



Environmental Sustainability: Waste / Water / Energy

Overview

Environmental Sustainability refers to ecologically beneficial actions, such as waste minimisation and water and energy efficiency, which contribute to using resources more wisely and reducing our ecological footprint. During the construction phase, this involves careful selection of materials and management and minimisation of waste through recycling and re-using natural resources and materials where possible. One way to ensure a sustainable approach to building is to undertake a life-cycle assessment and consider the whole life of products and materials being used (for further information see: [1] [2]).

A sustainable approach to site selection is also required that ensures protection of native flora and fauna, minimises impacts on wildlife habitats, respects cultural and landscape heritage and recognises opportunities for re-development within growth boundaries [3].

It is important to provide opportunities for efficient waste, water and energy management once the building is occupied, which is the focus of this factsheet. Environmental sustainability for post-occupancy may involve a range of initiatives such as providing recycling bins for residents; installing water efficient appliances and fixtures within dwellings and building common areas; infrastructure for the generation of renewable energy; planning garden spaces with limited need for watering; and designing dwellings for daylight, natural air-flow and passive heating and cooling to reduce reliance on artificial lighting as well as mechanical heating and cooling (e.g. air-conditioners).

Liveability benefits of improved environmental sustainability in a building include:

- lower financial costs associated with water and energy efficiency;
- health and psychological benefits of natural light, natural ventilation and achieving optimal thermal comfort within a dwelling
- contributing to an ecologically sustainable community and wider society

Research has indicated that improving the energy efficiency of residential and commercial buildings is one of the lowest cost ways for reducing greenhouse gas emissions [4]

What Our Findings Revealed...

[Sustainability in High-Density Buildings](#)

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Sustainability in high-density buildings

In personal one-on-one interviews in the QUT High Density Liveability Study, residents discussed environmental sustainability in relation to living in high-density precincts. Some believed utilising less space led to a more sustainable use of resources:

I: Do you think living in an apartment is any more sustainable than living in a house or do you think it depends...?

P: *I think it depends on how you utilise the space, if it's a small space you're going to use less energy, you're going to be less energy intensive as a household, both being basically based on the fact that you're probably going to have fewer people and you've got less room to cram more electronic devices into... It's more sustainable for a variety of reasons. You've got centralised provision of services, should make it more efficient, you've got smaller spaces to heat or cool... you're closer to your place of work, we are, so therefore you don't use the car as much as maybe other people would do. But therefore we use the public transport which is, is obviously another significant factor.*

To improve the sustainability of high-density dwellings, buildings should be designed to accommodate sustainability features, such as natural air-flow and daylighting or simple measures such as the provision of a clothesline for resident use:

There [are] no washing lines in this building ... and I think this is a problem, because people have to use the dryer. ... Because of the design only about two fifths of the apartments down this end and at the other end have flow through ventilation. The bigger apartments, which have a back bedroom and a back balcony. But all the ones in the centre of the building open to the corridor so you don't get the flow through of air, and therefore there is a reliance on air-conditioners.

Residents operated within the design constraints of their dwelling, but believed if sustainability features were built into the dwelling, this would help them reduce their ecological footprint.

I have modified my living environment to make it very comfortable for me, but also, as sustainable ... as I can based on what I've got. If somebody was to put design features into my living environment to aid me, then I think that would make my life even more comfortable and I'd be able to live even more responsibly, [both] financially responsibly and ecologically responsibly.

In addition, lack of control over purchasing building resources was a major barrier to residents engaging in environmentally sustainable behaviours.

There are obviously down sides to living in this sort of dwelling in terms of the environment: you can't have your own solar water system, you can't have your own solar power. So those sorts of things that you can do in a house block situation you couldn't do that here. But it depends on the building managers I suppose and the willingness of the various residents [whether] you could actually do some of those types of things to assist the environment.

Selecting most concerning issues from a broad list (including number of people in the neighbourhood, industrial activity, amount of water used, amount of electricity used, recycling waste), the greatest environmental concern for residents was the amount of water they used in their home (36%), followed by the barriers to recycling waste (21%). However very few residents were concerned with the amount of electricity they used (4%).

Opportunities to recycle waste

Residents in the survey were generally supportive of the concept of recycling. Over 60% indicated some concern about recycling waste while 39% were not very concerned. Almost two thirds of residents generally recycled waste either 'all the time' (29%) or 'most of the time' (33%). Only 12% reported 'never' recycling waste.

When asked to indicate level of satisfaction with a list of 35 dwelling features (including costs, design, climate, etc.), 'opportunity to recycle' had the second lowest mean response (2.88) on a 5-point scale (1= not at all satisfied; 5 = extremely satisfied). This indicates room for improvement in the provision of recycling facilities.

Interviews revealed mixed reactions to recycling options in their building. Some found lack of recycling facilities to be a great concern while others did not. However, as the second quote illustrates, even some residents who did not like recycling would still recycle if the facilities were available.

I've got 2 wine bottles by my door for me to take them down and throw in the... garbage. I feel guilty throwing glass in the garbage because I've been so used to [recycling], you just don't do it here. There's no facility to do it.

P: [There's] no recycling because the building was never made for recycling [collection]... [The Building Manager] said "We don't do recycling in the building. We do [recycle] in the other two buildings, they came later and we made provisions for it." And he said here it becomes a bit of a hassle because there's no place [for the recycling bins]...

I: How do you feel about that? Does it bother you?

P: No, I guess, probably I think about it sometimes... But you know it's funny, when [I] first came here and [saw] there was no recycling, I remember thinking to myself, "Oh thank God."...I mean if they had provision here I would definitely recycle, I did when we were at the house. We had our two bins and we always recycled, we scrubbed [items to be] recycled. But ... there was just no provision here so I just can't do it.

It is important to ensure appropriate space and structures are provided for recycling facilities at the design stage, as participants highlighted problems with retrofitting buildings designed without dedicated space or facilities for recycling.

We don't [have recycling], because apparently there's not enough room to be able to do it successfully. But I wish we did

No it wouldn't be easy [to recycle in the building]. Because the majority of them like ours is rubbish chute. So you walk along the corridor and drop the thing down the chute and it's gone, finished with. If you had to physically take it up and down the lift, I think that's cruel a bit.

Recycling is more likely to be practised if it is easy for residents. One resident discussed how his building is well designed for services, especially for older residents, with everything being serviced on a floor level.

So nothing has to be brought down, there's a rubbish chute where all the rubbish goes down. All our recycle bins are just on this floor. [In the hallway, near the lifts there's a small room with a place for the yellow-lidded bin]... The services are really good.

As well as design/space constraints to recycling, Council regulations represented a barrier to implementing recycling in some buildings.

P: Now we used to have yellow top bins which were for recycling bottles and newspapers ... but the Council said we're not allowed to put out more than six recycling bins every week because ...because the noise of all the bottles and the stuff in them disturbed so many people in the building that we're not picking up all the yellow bins anymore. They didn't just pick on us, they must have done it to every other complex in Brisbane. All we've got left is six. Six can't do this building so we've got it stored away somewhere.

I: Were there complaints?

P: We have people say we want to recycle how can we do it, and we really sat down trying to work it out and we couldn't work out how to do it. So now everything goes into the (garbage) bin.

Opportunities for water and energy efficiency

Over half of survey respondents believed it was very important to conserve water and energy. Water efficiency was of particular concern. However, it is important to note that the research was undertaken during South-East Queensland's drought period in 2007-08, which may have heightened this concern. The majority of respondents (95%) said they would look at ways to save water. Examples of water saving practices undertaken in the resident's building included planting drought resistant plants (45%), installing rain water tanks (18%) and water efficient appliances (36%). Residents reported equal levels of high satisfaction (about 44 %) with water and energy efficiency in their dwelling.

Interviews provided further insight into water and energy efficiency practices and perceptions. Some residents explained they were quite mindful of personal water and energy savings and took steps to be efficient users within their dwelling, such as using grey-water to water plants and relying on natural air-flow and daylight.

I open the back door and let the breeze go through. That's just the simplest form of conserving energy. Most people would go and turn the air conditioner on. There are times in the year where I have to do that but, you do simple things with what you've got to reduce the amount of energy you take to live there and you find that you can live more cheaply and very, very comfortably.

Residents spoke about infrastructure within the building that supported water and energy efficiency, such as water tanks, as well as areas for improvement.

They have big rainwater tanks underneath. [During] the drought, that's what they use to water any of the gardens. They did put signage out about it because they must have had some feedback from people saying why are you watering the garden? Nobody's allowed to do that. And they cut all the plants back too so they didn't grow and need the water. It looks really nice down there now ...

I think this building could do a lot more. Because, all right we've got a gas hot water system service but it's pumped up from down stairs [so] you run off a lot of water to get it here. Really it would be better, I think, if we had instant hot water.

Some residents discussed the cost and construction involved in implementing larger-scale energy or water saving infrastructure as factors impeding implementation.

[An issue at the body corporate meetings lately is] getting approval to put in a hundred thousand dollar water system...an alternative water system. I think that they should have an extraordinary general meeting, get everyone to vote on it so that they make sure everyone is happy about a special levy. I think they're planning to do that.

You know you have to use your things as responsibly and economically as you can. Otherwise you're going to be paying for more and your costs for production go through the roof. So, yeah, I do understand there is a direct link between running your lifestyle efficiently and the quality of life you have and the amount of time you can live that quality of life.

Recommended Guidelines

The following table presents practical suggestions for Residents, Building Managers, Designers and Developers for ensuring environmentally sustainable initiatives within their building.

	Residents	Building Manager	Designer	Developer
Make recycling easy - Design recycling systems that are accessible across the residential complex (e.g. receptacles on every floor or dedicated recycling waste chutes)			√	√
Design, with body corporate, an overall waste reduction strategy for complex- 1) Education initiative, highlighting that waste management/recycling can work in a high density context 2) Adopt a '1 waste bin/unit/week' scenario, to curb overall waste/dwelling unit 3) Incentives – design rewards system, be it financial (linked to	√	√	√	√

body corporate rates) or otherwise (i.e. City to Soil scheme)				
Link organic waste management strategy to landscape maintenance plan for building or agricultural activity in the neighbourhood, whereby material composted on site can be re-incorporated as organic matter		✓	✓	✓
Design for water efficiency and reuse: <ul style="list-style-type: none"> - Landscape (utilise plant species with low water requirements) - Buildings (mandatory inclusion of rainwater tanks, and water-efficient shower heads/tap fixtures/toilets 			✓	✓
Collaboration between body corporate, building manager and residents in the procurement and retrofitting of sustainable building systems	✓	✓		
Cross ventilate every habitable space by deliberate configuration of layout, combined with size and location of operable openings.			✓	
Investigate architectural and vegetated initiatives to create positive and negative pressure areas to induce cross ventilation.	✓	✓	✓	✓
Ensure adequate space for substantial shade trees in overall site plan, particularly on the western and eastern sides of building			✓	✓
Configure and orient blocks in accordance with characteristics of wind availability and topographic features			✓	✓
Use overhangs/other shading strategies to block direct sun in summer and allow the sunlight into dwellings during winter.	✓		✓	✓
Use materials with high thermal mass to maintain cooler indoor temperatures, keep these fully shaded on warmer days			✓	✓
Provide private outdoor space to each dwelling. Maximise northerly aspect. Where possible, face living areas towards north or east			✓	✓
Use louvre or casement windows to capture and channel external breezes into dwelling			✓	✓
Face living areas towards the north or east where possible and open to a terrace or verandah and garden area. Open living areas in two different locations with alternate orientations			✓	✓
Investigate architectural and horticultural strategies for reducing summer glare and direct light penetration into the dwelling; maximise opportunities for indirect natural light in stairwells and living spaces	✓		✓	✓
Design and supervise implementation of building and landscape management and maintenance system		✓	✓	

Incorporate adjustable external screens/shade canopy/vegetated systems to block direct sun in summer whilst allowing sun to shine through dwelling during winter	✓		✓	✓
Educate residents about environmental sustainability in the home	✓	✓		

Further Information

Queensland Development Code (QDC)

<http://www.dip.qld.gov.au/building/queensland-development-code.html>

South East Queensland Regional Plan 2009 – 2031

<http://www.dip.qld.gov.au/seqregionalplan>

Sustainable Homes Brisbane

<http://www.sustainablehomebrisbane.com.au/DESIGN.htm>

Your Home Technical Manual and Website

<http://www.yourhome.gov.au/>

Organic waste management guidelines for apartments

http://www.epa.ie/downloads/pubs/research/waste/ertdi%20no71_web%20final-with-cover.pdf

Different waste collection options

http://www.wme.com.au/categories/waste_management/june8_06.php

Cleaner Greener Buildings – Qld Government Legislation

http://www.climatechange.qld.gov.au/__data/assets/pdf_file/0003/25626/3_P-and-B-_E1_web.pdf

References

1. Stahel, W. R. *Product-Life Factor*, 1982. [cited 6 July 2009]; Available from: <http://www.product-life.org/en/major-publications/the-product-life-factor>
2. McDonough, W. and M. Braungart, *Cradle to Cradle: Remaking the Way we Make Things*, 2002. North Point Press: New York.
3. Queensland Department of Infrastructure and Planning, *South East Queensland Regional Plan 2009 - 2031*. 2009, Queensland Government: Brisbane.
4. Queensland Government, *Climate Q: Toward a greener Queensland*, 2009. [cited 16 September 2009]; Available from: http://www.climatechange.qld.gov.au/__data/assets/pdf_file/0003/25626/3_P-and-B-_E1_web.pdf
5. Photography Page 1: Lorraine Bell, 2008. Kangaroo Point, Brisbane.

