

Green Building Handbook for South Africa

EcoBuilding: Towards an Appropriate Architectonic Expression

Llewellyn van Wyk

CSIR Built Environment

'Earthrise' was the name given to NASA image taken by astronaut William Anders during the historic Apollo 8 mission – the first manned voyage to the moon – on December 24, 1968. The influence of this image on the human psyche was enormous: the noted wilderness photographer Galen Rowell called it "the most influential environmental photograph ever taken"¹ while Gro Harlem Brundtland argued that it had a "greater impact on thought than did the Copernican revolution of the 16th century, which upset the human self-image by revealing that the Earth is not the centre of the Universe"² but a small part of a much larger system.



Earthrise by William Anders, 24 December 1968

The photograph also drew attention to the finiteness of the Earth's resources in what appears to be an inhospitable universe, and more critically, that humanity's continued inability to fit its activities into that pattern will change planetary systems in a fundamental and life-threatening manner.

A global agenda for change

¹ 100 Photographs that Changed the World by Life, The Digital Journalist

² UN (1987). *Our Common Future*, Report of the World Commission on Environment and Development, New York, p18.

The key concepts and definition of sustainable development have their origins in the report 'Our Common Future', the outcome of a United Nations resolution dated 19 December 1983, when the General Assembly welcomed the establishment of a special commission that would investigate and report on issues relating to the environment to the year 2000 and beyond. This report of the World Commission on Environment and Development was adopted by the Governing Council of the United Nations Environmental Programme (UNEP) on 16 June 1987, and referred to the General Assembly for its consideration and adoption on the 4 August 1987 under the title 'Our Common Future'.

The report identified a number of common challenges shared by the world's nations, including population and human resources, food security, species and ecosystems, energy, industry, and the urban challenge.

The Chair person of the Commission, Gro Harlem Brundtland, in her foreword notes that the Commission was tasked to formulate "a global agenda for change", and that the commissioning of the report arose, in her view, "out of a widespread feeling of frustration and inadequacy in the international community about our own ability to address the vital global issues and deal effectively with them"³. She notes that there were those who wanted the work of the commission to be limited to the environment alone which would have, in her view, "have been a grave mistake as the environment does not exist as a sphere separate from human actions, ambitions, and needs"⁴. Likewise, she notes the difficulties associated with the understanding of the notion of development, but also records her view that development too is inseparable from environment.

The notion of sustainable development contains within it five key concepts:

- i) **Needs** – the concept of meeting the basic needs of all, and in particular the essential needs of the world's poor, and extending to all the opportunity to satisfy their aspirations for a better life;
- ii) **Limitations** – the idea of limitations imposed by the state of technology and social organisation on the environment's ability to meet present and future needs;
- iii) **Transformation** – that sustainable development is pro-development providing that development involves a "progressive transformation of economy and society"⁵;
- iv) **Responsibility** – sustainability implies "concern for social equity between generations, a concern that must logically be extended to equity within each generation"⁶; and
- v) **Restoration** – development must not, as a minimum, "endanger the natural systems that support life on Earth (atmosphere, water, soil, and living beings)", and the "impact of development on the quality of natural elements must be accounted for"⁷.

In essence therefore, "sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations"⁸.

Two critical discourses of the sixties

³ Ibid., p11.

⁴ Ibid., p14.

⁵ Ibid., p54.

⁶ Davis, K., (1966). *Human Society*, Macmillan Company, New York, p54.

⁷ Ibid., p55

⁸ Ibid., p57

The 1960s was a period of optimism driven by commitment to never repeat the calamitous events that led to the First and Second World Wars. Twenty years before the adoption of the Brundtland report, two critically acclaimed books published during the early part of the 1960s articulated specific issues arising out of the interface between environment and development: the first is *Silent Spring* by Rachel Carson (1963), and the second *Human Society* by Kingsley Davis (1966).

Silent Spring, while essentially dealing with the impacts of pesticides and insecticides on ecosystems, highlighted the need for humans to realise that they are part of the entire living world inhabiting this planet, and that they must understand its conditions of existence and so behave that these conditions are not violated.

Human Society, by contrast, raised questions that concern social systems as wholes, concerning itself with certain theoretical problems and principles. The intention of the book was to synthesise the most advanced ideas having a bearing on the questions at issue, and in doing so, to integrate different schools of thought, many of which had seemingly come to the same solutions but with different terminologies and from different sets of data. In the chapter 'Rural and Urban Communities', Davis notes that the great impetus for the development of cities came with the industrial revolution, and that this change, while occurring rapidly, had only just commenced. Importantly he notes that "when the whole world becomes urbanised, as it seems it surely will, then human society will have undergone a major transformation"⁹.

Davis acknowledges urban ecology as a highly objective and readily accessible method for the study of urban social organisation, noting the pioneering work done in the field of urban ecology by the Department of Sociology at the University of Chicago in the 1920s under the inspiration of Robert Park.

At the conclusion of the chapter he asks some critical questions relating to whether the problem relating to social order can still be solved, namely:

- i) "Can the anonymity, mobility, impersonality, specialisation, and sophistication of the city become the attributes of a stable society, or will the society fall apart?
- ii) How can devotion to a common system of values and a common set of mores be maintained in a highly literate, scientifically trained, individualistically inclined, and sceptically oriented population?"¹⁰

Davis states that the answer to these questions was not clear: critically, the answer is still not clear some 42 years later.

These two works prophetically highlighted the critical issue of the 21st century, namely the intersection of the planet (ecology) and people, and the inter-and intra-relationships between them. In so doing it also essentially prefaced the findings and recommendations of *Our Common Future*.

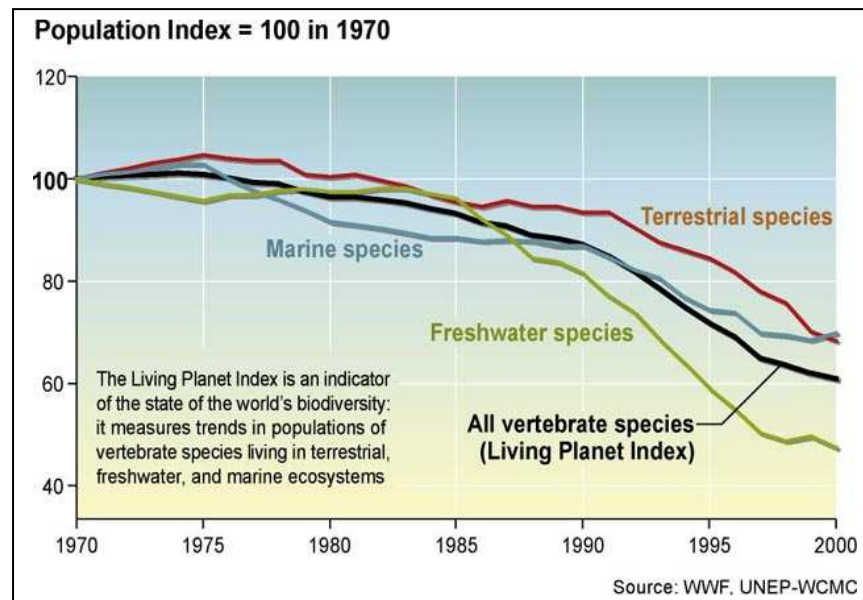
The people/planet interface

The sheer weight of humanity, commonly referred to as its ecological footprint, leaves a deep imprint on the resources of the Earth, and the ability of those resources to regenerate. The world population is approximately 6.3 billion, with another 73 million added annually. To grasp the physical consequence of this, providing infrastructure for just the additional people will require the construction of a city the size of Johannesburg and Pretoria combined every 6 weeks. Nowhere in the world is city-making occurring at anything near this level, meaning that millions of additional people are forced, alongside those already in cities, to live in slum-like conditions. At the same time, more and more people are required to be sustained on the same quantum of natural resources: however, the accelerated rate of consumption exceeds the rate of regeneration resulting in a net deficit every year.

⁹ Ibid., p322.

¹⁰ Davis, K., (1966). *Human Society*, Macmillan Company, New York, p342.

The Living Planet Report of 2006 confirms that humans are consuming the planet's resources faster than they can be renewed by about 25 per cent. The Living Planet Index, using a baseline index of 100 in 1970, shows territorial and marine species down to about 70, freshwater species at about 45, and all vertebrate species or the Living Planet Index at about 66¹¹.



The consequence of a prolonged pattern of this lifestyle will be ecological and infrastructural collapse, followed by social collapse or the “falling apart of society” projected by Davis. South Africa witnessed a small preview of this outcome with the outbreak of xenophobic attacks in 2008 ascribed in many ways to a dysfunctional built environment, i.e., inadequate housing, poor and/or non-functional municipal service delivery, unemployment, inadequate policing, an overstressed judicial service, a contest for women between local and foreigners, the rising cost of living, and poverty¹². In essence, in any context between the rich and the poor for ecological goods and services, the poor will lose, thus leading to deterioration in social inequality and social cohesion.

Thus the challenge is to prepare and undertake adaptation and mitigation strategies as a matter of urgency.

Constructing the built environment

Environmental planners design and oversee the construction of the infrastructure that substantially supports the built environment. We can describe infrastructure as the basic physical assets of a country, community or organisation, and the built environment as comprising urban design, land use and the transportation systems, and the patterns of human activity within this physical environment.

The construction industry, as the central deliverer of the infrastructure, is a significant economic force, generating some \$4.2 trillion, employing over 100 million people, and contributing 10 per cent to global gross domestic product (GDP).

However, in doing this, the construction industry and the built environment consumes:

- 50 per cent of all resources globally;

¹¹ WWF (2006), *Living Planet Report 2006*, WWF-World Wide Fund for Nature, Switzerland.

¹² HSRC (2008). *Citizenship, Violence and Xenophobia in South Africa: Perceptions from South African Communities*, Human Sciences Research Council, Pretoria.

- 45 per cent of all electricity generated to run the built environment, and an additional 5 per cent during construction;
- 40 per cent of all water globally for sanitation and other purposes;
- 60 per cent of prime agricultural land lost to farming; and
- 70 per cent of all timber products¹³.

There is a school of thought that argues that the creation of the built environment is, itself, an unsustainable act as it collects materials from one place and assembles them in another in a manner that does not easily or readily allow them to be so collected again. Purporting to design for sustainability therefore would appear to be a direct contradiction, if not a blatant deception.

However, notwithstanding this powerful argument, it is possible to establish a reasonable counter argument based on not so much the consumption of material but the displacement of material. Provided that elementary materials are used, particularly timber, sticks, rocks and stones, one can argue that use, as compared to consumption, simply displaces the material from one position to another, since the material is not lost in the process.

Finding an adequate architectural expression

Architectural history is and always has been bound up with history as a whole, for everything that is built bears material testimony to the general intentions and aspirations of mankind: architecture gives concrete expression to the needs and desires of life as it is, after all, the shelter of society.¹⁴ The main event of architecture in the twentieth century was the profound schism that took place around 1910/20 when a group of architects argued that the industrial age demanded an architectural expression of its own, thereby rejecting the architectural expression of the 19th century which focused on earlier historical styles and construction technologies.

The same damning argument against architecture and architects can be applied today with regard to the intellectual and economic traditions they adhere to and which impede the necessary changes towards a sustainable society. This argument¹⁵ makes the case that a common thread in critiques of industrialised development is that its monumental waste, environmental degradation and social dislocation is a manifestation of poor systems design, supported by academic and professional ideologies.

As a result, green critiques, from both within and outside of academia, have challenged the mainstream professional disciplines and germinated new fields of intellectual inquiry, notably eco-branches of planning, law, economics and design. Regrettably this has set up these new fields as fringe activities and relieved any obligation on the part of the design professionals to build a coherent and holistic defence. Those who have taken up the challenge have themselves fallen into hybrid reactions, namely build only with renewable materials (in response to the opening riposte) and the technocrats who seek to alter while being locked into the embedded paradigms of planning, design and construction.

Ecological designers such as Sim van der Ryn and Stuart Cowan make the point that “if we are to create a sustainable world – one in which we are accountable to the needs of all future generations and living creatures – we must recognise that our present forms of agriculture, architecture, engineering, and technology are deeply flawed. In order to successfully integrate ecology and design, we must mirror nature’s deep interconnections in our own epistemology of design”¹⁶.

¹³ Edwards, B., (2002). *Rough Guide to Sustainability*, RIBA, London.

¹⁴ Klotz, H., (1989). *20th Century Architecture: Drawings, Models, Furniture from the Exhibition of the Deutschen Architekturmuseums*, Frankfurt Am Main, Deutsches Architekturmuseum, Rizzoli.

¹⁵ Birkeland, J., (2002). *Design for Sustainability: A Sourcebook of Integrated Eco-logical Solutions*, Earthscan.

¹⁶ Van der Ryn, S., and Cowan, S., (1996). *Ecological Design*, Island Press, Washington, p9.

Environmental management processes remain exactly that; managing and controlling nature while encouraging growth, rather than working with natural processes to achieve health and well-being. The history of the Industrial Revolution is a history of domination, social, economic and environmental. Because of the adherence of architects to the industrial ethic, built environment designers have to date not been seen as environmental managers, although their decisions directly impact upon the environment on which other people depend¹⁷. Relatively few designers have as yet explored the transformative potential of ecological design and have preferred to remain apolitical and unconcerned with the distributional impacts of design as they affect the health of humans and ecosystems. The idea of design as a method of social and environmental problem prevention and problem solving is still largely dormant in the environmental design professions.

Thus architects and other environmental planners must realise their role as potential agents of change whose decisions can constrain, alter, guide or enhance the future decisions of others.



California Academy of Sciences, San Francisco Golden Gate Park, 2008 – by Renzo Piano. A building that uses technology to demonstrate ecological restoration and social transformation. Source: www.architectureweek.com/

“For design to become relevant to social and environmental problem solving, however, design processes and design education itself must be dramatically reformed. First, it needs to be recognised that ecological design is a highly intellectual activity: any technology, building or product must function within an existing context of anachronistic social, political and institutional structures, as well as within its natural environment. And yet it must also function to transform those very systems, as these mitigate against life quality, social justice and healthy, symbiotic relationships. Second, design needs to shift from a paradigm of ‘transforming nature’ to one of ‘transforming society’ towards sustainability by improving the life quality of, and relationships between, all living things, communities and the natural/built environment. This means that designers in all fields need to:

- *Re-examine human needs, and set appropriate goals which prioritise ecological sustainability and social equity;*

¹⁷ See also Wilson and Bryant 1997, and Barrow 1995

- *Rethink the basic nature, methods, and goals of the design process itself;*
- *Integrate knowledge from other fields concerned with human and ecosystem health; and*
- *Promote new technologies, systems of production, and construction methods that do not rely on natural capital, fossil fuels and harmful chemicals.”¹⁸*

Conclusion

Sustainable infrastructure development requires architecture to find an appropriate architectural expression that addresses the key concepts as contained in *Our Common Future*, namely: an architecture that is restorative and transformative, and whose execution is a process of change in which the exploitation of resources, the direction, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations.

¹⁸ Birkeland, J.,(2002). *Design for Sustainability: A Sourcebook of Integrated Eco-logical Solutions*, Earthscan, p6.