Achieving sustainable residential flat buildings

Author:
King, Steve Earnest

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DEALING WITH DAs & SEPP65: 2006 UPDATE
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Achieving sustainable residential flat buildings

STEVE KING B ARCH DIP BLDG SC, Associate Director, SOLARCH, UNSW

Introduction

Sustainable development, and regulating for it, isn't new. Present trends take as their beginning the first UN Earth Summit, in Rio de Janeiro in 1992. That meeting famously agreed on the broad definition of sustainable development:

'Development that meets the needs of the present without compromising the ability of future generations to meet their own needs'.

Making sure future generations have the means to face *their* future with no less than we do, has always been what planning was supposed to ensure. But a more expansive UN position demands ". . . we seek ways of living, working and being that enable all people of the world to lead healthy, fulfilling, and economically secure lives without destroying the environment and without endangering the future welfare of people and the planet". So it's immediately obvious that planning regulations have to deal with sustainability on a broad front, and inevitably over time, they will do so more and more.

Why does this cause us so much difficulty? And especially, why does both the use of the specific terminology, and the idea — that something so apparently self-evident should be dealt with by regulation — give so many designers so much trouble? In its simplest terms, the answers are embedded in the question.

Firstly, there are many different opinions about what constitutes sustainable architecture. *Architectural Design* reported in July 2001 on a set of 'green questionnaires' completed by eminent architects - Norman Foster, Richard Rogers, Jan Kaplicky, Ken Yeang and Thomas Herzog. All make significant claims to have adopted aspects of sustainability at the core of their iconic architectures, but differ markedly both what they are concerned with, and how the success of their buildings might be confirmed.

> As even this tiny sample suggests, the mainstream of architecture is in some disagreement about design priorities, the role of technology, the importance of aesthetics, the relationship between natural and built environments, and the degree of optimism or pessimism the current state of sustainable architectural practice should invoke. It is perhaps not surprising that given this complexity and potential for contradiction, Foster is tempted to define sustainable design as simply just 'good architecture' (Edwards 2001)

But some are more hostile, characterizing the ideology of 'green' as actively subversive of any true architecture. Recent research here in Australia has tended to confirm that the perceived contradictions between being a 'green' architect and a 'good' architect are still so pervasive as to actively discourage some practitioners from allowing themselves to be identified as promoting their sustainability credentials. Acknowledging the alienation has its roots in both sides of the debate, one author suggests

> Exploration of diversity in design and development would encourage a deeper engagement with sustainable architecture, one that does not shy away from broader sociological or philosophical questions or merely indulge in the narrowly instrumental debates that characterize so much of the green architecture literature (Guy and Shove, 2000)

The second likely answer follows in part from the first. Because there is a perception that 'green' is outside the architectural mainstream, that sustainability is a narrow, often technical preoccupation, it is fair to suggest that a significant majority of planners and architects actually do not have highly developed skills or knowledge that can be brought to bear on the problem. Or at least not with anything like the rigor even the most rudimentary regulations demand.

The third and most vital point is that on the one hand, regulations for sustainability are untested for their long term benefits. And on the other, they are not primarily intended to affect the unusual or exceptional in design, but to assure an incremental improvement of the greater proportion of our building production. For that reason, our present regulations, themselves in their infancy, should not be seen as either inflexible or sufficient in achieving advances towards sustainability. Canadian Ray Cole, best known for his advocacy of the Green Building Tool, describes an approach that emphasizes 'process over product' in which:

> assessment methods ... facilitate and enhance dialogue, communication and story-telling among and between key parties involved in a building project. (Cole 2005)

Designers should see mandated performance, and the predictive rating tools by which it is assessed, as but the beginning of a more comprehensive approach to a sustainable built environment. In this paper and presentation I rehearse the present state of play in the regulatory framework, and briefly discuss how, and how far a responsible designer or local government officer might go *beyond* that framework in promoting sustainable multi-unit dwelling projects.

SEPPs and sustainability ratings

For the past seven years or more, SEDA NSW, now absorbed into the grandly named DEUS, has successfully coopted increasing numbers of Councils under its Energy Smart Homes Policy. The most visible sign of the policy has been the requirement for NatHERS Ratings, addressing heating and cooling energy use. Many Councils have also implemented wider ranging Sustainable Development DCPs, taking the policy much closer to where it was intended.

But the real impetus became visible as the State government began to step in, first with a tentative similar policy for commercial building types, then with State Environmental Planning Policies (SEPPs) aimed at the residential sector. First came the provisions of SEPP65 for ‘Amenity’ and ‘Resource, energy and water efficiency’, and more recently SEPP BASIX, a multi-index rating tool that for the moment deals only with energy efficiency and water conservation.

BASIX

BASIX is not like other SEPPs. It has little of the ‘discretionary’ character of other planning instruments, and though performance based, is much harder to satisfy by ‘alternative solutions’. A Development Application has to get its BASIX Certificate, which generates a schedule of ‘undertakings’ — and for the final issue of the Construction Certificate, those undertakings will have to be certified as actually built. As of October 2005, a BASIX Certificate has been required for multi-unit construction.

BASIX deals for the moment only with a limited range of sustainability concerns. However, even those limited impact are of particular interest to those dealing with multi-unit residential projects, because the background to its ‘metrics’ has been quite contentious.

Firstly, the energy targets for apartments are widely perceived as discriminatory to high rise buildings. Indeed they are, and for very good reason. There is ample evidence that overall, high rise apartments consume a lot more ‘static’ energy than do low rise individual dwellings. Figure 1 below is reproduced from the *Multi-Unit Residential Building Energy & Peak Demand Study* available from the BASIX web site.

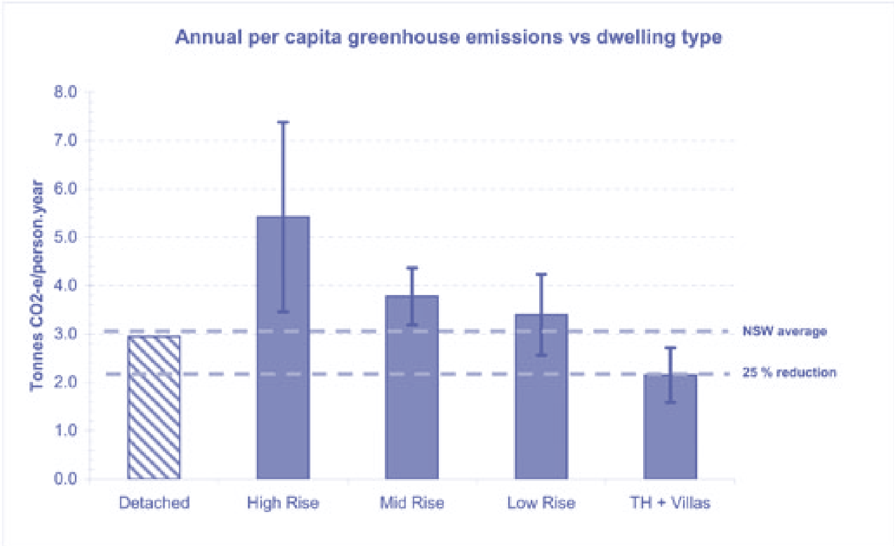

Figure 1: Greenhouse gas emissions by dwelling type

As the authors point out (my emphasis):

> Substantial greenhouse inefficiencies, such as electrically-heated swimming pools and uncontrolled and inefficient lighting and ventilation systems, were commonly identified in the energy audits. **With more thoughtful selection of common area technologies, many high-rise buildings could enjoy large energy and greenhouse savings.** In fact, as none of the audited buildings boasted energy-efficient design. It is likely that even those that are represented by the lower variance markers in (Figure 1) could achieve substantial greenhouse savings with quite modest changes to common plant, systems and apartment design. (Myors 2005)

BASIX does give a nominal concession on the expected energy savings. This is illustrated in Figure 2, taken from the *BASIX for Multi-Units Fact Sheet*, also available on the web site.

Discussion papers do call attention to the likely transport efficiencies of higher residential concentrations, but at the moment, transport and related 'non-static' energy costs are not factored into the assessment tool. This leaves open to applicants a significant area of real analysis and evidence of improved sustainability, that might be brought before approving authorities.

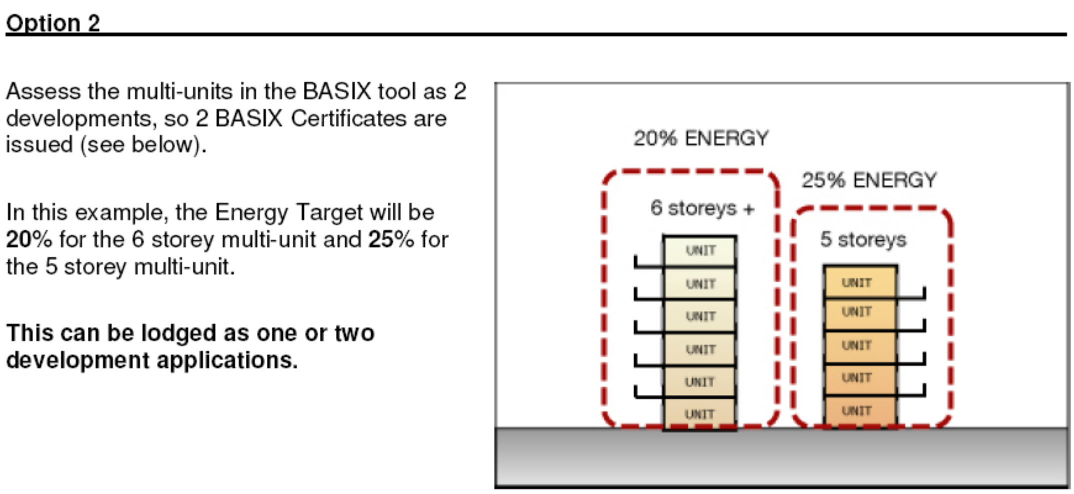

Figure 2: Energy savings concession for high rise apartments

The second discrete area of significant contention is the issue of greywater reuse. There is a temptation to nominate greywater recycling as a large impact sustainability initiative — which it would undoubtedly be.

But in most NSW local government areas there are at present no options other than *project scale* implementation of such systems. It would be fair to say that the health risks associated with long term maintenance of small, body corporate operated greywater treatment plant are at present unacceptable to both the approving authorities and the developers. As far as I am aware, only the ACT is actively engaging its local water supply authority in developing the option of *community scale* recirculation.

More generally, with BASIX taking effect, there has been much confusion concerning its potential conflicts with SEPP65 and the related provisions of the *Residential Flat Design Code*. The confusion is not really justified. The BASIX website has long made available a concise discussion of the relationship between the two SEPPs, which I reproduce below.

Multi-unit BASIX and SEPP 65

Aspects of SEPP 65 overridden by BASIX	**Key Aspects of SEPP 65 which are retained but which have a relationship with BASIX**
1. Multi-unit BASIX requires a reduction in potable water consumption	
Design Quality Principle 5: Resource, water and energy efficiency • Efficient appliances and mechanical services eg. 4A rated washing machines and dishwashers and 3A rated water fixtures (dual flush toilets, shower heads and taps). • Storm/rainwater collection for toilet and garden use. (Provisions included in Residential Flat Design Code - Building performance: Water Conservation) **Design Quality Principle 6: Landscape** • Native, low water use landscaping for potable water reduction. (Provision included in Residential Flat Design Code - Site Configuration: Landscape Design)	**Design Quality Principle 6: Landscape** for the purposes of: • Improving residents' quality of life in the form of privacy, outlook and views. • Contributing to streetscape character, public domain and open space. • Improving urban air quality. • Contributing to biodiversity. (Provisions included in Residential Flat Design Code - Site Configuration: Landscape Design)
2. Multi-unit BASIX requires a reduction greenhouse gas emissions or energy consumption	
Design Quality Principle 5: Resource, water and energy efficiency • Natural day light access *to minimise the need for artificial lighting* eg. Adequate ambient lighting for bathrooms and kitchens. • Efficient appliances and mechanical services eg. High efficiency hot water systems, and, heating and cooling systems, and lighting systems. • Natural ventilation *to reduce energy consumption by minimsing the use of mechanical ventilation, particularly air conditioning.* (Provisions included in Residential Flat Design Code - Building Performance: Energy Efficiency; Building Amenity: Daylight Access; Building Amenity: Natural Ventilation) **Design Quality Principle 6: Landscape** *for the purposes of improving energy efficiency and solar efficiency of dwellings*	**Design Quality Principle 6: Landscape** for the purposes of: • Improving the microclimate of private open spaces. (Provisions included in Residential Flat Design Code - Site Configuration: Landscape Design) **Design Quality Principle 3: Built Form** • Maximizing solar access to contribute to amenity of dwelling or private open space; or to contribute positively to desired street character, or to support landscape design of consolidated open space areas. (Provisions included in Residential Flat Design Code - Site Configuration: Orientation) **Design Quality Principle 7: Amenity** • Access to and control of sunlight in order to improve residents' amenity (eg. Glare control). (Provisions included in Residential Flat Design Code - Building Amenity: Daylight Access)
3. Multi-unit BASIX requires an improvement in the thermal performance of a residential building	
Design Quality Principle 5: Resource, water and energy efficiency • Passive solar design principles *to provide adequate ambient lighting and minimise the need for artifical lighting* eg. Use of external shading to glazing; Use of wall insulation; Performance glazing for highly glazed apartments; Roof design to control solar access for thermal performance.	**Design Quality Principle 7: Amenity** for the purposes of: • Access to and control of sunlight in order to improve residents' amenity (eg. Glare control). • Ventilation to provide access to fresh air. (Provisions included in Residential Flat Design Code - Building Amenity: Daylight Access; Building Amenity: Natural Ventilation)

• Orientation of glazing to reduce artificial heating. **Design Quality Principle 7: Amenity** *for the purposes of improving thermal performance of residential flat dwellings:* • Cross ventilation to reduce artificial cooling. (Provisions included in Residential Flat Design Code - Building Amenity: Daylight Access; Building Amenity: Natural Ventilation; Building Form: Roof Design)	

Key features of Design Quality Principles which are retained under SEPP 65 include:

Design Quality Principle 5: Resource, water and energy efficiency such as demolition of existing structures, recycling of materials, selection of appropriate and sustainable materials, adaptability and re-use of buildings.

Design Quality Principle 6: Landscape in order to optimize usability, privacy and social opportunity, equitable access and respect for neighbours' amenity, and provide for practical and long term management, and which contribute to positive image and contextual fit of development through respect for streetscape and neighbourhood character, or desired future character.

Design Quality Principle 7: Amenity including appropriate room dimensions and shapes, visual and acoustic privacy, storage, indoor and outdoor space, efficient layouts and service areas, outlook and ease of access for all age groups and degrees of mobility

All aspects of Design Quality Principles 1: Context; 2: Scale; 3: Built Form, 4: Density; 8: Safety and Security; 9: Social dimension; 10: Aesthetics.

As the BASIX site states, 'the above information does not constitute legal advice. It is only intended to provide a general overview of its subject matter. Users are advised to seek professional advice, as necessary, before taking action in relation to any of the matters covered by the above information'.

Beyond BASIX

What should be clearly understood is that BASIX will remain limited in its scope only as long as it takes to figure out *how to measure* some of the other variables of sustainable construction. In Australia, both the compliance regime, and the skills to design to meet sustainability requirements are rapidly becoming a lot more rigorous.

We get a clue to what those variables of sustainability able to be regulated by planning might be, if we look at the next tool to be 'commercialised' by DEUS. NABERS is designed to be a tool to capture 'performance as built and used', and is not intended to be a replacement for other ratings systems that focus on the design stage of projects. The intention is that NABERS can be used in a mutually supportive way with other rating systems currently in the market, and that it might be used in both societal inventories, and *individual performance contracts between building developers and building users*. NABERS has not been designed for multi-unit residential homes at this stage.

NABERS will measure environmental performance against the set of key impact categories listed below. These categories may be said to be a suitable checklist for issues to which the designer of a multi-unit residential development today should routinely attend, and about which a council officer evaluating such a proposal should be concerned.

> Energy use and greenhouse emissions - Energy-related greenhouse emissions are a key factor in increasing the levels of carbon dioxide in the atmosphere, leading to human induced climate change. How buildings are operated can affect their energy demand significantly.
> Refrigerant use (Global Warming Potential and Ozone Depletion Potential) - Refrigerant use in commercial buildings is a significant contributor to greenhouse emissions and ozone depletion. Choice of refrigerant is a key determining factor.
> Water use - Building users can be major water consumers, but users can also adopt practices to harvest water sustainably and effect considerable reductions in overall water demand.
> Stormwater runoff - The built environment has altered the natural stormwater and infiltration flows in many areas, with adverse impacts on marine life, and on freshwater environments. Buildings and their sites can be designed to minimise this disruption to natural stormwater flows.
> Stormwater pollution - Poorly maintained sites and uncontrolled stormwater runoff is one of the principal routes for pollutants such as oil, chemicals and excess organic matter to enter

our waterways.
Sewage outfall volume - The volume of sewage sent out from buildings into the sewer system affects both the size of water treatment facilities, and the load on the existing sewage infrastructure, leading to the greater likelihood of overflows into the environment.
Transport - Transport is a major source of Australia's greenhouse emissions. The location of buildings and the transport choices of those who use them make a considerable difference to transport-related emissions associated with buildings.
Landscape diversity - Appropriate land use practices and landscaping can ensure that a building can help make a contribution to overall biodiversity, by using land efficiently and by creating potential habitat.
Toxic materials - The use of toxic materials in buildings and on their sites can be avoided in many cases. If toxic materials are used, their potential for environmental damage and adverse impacts on human health is considerably reduced if the correct handling, storage and disposal practices are in place.
Waste - Waste contributes to resource depletion and a range of pollutants and emissions. The reduction of waste minimises the area needed for landfill, and reduces the environmental impact of overall materials throughput.
Indoor air quality - It is important for the long-term health of building occupants that a building provides a satisfactory level of indoor air quality. Good indoor air quality is essential for occupant satisfaction, health, and productivity.
Occupant satisfaction - as well as minimising impacts to the wider environment, buildings must also provide a comfortable working or living environment for those who use them.

A sustainable residential development checklist

The scope of this paper does not extend to discussion of other existing or potential rating tools. Instead, I'd like to set out a checklist of the sort of initiatives that might be grouped under a 'triple bottom line' approach to a denser residential project.

Such initiatives may be the framework around which the sustainability of a project might both argued by its designers, and examined by a concerned local authority. The checklist is organised hierarchically from 'master plan' to 'maintenance in use', and is based on a 2002 case study of the sustainability response developed for Kelvin Grove Urban Village, by QUT in conjunction with Hassell Pty Ltd.

1. Location:

- Where possible reuse a brownfield site;
- Capitalise on existing and proposed transport networks to achieve a Transport Orientated Development;
- Redeveloped inner city sites generally enable the co-location of uses to provide accommodation in close proximity to employment opportunities (including the CBD), within walking distance to the site, and more easily utilising local bus services;
- Facilitate a smaller environmental footprint than low density urban fringe areas;
- Maximise utilisation of existing physical and social infrastructure.

2 Master planning should provide a coherent and supportive physical framework for 'urban village' scale developments, aiming for a memorable urban environment of high quality.

A. Social planning initiatives of a master plan should include:
- o providing active public spaces, community facilities and unique character which will develop a sense of community;
- o responsiveness to community concerns; and
- o making available and accessible the diverse facilities of existing institutions that have commitment to life long learning and engagement with the community.

B. Environmental initiatives of a masterplan should include:
- o a site sensitive approach which builds on the natural attributes of the area;
- o facilitating a decrease in car travel, by providing a mixed use, walkable and accessible urban environment;
- o minimising the use of fossil fuels and hence a reduction in air pollution; and
- o ensuring development minimises energy demands, reduces greenhouse gas emissions and provides low energy solutions to achieve adequate comfort levels.

C. Economic initiatives of the masterplan should include:

- o facilitating a density of development which makes cost effective use of scarce land;
- o improving the quality of the site to provide a high standard environment which also improves the return for the development;
- o reducing the need for private transport;
- o including a mix of housing densities, ownership patterns, price and building types suited to different income levels, life-styles, cultures, and age groups;
- o utilising the existing infrastructure; and
- o embracing the concept of shared opportunities and synergies within the area, contributing to overall efficiencies.

3. The infrastructure should:

- utilise best practice techniques to manage the majority of the soil contamination on site, to minimise impacts within the site and externally;
- remove domestic waste material of concern to the local community;
- encourage the recycling of existing buildings within the site;
- recycle materials from the site;
- use pavement treatment and grading to allow rainwater to percolate through the soil to replenish the underground water table where possible;
- include planting a significant amount of trees and shrubs in 'streets' and 'parks'; and
- provide practical urban 'green' ways with managed utility services and stormwater.

4. Is it possible to negotiate a Local Area Plan that could set high sustainable standards for development within the site which:

- exceed the requirements of BASIX for energy ratings and water efficiency;
- require a construction waste strategy;
- require life cycle analysis of construction materials;
- require the development to prepare a strategy which identifies how it will comply with these sustainable development standards, and demonstrate how compliance will be maintained during the life of the building; *and*
- *has a negotiated entitlement to a bonus of up to 10% in additional gross floor area* if the development includes appropriate best practice sustainability measures?

5. The building design stage should implement the initiatives by:

- building contracts which support sustainable development outcomes, by providing a balance for the issues of capital and operating costs, environmental and social outcomes;
- an implementation plan for all future development thatrequires a statement of compliance with the ESD policy and the application of the minimum performance criteria and other principles relevant to the particular lot, portion or building.:
- performance criteria relating to the priority areas
  - o Energy Efficiency
  - o Transportation
  - o Biodiversity
  - o Atmospheric Management
  - o Water Management
  - o Indoor Air Quality Management
  - o Waste Management
  - o Light and Noise Pollution
  - o Monitoring and Implementation
- Seeking development bonuses, for example for:
  - o facilitating on site wastewater treatment by allowing the separate collection of grey water and black water; and
  - o generating electricity through solar photovoltaic cells and use of green energy from the grid.

6. **Construction stages** should:

- require site specific environmental management plans (EMP) to be developed to minimise on and off-site air, noise and water pollution during construction. Possible initiatives could include:
  - keeping dust to a minimum by ensuring large surfaces are kept damp (not wet) and plant or equipment filters are used;
  - ensuring sedimentation control systems are in place and properly maintained throughout the project;
  - using bunding to avoid pollution leaving the site from spills or leaks;
  - comply with all noise-related consent and approval conditions;
  - develop specific site-protection requirements that the contractor should follow and require the contractor to submit plans for meeting them;
  - designate and fence off vegetation that needs to be protected throughout the construction process; and
  - avoid mixing materials which cannot be separated in the future for recycling or reuse.

7. **Operational stages** of the project should:

- ensure that ownership arrangements do not jeopardise the sustainability initiatives conceived in the early stages of the development and encourage best practice;
- demonstrate a commitment to triple bottom line accounting by placing values on the social and environmental outcomes of the development;
- establish environmental indicators against which the development's strategies can be assessed, to determine if the community is moving towards sustainable development;
- incorporate meters to measure the use of resources such as energy and water to evaluate performance against these indicators.

The precautionary principle

Finally, the bigger picture.

Whatever the disputes about the actual magnitude of potential global warming and its collateral damage from greenhouse gas generation, it is now universally agreed that we are exploiting resources and stressing the environment's cyclic processes beyond it's capacity to recover. Thus in the greater debate about global sustainability, there has developed the so-called Precautionary Principle — which roughly translates as 'if *you don't know* how much damage you will cause, *don't do it*".

Historically, laws relating to development did not allow consent authorities to take into consideration the potential for such longer term damage, unless its nature and extent could be quantified with some certainty. All that has changed with a recent decision of the Land and Environment Court.

The Planning Principle ESD principles: ***What regard should a consent authority give to the principles of ecologically sustainable development*** may be found in *BGP Properties Pty Limited v Lake Macquarie City Council [2004] NSWLEC 399 revised - 05/05/2005.* The judgement exhaustively revisits the history of the Precautionary Principe, and more importantly, recent case law in the various Courts in NSW. It concludes that the Precautionary Principle may be legitimately applied by local councils in determining Development Applications.

What does that mean? For the moment, it may mean only that projects on ecologically sensitive sites are constrained much more than is made explicit in any particular controls. In the longer term, it gives legitimacy to a generally more stringent scrutiny of potential sustainability impacts of proposed developments.

It shifts the onus on applicants from merely doing what the regulations have told them they *had to do*, to instead *demonstrate how hard they have tried* to eliminate adverse impacts of their developments, now and in the future.