

THE WASTE COMPONENT OF “SUSTAINABLE BUILDINGS” – VOLUNTARY OR MANDATORY?

Jenny CAMPBELL¹

¹ Encycle Consulting Pty Ltd, Perth, Western Australia, jenny@encycle.com.au

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Summary

Several planning and building regulatory bodies throughout Australia, including federal, state, territory and local governments are well on the way to implementing mandatory sustainability requirements for energy and water into their planning and building processes.

However, there are currently no national and few state or territory Government or industry regulations specifically requiring new or existing buildings to comply with any sustainable waste management and recycling requirements. A small number of state and local government authorities require particular sustainability assessments for residential and non-residential planning applications, including the need for a waste management plan for either or both the construction and operational phases of the building.

National voluntary rating tools such as Green Star and the recently released National Australian Building Rating System (NABERS OFFICE Waste) are useful for measuring waste generation and diversion from landfill, and comparing performance against benchmarks for a range of building typologies.

This paper identifies current Australian mandatory and voluntary sustainability assessment tools for buildings that include a waste management component. The waste and recycling requirements of the tools are compared and the need to regulate the building industry to achieve state-based waste minimisation targets is discussed.

1. Introduction

According to the Green Building Council of Australia (GBCA), the impact of buildings on the environment is significant. Reportedly, activities around buildings consume 32% of the world's resources including 12% of its water and up to 40% of its energy. They also produce 40% of waste going to landfill and 40% of air emissions (GBCA, 2003).

These figures are likely to vary from region to region, and in Western Australia for example, the waste to landfill from the construction and demolition of buildings is actually above average. A recent study undertaken for the Commonwealth Department of Environment and Heritage revealed that in Western Australia up to 55% of all waste to landfill (compared to 34% across other states) is derived from the construction and demolition sector (Hyder Consulting, 2006). It should also be noted that waste from buildings during the operational phase (classified as commercial & industrial waste) continues to contribute waste to landfill for the remainder of the life of the building.

The Basel Convention defines wastes as "substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law" (Basel Convention, undated). The generation of waste represents poor use of resources which are not just limited to the materials used in the product, but also the energy and water consumed during the process of extracting natural resources and in manufacturing and transportation.

The environmental impacts from landfills are significant and while existing landfills are filling rapidly, new landfill sites are becoming less available. Landfills are also a source of greenhouse gases (mostly methane) that contribute to climate change. By diverting waste away from landfill to recycling there is potential to save significant tonnes of greenhouse gases. The savings would be derived from not only the reduced production of landfill gas, but also the reduction of lost embodied energy in the resources. Embodied energy is defined by the total life cycle energy used in the collection, manufacture, transportation, assembly, recycling and disposal of a given material or product (Greater London Authority, 2008).

Federal and State Governments are working with local governments (who manage municipal waste and own a large number of Australia's landfills), industry and the community on strategies to avoid and reduce the generation of waste, recover the waste that is generated and appropriately manage landfills.

Most of Australia's state and territory government's waste management policies include targets for reducing waste to landfill. In Victoria for instance, Sustainability Victoria through its *Towards Zero Waste Policy* has committed to a target of reducing the amount of waste to landfill from 4.2 million tonnes (2007/08) to 2.44 million tonnes by 2014. It is also aspiring to the recovery of 75% of the total amount of waste generated for reuse, recycling or conversion to energy by 2014 (Sustainability Victoria, 2007).

South Australia in its *Zero Waste Strategic Plan* has set a target of reducing waste to landfill by 25% by 2014 (using 2002/03 data as the baseline) (Zero Waste SA, 2005).

For New South Wales, the Department of Environment and Climate Change in its Waste Strategy 2007 states targets for recycling of commercial and industrial waste from its baseline of 28% to 63% by 2014 and construction and demolition waste from the 65% baseline to 76% by 2014 (DECC NSW, 2007).

Whilst there is a significant amount of waste produced from buildings (both in their construction and operation) producing the associated impacts on climate change and the rapid filling of landfills, there is a disconnect between state and territory governments who are actively seeking waste reduction target achievement and the inclusion of buildings in any waste reduction regulatory requirements. It appears that the few localised mandatory sustainability requirements set by a small number of organisations and the voluntary building rating tools are the main drivers for encouraging a reduction of waste to landfill from buildings.

2. Existing mandatory state and local government and voluntary national waste management and recycling requirements

National mandatory requirements pertaining to recycling from construction sites or from operating buildings currently do not exist. However in some Australian States, such as Victoria and Western Australia several state and local government organisations include mandatory waste management and recycling requirements in their planning and development application process. Listed in table 1 are some of the mandatory sustainability requirements set by five organisations. Table 2 lists the three national voluntary rating tools.

Table 1 List of mandatory sustainability assessment tools and/or guidelines for the built environment and their key waste management and recycling requirements.

Organisation and name of tool or guideline	Key waste management or recycling requirements
VicUrban – <i>Melbourne Docklands ESD Guide</i> (2006)	<ul style="list-style-type: none"> • Provision of recycling facilities in all new developments • No recycling performance targets stipulated
Manningham City Council – <i>Doncaster Hill Sustainability Guidelines</i> (2004)	<ul style="list-style-type: none"> • Waste management and avoidance plans required for construction and operational phases • Waste management design strategy • No recycling performance targets stipulated
Moreland City Council – <i>Sustainable Design Scorecard</i> (2005)	<ul style="list-style-type: none"> • Waste management design strategy • Construction phase waste management plan with a 60% recycling performance target • No operational phase recycling performance targets stipulated
Department of Sustainability and Environment Victoria – <i>Environmentally Sustainable Design and Construction Principles and Guidelines</i> for Victorian Government departments (2003)	<ul style="list-style-type: none"> • Waste management design strategy • Construction phase waste management plan with a 90-95% recycling performance target • Operational waste management plan with a 80% recycling performance target
Armadale Redevelopment Authority, Western Australia – <i>Sustainable Audit Scorecard</i> (2003)	<ul style="list-style-type: none"> • Operational phase recycling strategy with a 50% or 75% recycling performance target • No construction phase recycling targets stipulated

Table 2 List of national voluntary rating tools for the built environment and their key waste management and recycling requirements

Organisation and name of tool or guideline	Key waste management or recycling requirements
Green Building Council of Australia: Green Star – Office Design v3 Green Star - Office As Built v2 Green Star - Healthcare (Pilot)	<ul style="list-style-type: none"> • Awards innovation • Waste management design strategy • Construction phase waste management plan with a 60% to 80% recycling performance target • No operational phase recycling performance targets stipulated
Green Star – Office interiors v1	<ul style="list-style-type: none"> • Waste management design strategy • Fit-out phase waste management plan with a 40% to 80% recycling performance targets • No operational phase recycling performance targets stipulated
Green Star – Office Existing (Extended pilot)	<ul style="list-style-type: none"> • Commitment to waste reduction/recycling monitoring and landfill disposal targets • Demonstrate recycling storage area
Green Star – Education (pilot)	<ul style="list-style-type: none"> • Waste management design strategy • Construction phase waste management plan with a 60% to 90% recycling performance target
Green Star – Shopping Centre (pilot)	<ul style="list-style-type: none"> • Waste management design strategy • Construction phase waste management plan with a 60% to 80% recycling performance target • Operational phase waste management plan with annual non-prescribed waste reduction targets.
National Australian Built Environmental Rating System - NABERS OFFICE Waste	<ul style="list-style-type: none"> • Applies to operational phase of offices only • Very detailed ongoing assessment and analysis, monitoring and performance based.
Urban Design Institute of Australia (UDIA) Qld - EnviroDevelopment (currently under development in WA, SA and Vic)	<ul style="list-style-type: none"> • Waste management design strategy • Construction phase waste management plan with a 40% minimum recycling performance target • No operational phase performance targets stipulated • Mainly applies to multi-residential developments
Sustainability Community Rating (VicUrban) <ul style="list-style-type: none"> • Urban Renewal Community v2007 • Master Planned Community v2007 • Provincial Community v2007 	<ul style="list-style-type: none"> • 90% of infrastructure and building construction and demolition waste to be recycled and or reused.

These case studies show that use of waste management plans and target-driven requirements is achievable and can produce positive outcomes. Ultimately, these requirements will only prove effective if there are mechanisms for ensuring that waste management plans are actually adhered to on construction sites and during the building's operations. Sound data collection, recording and reporting systems are crucial elements in the ability to measure performance, and such systems are not always easily implemented. Data collection is discussed further in section 3.

3.1 How do waste management requirements in these tools compare?

Tables 1 and 2 provide a summary of the types of sustainability assessment tools and guidelines that exist today for the built environment. This includes those mandatory, location-specific requirements and the national voluntary programs. It can be seen that mandatory waste management requirements only apply to those few locations in Victoria and Western Australia. The organisations that have developed and/or implemented them should be regarded as leaders in incorporating sustainability requirements, including waste management and recycling, into their planning application processes.

Table 3 sets out the phase of a building's lifecycle each tool applies. As can be seen only 3 tools include waste management requirements for each phase of the building (design, construction and operational).

Table 3 The building phase or phases to which each tool applies

Organisation and name of tool or guideline	Design phase	Construction phase	Operational Phase
Armadale Redevelopment Authority WA Sustainability Audit Tool (Mandatory)	x	x	✓
Doncaster Hill Sustainability Guidelines (Mandatory)	✓	✓	✓
EnviroDevelopment (Voluntary)	✓	✓	x
ESDC Guidelines Vic Government (Voluntary)	✓	✓	✓
Green Star - Office Design v 2, Office As Built v 2, Healthcare (Pilot) (Voluntary)	✓	✓	x
Green Star - Office Interiors v 1 (Voluntary)	✓	✓	x
Green Star - Office Existing (Extended Pilot) (Voluntary)	x	x	✓
Green Star - Education (Pilot) (Voluntary)	✓	✓	x
Green Star - Shopping Centre (Pilot) (Voluntary)	✓	✓	✓
NABERS OFFICE waste (under development) (Voluntary)	x	x	✓
Sustainable Community Rating (Voluntary) Master Planned Community; Urban Renewal Community; Provincial Community	x	✓	x
SDS (Mandatory)	✓	✓	x
VicUrban Melbourne Docklands ESD Design (Mandatory)	x	x	✓

3.1.1 Mandatory tools and guidelines

It is important to understand the objectives of each tool and guideline before comparing their functional differences. For instance the guidelines developed for the Melbourne Docklands precinct, Doncaster Hill precinct and Victorian Government Departments all aim to inform stakeholders of the ecological sustainable design principles, frameworks and practices for their respective development areas. Both the Melbourne Docklands and Doncaster Hill frameworks are bound by policy and are incorporated into the planning and development application process.

The Guidelines for Victorian State Government departments are not incorporated into any local or state authority planning process, but rather are designed to be incorporated into the tender process for capital works. There is a high risk that the principles may not be included as there does not appear to be a mechanism that enforces their inclusion throughout the tender process, building design, construction and operation. Further these Guidelines specify that a voluntary rating tool be used to provide an environmental impact rating for the building. This would only apply if the development was an office, healthcare or education facility.

In comparison to the three sets of guidelines the mandatory assessment tools developed by the Armadale Redevelopment Authority (ARA) and the City of Moreland provide a basis for calculating a numeric score against the level of sustainability a building is predicted to achieve. While the tools specify performance requirements to be met, there is no mechanism for checking whether the development actually achieved the predicted performance targets once the building has been constructed. Furthermore, the assessment tools focus on two different phases of the building. The ARA tool focuses on waste from the operational phase, while the City of Moreland tool, the Sustainability Design Scorecard (SDS), only applies to the construction phase of the development.

This demonstrates that the tools used in different parts of Australia are not comparable and the data from the performance targets (if collected from each development and aggregated) are unlikely to be meaningful on a national level. Furthermore, the mandatory assessment tools and guidelines that exist today have been developed for a range of purposes and for a specific group of buildings i.e. Victorian Government, Melbourne Docklands or Doncaster Hill precincts.

3.1.2 Voluntary assessment tools

The national voluntary rating tools are also selective in the types of buildings in which the tools apply. There are Green Star tools that apply to offices, health care facilities, education facilities, shopping centres, multi unit residential and mixed use developments. The National Australian Built Environment Rating System (NABERS) only applies to buildings that are offices while EnviroDevelopment seems to only applies to multi-residential developments in Queensland, although the UDIA in other states such as Western Australia, South Australia and Victoria are looking to adopt similar models.

VicUrban, the Victorian Government agency for sustainable urban development, has initiated in partnership with industry the Sustainable Community Rating. While three tools have been developed (Master Planned Community, Urban Renewal Community and Provincial Community), only the Master Planned Community tool has been road tested (Sustainable Community Rating, 2007).

While there is a small amount of overlap with mandatory tools in terms of the geographic locations in which they apply, the voluntary national tools can generally apply to certain commercial building typologies in any location. This increases the number of buildings within Australia that are able to adopt the rating tool and proactively drive the reduction of waste to landfill. The EnviroDevelopment and Sustainability Community Rating tools can apply to communities located anywhere in Queensland and Victoria, respectively and the tools cover mainly residential developments and in Victoria, mixed use developments. The way Green Star tools are designed to award innovation is a clever way to encourage the building and property industry to think of alternative ways for a building to function so as to minimise its impact on the environment. By awarding points for adequate recycling storage and collection access, it encourages designers to focus on the practical issues of waste management and recycling. Many existing buildings are restricted in their ability to recycle simply because there is not the space to store recycling bins, balers and other waste handling equipment.

The Green Star tools also award points for incorporating building materials with recycled content. This is another very positive aspect to the tool that helps to drive the demand for recycled building products by providing a 'pull' along the recycling supply chain. Supporting the end markets and in turn, the whole recycling industry, makes it easier for construction sites overall to recycle.

A downfall of the waste management aspect of the Green Star tools is the component that specifies performance recycling targets at the construction phase. As the tool is a predictive one, there is no mechanism to actually check that the predicted target was actually achieved and it may be questionable as to how appropriate the recycling practices and systems in place actually are once the construction phase is underway.

Another concern with the Green Star tool is the fact that credit points relating to waste management and recycling within the tool are optional. Obviously buildings that wanted to achieve a higher rating would need to comply with the criteria, but it is not essential for every Green Star rated building.

Furthermore, it has been observed that there are problems with recording and reporting data to enable performance to be measured. For instance, in Western Australia anecdotal evidence suggests that some recycling companies do not have the means for recording the weight of materials from individual building sites (in most cases weighbridges are not installed at recycling facilities) and the composition of mixed loads of recyclables would need to be known before the volume can be converted to weight.

In addition, it appears that little effort is put into setting up robust data recording mechanisms for individual construction sites. It is acceptable under the Green Star Office Design & Office As Built v3 tools for those projects who engage a recycling contractor to sort and recycle construction waste on the project's behalf, and does so on a bulk basis instead of a project basis, to use the recycling facility's average recycling rate for the total material that comes through the gate. The recycling contractor is required to provide this evidence (GBCA, 2008). Although useful, this information is not accurate for individual construction sites, who may or may not benefit from such a method.

The recycling rate methodology and data collection mechanism is something that should be incorporated into any waste management plan, to ensure that only contractors who are able to provide the necessary data are employed to collect and recycle the material.

3.1.3 Comparison between mandatory and voluntary guidelines and tools

When comparing mandatory tools with voluntary tools, in all cases except for the Moreland City Council SDS tool, there are no specific recycling performance targets for the construction stage in the mandatory tools. In comparison, voluntary tools provide more exacting targets that provide credibility but can be off-putting to developers and planners perhaps due to the difficulties in obtaining accurate data and reporting performance.

While the requirements for each guideline or tool vary there are some similarities. In the design phase many tools require either a waste management plan and/or dedicated storage area to be incorporated into the project. Construction waste management plans are a requirement of all tools and guidelines that do actually include the construction phase in the assessment.

However, very few of the tools actually specified what should be included in a waste management plan. They also fail to provide a methodology for evaluating the recycling performance, including recording and reporting systems. A little more detail of such requirements would allow for a more standardised approach and ensure that the plans were not only meaningful and useful but had the ability to be compared in a consistent manner.

One general observation is that the waste management components of the mandatory tools are usually less onerous and specific than the requirements of voluntary rating tools. For example, the *Doncaster Hill Sustainability Guidelines* (2004) in Victoria require on-site waste management separation and recycling during the construction phase, with no specific targets, while the voluntary Green Star - Office Design v3 tool requires a waste management plan and contract provisions to reuse and /or recycle from 60% to 80% of construction waste by weight.

Overall, there is greater focus on the waste minimisation aspects of the construction stage of buildings than the operational phase. Further, the waste performance measures for the operational phase of buildings are where there is the widest variation in performance across the tools. Except for NABERS Office Waste, the waste requirements range from having a “commitment to recycle”, to education programs, to percentage targets, to waste management plans. The NABERS Office Waste tool is clearly the most comprehensive tool in terms of operational performance; however, it is only limited to the Building Code of Australia class 5 office buildings.

It is important to note that the effectiveness of recycling systems during the operational phase relies heavily on the design of the building. However, there should be just as much emphasis placed on the requirements of operating waste management plans, including the need to meet recycling targets.

In saying this, the ARA tool specifies targets such as either a 50% or 75% recycling rate of the total waste stream from the operational phase of buildings but fails to state whether this is by volume or weight, an important factor when it comes to determining whether or not compliance was or was not achieved. It is important to note here that mass is the standard unit of measure for waste and if this is not stipulated in the guidelines, there is potential for waste to be measured by volume. While volume can be converted to mass (if the composition of the waste is known), it is necessary to ensure that data is recorded accurately by using a consistent unit of measure.

Finally, many of the tools could be strengthened by requiring or providing evaluation tools for ongoing reporting of criteria such as recycling rates or achievement of waste minimisation targets, particularly if standardised against other similar buildings to allow owners continued opportunities to show off their environmental credentials.

3.1.4 The need for a national mandatory approach

As waste from the demolition and construction sector contributes approximately 34% of all waste to landfill in Australia (and in some states, significantly more) (Hyder Consulting, 2006), stakeholders within the industry should firstly be required to meet standard proportional recycling targets for all new and existing buildings. Consistency in performance requirements will then help to drive markets for recycling of building materials. By also incorporating standard proportional use of building products containing recycled materials in the construction of new buildings, recycling markets will continue to grow and develop.

An example of where this is already occurring is in the United Kingdom. As from April 2008 it is a legal requirement for construction sites in England to have a formal Site Waste Management Plan (SWMP) for developments over £300,000 and for those over £500,000 a more detail plan is required (Building Research Establishment, 2008). Implementation is enforced by both local authorities and the Environment Agency. The United Kingdom’s Building Research Establishment (BRE) has developed a free software tool for preparing, implementing and reviewing a SWMP. This tool is called SmartWaste Plan and helps manage all aspects including the creation of a SWMP to measuring and reporting waste generation.

BRE’s *Code for Sustainable Homes* also requires the mandatory use of a SWMP (BRE, 2008). The Code came into effect in May 2008 and to satisfactorily comply with the Code, compliance assessments conducted both at the design phase and at the completion of construction must be successful. A final assessment certificate is issued upon compliance.

The United Kingdom’s regulatory model shows that it is possible to prescribe national waste management requirements for building sites and that they can be readily enforced. This type of model should be considered when investigating suitable options for Australia.

It is imperative that any national Australian approach includes, like the United Kingdom model, a mechanism for ensuring compliance as well as verifying performance. The data to prove performance must be collected in such a way that it will enable data to be aggregated on local, state and national levels. This will enable governments to more easily and accurately determine the effectiveness of waste reduction and climate change policies and achievement of targets, particularly for reduction of total waste to landfill, the quantity of construction and demolition waste generated and proportion of construction and demolition waste recycled. It will also help to highlight opportunities for improvement in the future.

The consistency in requirements will help the building and property industry develop standard waste management plans with standard data collection and reporting requirements for individual building sites. This information will enable building owners, developers, construction companies to report aggregated recycling performance rates to interested parties. This data will also be critical for large building companies to comply with greenhouse gas reporting obligations, such as the National Greenhouse Energy Reporting System, who would also be keen to demonstrate and promote the tonnes of CO₂ equivalent they have saved.

4 Conclusion

Current and proposed sustainability legislation for buildings ensures consistent standards are required to be met for energy and water in new homes and some commercial buildings. Holistic sustainability requirements for other building typologies across Australia are *ad hoc*, with some state and local government organisations in Victoria and Western Australia leading the way in requiring new developments to incorporate sustainability into the design at the planning stage of projects.

The waste minimisation requirements in both mandatory and voluntary assessment tools vary across the design, construction and operational phases of buildings. Voluntary tools such as Green Star and NABERS Office Waste require more rigorous performance requirements than mandatory tools. The waste components in the mandatory tools tend to be vague and performance requirements largely non-specific. Furthermore, processes for checking compliance and/or actual performance once the buildings are constructed appear to be lacking in the majority of the tools.

The voluntary tools go some way toward specifying meaningful waste minimisation performances in the design and construction phases of buildings, but the waste management components within tools such as Green Star do not necessarily have to be met in order to become a Green Star rated building. Further, the tools only apply to certain building typologies and no tools address waste minimisation on single residential building sites.

While the waste management and recycling requirements within the few mandatory sustainability rating tools for new and existing buildings are varied, the organisations who prescribe the conditions should be commended for at least incorporating them. The voluntary tools with their more onerous waste management requirements are also a great step in the right direction. However, those buildings located within a geographic region whose local authority does not require waste-related sustainability requirements or whose owner has not prescribed an aspiration for the building to meet any voluntary sustainability status or branding, are unlikely to assist state and territory governments to achieve their demanding waste to landfill reduction targets.

Therefore, the introduction of consistent mandatory requirements for waste minimisation into sustainability tools for buildings, or separate legislation, will be of paramount importance in achieving some of the goals of many state government policies. This would also be instrumental in assisting the development of localised recycling markets, which in turn could result in a greater range of building materials with recycled content for use in new buildings in the future.

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