

Sustainable building and the regulatory approach in Australia

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ABSTRACT: Sustainability (and sustainable building) are topical subjects which have recently crept into the regulatory arena. This paper is concerned that the use of these terms in current regulation may be misleading and therefore distract practitioners and regulators from the real focus of sustainability and so inadvertently create an inappropriate development path for Australia into the future.

Principles of sustainability and Australia's current policy on regulation set the background for this paper to review some examples of recent building and planning regulation which claim to be sustainability based. Then a method for translating sustainability principles into an operational national sustainability strategy (including sustainable building) is described, and problems which face a regulatory approach to the issue are identified. A discussion follows to highlight specific areas of divergence between the current regulatory approach in Australia and global principles of sustainability.

Conference theme: The indicators of sustainable building
Keywords: Sustainable development, buildings, regulation

INTRODUCTION

The expression 'sustainable building' has become increasingly popular in the literature in recent years; indeed it is used as one of this conference's themes. Yet despite its increasing usage, no consensus for either a definition or a conceptual framework for the term has yet emerged in Australia. This situation is now exacerbated by a rapidly growing number of regulatory initiatives being introduced into the Building Code of Australia and most State planning authorities under the banner of sustainability. A sceptic may well argue that we are already regulating something that we don't yet understand.

This paper postulates that the essential meaning of sustainable building, in the context of appropriate management of the development of the built environment, can only surface by returning to root principles of sustainability, where it is shown that building sector activity is an integral part of a wider National Sustainable Development Strategy (NSDS). The objective of the paper is to review selected examples of building regulation which claim to be sustainability-based and test them against underlying principles of a NSDS in order to evaluate the extent to which the claims are valid. After establishing Australian national regulatory policy, the review identifies the regulation objective and method for each example and compares it on the one hand with a stated political strategy and on the other to its compliance with regulatory policy. Results of the evaluation are then discussed.

Outcomes of the study suggest that in all cases claims of regulation to be sustainability-based are false, firstly on the basis that regulatory policy conflicts with sustainability principles and secondly on the basis that regulation does not address sufficient aspects of sustainability. One disturbing outcome is that in some cases wording of the regulatory objective inhibits the regulation from addressing major intentions of the strategy. A further disturbing outcome in all cases is a departure from scientific method in the technical methodology behind the regulation, and/or denial of public access to data under the guise of 'commercial-in-confidence' from government agencies; and In all cases there have been no post occupancy evaluation studies to validate theoretical predictive models which underpin the regulation.

1. BACKGROUND

1.1. Sustainability and sustainable building

Foundational concepts of sustainable development (or sustainability) as articulated in the Brundtland Report "*Our Common Future*" (UN General Assembly 1987) described it as a framework for the integration of environment policies and development strategies. It emphasised that the term 'development' should be taken in its widest context to include both economic and social policies which drive the strategies. Subsequent United Nations' forums, including the ongoing Commission on Sustainable Development (CSD), have persistently reinforced this interpretation.

The notion that sustainable development at the global level can only evolve by the action of every nation to take ownership and responsibility for developing, implementing and maintaining its own national sustainable development strategy can be traced back to the Brundtland Report. An unequivocal consequence of this concept of sustainability is that prime responsibility rests with national governments and their political will and capacity to make integrated and balanced policy decisions on all issues that involve interaction of economic and/or social development strategies with

their environmental consequences. Since all activity in the built environment involves an interaction of development and its environment impacts, it follows that any conceptual framework for sustainable building can only exist within the wider framework of sustainable development. Such a framework would be embodied in the structure of a NSDS. This paper reviews the underlying principles of a NSDS developed by the CSD in order to identify the elements that would be contained in a conceptual framework for sustainable building.

1.2. Regulatory activity in Australia's building sector

In response to environmental impacts arising from building development (following actions by some States), the Building Code of Australia (BCA) expanded its traditional scope of safety, health and amenity of building occupants by introducing energy efficiency provisions for residential construction in 2003. Then in July 2004, following a scoping study (CRC-CI 2003), the Australian Building Codes Board (ABCB) announced its intention to further broaden the scope of the BCA by "...prioritising specific sustainability issues, including energy, water, materials and indoor environment quality" (ABCB 2004a:1). The 2006 edition of the BCA has incrementally broadened energy efficiency provisions in both the number of building classes and the stringency levels (performance criteria). A draft 2007 edition of the BCA, released for comment in June 2006, proposes to add 'sustainability' to its existing three goals of safety, health and amenity. To support technical aspects of the code, the BCA cites 'referenced documents', usually in the form of Standards. In January 2006 Standards Australia distributed a white paper, *Sustainability in Buildings* (Blair et al 2006), purportedly to harmonise the work of various existing committees under the general title of sustainability. This paper reviews the BCA energy efficiency provisions, the Standards Australia inquiries, and their claim to be sustainability initiatives.

Under Australia's federal system of government, jurisdiction over division and development of land is vested in the States. A desire by all States to apply uniform technical regulations on building development resulted in a national building code in 1990 whereby the States incorporated the BCA into their legislation. Notwithstanding this action, States retain sovereign powers over building controls by two mechanisms; firstly by the authority to add, amend or delete clauses of the BCA through State appendices, and secondly by including environmental provisions in planning applications, thus pre-empting BCA requirements. This paper reviews the 2006 SA water efficiency provisions as an example of the first mechanism and the NSW building sustainability index (BASIX) as an example of the second.

1.3. Regulatory policy in Australia

The National Competition Policy (NCP) appeared in 1994 as a national strategy to stimulate Australia's international competitiveness by increasing productivity levels, and the National Competition Council (NCC) was established to implement the NCP. The Office of Regulation Review (ORR) and the Productivity Commission (PC) were later formed to reinforce this policy implementation. While ORR's role is primarily one of watchdog and gate-keeper of proposed regulation, PC's role is to actively inquire and research the current climate of Australian productivity and the impact of regulation on business and consumers. The mission of NCC and its agencies is to pursue regulatory efficiency reform throughout the nation; the metric of productivity according to this vision is national economic growth and individual financial wealth.

The Council of Australian Governments (CoAG) is the top intergovernmental body of Ministers in Australia comprising members of Commonwealth, States, Territories and Local Government. It determines and implements policies which require national cooperative action, including the establishment of the ABCB to administer the BCA. Any regulatory proposals falling under the auspices of CoAG are required to conform to its principles, including those set out by the NCP. The principal test for potential regulation is the Regulatory Impact Statement (RIS). A RIS must provide a quantitative analysis which is scientifically rigorous and which demonstrates by way of risk analysis and cost-benefit analysis that the regulatory proposals are the most appropriate instrument to achieve policy objectives. Further, a RIS must address the following issues; 1) need for regulation; 2) regulatory failure; 3) alternative solutions; 4) benefits of regulating; 5) costs of regulating; 6) public consultation; 7) support for regulation and 8) impact on competition. Finally the RIS must be submitted to the ORR to verify compliance.

2. EXAMPLES OF REGULATORY ACTIVITY IN AUSTRALIA

2.1. Building regulation – the Building Code of Australia

The BCA replaced its original prescriptive-based regulatory structure with a performance-based format in 1996 "using several international models (including the New Zealand, British, Swedish and Dutch examples) adapted to suit the Australian building regulatory environment" (ABCB 2002:6). Advantages for adopting this approach were primarily claimed to provide cost savings in building construction by allowing innovation and flexibility in the selection of materials, forms of construction and building design.

Australia has now had ten years' experience applying a performance-based building code, and practitioners long ago identified some areas of weakness which have resulted in limited applications of alternative (performance) solutions. One impediment to greater use of alternative solutions is a gap between the qualitative performance requirements and a verifiable solution due to a lack of quantitative performance criteria. Recent collaborative work between the International Council for Research and Innovation in Building and Construction (CIB) TG37 and the Inter-jurisdictional Regulatory Collaboration Committee (IRCC), which resulted in the *Performance System Model* (PSM), provides a methodology to overcome this weakness (Meacham et al 2002). It is achieved by inserting a performance/risk level after performance requirements followed by quantitative criteria level to support the verification process. PSM has not yet been incorporated into any national building code, including the BCA. A directly related difficulty arises over the lack of available performance-based standards. A separate but equally important issue is that of clarity and intent in the wording of regulatory objectives, which are the foundations upon which the whole performance process stands.

The BCA defines an objective as “an interpretation of what the community expects from buildings”. This definition is contested in the cases of energy efficiency and water efficiency examples reviewed below, where the whole performance process is challenged by arguably inappropriate wording of objectives. Notwithstanding these apparent shortcomings in present code editions, it is considered that a performance-based building code is an indispensable element in the pursuit of sustainable building.

The brief history of Energy efficiency regulations of the BCA can be traced back to Prime Minister Howard’s speech *Safeguarding the future: Australia’s response to climate change*, and the formation of the Australian Greenhouse Office. With regard to buildings and climate change the Prime Minister stated (Howard 1997:9);

The Government will also work with the States, Territories and industry to develop energy efficiency codes and standards for housing and commercial buildings, appliances and equipment. We will expand the Nationwide House Energy Rating Scheme by including a minimum energy performance requirement for new houses and major extensions...

A major focus of the National Greenhouse Strategy released the following year was to limit the growth of greenhouse gas emissions and enhance greenhouse sink capacity (AGO 1998). The 110 page strategy devoted one sentence to residential buildings in section 4.9 which echoed the Prime Minister’s previous statement. When energy efficiency provisions were finally incorporated into the BCA in 2003, the objective was worded “The Object of this Part is to reduce greenhouse gas emissions by efficiently using energy”. Reasoning for this wording was explained in a directions report (ABCB-AGO 2001:20)

This *Objective* focuses on energy efficiency while clarifying the goal. To refer only to energy efficiency could be seen as regulating for the sake of saving fuel or operating costs, which is not an appropriate goal for regulations. It could also discourage innovation in alternative energy technologies. To mandate only for greenhouse gas reduction would depart from the inter-government agreement and could be seen as trying to regulate other greenhouse aspects not intended to be regulated at this time.

The directions report further determined that, because the life of a building’s fabric generally exceeds the life of its services, performance requirements should not permit concessions or trading with more energy efficient services, fuels of differing emissions rates or renewable energy choices. In other words the building’s fabric would be required to ‘reduce energy’ in its own right by achieving minimum performance standards, regardless of any other factors which may contribute to reducing CO₂ emissions. On this basis performance standards were created using simulation software packages to predict the amount of annual space heating and cooling energy that would be required to maintain a theoretical thermal comfort range for occupants in a given climate for various building fabric materials. The results of simulations provided data which enabled the States to determine acceptable cost levels of insulation and glazing, and so determine quantitative levels of performance (on a unit floor-area basis) which were then grouped into a ‘star rating’ system known as the stringency level.

The RIS drafted to justify the regulatory proposals for the current BCA energy efficiency provisions (ABCB 2006) provides insight into the limited focus of these regulations. First a market failure was declared as existing thus ruling out other regulatory options (quasi-regulatory). Other policy instruments (information, education, labelling) were summarily dismissed, as too were taxes, subsidies and tradable property rights, on the basis that they were different policy issues and not within the mandate of energy efficiency (or greenhouse) policy. Submissions which proposed directly targeting greenhouse emissions were rejected, as too were recommendations of the Productivity Commission including; “New or more stringent energy efficiency standards for residential buildings should not be introduced until existing standards have been fully evaluated” (Productivity Commission, 2005: XLVIII). Using AccuRate software to model four house designs in each of the eight BCA climate zones, the RIS applied life-cycle cost analysis to demonstrate a benefit/cost ratio of 1.27 with predicted reduction of 274,686 tonnes of CO₂ emissions. This result was derived using a 6% discount rate over a 40 year building life, however the precision of these figures belies several significant assumptions and data limitations as stated in the 25 page analysis in Appendix A of the RIS.

It is important to understand the function of the rating scheme. It is not meant to predict energy use and energy bills but to give a relative ranking of one house compared to another. The use of rating tools to evaluate regulatory impacts will therefore always require changes to the rating scheme occupancy assumptions. (ABCB 2006:86)

Limited data are available on how Australians actually use their heating and cooling appliances. The most recent comprehensive data are from the 1986.... (ABCB 2006:87)

Given existing information gaps it is not feasible to directly estimate the avoidable cost of the electricity that will be saved by the proposed measures. (ABCB 2006:101)

The BCA often refers to external or ‘referenced’ documents to support particular provisions of the code which would otherwise contain an unwieldy amount of technical detail. Referenced documents typically include Australian regional and international standards as well as industry-based documents. Because they become part of the BCA regulatory framework with potential legal or treaty implications, the ABCB drafted a protocol for the development of referenced documents (ABCB 2004b). In these circumstances, Australia’s responsibilities under the World Trade Organisation (technical barriers to trade) and economic agreements with New Zealand determine the board’s policy preference of international and regional standards over Australian standards, where available.

The protocol informs that the BCA is a performance-based code and stipulates that referenced documents should be either *descriptive* (e.g. materials, products, services, testing) or *design methodology*, these being the current types of documents in the deemed-to-satisfy provisions. It prohibits standards from addressing performance requirements, which are statements representing public policy expressing community expectations on building construction and involve risk assessment. It does however expect them to address “how a material, a product or an assembly is to be designed, manufactured, tested, installed or maintained to achieve a specific level of performance”. While this division is clear, the protocol does not make the final step to say which levels of performance will achieve compliance. Documents which state this may be referred to as *performance statement standards* and the other as *performance specification standards* (Bukowski 2002). While the ABCB reserves authority over performance statement standards, it only prescribes a limited number in the BCA – for example importance of buildings and return periods for wind and earthquake design, and indirectly through the ‘star rating’ system of energy efficiency provisions. This is exactly the gap referred to previously which is addressed in the Performance System Model. Bukowski also reminds that many current standards are not drafted in a way that they could be described as performance specification standards. This and other issues still remain unresolved in the existing stock of Australian standards.

With the unresolved issue of how (performance-based) standards should relate to the performance-based BCA rarely heard in local debate, Standards Australia released a white paper in January 2006 titled *Sustainability in Buildings*, purportedly to harmonise the work of a number of existing committees under the general banner of sustainability. A collection of environmental issues are identified in section-3 of the paper, including water, energy, natural resources, waste generation and pollution and transport. The section opens with the Brundtland report definition of sustainability and promptly misinterprets it with statements as; “In order to create a sustainable building sector, policies to achieve eco-efficiency are required” and “... the initial focus of SA’s sustainability effort will be focused on environmental sustainability aspects”. In a quest to position itself as a national repository of sustainability data and information, and with one eye on the BCA’s impending expansion into ‘sustainability’ issues, Standards Australia (correctly) affirmed its connections to the International Organisation for Standardisation (ISO) and the International Energy Agency (IEA) and therefore its role in disseminating information on this topic. The paper’s reference to the ISO committee’s draft standard on general principles for sustainability in building construction (ISO/CD 15392:2002) is important because it highlights the different conceptual approaches of the two documents. While the ISO committee draft also draws on Brundtland for its definition of sustainability, it specifically falls short of definition with regard to sustainable building, noting that it (sustainable building) should address environmental, social and economic aspects, spatial and temporal relevance, building products and services, building processes and perspectives of concern from stakeholders. Most importantly, clause 5.2 of ISO/CD 15392 is completely at odds with the white paper’s approach when it states;

There are three primary *aspects* of sustainability - economic, environmental and social. They are inextricably linked to each other, are interdependent and to be balanced. They must be considered equally.

The 2006 edition of the BCA Vol-2 contains a new South Australian addition under Health and Amenity provisions (p.597) titled *Water Efficiency*. This requires all new build housing to have a rainwater tank of 1 kL minimum capacity installed and connected to the mains supply (with back-flow prevention), thus typically requiring installation of a pump and controller. The tank is required to be plumbed into either a water heater, laundry or water closet; it is not intended to be a source of potable drinking water. The regulation is purportedly the result of a range of policy measures directed at water conservation as described in the strategy document *Water Proofing Adelaide* (WPA), and framed to address the risk that in the future Adelaide will face more frequent and severe water restrictions. One target of the strategy is to achieve a 25% reduction in per capita household mains water use by year 2025; a joint media release by Premier Rann declared that a 1 kL rainwater tank is predicted to save around 19 kL per year per household. The objective of the measure as stated in the BCA is “to efficiently use all available water supplies”, with a performance requirement that a dwelling “must provide an additional water supply (other than the mains reticulated water supply) which must be plumbed to at least a water closet or a water heater or all the cold water laundry outlets”. The only deemed-to-satisfy provision to achieve the objective is to install a rainwater tank as described above. Unfortunately no requirement exists for a RIS to be produced by the SA Government for regulations introduced via an appendix to the BCA.

Investigation of these provisions (Williamson and Beauchamp 2006) indicates that they would likely fail on at least four criteria of a RIS. For example, a regulatory proposal needs to demonstrate market failure has occurred. In this case a recent survey (ABS 2004) reported that 48% of South Australian households used a rainwater tank as a source of water (almost three times the national average) and 28% had a rainwater tank plumbed into their dwelling. In the South Australian context, household water use represents 11% of all water consumption. It would seem difficult to argue the case for market failure on this evidence. Further, RIS criteria require the benefits and costs of regulation to demonstrate a net economic benefit. Based on the assumption of 19 kL annual household savings and the current higher tier price of water, a household can expect a benefit of about \$ 25.00 per year, whereas the initial cost of the tank and stand, pump and controller, plumbing and electrical work, without considering maintenance/replacement costs, may well exceed \$ 3,000.00, representing a payback period of several hundred years. Not surprisingly, proponents of the regulation claim that net benefits accruing to the community via reduced major infrastructure costs outweigh those of the individual household. However, another criterion of a RIS is to demonstrate that no alternative solutions can achieve the objective. If the true objective is to reduce household water consumption (as distinct from the wording of the regulatory objective), there clearly exist alternative solutions which have not been considered here. For example, garden watering appears to represent 45-50% of household water use, but cannot be addressed by this regulation. It is concluded that the regulations have not articulated either a clear objective for the policy nor stated quantitative performance criteria in order to allow designers to investigate alternative solutions in accordance with the

BCA performance-based structure, and in line with CoAG principles. Research by the author was unable to find evidence that the State water authority knows the amount of water used by households for gardens and outdoors with any degree of certainty. No studies of detailed household water use patterns have been undertaken for Adelaide, and the technical analysis which contributed to the 1 kL tank capacity of the regulations drew heavily on possibly inappropriate data derived from a study of household water use patterns in Perth (Loh and Coghlan 2003).

2.2 Planning regulation – the building sustainability index – BASIX

Whereas building regulation has traditionally focused on construction rules and techniques for the performance of individual buildings regarding safety of structure and fire as well as design and construction methods, planning and development regulation has traditionally been concerned with the impact of buildings in their urban setting – zoning of building use types, intrusion on neighbouring buildings, context in the streetscape and desired urban character.

However, with growing public awareness of environmental issues and potential political opportunities at both Local and State government levels, planning and building regulators now compete for the role of prescribing controls over the environmental impact of new buildings. All Australian States define the role of Councils in a Local Government Act, and some States incorporate sustainability as a responsibility of Councils in the Act itself. Most States delegate authority for assessment of planning applications to Councils. In addition, some States have absorbed their building (BCA) staff into and under control of their planning departments. A combination of these circumstances creates the potential for a diverse range of specific environmental regulations independently of BCA regulations.

The New South Wales Government introduced energy and water consumption controls on residential development applications through its Department of Infrastructure, Planning and Natural Resources (DIPNR) in July 2004. These controls resulted from a State Government policy targeted to reduce the annual consumption of household energy and mains water usage for all new dwellings by 25% and 40% respectively. From that time till now the system has grown increasingly more complex in methods, options, building types and variable increases in stringency levels for energy. Since the measures are regulated at the planning stage of a building application, they pre-empt equivalent regulation of the BCA. The regulations apply State-wide, using an interactive website for project submittals.

In simplified form, a BASIX application requires the applicant to complete four pages about the application, two relate to water and two relate to energy. The first water-page addresses outdoor water use and landscape, the second is for indoor usage. The first energy-page is for thermal comfort (predictions of space heating/cooling loads as required by BCA energy efficiency provisions), the second is for fuel source of various appliances and appliance type to determine energy consumption to estimate CO₂ emissions. The methodology for BASIX provisions (DIPNR 2004) is based on classifying the existing housing stock (e.g. into 2 or 3 bedroom detached houses etc.) and collecting statistical data for each type including occupancy numbers and both energy and water consumption. The likely types energy and water appliances, fittings and fixture that exist in these dwellings is then determined by 'market penetration' or relative sales of the various types. These sets of statistical averages then became the benchmarks against which new building applications would be evaluated. For example, knowing that a 3-bedroom house has a statistical average of 2.9 occupants, and that the average person uses the toilet 2.6 times per day, and the average litres per flush based on the market penetration of various star rated toilets, one can calculate the benchmark volume of water consumed by a toilet in a 3-bedroom house per day. Then if the nominated toilet in the application consumes less than the benchmark volume, points are scored. Following this process for all water uses the application is successful if more than 40 points are scored. A further assumption involves distribution of water use among consumption activities (i.e. x% water used for showering, y% for toilets, z% for kitchen etc.). A similar process is applied for energy.

Unfortunately the base data and statistical analyses which constitutes much of the methodological background, is not available in the public realm, so there is no opportunity to scrutinise the method. Further, there has been no announced strategy for post occupancy evaluation studies to validate the method. The same limitations apply to South Australia's water tanks and their predicted 19 kL annual water savings.

3. FROM GLOBAL PRINCIPLES TO REGULATORY APPLICATION – THE PROBLEMS

3.1. A global perspective of sustainable development

Basic principles of sustainable development are clearly outlined in the Brundtland report and have been repeated and strengthened in subsequent Rio and Johannesburg world summits and ongoing work of the CSD. Brundtland's report started with the vision that all human beings, now and in the future, have the right to a healthy and prosperous life in harmony with nature, and that the conditions for such development are a balanced combination of economic growth, socio-cultural equity, and sufficient natural resources to sustain it. The report observed that at present there are massive global imbalances in poverty, population and the consumption of natural resources, which clearly showed that the present path of development was not sustainable and could not achieve the vision, because matters of development and matters of the environment have been dealt with based on separate and often competing goals. To achieve the vision, it reasoned that another path was needed; one by which development strategies would be integrated and balanced with their environmental consequences. It concluded that, because each country has its own unique historical, socio-cultural, political, ecological and economic identity, the global strategy could only be achieved by individual nations developing and implementing their own strategies. Both Agenda-21 and the Johannesburg Plan of Implementation called on nations to undertake this new development path.

3.2. National sustainable development strategies

Slow and erratic uptake to this challenge by nations prompted the CSD to produce a comprehensive set of guidelines for preparing their NSDS (UNDESA 2002). The guidelines, introduced at the 2002 Johannesburg Summit, stressed an important shift in the perception of sustainable development from its early emphasis on environmental protection to the integration of environment policy with economic and social development strategies.

These UN Guidelines summarise the work of ten years evaluating the experiences of many nations which attempted to implement NSDS's, noting both positive and negative outcomes. They concluded that there is no blueprint for a NSDS, and that it cannot be a separate or parallel strategy alongside existing economic and social strategies but one which integrates existing policies and processes according to sustainability principles. Overall evaluations indicated that the most successful national strategies contained common elements or *underlying principles* which distinguished them from less successful strategies. These principles are; 1) national ownership and strong political commitment; 2) integrated economic, social and environmental objectives across all levels of government and sectors; 3) broad participation and effective partnerships; 4) developing capacity and enabling environment; 5) focus on outcomes and means of implementation (UNDESA 2002:2). Examples of these elements can be found in the NSDS of some countries including the UK and Switzerland. National ownership creates a sense of relevance and so encourages participation at business and community levels. Political commitment is critical at Commonwealth State and Local levels, not only as a leadership signal but also because this is where (integrated) policy is formed and institutional reform is established. Integration of development and environmental policy, applied and also integrated both vertically from local communities through State to Commonwealth government and horizontally across all economic sectors, creates unified approach and common purpose. Public participation is seen not only as a prerequisite to sustainable development and so making the political process legitimate, but also as a basic principle of social equity. It implies much more than public consultation, and includes public negotiation of preferences and tradeoffs, conciliation and consensus-building processes. A strategy which focuses on outcomes is able to set short and long term targets and monitor progress, so encouraging participation. An essential element of a NSDS is that, it be implemented by an independent council or commission, in much the same way as the NCC.

The ongoing operational process of implementing and maintaining a NSDS may be summarised in simple terms as; setting and integrating *policy*, stating policy *objectives* and *targets* to achieve the objectives, defining *indicators* to measure progress toward targets, a methodology for *monitoring* and *evaluating* trends, a method of regular *reporting* (especially to the public), a feedback loop to adjust policies, targets or indicators, and an *auditing* regime to assess performance of the operational process. Such a process structure is dynamic and is able to respond to the basic nature of sustainable development, including uncertainty (political, environmental, economic and social change) at various spatial (national, state, regional, local) and temporal (short-, intermediate- and long-term) scales. A similar operational process is applied in the ISO 9001 *Quality Management Systems* (QMS) for corporate entities which supply goods or services to customers, where the purpose is to strive for continual improvement in its delivery of services leading to increased customer satisfaction. ISO 14001 *Environmental Management Systems* (EMS) employs the same methodology, as does the Australian Standard AS 8003-2003 *Corporate Social Responsibility* (CSR).

3.3. Australia's national strategy for ecologically sustainable development (NSED)

Australia's NSED was developed around the time of the Brundtland report in the late 1980s, implemented in 1992, and has never since been substantially reviewed in light of major perceptual shifts in the concept of sustainability. Indeed the very title alludes to this by continuing to retain the adverb 'ecologically'. The NSED was prepared ten years before the UN Guidelines, and while it contains much valuable information on environmental policy, it exhibits clear shortcomings both in structural and operational elements and fails to meet the benchmark of the UN Guidelines in several basic aspects.

3.4. Problems for the regulatory approach

From the position that sustainability requires an integrated national approach to all policy implementation involving development which impacts on the environment, and that the approach requires coordination through all levels of government and across all sectors of the economy, it is difficult to envisage a framework for sustainable building that is not embedded in that structure. It then follows that until a robust NSDS is developed and implemented, dimensions for a sustainable building strategy cannot be adequately defined. Although instinctive concerns by both educators and practitioners about the impact of building activities on depleting natural resources and increasing emissions and waste are quite correctly held, lack of a national strategy prevents an adequate framework for the building sector's contribution to these environmental issues being identified in relation to their social and economic impacts, where financial and human resources should be focused, and how they should be balanced against social equity issues (e.g. affordable housing, shifting demographics of aging population, lower household occupancy rates and increasing dwelling size) in the national economy. A NSDS provides the tool for informed policy decision making, and one which could possibly set the building sector on quite a different development path to the existing one.

Whilst climate change and water conservation (the apparent focus of current building regulation) are global issues, they do not occur in a vacuum, isolated from other components of ecological and social systems. Some degree of risk of undesirable outcomes must result from treating such systems in isolation. An effective regulatory approach to sustainable building would therefore need to account for the complex nature of connected natural phenomena and at the same time evaluate social and economic policy impacts simultaneously, requiring application of multiple criteria decision making tools and trade-off evaluation methods. The inherent legal limitations imposed on regulatory drafting (including performance-based) to address these principles together with the administrative and legal complexities of assessing building applications (and their subsequent enforcement) suggests that any regulation having the stated objective of sustainability is making a very problematic and contestable claim.

6. DISCUSSION

The examples described above clearly address specific environmental issues (in isolation) including non-renewable energy consumption and domestic water use, and potential issues of natural resources and generation of emissions and waste in the building sector context. Apart from the RIS of energy efficiency regulation, there is no evidence to show that these measures have considered the economic or social consequences of their environmental controls. Such approaches are contrary to a basic principle of sustainability which requires balancing environmental policy and development strategy. The examples also place almost all of their regulatory burdens onto new home buyers, and provide no alternatives in the case of disadvantaged groups, contrary to another basic sustainability principle of social equity. Evidence from the RIS of energy efficiency regulation shows that benefits and costs are determined on corporate financial principles, where cost is equated to the additional construction costs of insulation, glazing etc. (the cost of the regulation) whereas benefits are measured only in terms of contestable (predicted) reduced energy bills. No benefit or cost measured in terms of Commonwealth or State social policy appears in the accounting.

NCP requires of regulatory policy that it be framed to promote national economic growth and individual financial wealth, contrary to the sustainability principle which requires economic, social and environmental considerations of issues be integrated and balanced when forming policy. Since the NCP (and the RIS required of building regulation) demands no compulsion to address environmental and social consequences of economic policy in a balanced and integrated way, it is concluded that Australia's policy on regulation is drafted in a form which seriously limits its capacity to pursue sustainable development in a meaningful way.

Australia's regulatory-making system requires the proposer of regulation to prepare the regulatory impact statement which is then reviewed by the ORR for regulatory compliance. This process is contrary to a principle of sustainability which requires both policy and its instruments to be determined by a group or council of proposers representing the environmental, social and economic aspects of the proposal. In this sense the failure of Australia's NSESD may in part be attributed to its development and implementation being managed by a single Commonwealth department. Similarly, the singular role of the ABCB in assessing the suitability of 'sustainable building' regulation is also contrary to this sustainability principle. It further indicates that any council for sustainability which would administer a NSDS would be on a policy collision course with NCC under present conditions. This situation may have contributed to the demise of the Intergovernmental Committee on ESD which reported only once to the heads of government in 1996 on progress of the NSESD before it was dissolved.

Energy efficiency regulations demonstrate how a broad national policy targeted to reduce greenhouse gas emissions has been diminished, in the case of residential buildings, to little more than an exercise in building physics of predicting heat flows, solar gains and passive solar principles. The extent to which these regulations contribute to the reduction of CO₂ emissions is unknown since the objective of the regulations permits little in the methodology to address emissions, and no post occupancy evaluations have been undertaken to verify or falsify the predictive simulation models. After three years of application the regulations have taken on a life of their own and spawned a burgeoning consultancy industry specialising in software application for building certification. Progress in the field now consists of tweaking the simulation models, adding increasing regulatory complexity and cost to the process. Wording of the original political policy announcement, which followed into the National Greenhouse Strategy and finally into the regulatory objectives, may well account for this outcome. Likewise, wording of the objective in South Australia's water efficiency regulation appears unnecessarily restrictive and convoluted to an observer anticipating water saving measures in accordance with the Water Proofing Adelaide strategy. It is only after reading the strategy document and finding that rainwater tanks are not mentioned anywhere in the voluminous discussion that a different reason may be ascribed to wording of the regulatory objective. These actions clearly contradict several sustainability principles, and it therefore seems reasonable to ask questions of the relationship between political intent and regulatory objectives in the case of these environmental issues.

Competition between the national building code and the States to regulate environmental issues in respect of building development is another example which is contrary to the sustainability principle which require vertical integration of policy starting from local communities through to Local, State and Commonwealth government levels. UN Guidelines recognise the special challenges faced by federal systems of government yet conclude that there must be a will by all parties to overcome these obstacles. The sustainability principle of political commitment addresses this issue. Twenty years ago the Australian States expressed a common desire to create nationally uniform technical provisions for their building codes. Today it is clear that they do not have the same common desire with respect to environmental control of buildings.

In the same sense that sustainability requires vertical integration at local, state and national policy making scales, it also requires horizontal integration across industry, business and community sectors, and balance across economic sectors. This necessitates that any move toward sustainable building would require that it understand its contribution, relative to other sectors, to the nation's overall environmental, social and economic performance. Groundbreaking data provided in *Balancing Act* (CSIRO 2005) may well provide a valuable starting point for this. Such a process is needed to accord with the sustainability principle of balance between environmental social and economic aspects so that resources are used where impacts are greatest.

CONCLUSION

Australia's commitment as a nation to embark on a path of development which will provide future generations the opportunity to live a healthy, prosperous life in harmony with nature, as we do, depends on our actions. We already have the knowledge and resources to pursue a nation-wide course of sustainable development. While the principles of sustainable development are at hand, the examples in this paper suggest that the greatest impediment to progress

is connected to political awareness or intent and misleading regulatory labels of sustainability. In such circumstances no amount of regulatory intervention at State or Commonwealth level claiming to address sustainability is likely to be effective, and no substantial framework for sustainable building is likely to evolve. It is therefore concluded that the only way to move toward sustainable building in a meaningful way is for educators and practitioners of architectural science to lobby for an effective Australian National Sustainable Development Strategy – with a very loud voice.

ACKNOWLEDGEMENTS

The author acknowledges and thanks Dr. Terry Williamson and Dr. Veronica Seobarto for their ongoing support and guidance.

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