# GREEN BUILDINGS – ARE CODES, STANDARDS AND TARGETS SUFFICIENT DRIVERS OF SUSTAINABILITY IN NEW SOUTH WALES?

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# Green buildings – are codes, standards and targets sufficient drivers of sustainability in New South Wales?

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*With the introduction of the Building and Sustainability Index (BASIX) in 2004, New South Wales became an innovator in both Australian and international efforts to improve building design and sustainability. Today, BASIX continues to be promoted as an effective measure to ensure homes are designed to operate more sustainably, and the government is expanding its standards-based approach with the introduction of new housing codes. The effectiveness of these tools, however, remains essentially untested. In an effort to fill this critical gap, this article reflects on BASIX, the new NSW Housing Code and other similar measures in Australia, the United Kingdom and the United States. It suggests that codes, standards and targets can be appropriate tools to drive sustainable housing, but that the current measures in New South Wales do not achieve this aim.*

## INTRODUCTION

The need to reduce the environmental impacts of buildings is undisputed, with buildings globally producing 25% of greenhouse gas (GHG) emissions.[1] Sustainable growth and effective management of natural and environmental resources are stated priorities of the New South Wales government,[2] and studies such as Australia's State of the Environment Reports continue to demonstrate that. However, despite increasing recognition of the need for sustainable development, environmental

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[1] Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2007: Mitigation of Climate Change* (IPCC Fourth Assessment Report, 2007) "Ch 6 – Residential and Commercial Buildings", p 39.

[2] New South Wales State Plan priorities at Department of Planning (New South Wales Government), http://www.planning.nsw.gov.au/SettingtheDirection/OurprioritiesinNSW/tabid/93/Default.aspx viewed 12 October 2009; and State Plan – A New Direction for NSW, *The State Plan* (New South Wales Government), http://www.nsw.gov.au/stateplan/index.aspx?id=8f782cbd-0528-4077-9f40-75af9e4cc3e5 viewed 6 October 2009.

impacts are increasing in New South Wales.[3] Energy use is rising: the 2006 report found per capita energy use rose from 255.3 to 265.8 GJ per capita between 1997-1998 and 2003-2004.[4] Contributing to this are trends such as a rapid growth in the installation of private air-conditioning systems, the use of almost 30% of energy in private cars and an increase in dwelling sizes (despite shrinking households).[5] Water use is also increasing: up to 44% of household water is used outside the home, and urban stormwater is essentially not used, despite an effective "catchment" area equivalent to most urban water supply catchments.[6] Waste generation remains high: around one tonne per capita is sent to landfill each year.[7] Buildings are a key contributor to this, with construction and demolition waste accounting for 23% of landfill in New South Wales.[8] Pressure on agriculture, habitats and areas vulnerable to fires and climate change is also increasing: urban areas are rapidly expanding, with New South Wales now home to two identified mega-metropolitan regions (from Byron Bay to Queensland, and from Newcastle to Wollongong).[9]

The capacity to address these trends through better building design and operation is also undisputed. Buildings have the largest share of cost-effective opportunities for GHG mitigation among the sectors examined in the most recent report of the Intergovernmental Panel on Climate Change. The buildings industry has the potential to mitigate 5.3-6.7 Gt of carbon dioxide equivalent at US$100 per tonne, more than any other sector (energy supply, transport, industry, agriculture, forestry, waste).[10]

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[3] Beeton RJS, Buckley KI, Jones GJ, Morgan D, Reichelt RE and Trewin D, *Australia State of the Environment 2006* (State of the Environment Committee, Australian Government, 2006), http://www.environment.gov.au/soe/2006/publications/report/index.html viewed 6 October 2009.

[4] Beeton et al, n 3, pp 11-12.

[5] Linacre S, "Larger Dwellings, Smaller Households", *ABS Australian Social Trends* (Australian Bureau of Statistics, Catalogue no 4102.0, 2007). In 1997, the average New South Wales household comprised 2.71 persons with 2.84 bedrooms; by 2006 this was 2.6 persons with 3.05 bedrooms: Australian Bureau of Statistics (ABS), *NSW Summary 1997-2007* (ABS Catalogue no 4102.0, 2008) Table 2.1.

[6] Beeton et al, n 3, p 14.

[7] Beeton et al, n 3, p 14.

[8] Beeton et al, n 3, p 14.

[9] Beeton et al, n 3, pp 10-11.

[10] IPCC, n 1, "Summary for Policymakers" at Fig SPM 6; and IPCC, "Ch 6 – Residential and Commercial Buildings", p 39, line 40.

In its efforts to encourage more sustainable development and harness some of the mitigation potential of the buildings sector, the New South Wales Department of Planning has placed considerable weight on codes, standards and targets. The Building and Sustainability Index (BASIX)[11] continues to be promoted as "one of the strongest sustainable planning measures to be taken in Australia, delivering equitable and effective water and greenhouse gas reductions across the state",[12] and recent reforms to the New South Wales planning framework mean that new codes are being developed.[13] In 2009, the first of these codes commenced operation, with claims that it "will enable the New South Wales Government to implement some important sustainability initiatives".[14]

The driver for this emphasis, however, appears to be the simplicity of these schemes rather than their effectiveness in achieving environmental outcomes. After five years of operation, the Department of Planning has made little effort to determine whether BASIX is indeed effective, or whether adjustments may be necessary; the review of BASIX scheduled for 2008 did not take place, and monitoring of the scheme has been very limited.[15] Similarly, sustainability has played a minor role in the development of the new *NSW Housing Code* (the Code). The Department of Planning has promoted the Code as a way to speed up development, with the promotion of sustainable design features very much a secondary goal.

This article considers the effectiveness of the BASIX scheme and of the new Housing Code, as well as codes, standards and targets more broadly, in light of the context outlined above. While noting several limitations inherent in such mechanisms, and particularly in the design of BASIX and the Code, it concludes that codes, standards and targets can offer more than just a streamlined

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[11] Department of Planning, *About BASIX* (New South Wales Government), http://www.basix.nsw.gov.au/information/about.jsp viewed 6 October 2009.

[12] Department of Planning, *BASIX Fact Sheet* (New South Wales Government, June 2006), http://www.basix.nsw.gov.au/information/common/pdf/basix_fact_sheet.pdf viewed 6 October 2009.

[13] *Environmental Planning and Assessment Amendment Act 2008* (NSW).

[14] Department of Planning, *NSW Housing Code Fact Sheet: Sustainability and the NSW Housing Code* (Australian Government, issued 12 December 2008) p 1, http://www.planning.nsw.gov.au/planning_reforms/p/HC_sustainability.pdf viewed 6 October 2009.

[15] Monitoring has been focused on what measures dwellings are taking to obtain a BASIX certificate, rather than on measuring the environmental outcomes achieved from undertaking these measures or from the program overall.

process. Schemes such as BASIX, and particularly more comprehensive schemes such as those operating in the United States and the United Kingdom, can play an important role in achieving sustainable outcomes. To be effective, however, codes and targets must be designed to encourage flexibility, innovation and a wide definition of sustainability, and introduced as part of a broad range of complementary policy instruments.

### OVERVIEW OF THE BASIX SCHEME

The New South Wales Building Sustainability Index is an online tool which projects and assesses the thermal comfort, energy and water use of proposed buildings. Buildings subject to the scheme must meet minimum standards for each of these criteria to gain development approval.[16]

To assess thermal comfort, BASIX reviews the design, insulation, shading, glazing and floor area of proposed dwellings. Heating and cooling requirements are projected from this, and must fall below maximum loads for each climate zone. To assess energy and water use, BASIX reviews the building fabric, appliances and floor area. Both energy and water use projections must meet targets for their dwelling type and location, which are set relative to the consumption of existing households. Benchmarks are determined using data from the Australian Bureau of Statistics and from utilities across the State.[17]

BASIX was introduced on 1 July 2004 by the *State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004*, under the *Environmental Planning and Assessment Act 1979* (NSW). Initially, BASIX applied only to new single and dual use occupancy dwellings and small short-term accommodation in certain Sydney areas. Coverage was increased in several stages, expanding progressively until 2007, when BASIX was applied to all residential developments in New South

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[16] There is provision in the BASIX SEPP for proponents to apply for alternative assessment methods where the BASIX tool is not suitable.

[17] Department of Planning, *BASIX Benchmarking Fact Sheet* (New South Wales Government, April 2006), http://www.basix.nsw.gov.au/docs/Benchmarking_BASIX.pdf viewed 6 October 2009.

Wales costing $50,000 or more. This includes multi-unit residential developments and alterations and additions.

The initial targets set were for dwellings covered by BASIX to use 40% less water and 25% less energy than comparable existing dwellings. In 2006, the target for GHG emissions was increased to 40% below existing dwellings. Multi-unit residential developments over six storeys are subject to targets of 20% rather than 40%.

The total emissions reduction to be achieved through BASIX's energy savings between 2005 and 2008 was 173,000 tonnes of carbon dioxide.[18] With annual emissions in New South Wales totalling approximately 160 million tonnes,[19] that translates to a modest goal – a reduction of approximately 0.04% in GHG emissions per year.[20] The commitment for total water savings to be achieved over the same period was 5,690 million litres. Again, compared with the 501,128 million litres supplied to the Sydney area yearly, this equates to a very minor reduction – less than 0.4% of the water supplied to the Sydney area.[21]

## HOW EFFECTIVE IS BASIX IN ACHIEVING SUSTAINABILITY OUTCOMES?

It is difficult to measure the effectiveness of BASIX in achieving its stated goals, as this has not been the focus of the monitoring so far undertaken. Despite BASIX being an outcomes-based sustainability tool (ie requiring energy and water use reductions, rather than particular technologies or design features), the monitoring done to date has focussed on which design features have been most popular rather than the outcomes achieved. Monitoring has not been undertaken by the New South

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[18] Note that the amount of GHG emission reduction actually achieved was not measured. This means that the figure of 173,000 tonnes is the maximum.

[19] Department of Water and Energy, *Energy* (New South Wales Government), http://www.dwe.nsw.gov.au/energy/sustain_carbon_greenhouse.shtml viewed 6 October 2009.

[20] Based on 173,000 tonnes of savings over four years.

[21] Based on 5,690 million litres saved over four years.

Wales government to verify the predictions of design tools used to generate BASIX certificates. To assess and improve the effectiveness of BASIX, there is a need to compare the emissions of houses that have been certified under BASIX with a large sample of existing houses. Without this type of monitoring it is impossible to determine whether environmental improvements that BASIX seeks to achieve are translated into actual improvements, much less to improve the tools over time.

Given the low commitments made under the BASIX scheme, and the fact that energy use, water use and emissions are continuing to increase in New South Wales, it is reasonable to assume that BASIX has not brought about significant advances in sustainability. In addition to the low targets, there are a number of limitations in the BASIX scheme that restrict its potential to effect sustainable development. This section considers four key shortcomings of BASIX:

1. it excludes several important factors from consideration;

2. it allows for trade offs with questionable benefits in the long term;

3. it is not applicable until late in the design phase; and

4. it limits the potential for other sustainability measures.

First, in addition to excluding commercial buildings, BASIX excludes several important factors associated with residential buildings. BASIX does not consider embodied energy (ie the different energy requirements to produce, say, timber or concrete flooring – a measure encompassing factors such as raw material extraction, transport, manufacturing, assembly and installation). Embodied energy can amount to 40% of a dwelling's operational energy over a 100-year period,[22] making this a significant omission in sustainability terms. In addition to this direct omission, BASIX actually favours certain materials with high embodied energy. In contrast to the Green Star rating scheme for offices, which awards credits for use of recycled steel and for replacing concrete with less energy-intensive

[22] Holloway D and Bunker R, "Planning, Housing and Energy Use: A Review" (2006) 24 UPR 115.

materials, BASIX favours high mass materials which typically have high embodied energy.[23] Additionally, BASIX excludes many building-related emissions, particularly construction and demolition energy and waste. With construction and demolition waste accounting for around 23% of landfill in New South Wales,[24] this is another significant omission. Alterations and additions under $50,000 are also excluded. While these will often be minor, they may also compound problems. For example, upgrading a kitchen that blocks northern light to a living room (as is typical in many older houses) may preclude renovations to improve passive solar design in the future.

Secondly, BASIX allows trade offs for appliances and equipment. These trade offs mean that by installing gas or solar-powered appliances, weaker standards may be accepted in the building fabric. The lifespan of appliances is much shorter than that of the building, however, so that even the modest gains predicted under BASIX will not be achieved in the long term.

Thirdly, BASIX requires detailed design information available only late in the design process. By this stage, it is much harder – and more expensive – to include many sustainable design features.[25] Anecdotal evidence from architects suggests that BASIX may cause a south-facing window to be reduced in size, but is unlikely to prompt more significant changes to reduce the environmental impact of a building.

Fourthly, BASIX prevents consent authorities imposing more stringent water and energy efficiency requirements on residential development. The State Environmental Planning Policy implementing BASIX specifically declares that any environmental planning instruments or development control plans will be invalid to the extent to which they aim to reduce energy

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[23] Productivity Commission Inquiry Report, *The Private Cost Effectiveness of Improving Energy Efficiency* (No 36, Australian Government, 31 August 2005) "Ch 10 – Building Ratings and Standards", p 226, http://www.pc.gov.au/__data/assets/pdf_file/0018/44622/energy.pdf viewed 6 October 2009.

[24] Beeton et al, n 3, p 14.

[25] Arup and Brisbane City Council, "Assessing Sustainable Urban Developments: Are Rating Tools the Answer?" (2004) 41 *Australian Planner* 33.

consumption, water consumption or thermal performance.[26] The impact of this provision is exacerbated by the fact that the BASIX targets have not been tightened since 2006. Despite increasing evidence on the need to reduce the environmental impact of houses and the fact that new technologies are making the achievement of targets easier, local authorities are powerless to require more sustainable housing, much less to push the market to develop further sustainable technology.

While BASIX was welcomed upon its introduction in 2004, it can no longer be described as one of the strongest sustainable planning measures to be taken in Australia. Since the introduction of BASIX, other States have introduced various measures to improve the energy and water efficiency of domestic dwellings, and the *Building Code of Australia* has been amended to include energy efficiency standards that ensure thermal efficiency in the building envelope and in domestic services. Victoria and the ACT, in particular, have introduced regulations as well as market-based mechanisms (ACT)[27] that are likely to be more effective than BASIX.

In Victoria, all new residential homes, and renovations and relocations of existing homes, must be built to 5 Star Standards.[28] The requirements of the 5 Star Standard are:

- 5 Star energy efficiency rating for the building fabric (calculated by either the FirstRate or NatHERS rating tools); and
- water efficient taps and fittings; and
- either a rainwater tank for toilet flushing, or a solar hot water system[29] (where there is reticulated gas, the solar hot water system must be gas boosted).

Homes built according to these standards are 50% more energy efficient for heating and cooling than the average 2 Star dwelling built before the regulations took effect,[30] indicating a significant

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[26] *State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004* under the *Environmental Planning and Assessment Act 1979* (NSW), cll 7-10.

[27] Reducing market friction.

[28] *Building Code of Australia*, Victoria Appendix.

[29] Building Commission, *5 Star for New Houses, Home Renovations and Relocations* (Victorian Government, March 2008), http://www.buildingcommission.com.au/resources/documents/14161_BC_5_Star_House_c2.pdf viewed 6 October 2009.

[30] Building Commission, n 29.

improvement from the achievements made under BASIX, as BASIX requires only a 40% increase in energy efficiency from the average dwelling.

The ACT requires all new buildings to meet the mandatory minimum energy efficiency performance levels established in the *Building Code of Australia*. This minimum standard is the achievement of a 5 Star rating derived from one of a number of computer software packages – FirstRate, AccuRate, NatHERS and BERS.[31] This is contrasted to the average 4.2 Star rating achieved under BASIX.[32] The energy performance must be demonstrated when applying for building approval.[33]

The ACT has also introduced a market-based mechanism to reduce market friction in the housing market. This measure requires the thermal performance of building shells, called energy efficiency ratings, to be disclosed by sellers or landlords when selling or renting residential properties. This aims to encourage buyers to choose properties that will require less energy to operate.[34]

For water efficiency, property owners who are building, renovating or significantly extending their properties will need to demonstrate how they meet a new 40% water efficiency target. For single residential properties the following options are deemed to comply with this target:

- installing a rainwater tank of minimum capacity based on the block size, which is connected to toilets, laundry and all external water sources; or

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[31] Australian Building Codes Board training presentation, http://www.abcb.gov.au/index.cfm?objectid=87943F5E-AA77-3730-3FDF460CE6F9815A viewed 6 October 2009.

[32] Department of Planning, *Single Dwelling Outcome: BASIX Ongoing Monitoring Program 2005-2008* (New South Wales Government) "Using the NatHERS Star Rating Tool", www.basix.nsw.gov.au viewed 6 October 2009.

[33] ACT Planning and Land Authority, *Energy Ratings*, http://www.actpla.act.gov.au/topics/design_build/siting/energy_ratings viewed 6 October 2009.

[34] *Civil Law (Sale of Residential Property) Act 2003* (ACT) and the *Residential Tenancies Act 1997* (ACT).

- installing a greywater system where all bathroom and laundry greywater is captured, treated to Class A standard, and connected to all toilet laundry and external uses.[35]

This is more stringent than the BASIX 40% target, as only an average of 76% of houses connected an alternative water source to the laundry and 91% of toilets connected to alternative water sources under BASIX.[36] Overall, considering both the higher energy efficiency and greater water efficiency measures needed to meet the required target, as well as the use of the market mechanisms, the sustainability of housing in the ACT is likely to be greater than in New South Wales.

There are no indications that BASIX has been, or will be, effective in achieving sustainability outcomes. BASIX excludes several important factors from consideration, allows for trade offs with questionable benefits in the long term, is not applicable until late in the design phase, and limits the potential for other sustainability measures. The targets set by BASIX are very low, and no effort has been made to ensure that even these are achieved. In the context of measures being adopted around the country, claims that BASIX is "one of the strongest sustainable planning measures to be taken in Australia, delivering equitable and effective water and greenhouse gas reductions across the state"[37] cannot be sustained.

**OVERVIEW OF THE NSW HOUSING CODE**

The first stage of the *NSW Housing Code* came into effect at the end of February 2009 as part of a broad series of planning reforms introduced in the *Environmental Planning and Assessment Amendment Act 2008* (NSW). The Code introduces a checklist-style system under which housing

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[35] ACT Planning and Land Authority, *Water Efficiency*, http://www.actpla.act.gov.au/topics/design_build/siting/water_efficiency viewed 6 October 2009.

[36] Department of Planning, n 32.

[37] Department of Planning, n 12.

developments can be approved within 10 days by an accredited certifier or council if they meet certain requirements.

The first stage of the Code applies to one and two-storey houses, alterations, additions and minor ancillary developments on lots over 450 $m^2$. It also sets out a range of minor alterations, improvements and landscaping as exempt development; these are permitted without planning approval. Certain areas are excluded – particularly heritage and bushfire prone areas – and councils may apply for local variations regarding front and side setbacks and amount of landscaped area. Future stages will cover duplex and terrace houses, a greater range of lot sizes, and commercial developments.

The primary objective of the Code is to allow faster and more streamlined approval for the construction of and alterations to houses. Presenters at a recent workshop on implementation of the Code stressed that it was not intended to improve upon current standards, but simply to make it faster to gain approval for what is already common practice.[38] Currently, exempt and complying development accounts for 11% of development in New South Wales. The Code is intended to increase this to 50% within four years.[39]

Although sustainability was not an objective in the design of the Code, it is being promoted as an initiative that will support the New South Wales government's efforts to achieve sustainability outcomes.[40] Key sustainability features of the Code highlighted by the Department of Planning are that solar water heaters and photovoltaic systems may qualify as exempt development, that floor area and site coverage limits are set, and that minimum landscaped areas are required.

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[38] New South Wales Housing Code Practitioners Workshop, Eveleigh Technology Park, Sydney, 18 February 2009.

[39] Department of Planning, *NSW Housing Code: Guide to Complying Development for Detached Housing* (New South Wales Government, 2008) p 6, http://www.planning.nsw.gov.au/planning_reforms/p/guide_to_complying_development.pdf viewed 6 October 2009.

[40] Department of Planning, n 14.

**HOW LIKELY IS IT THAT THE CODE WILL ACHIEVE SUSTAINABILITY OUTCOMES?**

The fact that the Code is expressly intended to speed up the approval process for what is already commonplace suggests that the Code will in fact work against sustainability outcomes. The trends described above – for example, increasing energy consumption per capita and increasing dwelling sizes despite declining household sizes – highlight the inadequacies of current development in sustainability terms. In addition to facilitating the expansion of development that is already contrary to sustainability outcomes, the Code also includes elements that may work against sustainability more directly.

Two features of the Code are highlighted by the Department of Planning as sustainability initiatives: it sets maximum floor areas and requires minimum landscaped areas. Neither of these are likely, however, to contribute to sustainability outcomes. The floor area maxima are very large – between 330 $m^2$ and 430 $m^2$.[41] Given that the average house size in New South Wales was less than 250 $m^2$ in 2003,[42] these limits are more likely to stimulate additional energy use than to reduce consumption. Similarly, the landscaped area requirements are relatively small – starting at 20% for a 450 $m^2$ lot.[43] Given that over 40% of this lot would remain after the construction of an average house, the 20% requirement is unlikely to achieve much. The Code does not include any requirements that could make this area more effective in achieving sustainability outcomes, such as water-sensitive landscaping. The Department of Planning's claims that these maxima and minima will further sustainability outcomes are thus difficult to sustain.

In addition to the shortcomings of these stated sustainability measures, a number of key omissions in the Code are significant for sustainability. The Code does not promote passive solar design, appropriate urban design or sustainable technology, and may in fact discourage sustainable outcomes in these areas.

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[41] *NSW Housing Code*, Pt 2, Div 2, Subdiv 2, cl 3.10.

Passive solar design is critical to energy use and thermal performance.[44] The draft code released in 2008 required that at least one habitable room must have at least one window within 15˚ of north, and that at least 25% of private open space face within 15˚ of north; however, neither of these requirements are contained in the Code as gazetted. Beyond these exclusions, the Code may even work against good solar orientation. Changing the configuration of a room means that a development cannot be exempt, regardless of whether the new configuration would improve thermal performance.[45] Renovating a kitchen or bathroom is permissible as exempt development, regardless of whether its location works against good passive solar design.[46] Given the fact that many older homes, such as the typical Sydney terrace, feature kitchens and bathrooms at the back of the house, blocking solar access for living areas, this is a significant oversight.

Urban issues are also critical to energy consumption and GHG emissions, and to sustainability of cities as a whole. While the 2008 draft code suggested that the requirement for parking should be less in higher density areas where there is better access to public transport or proximity to workplaces and amenities,[47] the Code makes no reference to urban issues. At least one car space is required for all houses, and setback requirements mean that two are effectively required, regardless of proximity to public transport or other services.[48] Setback requirements may also work against sustainable urban design, potentially leading to wasted space as they relate solely to building heights and do not consider urban context.

The Code does little to promote the adoption of sustainable technology. Solar hot water heaters, photovoltaic systems, rainwater tanks and windmills may be permissible as exempt development.

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[42] "Average Floor Area of New Houses", *Year Book Australia 2005* (Australian Bureau of Statistics, Catalogue no 1301.1, 19.9, 2005).

[43] *NSW Housing Code*, Pt 3, Div 2, Subdiv 4, cl.3.24.

[44] Your Home Technical Manual, *4.3 Orientation* (Australian Govvernment), http://www.yourhome.gov.au/technical/fs43.html viewed 6 October 2009.

[45] *NSW Housing Code*, Subdiv 26 – "Minor Building Alterations" (internal), cl 2.52.

[46] *NSW Housing Code*, Subdiv 26 – "Minor Building Alterations" (internal), cl 2.51.

[47] Department of Planning, *NSW Housing Code for Exempt and Complying Development* (draft for discussion, New South Wales Government, May 2008) p 14.

[48] *NSW Housing Code*, Pt 3, Div 2, Subdiv 5, cl 3.26-7.

However, they are subject to several limitations. To qualify as exempt development, solar hot water heaters and photovoltaic systems must be integrated into the building or be flush or parallel with the surface of the roof – regardless of whether this orientation is suitable for solar access.[49] Rainwater tanks are subject to a long list of detailed requirements covering the capacity of tanks, stand height, use of space below the tank, setbacks, heights, installation, footings, cut and fill, connections, signage, maintenance, soundproofing and overflow systems.[50] If the site is sewered, stormwater must be collected into a council or inter-allotment system – there is no scope for onsite recycling or other sustainability measures.[51] Windmills are permissible as exempt development only in rural areas.[52]

In contrast, air-conditioning is permissible as exempt development and is subject only to limited standards regarding boundary setbacks, height limits, weatherproofing, and structural integrity of the building to which they are attached.[53] Despite the high energy consumption of air-conditioning and the ability of good passive thermal design to remove the need for it in many cases, there are no particular requirements in the Code for air-conditioning to be accompanied by insulation or natural ventilation, or to demonstrate that cooling can't be achieved by more sustainable means. The much simpler standards set for air-conditioning in contrast to rainwater tanks suggests a preference in the Code for unsustainable technology.

The Code also does little to promote sustainable construction materials or methods. Embodied energy and energy consumption impacts of materials are not considered; reuse and recycling are not addressed. General conditions for construction and demolition are set, but these merely require that waste is disposed of at a waste management facility.[54] Given the significant impacts of materials on

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[49] *NSW Housing Code*, Pt 2, Div 1, Subdiv 38, cll 2.75, 2.76.
[50] *NSW Housing Code*, Pt 2, Div 1, Subdivs 32, 33, cll 2.63-2.66.
[51] *NSW Housing Code*, Pt 3, Div 2, Subdiv 6, cl 3.32.
[52] *NSW Housing Code*, Pt 2, Div 1, Subdiv 41, cll 2.81, 2.82.
[53] *NSW Housing Code*, Pt 2, Div 1, Subdiv 3, cll 25, 2.6.
[54] *NSW Housing Code*, Pt 3, Div 3, Subdiv 2 cl 3.43(2).

energy consumption (both through embodied energy and building performance), these omissions are a serious concern.

### ARE CODES, STANDARDS AND TARGETS USEFUL TOOLS MORE GENERALLY?

In addition to the particular shortcomings of BASIX and the *NSW Housing Code* outlined above, both suffer from limitations inherent in regulatory codes, standards and targets more generally. A number of structural issues mean that even the best-designed systems will be limited in their ability to achieve sustainability outcomes. While it is important to recognise the limitations of these mechanisms, it is important also to recognise their potential. When carefully considered, and implemented as part of a comprehensive package of policy tools, codes, targets and standards can play a useful role in achieving sustainable outcomes.

Codes, standards and targets address only a small part of the issues necessary to achieve sustainable outcomes; they do not encourage innovation and often do not consider local circumstances. The potential for targets such as BASIX to achieve energy and water savings and emissions reductions is inherently limited by the fact that they apply only to a limited aspect of the development process. Site area, the location of the dwelling, the number of shared walls and the type of dwelling have all been found to have more impact on energy use than the issues covered by energy efficiency ratings,[55] so ratings alone will not be able to achieve significant impacts on energy use. The potential for targets to promote innovation is also limited, if used inappropriately, and may work instead to preclude it by encouraging "lowest common denominator" design. Targets provide no incentive to improve beyond the set target,[56] and distort the market in favour of designs that use

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[55] Holloway and Bunker, n 22.

[56] Urge-Vorsatz D, Koeppel S, and Mirasgedis S, "Appraisal of Policy Instruments for Reducing Buildings' CO2 Emissions" (2007) 35(4) *Building Research and Information* 458.

prescribed materials and methods or satisfy particular performance algorithms.[57] Codes and targets are also limited by their inability to anticipate or cater adequately to all of the impacts that may arise from development in all circumstances, particularly development on atypical sites or in environmentally-sensitive areas. While exclusions and smaller-scale schemes may help to mitigate these risks, it is unlikely that any scheme will effectively be able to predict or to respond adequately to all circumstances.

These shortcomings do not, however, require that codes, standards and targets be abandoned altogether. With proper recognition of their limitations and the adoption of appropriate policies to balance these, codes, targets and standards can make important contributions to sustainable outcomes. In one international study, appliance standards, building codes, tax exemptions and voluntary labelling were found to be the most effective policy instruments in encouraging a reduction in GHG emissions from buildings.[58]

### HOW COULD CODES AND STANDARDS IN NEW SOUTH WALES BE MORE EFFECTIVE?

Regulatory codes and standards can play an important role in providing a minimum standard for building sustainability, provided they are designed appropriately. Codes and targets should not set maximum standards, as BASIX currently does, and they should avoid the narrow focus on water and energy efficiency that characterises all of the schemes presently operating in Australia. For codes to be able to contribute to sustainability, they need to be made more flexible, to encourage innovation, and to enlarge their focus past water and energy to include sustainability indicators across a much broader range of areas which more accurately reflect the total ecological footprint of buildings. This could include indicators reflecting the building site chosen (eg greenfield or brownfield), waste

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[57] *Integrating Sustainability* (submission to the House of Representatives Standing Committee on Environment and Heritage, August 2005) p 18. http://www.aph.gov.au/House/committee/environ/cities/subs.htm viewed 6 October 2009.

[58] As opposed to Kyoto Protocol flexible mechanisms or energy/carbon taxation. Urge-Vorsatz et al, n 56.

minimisation and recycling services provided, alternative transport options, landscaping choices, and the incorporation of water sensitive urban design principles.

There are a range of codes and tools used internationally that incorporate a wide variety of sustainability indicators, encouraging the consideration of factors beyond water and energy use that are necessary if sustainability is to be taken seriously. The United Kingdom's *Code for Sustainable Homes* (UK Code) and the United States' LEED for Homes (LEED) program are particularly effective examples, offering valuable lessons as to how New South Wales' BASIX scheme and *NSW Housing Code* could be improved.

Both the UK Code and LEED are rating tools that incorporate a range of indicators of sustainability, as opposed to simply providing targets for water and energy efficiency. Both also combine a flexible approach with points being awarded for a range of measures or design features to improve the sustainability of the home and contributing to the overall rating or score, along with minimum standards that must be achieved in certain categories to be awarded certain ratings. This encourages innovation and yet ensures minimum standards are met in areas deemed to be essential to achieving sustainability of residential buildings.

**Code for Sustainable Homes**

The United Kingdom's *Code for Sustainable Homes* is based on the voluntary standard, BREEAM Ecohomes rating tool, and all homes that are sold in the United Kingdom are required to obtain a rating, or to disclose that they received a "no rating" (which means they didn't comply with the

minimum standards required to obtain a rating).[59] There is no minimum standard that all new homes must obtain; however, there is a stamp duty exemption for homes that are "zero carbon".[60]

For a rating to be obtained under the UK Code, four mandatory standards must be achieved. Achievement of these standards does not earn points, but is a prerequisite for earning a rating. These are:

1. environmental impacts of materials;
2. management of surface water runoff from developments;
3. storage of household waste; and
4. construction site waste management.

Minimum energy efficiency (measured as dwelling emission rate) and water efficiency (measured as indoor water use) standards must also be met to be eligible for certain rating levels.[61]

Once mandatory standards are achieved, points can be awarded in the categories of:

- energy and carbon dioxide emissions;
- water use;
- materials;

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[59] BREAM (BRE Environmental Assessment Method), *Nil-rated Certificate: Background and Guide to Completing the Certificate*, http://www.breeam.org/page.jsp?id=103 viewed 6 October 2009; and BREEAM, *The Code for Sustainable Homes*, http://www.breeam.org/page.jsp?id=86 viewed 6 October 2009.

[60] Department of Communities and Local Government, *Eco Friendly Ratings for All New Homes* (United Kingdom Government, 27 February 2008), http://www.communities.gov.uk/news/corporate/705107 viewed 6 October 2009.

[61] Department of Communities and Local Government, *The Code for Sustainable Homes: Setting the Standard in Sustainability for New Homes* (United Kingdom Government), http://www.communities.gov.uk/planningandbuilding/buildingregulations/legislation/codesustainable viewed 6 October 2009.

- surface water runoff;
- waste;
- pollution;
- human health and wellbeing;
- management of the home to maximise its key sustainability features; and
- ecology.

Categories are weighted, and there are a number of components eligible to score points within each category.[62]

While energy and carbon emissions are given the greatest weightings (36.4% of the final score), the inclusion of the other factors, such as water use and ecology, allows the broader environmental impact of building and living in the house to be considered and communicated to potential buyers. Health and wellbeing (14%), ecology (12%) and water use (9%) contribute significantly to the score. The inclusion of health and wellbeing and its relatively high weighting does, however, mean that environmental performance can be traded off against indoor environmental quality, which includes factors such as sound insulation. Although these factors increase the liveability of homes, they are not direct reflections of the environmental sustainability of the house.

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[62] For example, within energy and carbon dioxide emissions there are a number of components within which points can be scored. These include: dwelling emission rate – credits given for improvement over standard for estimated carbon dioxide emissions per $m^2$ arising from energy use for heating, hot water and lighting; building fabric – assesses thermal performance of the building envelope; internal lighting – energy efficient internal light fittings; drying space – provision of adequate secure drying space; energy efficient white goods – provision of energy efficient white goods, or provision of information on these white goods if they're not provided with house; external lighting – energy efficient external space and security lighting; low or zero carbon technologies – credits awarded for carbon emission reduction as a result of renewable energy production; cycle storage – safe, secure, convenient and weather-proof bicycle storage to promote greater use of bikes for transport; home office – credits awarded on the basis of the provision of space and services that enable a suitable quiet room to enable working from home and thereby reducing the need to commute.

In addition to the broad range of factors highlighted, the UK Code is innovative in its use of components. For example, the large range of components eligible to score points in the energy and carbon dioxide emissions category enables a wide range of potential contributors of GHGs to be factored into the final score, including transport emissions (cycle storage and home office space), appliance efficiency, lighting, and the thermal performance of the building envelope which will influence the energy required for heating and cooling. The inclusion of extra credits for low carbon technologies also promotes uptake of these technologies.

**LEED for Homes**

LEED for Homes is an entirely voluntary rating system used in the United States, established by the US Green Building Council. There are a number of categories under which points can be scored, with 18 prerequisites within these categories that must be included to obtain a rating. There are also minimum scores required in some categories, such as sustainable sites, water efficiency, materials and resources, and indoor environmental quality. The prerequisites include:

- preliminary meetings and planning for LEED certification;
- building planned and managed to be durable;
- erosion is controlled and site disturbance minimised;
- no invasive plants are included in landscaping;
- Energy Star for Homes is used to optimise energy performance of the home;
- refrigerant charge test is undertaken;
- waste from framing is limited;
- tropical wood used is FSC (Forest Stewardship Council) certified;
- house is ventilated with outdoor air;
- moisture and pollutants are reduced in kitchen and bathroom through outdoor exhaust systems;
- heating and cooling loads are calculated for each room;
- air filters are installed;
- radon-resistant construction is undertaken in high-risk areas;
- there is no HVAC (heating, ventilating and air-conditioning) in the garage; and

- basic operations training for homeowner or tenant.[63]

Energy and atmosphere is given the highest weighting (28%) and covers a range of aspects of energy use, allowing homeowners to apply the Energy Star for Homes tool, or score points for components such as insulation, efficiency of heating and cooling systems, reducing air leakage and thermal loss from windows, efficiency of hot water heaters, improving efficiency and design of fixtures in the house (eg siting hot water heater close to where the hot water will be used), energy efficient appliances, installation and operation of renewable energy generations schemes, and residential refrigerant management. Sustainable sites is the next most important category (16%), and includes a range of components such as erosion control, landscaping, surface water management (Water Sensitive Urban Design (WSUD)), non-toxic pest control, and compact development. This is followed by indoor environmental quality (15%), encompassing mainly indoor air pollution; and water efficiency (11%), which covers water reuse (rainwater tanks and greywater systems), efficient outdoor irrigations systems, and efficient indoor water fittings.

As with the UK Code, LEED has some shortcomings. The relatively high weighting of indoor environmental quality means that impacts on the environment may be offset by improving internal comfort for homeowners, and the weightings make GHG emissions the primary measure of housing sustainability. There is also no category dealing with the ecological impact of developments in the LEED tool, which is one of the categories with a relatively high weighting in the UK Code. In contrast to BASIX and the *NSW Housing Code*, however, the number and broad ranging nature of the prerequisites and the minimum standards that must be attained mean that both LEED and the UK Code are far more likely to achieve sustainable outcomes.

**Proposed improvements to regulatory framework in New South Wales**

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[63] It is unclear in documentation surrounding the tool, however, as to how these prerequisites were arrived at. For example, there is no water use prerequisite; however, there are a number of prerequisites related to indoor air quality. US Green Building Council, *LEED for Homes Rating System*, http://www.usgbc.org/DisplayPage.aspx?CMSPageID=147 viewed 6 October 2009.

LEED and, particularly, the UK Code provide useful models from which to redesign the New South Wales BASIX scheme and *NSW Housing Code*. Bringing together compulsory assessment and disclosure to the buyer, minimum standards that must be achieved for certain categories such as energy and water efficiency, and weightings to reflect what are considered the most important aspects of sustainability, would be a vast improvement on the current framework in New South Wales, and across Australia. Importantly, such a system would encourage innovation beyond the minimum standards required, as points would be awarded for better performance.

In addition to adjusting weightings to reflect Australian priorities, if LEED and/or the UK Code were used as a model for New South Wales, adjustments would also be required with respect to indoor environmental quality indicators. These should be included as a separate score, as a building that is comfortable to inhabit will not necessarily be a good environmental performer (particularly if comfort is achieved through mechanisms such as air-conditioning). By separating these aspects of the tool ecological sustainability will be better able to be assessed.

Importantly, a more effective strategy to promote sustainable building in New South Wales would go beyond codes, standards and targets to adopt a comprehensive package of complementary policy instruments. Mechanisms, such as information programs, voluntary and market-based instruments to encourage consumer choice towards more sustainable dwellings, should be considered as essential counterparts to the minimum standards set in codes and standards. Voluntary mechanisms, for example, have proven to be effective in combination with regulatory schemes. Voluntary rating tools, and the disclosure of results achieved under the tools, can encourage consumers to go beyond compulsory standards and purchase more sustainably designed and sited houses. Information programs have also proven effective, and were favoured by the Productivity Commission in its report on energy efficiency.[64] Other options include: tax exemptions as an additional incentive for high environmental performers; capital subsidies; grants or loans at reduced rates; mandatory audit and energy management requirements; and detailed billing

and disclosure requirements. Many of these policy tools are currently being used in New South Wales (eg water use education); however, a comprehensive approach would improve their effectiveness.

## CONCLUSION

Over its five years of operation, BASIX has moved from being an innovative mechanism at the forefront of sustainability efforts in Australia and overseas, to a measure that is increasingly outdated. In turn, the New South Wales government appears less like a leader and more like a cynic. In the context of alarming trends in water and energy consumption, loss of bushland, waste production and GHG emissions, the government's failure to test the effectiveness of codes, standards and targets in achieving sustainable outcomes is disappointing. With its limited scope and low commitments BASIX appears little more than a formality; with its focus on efficiency the new *NSW Housing Code* could be interpreted as a thinly veiled attempt to speed up development regardless of its impacts.

While noting several limitations inherent in such mechanisms, this article does not conclude that codes, standards and targets offer merely a streamlined process. As LEED and the UK Code demonstrate, codes can play an important role in achieving sustainable outcomes. Provided they are designed to encourage flexibility, innovation and a wide definition of sustainability, and introduced as part of a broad range of complementary policy instruments, codes, standards and targets can and should be used to ensure that sustainable growth and effective management of natural and environmental resources are not merely prioritised in New South Wales, but actually achieved.

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[64] Productivity Commission Inquiry Report, n 23, "Ch 10 – Building Ratings and Standards", p 226.