Author: Alec Couchman, B.Arch, ANZIA, ARCUK,
NZGBC and GBCA Green Star Accredited Professional

Title: Sustainability is not working: Architecture and the new global challenge.

Warren and Mahoney Ltd │201 Victoria Street West, Auckland │ PO Box 91517 │Auckland │New Zealand │Tel: 64 9 309 4894 │Fax: 64 9 309 2671│ E-mail: alec.couchman@wam.co.nz

Presenter: Alec Couchman

Abstract

The irony of the late 20th and early 21st century is that just when the dominant architectural movement known as Modernism finally achieved global domination and acceptance, the very premise on which it was founded, namely that buildings were artificially lit, air-conditioned machines that could ignore the natural environment around them, collapsed. The recent awareness of our impact on the global environment has seen architects and engineers question every aspect of building and the amount of energy required to make them habitable.

Modernism as an architectural movement was not reliant on place, climate, location or altitude or even the availability of local materials. These new 'machines for living in' only needed a generous budget and an endless supply of carbon based fuels to allow their climate independent structures to be inhabited.

Indeed we continue to live in an age where there are no limits to building design, no material that cannot be sourced, no extravagances that cannot be indulged. The sourcing, mining, transportation and installation of materials throw large quantities of toxins and other poisonous materials into the atmosphere and ground, often for generations to come. Buildings by humans have become an unnatural imposition on the natural world. Our built carbon fuelled urbanity has transformed the world's delicately balanced ecosystems into an increasingly unequal and unnatural fit.

Yet at the very time when the normative limits to architecture appear to have been shattered, the earth has reached its own natural point of exhaustion. The era of designing whimsical buildings without consequences are over. It is now all about impact, morality and living in a carbon restrictive world. As Timothy Hill (2007) has stated, 'the problem solving days of architecture are over. It's about ethics now. As a world we have more capabilities than we have problems. The issue for designers is not how to do something, but what we do, since the obligations on professionals in the labyrinth of politics, pluralism and sustainability are complex.'

The process of building was and continues to be the ultimate environmentally destructive act consuming vast amounts of energy and resources. However you analyse the numbers or debate the reasons, global warming, water pollution, deforestation, over-population and toxic contamination is happening and is happening faster than previously thought. Furthermore it is universally acknowledged that the impact of the world's current 6.3 billion inhabitants is partly, if not wholly responsible.

Our increasing population and demand for shelter means the production and maintenance of our built environment will continue. Therefore our buildings will continue to be a factor in global warming, resource depletion and environmental pollution.

As James Wines (2000) noted, 'virtually no form of shelter constructed today can be credited as being authentically green. Everything that our technologically dependent societies assume is essential for survival is plugged into the same diminishing sources of power'.

Accordingly, humans cannot afford to continue to build structures that are reliant on this ever decreasing reservoir of carbon based fuels. The very way buildings are put together needs to be reassessed. David Suzuki summed this up with the idea that 'our modern culture is paradoxically behind the times, still assessing the world the way it did in the nineteenth or even eighteenth centuries: as a place of inexhaustible resources, where man is at the pinnacle of creation, separate from and more important than anything around him' (Suzuki, 1998)

The recent awakening of the world community (Stern, Gore, Flannery et al) to the issues has been heartening and the goals of sustainability admirable but this paper would note that this awareness may be too little, too late, as argued convincingly by Monbiot (2006). Buildings and by extension, architecture should be more than merely sustainable. If we are to repair the environmental damage inflicted to date and give the next generations hope, they should be restorative in every sense: environmentally, socially, culturally and economically.

Introduction

Environmentally Sustainable Design (ESD) is the catchphrase of the moment in the building industry. But even as the building industry awakens to the concept of "sustainability" the industry will have to realise that simply designing buildings to "sustain" our current lifestyle will not be enough.

Being merely 'sustainable' in the face of the mounting environmental crisis is the equivalent of re-arranging the furniture whilst the house collapses around us. The common ecological mantra of 'reduce, recycle and re-use' is, at best, delaying the inevitable environmental crisis.

That is not to say that recycling products, reducing energy use and re-using elements is a bad thing. It is a fantastic start and may give the whole world some room to manoeuvre. In effect, by doing all those laudable 'sustainable' things, we are buying the human race some breathing space (quite literally) until we come up with an alternative way of looking at the whole process of manufacturing, assembly, distribution, building, use, refurbishment and eventual demolition of our human shelters.

Many economists and building professionals have argued it is economically profitable, in the short and long term as well as environmentally advantageous to design and build buildings that are 'sustainable' or 'green'.(Davis Langdon, 2007, Fullbrook & Finlay, 2005). All the projects reviewed had a common theme: they still required significant yet reduced amounts of energy and water to operate and overall they represented a tiny proportion of the total built environment.

Furthermore, these 'sustainable' features are often argued against in terms of cost-benefit terms or payback periods. Yet there is little debate about the 'payback' period of a new sports car or a marble bench top in a new kitchen. It is all a matter of priority.

This paper would argue that there are far greater benefits in designing buildings that go beyond a reduced negative environmental impact, i.e 'sustainable' but actually repair the environment. This paper believes that all buildings we produce from this moment on must meet this ideal of being environmentally restorative.

Overview and Solutions

The Worldwatch Institute has revealed that buildings in the United States of America use 17 percent of the total freshwater flows, 25 percent of harvested wood, 50 percent of chloroflurocarbon (CFC) production; 40 percent of the total energy flow, generate 33 percent of CO2 emissions and generate 40 percent of landfill material as a result of construction waste. There is no reason to suspect that the figures for NZ are much different. By any measure, the construction industry has a permanent and lasting impact on the environment.

If we accept that every new building (or refurbished existing one) we build adds to degradation of the environment and, hence, by extension our very ability to survive, we have a choice: not to build at all or create buildings that have a nett positive impact on the environment, that are a source of pride and joy with the expectation it will further reduce our impact on this earth.

In New Zealand, the recently completed and independently audited (University of Victoria, Wellington) Paraparaumu Public Library building is a tentative step towards restorative architecture. It has a passive airconditioning system routed though an innovative, thermally massive, double-layer, floor slab supplying air to the library via floor diffusers. The building uses a combination of tempered fresh air supply and ceiling mounted radiant heating. The extra capital cost of the double glazing, increased insulation levels and the thermally massive double layer floor were offset by the savings made through the

omission of traditional mechanical cooling systems. Hence, the building cost no more to construct than a more traditional solution and life cycle costing predictions indicate the low energy systems could potentially save some $280,000 over their economic lifetime on this one building alone.

Even better is the Melbourne City Council's CH2 office building officially opened in August 2006. This landmark building (rated as showing 'World Leadership' by the Green Building Council of Australia) has numerous restorative environmental features including the ability to process 100,000 litres of the city's raw sewerage daily and convert it into drinkable quality water. CH2 also breaks new ground in sustainable office development with features such as hanging gardens, shower towers, phase change material to cool the air, wind turbines, solar cells, and rainwater collectors on the roof. CH2 ultimately is aiming to be a zero net emissions building. This buildings' dramatic architectural qualities make this a prime example of the ideal of 'restorative architecture' and an example of the possibilities of architecture in what James Wines called "the new Age of Information and Ecology"(Wines, 2000).

More relevant, given New Zealand's large stock of owner/ occupier housing is the example of Michael Mobbs, whose small existing brick clad row house in South Sydney, Australia is a prime example of a refurbished house which has a minimal if not zero impact on the environment. Analysing every element within the new house on a cost benefit/ environmental impact basis, Mobbs demonstrated the immediate and long term economic benefits of being sustainable (Mobbs, 1998).

Through trial and error, careful analysis and local government support, Michael Mobbs was able to create an extremely liveable family environment that was, in the words of David E. Williams, virtually 'unplugged' (Williams, 2007). That is to say, the house had reached a point where it could operate quite happily with only the most minimal amount of outside assistance.

The lessons from the Mobbs house are that given a wider budget and or further incentives, there is every possibility that each new house or building constructed today could potentially have a zero impact on the planet or even a small positive impact. And this was based on existing, readily available technology, now 10 years old.

The Mobbs house, Paraparaumu Public Library and CH2 demonstrate that at every level (domestic, community, civic) there is value in questioning the core assumptions and calculations put forward in creating a building. Architects in particular risk being seen as self-indulgent narcissists more concerned with their own egos and self-aggrandizement than addressing the real world issues around them.

The whole way buildings are thought of and designed needs to change and architects have a unique opportunity to be in the centre of that process.

In this process, architecture can be the truly restorative act. Put simply, buildings will have to do more than they ever attempted. They have to enliven, energise, supplement and restore the built, social and spiritual environment. This architecturally inspiring building would replace all the energy it extracted and exhausted, and will continue to exhaust, to build the structure in the first place. This architecture can be a restorative, joyful, beautiful and exciting place of work, of play and community. Buildings and architecture could be more than just be 'less damaging' to the environment. That is the vision.

However, any architectural movement based on a style or a concept of beauty has inevitably been doomed to the rubbish bin of history. Therefore the concept of 'restorative' architecture cannot be an aesthetic movement but a redefinition of the practice of architecture and the materials that construct it. This redefinition of architecture will have to develop its own aesthetic. Whatever that aesthetic is, it needs to appeal on an emotional, technological and social level, inducing people to maintain and preserve our physical shelters. Suffice to say that we 'owe it to the fields that our buildings will not be the inferiors of the virgin land they have replaced. We owe it to the worms and the trees that the buildings we cover them with will stand as promises of the highest kinds of happiness' (Botton, 2006). Once lost, every virgin field is gone forever. It cannot return and whatever the architecture that replaces it is, it must have that promise of restoration.

The Vision

Try to think of a building that is architecture, making an exciting, positive long term impact on the environment. This is first and foremost where:

- The building footprint is optimised balancing the need for floor space with its impact on the landscape.
- All the occupants and inhabitants of buildings are treated with respect.
- The building is a net energy provider, using a variety of active solar energy systems such as integrated photovoltaic panels and materials, energy producing lifts and vertical axis wind turbines.
- The building can operate uninterrupted, even when temporarily 'unplugged'.
- All construction waste produced is either recycled or re-used on site or in a related building industry process. Example is waste gypsum on site being crushed as used to fertilise existing soil on site.
- Building design mitigates the effect of electromagnetic fields on occupants.
- All hot water required for the building is provided by an array of solar water panels.
- All products and materials provided are free of toxic off gassing either in their manufacturing, use or disposal.
- All products are sourced within 500 kilometres of the building site.
- All products and materials within the building are not sold but merely 'leased' with the products and materials returned to their original supplier for re-use into the production chain.
- All manufacturers, suppliers, importers and distributors of building products are certified as carbon neutral.
- All service companies, including architects, engineers and related consultants are certified as carbon neutral.
- The building provides a green roofscape where the natural vegetation can grow, reducing daily temperature fluctuations, filtering rainwater, protect the underlying roof material, reducing air pollution, cooling the surrounding atmosphere, collecting airborne particulates, and storing carbon.
- The building is full of natural lighting and fresh air.
- It is naturally ventilated using natural convention and robust simple mechanical means. In short, the whole building acts as a natural air-conditioning unit.
- It is self sufficient for water. Rainwater collected off the roof is filtered then re-used on site for potable uses such as drinking water and laundry use.
- All grey water is collected, filtered, cleaned and re-used within the building for all non-potable uses such as toilets, laundry use and on site irrigation.
- Excess rain water is stored and cleaned and made drinkable, with the excess potable water sold back to water service providers.
- The building connects into the wider community sewer system and processes all black water / waste and converts it into drinkable water and fertiliser.
- Each product and element within the building can be dis-assembled and used as the raw fuel for the same or similar products.
- Waste products from this building and the adjoining properties are exchanged as fuel.
- The indoor air quality is free of toxins, VOC and a host of other airborne chemicals.
- The building is a flexible, adaptable 'loose-fit' design, able to cope with changing technology and community demands without radical change.
- The building is a source of income to the owners/ tenants which over the 50-100 year life of the building, generates a healthy economic, social, environmental and spiritual profit.

- The building is an educator, demonstrating clearly to current and future generations the positive impact our buildings can have on the environment.

In summary, architecture could be part of the restorative economy as defined by Hawken (1993). It is in this way it will be part of the much wider attempt to re-build our planet.

Conclusion

This paper has argued that the concept of sustainability, however poorly defined, plays only a peripheral role in the building industry in this country. However, New Zealand is uniquely placed to benefit from the experiences of its immediate neighbours in terms of learning and implementing the benefits of sustainable, and ultimately restorative design. This applies not only in the building industry, but throughout the New Zealand economy. Every new building, structure, product and process should be viewed as a potential source of energy, a processor of waste and a collector and filterer of water. If this were to happen, New Zealand could go a long way towards meeting our obligations under the Kyoto Protocol, reduce our dependency on fossil fuels, rejuvenate our economy over the long term, and at the same time showing to the world a new level of global responsibility and leadership.

References

De Botton, Alain (2006). *The Architecture of Happiness*, London, U.K. H. Hamilton Ltd.
Flannery, T. (2005). *The Weather Makers: The History and Future Impact of Climate Change*. Melbourne, Australia: The Text Publishing Company.
Fullbrook, D., Finlay, G & Jackson, Q. (2005) *Value Case for Sustainable Building in New Zealand.* Wellington, New Zealand. NZ Ministry for the Environment
Gore, A. (2006). *An Inconvenient Truth*. United States: Rodale Books.
Hawken, P. (1993) *Ecology of Commerce: A Declaration of Sustainability.* New York, United States. Collins Business
Hill, T.(2007) Interview. *Issue 39. Urbis Magazine*. Auckland, N.Z.
Melbourne City Council (2006) AusIndustry Research Papers 1-10 accessed January 30th, 2006 from http://www.melbourne.vic.gov.au/info.
Mobbs, M. (1998) *Sustainable House.* Dunedin, New Zealand. University of Otago Press.
Smith, P. *(2001) Architecture in a Climate of Change, 2nd Edition*. Oxford, England. Elsevier Books
Monbiot, G. (2006) *Heat.* London, U.K. Penguin Press
Stern, N. (2006). *Stern Review on the Economics of Climate Change*. Cambridge, England: Cambridge University Press.
Suzuki, D. *(1998) The Sacred Balance: Rediscovering Our Place In Nature*. Amherst, New York, USA. Prometheus Books
Wines, J.(2000) *Green Architecture.* Koln, Germany. Taschen.
Williams, D.(2007) *Sustainable Design.* John Wiley and Sons Inc. Hoboken, New Jersey.