very significant components, such as food, transport and infrastructure, that, if dealt with at the local, regional or national level, could have a huge effect.

In terms of immediate action, there is a potentially neat fit between the technique of eco-footprinting and the requirements of the EU Energy Performance Directive, which will become mandatory in 2006. This will require an energy rating to be established for every building to be displayed in the case of public buildings or, in other cases, stated as part of any sale or lease. Whilst it is recognised that this is a huge task in itself, there would be merits in extending the rating in due course to cover broader sustainability issues (as suggested in a recent study covering domestic buildings by the Bioregional Development Group commissioned on behalf of

the Advisory Committee on Consumer Products and the Environment (ACCPE) by the Department for Environment, Food and Rural Affairs – see http://www.defra.gov.uk/environment/consumerprod/accpe/research/pdf/accpe_final030711.pdf)

Simply introducing the rating system would bring the issues to the attention of a wider public but, over time, it could form the basis of a system of carrots and sticks to generate improvement. Dealing with issues that are under the direct control of the individual building owner would be relatively straightforward – by a combination of demonstrable value added, grants, penalties or taxation – an alternative basis for the Community Charge perhaps. Dealing with issues that are more of a collective responsibility is less well tested – could this be a basis for assessing and encouraging good performance of a local or regional council in a similar way?

In the longer term, the aspirations and scope of the Sustainable Communities Plan, linking as it does to other significant government policies such as the Energy White paper, provides an opportunity to explore how best to address the wider issues and, by using tools like eco-footprinting, to coordinate and maximise improvement at each level. It should also provide a spur to develop theoretical ideal scenarios of the future – designing and, importantly, illustrating an end goal rather than getting bogged down in the nitty gritty of how we change what we have now – tomorrow's low carbon equivalent of the Utopias put forward by the likes of Titus Salt and Ebenezer Howard.

Looking at idealised scenarios set in a future where the effects of global warming are starting to bite, without being tied down to a historic infrastructure or employment patterns should throw up innovative solutions based on fundamental rethinking of human interactions.

- Where do we put all the PVs or other renewable generators we will need to generate the hydrogen to supply fuel-celled cars to provide the same level of personal transport we expect today?
- Or will we import and distribute hydrogen in the same way as we shortly import oil and can we accept the consequent dangers of fragility of supply?
- Or what would a truly integrated public transport system look like?
- Or what would a society where the need to travel has been designed out feel like – is it a stable, vibrant, people-centred community or is it a collection of isolated individuals communicating only through cyberspace?

- How do people have access to sufficient employment, social and cultural choice without travelling large distances
- Or do we find ways of better transporting ideas rather than people?

- How do buildings built at the beginning of the 21st century perform in summers like those we know today in southwest France?
- What will the balance between heating and cooling be?
- Will working patterns change to avoid the hottest parts of the day to avoid the need for cooling?

- What happens when any development that increases our carbon footprint must be 'paid for' by corresponding measures to reduce the footprint elsewhere to maintain the established balance?

- What infrastructure and controls are needed to support a zero waste community?

- What does a city that generates its own energy and grows most of its own food locally look like?

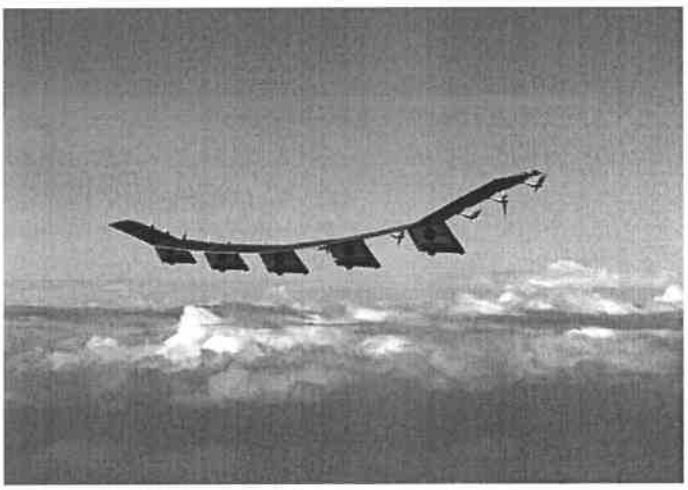
- What is the 'right' density for urban or rural living and what is the relationship between this and different patterns and types of agriculture?

Many of these questions are prompted by current ideas put forward as potential solutions to the Problem. Testing them theoretically on a large scale should enable us to identify the most promising leads and how these might also be applied to adapt our existing built assets. The process may also help us to understand the seriousness of the situation facing us – a potential solution that seems to work at one scale may not stack up when applied en masse.

Human intelligence will also continue to deliver technological advances. New materials will be developed and our understanding of existing materials and interaction between our built and natural environment will improve. This should enable us, on the one hand, to use a wider range of materials locally, with minimal processing, because they are 'good enough' rather than transport heavy 'best quality' materials over large distances. On the other hand, one can foresee the development of specialist, relatively light, 'super materials' which will be worth transporting over comparatively large distances because of their unique properties.

Improving glass technology is an excellent example. Today, we can achieve the same thermal insulation properties with double glazing that, fifteen years ago, would have taken quadruple glazing–using half the material for the same performance and at affordable cost. At the same time the degree to which the glass will reject solar radiation can now be tailored over a useful range-keeping buildings cooler. Whether we will achieve the Holy Grail of a material that is transparent, insulates in winter and keeps us cool in the summer remains to be seen…

Technology will not solve all our problems but, human intelligence is a powerful force – for good (and, regrettably, for evil). The global exploitation of fossil fuels has driven unprecedented development (for the few) but it has also connected humanity as never before. If the use of this precious resource can act as a spring board to a position where, by working together, we can develop societies that are comfortable, vibrant, equitable and benign, it will not have been entirely wasted. If not…



The two images above perhaps provide a glimpse of where we might aim. The BedZED development, a collaboration between Bill Dunster Architects, The BioRegional Development Group, the Peabody Trust and Ove Arup and Partners, offers a community where people can live

and work comfortably but with an eco-footprint approaching one planet – we can almost do it now if we try.

The NASA solar powered aeroplane provides a vision of what technology, single mindedly applied, can produce. It holds the world height record for any propeller driven 'plane and is intended to fly for six months continuously - something that no fossil fuelled device can achieve - and is beautiful!

We have the chance to be the architects of a brighter, sustainable future – but we need to get on with the job now. If we wait much, longer, we may end up just scrabbling for survival.

"Waste Not" - Construction and Low Carbon Economy

Val Lowman, Lend Lease and Uly Ma, Greenfile Developments Ltd

Introduction

A building consumes energy from the time a decision is taken to build to the time when the building is demolished. This paper focuses on one part in the energy life cycle of a building - the construction phase.

Although construction contributes to about one-tenth of the national economy, it also produces 70Mtonnes of waste[1] a year. This means about 15-20% of all construction materials delivered to construction sites later leave in skips[2]. Besides adding to the landfills and waste related traffic, every skip is also loaded with energy – the energy used in making the construction materials. The 15-20% of materials wasted generally exceeds the 10% average energy saving targets of the Climate Change Levy Sector Agreements[3].

Water-logged pallet of cement bags

Much of this is due to poor storage on construction sites, leading to spillage and spoilage. By improving the construction site organisation and housekeeping, it is possible to first reduce; then reuse and finally recycle a significant portion of the waste.

Reducing waste in construction operations start with people: from the construction operatives upwards to the project managers and specialists. The operatives need to be aware of the need to manage waste as well as to be provided with opportunities to contribute; project managers need to facilitate waste reduction activities on the construction sites whilst the specialists will be spotting opportunities to reduce, reuse and recycle much of the waste as well as coach the construction site teams on waste management operations. This paper describes how Bovis Lend Lease addresses wastes to meet all three aspects of sustainable development: economic, social and environmental.

The Bluewater Experience

Between 1996 and 1999, 375 long-termed unemployed restarted their careers with the site services teams during the construction of Bluewater, in Kent. They were tasked with housekeeping at the construction site through a partnership between Bovis Construction as main contractor, Lend Lease as the client, the local Employment Services and North West Kent College of Further Education. This partnership provided opportunities, through a Job Centre at the site, for the long-term unemployed to gain basic skills and escape social exclusion.

The project offered one way to introduce an awareness of waste and its handling to people starting a career in the construction sector, either as part of the construction activities or with the waste management contractors. Although meant initially as a first-

step to other career opportunities, there were many who saw their waste management role as a distinct contribution to the Bluewater project and remained in that role.

The training included topics on Health and Safety so that the trainee could qualify for a CSCS card, thus ensuring a continuation of their career in construction. The training also included Manual Handling, a personal development module called "Choices" as well as transferable skills such as First Aid.

Bluewater created a significant impact on the lives of many people. Quotes from the Bluewater Experience video include[4]:

- "This scheme gives you a chance" – a Kent prison inmate
- "I am the 2000th person through the scheme and I'd like to stay" – local long term unemployed person.
- "We have managed to resource the work force with the aid of this partnership" – Cliff Harrison, Bovis Construction (Bluewater Construction Management).
- "This isn't just about jobs it's also about training" – Barry Burman, Lend Lease (Bluewater Construction Management)
- "Bluewater is the blueprint for the future" – Right Hon Andrew Smith MP Feb 1999.

Evolution of the Bluewater Approach

"Site cleanup" may not be glamorous, but by keeping a site neat, orderly and by storing construction materials in a proper fashion, it is possible to reduce waste from construction activities. The experiences first gained at Bluewater have allowed Bovis Lend Lease (Lend Lease acquired Bovis Construction in 1999) to continue to examine several opportunities by extrapolating the tasks and activities to reduce waste on site.

The first opportunity is to join the thinking behind the site services teams with Lean Construction practices. Lean Construction is about reducing waste and meeting customer demands and one of the foundations towards achieving "lean" is having a well-organised construction site with standardised working practices. A well-known lean technique, **5S**[5] is particularly relevant for the site services application. **5S** was originally developed by Toyota Motor Corporation to provide a clean and organised factory to reduce waste and develop a workforce discipline towards better working practices. It is equally applicable to construction sites.

5S	Description
Sort	Arrangement – This is about sorting and storing items in a work area and involves the determination of the frequency of every item used and how they are stored; and eliminating sources of clutter and manage deliveries.
Set	Neatness – This relates to setting items to enable easy access and that all items should be clearly marked. "A place for everything and everything in its place".
Shine	Cleanliness – This starts with simple cleaning but also shows that clean surroundings will allow the identification of potential problems through a visual sweep of the workplace.
Standardise	Order – By developing and maintaining standardised working practices, it is possible to keep the workplace in an orderly fashion: organised, clean and safe.
Sustain	Discipline– This is about sustaining the commitment to the above four S's through training and awareness-raising to create a discipline for continuous improvement.

There are other benefits to deploying 5S for site services team: 5S is a recognised world class best practice technique. The knowledge that they are practising and achieving a world-class technique will result in a significant boost to the self-confidence and morale of the team members. This is especially true for those re-entering employment or those starting their careers.

Bovis Lend Lease and its partners will be starting a 5S construction project linking lean construction with a low-carbon economy. The project is part-sponsored by the Carbon Trust as part of its Low Carbon Innovation Programme.

The second opportunity is to link the activities carried out by the site services team to more definable achievements. Research has shown that the activities of the site services team at Bluewater were broadly comparable to the Vocational Qualifications awarded by the Waste Management Industry Training and Advisory Board (WAMITAB). Bovis Lend Lease and its partners have been exploring the possibility of pilot projects where site services team members can accumulate relevant experiences towards the Waste Management Operations (levels 1 and 2) awards with WAMITAB. This approach allows the development of recognised skills which are also transferable to other sectors.

Not only does this approach provide a systematic way of addressing waste issues on construction sites and develop skilled operatives for the entire construction sector, it also provides those re-entering employment an opportunity to build a solid foundation for their skills. Discussions are underway with partners to tie in both 5S techniques to the Waste Management Operations qualifications as an integrated approach towards reducing construction site wastes.

The third opportunity is directly aimed at addressing both training and waste. Bovis Lend Lease is exploring with a construction college ways in which reusable construction wastes can be provided to training centres so that new generations of construction professionals can get sufficient construction materials for their training.

Although discussions are at an early stage, it is envisaged that such a programme can include some of the students contributing to the waste handling activities on a construction site as part of their training. These can be extended to include learning and participating in logistics activities such as sorting the reusable waste at the construction site to arranging for its delivery from the construction site to the training college.

As the volume of reusable waste produced the construction phase of a development may be more than required by the training college. The more ambitious students can also be involved in the identifying local industries that may have a need for reusable construction waste for their raw material and organising such deliveries.

This approach provides the construction sector with a win-win solution: an opportunity to reduce waste through reuse and recycling; the transfer of knowledge to people learning about construction through practical experience; as well as support for the development of the next generation of skilled construction workforce. The first hand experience with waste issues in construction also helps them better understand the importance of sustainable development.

Construction and the Low-Carbon Economy

Bovis Lend Lease is confident that the construction sector can contribute significantly to achieving a low carbon economy. It will need the efforts of everyone in construction working together to realise a sustainable industry. Bovis Lend Lease and its partners have identified the necessary building blocks at the construction site level: awareness raising, skills development and most importantly, opportunities to innovate to reduce waste at all levels. Our research has allowed us to develop projects which address waste at different levels and involve partnerships between project managers, construction teams, specialists, the supply chain and the community.

Acknowledgement

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A CARBON-BASED APPROACH FOR UK CONSTRUCTION

Saving energy in nondomestic buildings: closing the credibility gap

A thinkpiece for nCRISP by Bill Bordass

William Bordass Associates and the Usable Buildings Trust

The cheapest, cleanest and safest way of addressing all our goals is to use less energy. We have to improve energy efficiency far more in the next 20 years than in the last 20.
ENERGY WHITE PAPER, PARAGRAPH 1.40

1 Introduction

1.1 Nondomestic buildings (commercial and public) account for about one-sixth of the UK's total CO_2 emissions and one-third of the building-related ones. Their proportion of energy (particularly electricity) consumption has also been growing. This thinkpiece considers some reasons why these buildings often use much more energy than they could, and suggests ways of improving the situation. It concentrates on operational energy use, and on savings that can be made on site before calling upon external sources of delivered energy (however low in carbon these may be).

2 Background

2.1 WE MUST REDUCE EMISSIONS QUICKLY
The Energy White Paper (EWP) argues that fossil fuel use in the UK needs to fall fast, not only to reduce global warming, but also to improve security and diversity of supply, and avoid massive growth of imports. Its target of a 60% reduction in CO_2 emissions by 2050 may seem ambitious - but ideally we need more, perhaps 80% in developed countries. The faster we can progress the better, as the effects of saved emissions are cumulative.

2.2 THE EWP STRATEGY
To reduce emissions, the EWP looks primarily to technologies and to energy markets, in particular through using less energy, increasing the use of renewable energy, and taking well-planned action across the economy. For buildings, it proposes a mix of measures including tax, building regulations, energy certification, product standards, industry consensus, a move from energy supplies to energy services, and the activities of the Energy Saving and Carbon Trusts. In the public sector, it stresses target-setting and improving purchasing and procurement standards. It sees the need for more research and to develop skills of science, engineering and technology, in particular to support the energy supply industry and the domestic sector. It has less to say about the "soft" skills of making things happen effectively.

2.3 A LOT IS EXPECTED FROM THE NONDOMESTIC SECTOR
Just over half the EWP's projected CO_2 savings for 2020 come from energy efficiency[1]; and over half this from businesses and the public sector. In other words, the EWP expects nondomestic buildings to more than pull their weight. Typically annual new nondomestic construction averages only about 1% of the stock - so well over half the buildings we will have in 2050 are probably physically here already. This puts pressure for improvement on services upgrading, fitout and refurbishment (which occur much more frequently) and on management (for which energy efficiency is not yet a major objective). New buildings also need to perform far, far better - so they become part of the solution, and do not add to tomorrow's problems.

1 The balance is in renewables, transport and carbon trading.

2.4 BUT IT IS LESS CLEAR HOW THIS WILL BE DELIVERED

The EWP's solutions for buildings in the commercial and service sectors appear less well developed than for other sectors. This is hardly surprising. The diffuse nature of nondomestic buildings (both physically and in their energy demands) makes them:

- less amenable than housing to standardised approaches; but also
- less amenable than energy-intensive industry[2] to site-specific management approaches.

How can we stop the opportunities in nondomestic buildings from slipping through our fingers? This thinkpiece makes some suggestions.

3 Flying blind[3]?

3.1 NONDOMESTIC BUILDINGS CAN WASTE A LOT OF ENERGY

Many nondomestic buildings are major energy-wasters. New buildings are not always better, often with major differences between predicted and actual energy consumption. CO_2 emissions of two or even three times design expectations are far from unusual, even in some buildings which won energy and sustainability awards based on predictions at design stage - a massive credibility gap. There are many contributing reasons: optimistic estimates, unexpected building uses, shortcomings in build and installation quality, poor control, and lax management. But for the most part nobody knows nor cares. Good briefing, good design and good management can deliver buildings which are simultaneously comfortable, productive, economic and energy-efficient, but these are still rare.

3.2 SURELY THEIR DESIGNERS WILL KNOW?

Ordinary people might reasonably expect designers and builders to be experts on the performance of the buildings they create. This is not normally so: those who produce buildings work on projects. These projects are about producing buildings. Having produced one, they go on to the next - as do the project managers and the procurement wings of major construction clients. By and large, the providers do not stay around to see how well the buildings they have produced actually work. Consequently, large differences between energy performance expectations and outcomes can occur virtually unnoticed, while designers continue to repeat flawed prescriptions. They may also fail to realise when they have a success on their hands which they should be replicating: instead they may attempt to gild the lily and create "solutions" which are more complicated than necessary.

3.3 THEN WHY NOT THEIR OCCUPIERS?

Business is about spending money to make money. Energy is used to add value, so if the costs are affordable they cease to be an issue: management time is best devoted to something else. Hotels and catering, for example, have a strong culture of service before economy, as retaining customers is much more important to them than saving energy ... and now offices are becoming more like hotels! The market does not sufficiently reward energy efficiency: the true costs are borne at the societal and global levels. Polluters pay nothing like the going rate, nor are they likely to, because of the political need to keep energy prices down. We need more than the fuel price mechanism.

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2 Where high, localised energy use makes it worth dedicating investment funds and management time into energy efficiency, carbon trading and negotiated agreements

3 W Bordass, *Flying Blind: Everything you wanted to know about energy in commercial buildings but were afraid to ask,* London: Association for Conservation of Energy and the Energy Efficiency Advice Service for Oxfordshire (October 2001). Available for download from www.ukace.org

3.4 AND THEIR OWNERS?

Owner-occupiers and the public sector have tended to be the main clients for low-energy designs. However, the uncertainties of a changing world and the management focus on core business has led many organisations to outsource their property, through renting and facilities management. This process tends to reinforce industry standards because such buildings can be more readily valued and exchanged; and many owner-occupiers and public sector clients now benchmark against rented buildings and require property market exit strategies. To date energy efficiency has not figured highly in these benchmarks and valuations: and has even led to mark-downs where there have been fears about novelty, technological risks, lost flexibility and departures from market norms. So there is little incentive for developers to invest in energy efficiency if it does not increase sale or rental value and when energy costs - whatever they are - get passed on to tenants in the service charge.

3.5 OR THEIR MANAGERS?

Some of the most comfortable, productive and energy efficient buildings we have found were run by a highly-committed manager employed directly by the occupier, and who really understood the organisation, the users, the building and the plant, and undertook effective monitoring and feedback. Outsourced facilities management may be more professional, but with some exceptions it prefers industry-standard buildings, does not seriously address energy efficiency, and breaks the feedback loop from end-user to client. Often energy efficiency is not in FM contracts at all (or only in a nominal way) and is of little interest to most of their customers: so the easiest way for FMs to keep occupants happy is to run systems liberally. A telling case of this is where the manager of one of our good buildings was replaced when his organisation entered into a facilities management agreement for all their premises: in his building, the energy consumption reportedly doubled!

3.6 THERE ARE EXCEPTIONS

Some individuals and organisations are, of course, more engaged with outcomes than this, and they are growing in number. However, they are still quite rare, and can find it difficult to operate consistently from project to project in a market which still puts very little value on energy performance, or much trust in design predictions.

4 Making improvements

4.1 THERE IS HUGE POTENTIAL

Many people would like better and more energy efficient buildings:

- Many developers are keen to produce lower-energy buildings if the market will pay for them.
- Many occupiers would like to have lower-energy buildings, but not if they lose flexibility.
- Many designers and builders want to produce lower-energy buildings, but many cannot yet do so reliably.

The larger nondomestic buildings - about 5% by number but over 50% by area, tend to be managed buildings. Once the management is convinced that energy is important, it will begin to deliver.

4.2 IMPROVING THE TOTAL SYSTEM

As Stewart Brand said[4], "you don't finish a building, you start it". As commercial buildings move through time, occupants, technologies, walls and servicing systems come and go. To get the best out of them, one needs to think of the whole system and its various components, as discussed further in Section 6.

4.3 CLOSING THE FEEDBACK LOOP

A key to improvement is effective monitoring and feedback of performance of the completed product - something largely overlooked by the Egan movement which concentrates on process[5]. In particular, designers and builders need to be more involved in follow-through and aftercare in the year or so after completing a building, to review performance, help occupiers to make the best of their new asset, deal with emerging problems, and extract valuable lessons for future projects. Previous experience suggests that amongst the issues they will need to address will be:

- Design for manageability. Many buildings are too complicated for their management.
- Better controls with better management and user interfaces, easy to understand, and in the right places. This needs much more understanding of user and management behaviour.
- Attention to detail. Many energy-saving items are intended to do one thing, but also have their downsides. For example, summer ventilation systems may leak too much air in winter, demand-responsive controls may switch systems on unnecessarily, large windows are shaded because of glare, removing the daylight, and motorised windows and blinds can irritate users.
- Avoiding defaults to ON, the scourge of modern buildings and equipment.

Designers who visit their buildings and appreciate the problems are less likely to repeat them. They will also discover simple, manageable successes which they will be able to replicate and improve.

4.4 DEVELOPING THE EXEMPLARS

Many people still regard energy efficient buildings as outlandish, expensive, fragile and risky. This is not necessarily so: indeed, they can be robust, pleasant, cost-effective and marketable; as a greater understanding of achieved energy performance and occupant satisfaction will surely reveal. However, since the market is risk averse, some government support in demonstrating robust, adaptable, economic exemplars of low-carbon commercial buildings would be desirable

4.5 CHANGING THE CULTURE

By and large, management has not been very interested in energy efficiency of nondomestic buildings because energy costs are not very important. However, if we can change the culture to one in which energy and carbon efficiency is seen a professional duty, rapid cuts in carbon emissions could ensue, with individuals, organisations (clients, investors, designers, landlords, occupiers and managers) and institutions beginning to compete on the basis of potential and achieved performance. A pre-requisite for this will be to *make energy performance visible,* as discussed in Section 5. The industry will then be able to engage directly in improving it and the market will begin to respond to the results.

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4 S Brand, *How Buildings Learn: what happens after they're built,* New York/London:Viking (1994).

5 The resultant standardisation may also lead to less context-sensitivity and greater reliance on energy-consuming services to tune the standard building to the local environment. For a historical perspective see G Cooper, *Air-conditioning America,* Baltimore: Johns Hopkins University Press (1998).

5 Making performance visible

5.1 CLOSING THE CREDIBILITY GAP

Designers predict energy performance as part of option appraisal, plant sizing or risk assessment. Their methods are strong on physics but not necessarily closely related to what actually happens in occupied buildings - leading to major credibility gaps, as mentioned in 3.1. To progress, we need to *make performance visible,* with:

- greater awareness of how buildings use energy and cause carbon emissions;
- better understanding of the elements of energy performance, and how they inter-relate;
- clear ownership of problems in achieving good results; and
- encouraging all parties to do their bit in achieving better performance.

5.2 THE ENERGY PERFORMANCE OF BUILDINGS DIRECTIVE (EPBD)

The European Directive 2002/91/EC on the Energy Performance of Buildings[6] can help us to achieve this visibility and get good things to happen. Amongst other things, the EPBD requires:

- Buildings to have energy performance certificates when they are constructed, sold or rented out, complete with reference standards and recommendations for cost-effective improvements.
- All "public" buildings7 over 1000 m2 to display an energy certificate.

The certificates displayed or provided at property transactions should not be more than 10 years old.

5.3 IMPLEMENTING THE EPBD IN THE UK

Following its abolition in 2001, the DETR's responsibilities were split between several ministries. This complicates "joined-up" implementation of nondomestic energy certification. The EWP gave the main responsibility to ODPM, which is sensibly aiming to integrate the certification of new and altered buildings within the Building Regulations. Inevitably, these certificates need to be based on theoretical predictions. The degree to which certificates for occupied buildings - in particular "public" buildings - should be based on predicted or measured energy is still under discussion. However, the EPBD states that *"to the extent possible, the certificate should describe the actual energy performance situation of the building and be revised accordingly."*

5.4 USING THE EPBD TO DRIVE THINGS FORWARD

Member States can add to the EPBD's requirements but ministries can find it difficult to go beyond the minimum without being accused of "gold-plating". For the EPBD, a more joined-up implementation would help to achieve the EWP's objectives, provide a means of making the elements of energy performance clearly visible, and make everyone's lives easier. We suggest that:

- It is essential that actual (usually metered) energy use is assessed for occupied buildings.
- Ten years is too long for a certificate, particularly for commercial buildings where energy performance is often altered radically immediately

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6 *Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings,* Official Journal of the European Communities L1/65 - L1/71, (4 January 3003).

7 The EPBD defines these as buildings occupied by public authorities or by institutions providing public services and frequently visited by the public. In our view, this would include shops, hotels, educational and sports buildings. However, there is a risk that in the UK this may be interpreted as applying to public authority buildings only. This would be very disappointing.

after occupancy through fitout activities, which can so easily ride roughshod over energy-efficient features in the base building.
- Any certificates based on solely on calculation should be valid only for a limited time (say three years, enough to accumulate a reasonable energy history), after which they are replaced by full certificates which take account of actual energy use8.
- In order to make measured energy consumption data readily accessible, the Government should require fuel and energy suppliers to give their customers accurate statements of the energy supplied each year; and landlords to give similar statements to their tenants.

Clear links need to be made between predicted and actual performance using a framework which assists transparency between expectations and outcomes. This will help to improve the relevance of predictions, allow designers to understand in-use performance better, and close the credibility gap. To make this work, it all needs to fit into a functioning system, the subject of the final section.

6 Conclusions - getting better nondomestic buildings

6.1 A SYSTEMIC PROCESS

Where "hard" technologies and "soft" human systems come together in complex arrangements like buildings you can get both good and bad outcomes, including emergent properties not anticipated at the outset. Consequently energy efficient technologies and improved processes of building design and construction will not alone deliver highly energy efficient buildings.

6.2 ENDS, MEANS AND FEEDBACK

To get more of what you want from a complex system, you need:

1 Goals: e.g. more sustainable buildings with happier, more productive occupants and minimum practicable CO2 emissions.
2 Objectives, to allow practical steps to be taken towards these goals; and
3 Feedback loops, to evaluate progress and take appropriate corrective action.

6.3 GETTING IT TOGETHER

Without goals, objectives and feedback all in place progress may well be disappointing, with vicious circles and unintended outcomes. This is why studies of buildings in use such as Probe[9] reveal widespread chronic problems for occupant satisfaction and energy performance, even in some of the best buildings. Frequently the technology fails to work as intended or does not connect up properly with the people. Much is not "fit and forget", but "fit and manage the consequences". To improve rapidly, you need to get all the people involved to talk to each other.

6.4 UNLOCKING THE MULTIPLIER EFFECT

Much energy consumption arises from the compounding of unnecessary loads - A LOVINS

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8 This would also be an effective way to meet the EWP's paragraph 3.20, where the Government proposes working with local authorities and building inspectors to achieve better correlation between design and built performance.

9 Probe produced 20 studies of technical performance, energy performance and occupant satisfaction in recently-completed buildings, most with innovative energy systems. 5-page summaries of each study were published in *Building Services, the CIBSE Journal* between 1995 and 2002. Five overview papers can also be found in *Building Research and Information's* Special issue on post-occupancy evaluation, **29** (2), March-April 2001. See also the Probe section of www.usablebuildings.co.uk

Fortunately the wasteful mechanism identified by Lovins can also be driven backwards: as efficiencies rather than inefficiencies can also build upon one another to slash energy consumption and CO_2 emissions:

1 Better building shells can help to remove the loads falling on building services.
2 Efficient occupiers' equipment and appliances save energy in their own right.
3 Both these reduce the loads falling upon services to control the indoor environment.
4 Some of the building services that remain can make use of passive energy systems.
5 Energy-consuming services that are still needed can be made more intrinsically efficient.
6 Renewable and low-carbon sources of energy can be added.
7 Control systems can be improved, for better usability and closer match of supply to demand.
8 All the above can be installed, commissioned and brought into use properly.
9 The result can be operated and managed more effectively and transparently.

Many of the above multiply together, so a 10% improvement in each could easily lead to a 60% reduction in CO_2 emissions. But normally the progress is at best linear, owing to the isolation of the players involved. How do we get the system to work better with the multiplier more visible?

6.5 MAKING CO_2 EMISSIONS A BUSINESS DRIVER FOR SYSTEM IMPROVEMENT

We have the government *objective* of reducing CO_2 emissions by 60% by 2050. However, people and organisations are not yet good at relating this to their individual decisions. To get the system to work properly, we suggest putting three missing links in place.

1 Raising general awareness that the goal of reducing CO2 emissions is of prime national and global importance, is not going to disappear, and needs to inform all our decisions. Once sufficient numbers of people and organisations accept this, the system will reach "the tipping point", where the forces of apathy and opposition join the bandwagon, and emissions reduction becomes an widely-agreed personal and management objective.
2 Making building energy performance visible. The European Directive (EPBD) gives us the opportunity to make this a business driver, allowing building performance to be related transparently to the objectives of the EWP and allowing virtuous circles to cut in involving clients, investors, designers, builders, producers, occupiers, managers and service providers.
3 Closing the feedback loop. For the whole system to work, the UK needs to implement the EPBD to certify building energy performance not just in theory at the point of sale or rental, but also in operation, taking account of actual performance in use. Accept no substitutes!

Only when goals, objectives and feedback systems are in place will we stop flying blind, narrow the credibility gap between expectations and outcomes, and start making step change improvements.

A Think Piece on the Built Environment and Global Warming

Christopher Morley

[As a member of Sir Martin Laing's Sustainable Construction Task Group, Christopher Morley has produced an alternative think piece on the built environment, the Energy White Paper and global warming. The views expressed in this paper are his alone and designed to prompt debate]

Drivers for action

The resounding consensus of world scientific opinion is that global warming is upon us, is profoundly serious, and is largely a consequence of man's activity on the planet – primarily the persistent burning of fossil fuels to derive energy.

Those unmoved by empirical argument can witness the evidence for themselves, as we continue to experience noticeably high temperatures for the time of year.

There are few global warming cynics in property. Whilst some industries will remain immune to the initial onslaught of global warming, and one or two might perversely stand to benefit, in contrast the property industry is already suffering.

Extreme temperatures and wind speeds damage the fabric of buildings. Flooding is particularly devastating, and the increased probability of it as a consequence of global warming is already restricting insurance cover and where it is possible to build.

There are many other drivers for property to take steps to help address climate change. Whilst the demand from occupiers for greener buildings has, on the whole, been very disappointing to date, pension fund managers and financial analysts are increasingly favouring investment in buildings with reduced carbon footprint. Those considering insuring buildings constructed today also seek evidence that they will withstand possible climate change within their forecast lifespan.

Acting voluntarily

Property companies also increasingly choose to act voluntarily. Just a few examples of voluntary practice raising the performance bar are Stanhope's Chiswick Park, MEPC's Milton Park and Prudential's Green Park. And whilst individually property companies occupy different points of the voluntary best practice scale, many have now adopted corporate strategies that have, at their heart, a commitment to the environment. For instance Land Securities' approach to CSR recently resulted in their inclusion in the investor guide FTSE 4Good.

Property in perspective

The jury is out over the precise contribution property makes to UK carbon emissions. Views differ on how much is a result of the buildings plus building services, and how much is a consequence of the processes and activities conducted inside them.

But it is probably fair to say that from leisure clubs to offices, and from shopping centres to homes, the built environment is the largest single contributor of UK carbon emissions.

Some are inclined to almost vilify property for that fact, or suggest that legislators, here and abroad, should therefore be imposing requirements on property that pay little or no attention to the costs they impose, or the willingness of customers of the property industry to accept either those costs, or the changes to the buildings incurred.

If we were to impose such regulation to address future threats, we would be overlooking the essential function of property to society today. Perhaps before adopting a heavy handed approach one should also bear in mind that our homes contribute more to carbon emissions than all other forms of buildings combined.

Energy is not the enemy

Besides, as the Prime Minister states in his foreword to the Energy White Paper, "energy is vital to a modern economy and to heat and light our homes".

Therefore, whilst clearly all reasonable steps should be taken to reduce energy consumption in the built environment, an emphasis on energy efficiency per se, as we seek to address the issue of global warming, and buildings' carbon footprint, could be counterproductive. Either because in focusing on energy efficiency we take our eye off the ball in other significant areas of carbon reduction, or because we are overly prescriptive as to the manner in which buildings are constructed and can perform.

By way of example, recent studies suggest that some naturally ventilated offices could well prove unusable in the summer as temperatures continue to rise. As a result, they may well have to be converted, (if retrospective conversion is even feasible), to mechanical air conditioning. Already this summer a number of city firms were forced to send their employees home, as working temperatures exceeded tolerable levels. The negative consequences, in sustainability terms, of such occurrences, even if they only happen a couple of times a year, are huge.

The importance of density in reducing carbon footprint

Notwithstanding concerns over the future usability of buildings as temperatures continue to rise, in certain cases there are also sound reasons for not necessarily abandoning mechanical air conditioning. It is situation dependent, with natural ventilation working very well in many instances, but an assessment of the environmental performance of a building is meaningless without factoring in the number of people it is able to comfortably house. Put crudely, one high density building with temperatures reasonably controlled through mechanical air conditioning, is a better result in environmental terms than two buildings of comparable size regulated through natural ventilation housing half the occupants of the first in each.

Another option, and one which addresses concern over the ability of buildings constructed today to cope with temperatures of tomorrow, is to introduce mixed mode cooling systems that rely on natural ventilation but have mechanical ventilation installed purely as back up in time of need.

But all this points to the value of the UK navigating a carbon reduction path that avoids unnecessary prescription. If modern air conditioning units can be designed with energy efficiency as their top priority, or if buildings can be powered through carbon neutral

energy sources, then there is no need to dictate how future buildings are cooled or interfere with many other internal energy consuming features.

Renewable energy

The different forms of renewable energy are too numerous to mention and whilst it is important to maintain choice in an immature market, it is worth making reference to offshore wind farm power now.

As an island, and the windiest nation in Europe, the UK has the potential to become a world leader in generating energy from this source. It is estimated that by 2010, (less than seven years from now), one in six homes could be powered by offshore energy, creating 20,000 jobs in the process and going a long way to meeting our 2010 ten per cent renewable target.

We would need to build eight to ten wind turbines a week to meet our renewable target, but three years ago Germany was installing two turbines a day and now that is up to five, so it is very achievable.

Maintain choice

The reason I mention this now, is that if there are alternative means of meeting our climate change objectives than those that dictate the construction and fundamental nature of a building, then perhaps we should focus on them. Or redouble our investment in tandem with continuous improvements to buildings.

The property industry, and more importantly its customers, might well prefer in the future, if given a choice, of making sizable financial contributions to the Government's offshore wind farm programme, or other investments in green-power, rather than have fundamental characteristics of their buildings dictated by future revisions to Part L of the Building Regulations. Those familiar with the Royal Academy of Engineering's 1:5:200 model on the long term costs of owning and using buildings, will appreciate the importance to society of buildings being modeled around business occupiers' exacting needs. – The key is to allow the flexibility for the market to find the most efficient way of meeting carbon reduction targets.

Property creating places

Property can actually substantially reduce carbon emissions from other sectors, notably transport, if it is able to create urban environments where people enjoy working, living and spending the vast majority of their time. Despite an economic downturn, we have seen some great examples recently of urban regeneration and mixed use communities reducing carbon emission by reducing the need and desire to travel. Manchester has recently undergone the most extraordinary regeneration experience of any city in Europe and in so doing increased beyond all recognition the number of people that choose to live and work in the city itself and spend the vast majority of their recreational time.

Government role

Obviously the property industry has a big hand to play in such urban transformations, but it must also initially rely enormously on others to play their part. The role of the planning

system in all this is obviously key, setting out a sustainable vision for a local area and providing the clarity and confidence for the private sector to invest in it. The Government can help by ensuring that local authorities have sufficient funds to invest properly in their planning departments and that these funds are not siphoned elsewhere.

Another way that Government could help would be to remove the market distortion that places VAT on refurbishment of existing buildings, which, from a global warming perspective posses embodied energy whilst virgin development obviously does not.

A holistic approach

As I have suggested, when considering the role of property in mitigating global warming one must take a holistic view. As the cover page of the Issues Paper presented at the Better Buildings Summit suggests, we have to address the issue of infrastructure when considering buildings and global warming.

A "Sustainable" Plan?

The Government's development proposals in the "Sustainable Communities Plan" lack the planned public transport infrastructure to underpin them and therefore, on that basis, could be considered "unsustainable". The Plan puts a premium on energy efficient design, which is good, but with a typical daily car commute almost double the carbon emission associated with per capita office occupancy, it is very important that future and existing development is adequately served by public transport.

By way of example, the Canary Wharf Group has taken considerable steps towards creating a sustainable environment, including sourcing 55 per cent of their electrical consumption from renewable sources. But the fact that 93 per cent of people visiting their East London developments use public transport, cycle or walk, creates an enviable carbon footprint.

Who pays for necessary infrastructure?

Whilst the Government footing the bill for all our public transport needs would be a marvelous solution for most of us and certainly for the environment, they cannot possibly pay for it all. There are a number of studies taking place at the moment to find innovative and effective ways of joint funding public transport, mainly in the context of Crossrail. Ideas range from including an additional business rate across the capital, a development tax, a levy on the increased value of property along the route, or the securitisation of the future tax income from the regeneration schemes.

The property industry is interested in this debate, because whilst they too cannot possibly pay for it all, or even necessarily a substantial quantity of what we need, the industry is generally not averse to paying for some of it, where it can. As I have already mentioned commuting to work consumes, on average, almost twice the carbon in terms of per capita office occupancy. On this basis an investment from property in transport would be more effective, in global warming terms, than a similar investment in energy efficiency.

Time to treat different industries very differently?

If we prove unable to satisfactorily abate the pace of global warming, we will have to quickly resort to properly reflecting the role and importance of industries to society when determining what measures to impose on them.

Political leadership

But politically, certainly in the UK, we seem light years away from that process at the moment. Only recently the Prime Minister stepped to the defense of the tobacco industry, by publicly announcing his future opposition to the European Commission's suggestion of forcing a restriction on smoking in public places. Whilst the tobacco industry's worst impact to society is obviously not a contribution to global warming, if global temperatures continue to rise exponentially, at what point do we decide which industries we really need?

Promote precious industries

In terms of essential industries, drawing a parallel between property and pharmaceuticals is not as strange as it sounds. Both are vital and both benefit from there being an open market, innovation and profitability, with profit determining future investment in important areas from employee training to research and development.

Demand-pull

Generally speaking the construction industry will build what developers pay them to build and, as with most industries, developers will build what their customers want. Public awareness and consumer preference for greener buildings must therefore be key. The Government could make a greater investment in raising public awareness of these issues and that would also send a strong signal to investors that potential purchasers and occupiers of buildings would likely in future consider energy efficiency as important.

Conclusion

We are at the beginning of a major shift to a low carbon economy in the UK – a shift that will change the way we think about energy, energy efficiency and carbon management. Climate change and the low carbon economy are firmly on the policy agenda. The UK's climate change programme, voluntary measures from industry, recent and forthcoming revisions to the Building Regulations and the incoming EU Energy Performance of Buildings Directive are all clear examples that action is being taken by business and governments, both here and abroad, to ensure that buildings play their part in reducing carbon emissions.

In playing a full role in addressing global warming, the property industry must first rely on the support and intervention of others. Whether it is in creating a "can do" culture in planning or introducing sufficient incentives for investment in energy efficiency, there is much that the Government and others can do.

It is therefore less a case of asking the property industry to reduce carbon emissions, which as I have already made clear they are predisposed to do, but to ask how we can all help property to address carbon emissions.

FUTURE BUILD: BUILDING FOR CORPORATE ACCOUNTABILITY AND BUSINESS EFFECTIVENESS

n-CRISP "Think Piece" *by Peter Sharratt – Director WSP Environmental*

A New Agenda for Construction

There is a growing realisation within the construction industry by agents for change such as n-CRISP, of the need to broaden its sphere of influence beyond representing the narrow interests of the construction industry *per se* and change how the industry positions itself in a wider debate on creating a sustainable future for us all. All too often the strategic importance of the built environment as essential to delivering improved quality of life and economic well being to UK plc and its citizens, is lost behind seemingly disconnected 'issue' driven agendas that are perceived to have limited relevance outside the industry.

To get a better understanding of these issues, WSP with the Business Council for Sustainable Development UK and n-CRISP have established 'Future Build' – a policy and action group tasked with promoting greater corporate responsibility in the Built Environment and overcoming some of the barriers to implementation by linking sustainable development principles to increased business effectiveness. Future Build started in September this year with a dedicated message of support from Nigel Griffiths MP, Minister for Construction. The Group is mid-way through it's activities with a policy and action plan to be defined in late October this year. To date, three workshops have been held covering the following core themes:

- Building Business Competitiveness: the role of the workplace.
- Measuring Value: does Sustainable Development add value and if so to whom and how is it measured?
- The Good City: the role of the private sector in the public realm.

The following represents some of the key thought outputs of the Future Build Group to date:

Corporate User Focus

Often as part of the 'cycle of blame' we hear the view that the demand for energy and resource efficient developments is not market led; and that the operational cost savings resulting from energy and waste management are simply not significant enough to excite interest from CEOs and finance directors. Instead, one has to look for the drivers to

sustainable practices within the organisation; issues such as staff retention and welfare, environmental risk, brand and workplace culture, all predominating corporate thinking, with operational cost efficiency of secondary, albeit growing significance.

Global leaders such as BT (part of Future Build) promote the idea that technological innovation will be the great facilitator of a more civil society. At one extreme, IT and artificial intelligence platforms will create a 'new economy' – one in which we won't be 'paid' for what we know but for our developed social skills; our ability to apply knowledge and to engage in values-based decision making. According to this vision the 'office' will be redefined as the primary space for social interaction and become a forum for the exchange of ideas rather than an expensive receptacle for data handling process as situated in city centres. For BT, as others, this trend is already discernable with office relocations for front and back office activities to regional centres with a 'parlour' presence near to industry peers in the heart of the city, as organisations seek to streamline their operations and outsource their property needs. This will create a demand for more new flexible spaces.

The 'quality of the working environment' is a key ingredient and is of growing importance to progressive organisations that see their working environments as key to retaining and motivating staff and sustaining corporate culture. Brand focused organisations such as Marks and Spencer, variously describe their activities in terms of 'people, products and places' and the physical environment within which they conduct their business is as important to them as other parts of the business, a consistent approach and in all spheres of activity is key.

Recent cases such as GreenPeace occupying the new parliamentary building and changing all the veneered doors with SFC certified replacements from B&Q show how vulnerable organisations can be to reputational damage. Increasingly commissioning clients will want assurance from their supply chain and the construction industry that their products, the buildings, will not expose them to risk, and are in accord with their environmental and social policies and practices.

Can the Construction Industry respond to these changing agendas?

It is certainly changing very rapidly; driven in part by tighter planning controls, regulation, government policy, skills shortages and the need to respond to new procurement structures such as Join Venture partnering and PFI which ideally promote a better understanding of

long-term development and value and in short, provide a better quality product. Enhanced supply chain management and the ability to discuss the social aspirations of end user clients will increase.

Measuring Value

The strong feeling from the Group was that the Business Case for sustainable development needs to be better articulated – if sustainable development creates value, then what value, how much and for whom? There is suspicion of the received wisdom that the economic benefits of sustainable development are a given. It is difficult to isolate 'sustainability' in business activities so measuring it is also difficult as the causal link is not obvious. New cost and accounting models are being assessed by organisations such as the ACCA to reflect broader understanding of the value and corporate wealth other than just the financial.

A counter view voiced by some in the Group is that justifying a commitment to sustainable development on the business case alone misses the point; the debate has now moved into the arena of values based decision-taking, which is accountable to stakeholders and must be consistent in approach. Ultimately though, corporate behaviour will be about bottom line benefit within a growing awareness of risk to brand value.

Issues to be developed by the Group are how long-term thinking will affect asset value: we are familiar with the impacts of asbestos and now toxic-mould on insurance and investment communities; what will be the key issues over a 25-year period? We are likely to see a shift in what is considered 'institutionally acceptable' for property investment as climate change, EU Policy, and legislative change take effect and change investors' tolerance of risk.

The creation of new funding sources such as Morley's and 'Igloo Fund' or their Sustainability Matrix are sending signals to the market that long-term strategic planning based on the principles of sustainability are likely to represent better business to them in the long-term, and Morley's focus is on creating a strong management culture for change within companies.

Education and cultural change within 'organisation' emerged as a surprisingly strong priority from several sectors: with the general view that the real challenge is operationalising policy objectives and penetrating the 'layer of clay' below which realising change is difficult in a top down corporate culture.

Perhaps controversially, the question of whether shareholders' short-term profit motives and the requirements for quarterly reporting reduce an organisations ability to behave in a responsible way. The question of whether we need new governance and reporting structures to deliver improved quality of life and economic prosperity was raised. As a short-term measure, accounting procedures that better reflected 'true environmental costs' were proposed and pilots suggested.

A number of recent fiscal and taxation instruments such as, ECAs and the climate change levy, are designed to reward proactive and environmentally positive behaviours while penalising inaction and poor performance. Industries with high environmental impacts such as, aviation and automotive manufacturing, are actively going down the voluntary route as a way of avoiding coercive regulations that will damage their business. One could interpret the recent Energy White Paper's proposal for mandatory energy certification by 2005 as a way of creating an aware market for property end-users, creating demand for more energy and resource efficient buildings.

The big question is: Who should lead on all this?

The Government sets expectations through policy and creates the legal and fiscal instruments for change; often seen as a short-term depressant to the vitality of UK plc. It was widely acknowledged that other bodies such as, RDA's have a key role to play in sustainability but some express the view that they are off to a slow start and find it difficult to field the level of experience that inspires confidence in the private sector, a crucial ingredient where partnerships are required.

It was noted that BREEAM was an industry initiative to reward their endeavours in improving their product and a good example of a proactive stance. Clearly, greater leadership is needed from private sector without off-loading risk onto government that we have seen recently in the rail industry.

End-user clients including government also have a duty to lead; by factoring sustainability impacts into their decision taking and ensuring sustainable development principles are at the heart of their procurement processes.

Next Steps...

Following a further meeting of Future Build at the end of October a prioritised action plan will be defined and be taken forward by the membership, n-CRISP and the BCSD-UK. The intention is to avoid duplication of effort and form links to existing networks engaged in similar issues. If you are interested in the outputs please contact:

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