

# A New Model: the city as ecosystem... Postcard from 2050

Caitlin McGee and Cynthia Mitchell  
Institute for Sustainable Futures; University of Technology, Sydney

## Introduction

In our 'postcard from 2050', we examine what it takes to achieve a truly sustainable city, using the technique of *backcasting*. In order to plan for a sustainable future, it is necessary to use both forecasting and backcasting. Forecasting is based on current trendlines, and shows us where we can make simple, marginal changes. However, as Richard Neville says, *The future is not at the end of a trendline.*<sup>1</sup> We need more than marginal changes to achieve a sustainable future, and that's where backcasting comes in.

Backcasting allows us to leave behind what we know and imagine an ideal future, independent of the limitations of our trendlines. It is placing ourselves within our vision of an ideal future and looking back that enables us to spot the opportunities for step changes in our thinking.

There is potential for landscape to play a major role in 'greening cities' - this is the message we hope our audience takes home. We mean 'greening' in the broadest sense of the word- what we're really talking about is sustainability. Our preferred model of sustainability is one in which the ultimate limits are set by our environment. In other words, society is a subset of the environment. Our economy is just a subset of society, and therefore a sustainable economy is one that operates within the bounds of both society and environment.

## Unlocking Landscape's Potential

In order to unlock landscape's potential to contribute to a sustainable city, we need to acknowledge its ability to play a role in:

- Sustainable water cycle management
- Greenhouse gas reduction and energy efficiency
- Attracting and providing habitat for native species
- Producing food in an urban setting
- Improving air quality
- Creating a sense of community

And lastly; we need to acknowledge landscape's role in making explicit our intimate connection with the natural environment.

The key to making the most of landscape in our cities is greater integration of landscape with other disciplines such as ecology, urban design, transport and land use planning, architecture, engineering and the social sciences.



## The Impacts of 'business as usual'

If our goal is achieving a sustainable city, business as usual is clearly not the answer. These are just some of the reasons why:

The current ecological footprint of our cities is unsustainable. As well as consuming a disproportionate amount of natural resources, our cities generate an even greater amount of waste. In Sydney, we pour

---

<sup>1</sup> From Footprints for the Future: Richard Neville's Handbook for the Third Millennium (2002) Richmond Ventures Pty Ltd

billions of litres of sewage into our waterways each week. We're intensive greenhouse gas producers, with one of the highest per capita rates in the world<sup>2</sup>. Our cities are responsible for large-scale ecological degradation, including loss of biodiversity and interference with life support systems like the water cycle and soils.

The way we design our cities disconnects us from our environment. We tend to bury our urban infrastructure underground and conceal services within buildings, so that it's hard to visualise how much we're consuming and where it comes from, how much waste we generate and where it goes to, and most importantly, the impact of this on our environment. The way we price resources such as water and (fossil fuel) energy has the same effect. Hidden subsidies conceal the real cost to society and the environment.

As a result the environment becomes devalued. It becomes an abstract concept rather than a part of our daily consciousness, and we don't perceive its direct significance to us. Because of this, we tend not to consider the impacts of our actions or take responsibility. So how do we get to a brighter, greener future?

## **A postcard from Sydney, 2050**

Imagine a city that functions in harmony with ecological processes and doesn't take more than it gives. Imagine a liveable, vibrant, healthy and equitable city, whose citizens take pride in it and look after it well.

What might characterise such a city? Efficiency of resource use would be maximised; the quality of resources supplied would match the quality required; source separation of used materials would be passed; and we'd invest in local treatment and productive reuse rather than extensive distribution and collection systems. We'd respect and care for our environment; and we'd do all this through representative, participative, deliberative community engagement.

What are the fundamental design and decision-making principles behind a city like this? We think there are two main principles: *integrity* and *health*.

Integrity for us has two aspects: firstly, the idea of honesty, and secondly, the state of being whole and undiminished. In a city with integrity, all the necessary components are present, and visible. But although integrity is vital for a sustainable city, it is not enough.

Health is also part of a sustainable city. A healthy city is resilient, and embodies vitality and well being. To draw a comparison, integrity enables ongoing survival, and health adds quality of life.

## **What does 'integrity' mean in practice?**

### **Honesty**

The first aspect of integrity is 'honesty'. In practice, this means exposing the infrastructure that supports us, and making explicit our relationship with the natural environment. Honesty encourages us to value the environment and take responsibility for its well being.

It is important to note that these principles can be expressed in any number of ways. The intention is to inspire creativity, not limit it.. there are as many solutions as there are designers. One such solution is the Thurgoona Campus at Charles Sturt University<sup>3</sup>. There are three important design principles illustrated here, operating at different scales, that we would like to draw out:

*Infrastructure is exposed as part of the 'landscape'*. The water management system illustrates this perfectly. The water cycle can be visibly traced in the landscape, from beginning to end. The tanks, integrated with the building fabric, collect water for use in the buildings. Greywater from the buildings is treated in the wetland, which is located just downhill of the buildings. (There is no need for blackwater treatment, as all the facilities use composting toilets). A series of swales for stormwater treatment meander under the pedestrian bridge and downhill to link up with the wetland.

---

<sup>2</sup> From Greenprint for Sydney, an environmental strategy for the 21<sup>st</sup> century (1999) Total Environment Centre Inc.

<sup>3</sup> Designed by architect Marci Webster Mannison, Water management system by David Mitchell

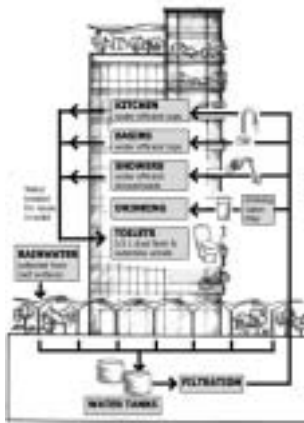
*Buildings are integrated with the landscape.* The building materials can be used to exemplify this. Rammed earth walls illustrate 'honesty' and connection with the landscape, expressing the colours and textures of the earth, which comes directly from the site. All of the materials, including the green roof, have been carefully chosen for their role in making the building envelope more energy efficient.



*Building form responds to site ecology and climate.* For example, the green roof over the auditorium, as well as being a space for outdoor recreation and part of the stormwater management, stabilises the internal temperature of the auditorium. A cleverly designed water feature near the auditorium entrance works to evaporatively cool the auditorium. This climate-responsive system, combined with the stabilising effect of the green roof, avoids the need for artificial cooling.

### Being whole

The second aspect of integrity was 'being whole'. In practice, this means a systems approach; looking at inputs and outputs, respecting limits, exploiting synergies, and taking an integrated approach to design. To illustrate this, we'll focus on our conceptual modelling for Sydney Water Corporation's proposed new headquarters in Parramatta. The footprint of the building is approximately 3600m<sup>2</sup>, and it will house about 1000 people.



Our brief here was to see how far we could reduce Sydney Water's reliance on its own water, sewer and stormwater systems, by minimising the inputs and outputs. Although this may seem odd to some, as though Sydney Water have no confidence in their own systems, what they're doing is leading by example. We know that even if we reduce per capita water use by a third in the next 10 years, we won't have enough water to go around, with increasing population and increasing commitment to supplying environmental flows.

In terms of respecting limits, we pushed the boundaries of demand management, water harvesting, and reuse within what was available on the site, and discovered we could reduce reliance on scheme water by about 95%.

We looked at the synergies between water cycle management and energy efficiency: using water storage as 'thermal mass' to moderate indoor temperatures, using roof gardens for thermal insulation and

wastewater treatment, and using planted balconies or 'green walls' for ventilation, shade and wastewater treatment.

In terms of integrated design, our modelling showed that the biggest potential draw on the water cycle was cooling towers for the air conditioning. How do we reduce that? By working with the designers from the earliest stages to reduce the energy load of the building - minimising resource use, and then by considering other options, like ground source heat pumps, that greatly reduce the requirement for water, chemicals, discharge, and energy.

### What does 'health' mean in practice?

And what about that second fundamental design and decision-making principle: 'health'? We'll use Sydney Water Headquarters again to illustrate this principle.

Health is about how the components function - their combined vitality and resilience. Adaptive systems, such as the adjustable sails for rainwater collection, respond to the weather and the climate. Roofgardens provide resilient water and wastewater treatment systems and improved energy efficiency as well as

beautiful spaces for people to meet and work.

Health is also about the human dimension; providing aesthetically delightful and liveable spaces for staff and visitors, maximising personal exchange, creating a sense of community, and providing interpretive and experiential education opportunities for all who come in contact with the building. This approach promotes awareness of resource use and enables users to be involved, take responsibility, and develop a sense of pride in their surroundings.



After all, what we do to our environment we do to ourselves.

### **The path to 2050- barriers or opportunities?**

In moving towards a sustainable Sydney, there are some barriers we'll need to overcome, as well as plenty of opportunities out there for the taking. The nature of these barriers and how we overcome them is a significant issue, and something we have spent considerable time researching. Some of the key barriers relevant to this discussion are:

Innovation is risky- nobody wants to be the first?

Lack of financial incentive?

The public aren't interested?

Industry doesn't have the skills or resources?

Lack of an integrated approach to decision making and design?

We've posed these barriers as questions rather than statements, as we believe that all of them contain the seeds of opportunity. To expand on this in detail is beyond the scope of this paper, but we'll choose two examples to illustrate.

*Innovation is risky- nobody wants to be the first?* This is largely to do with the perceived risk, time and cost associated with innovation. It's easier, and feels more comfortable, to do things the way we're used to doing them- we'd prefer to learn from other people's mistakes. Many developers say that without more successful best practice examples to learn from, going beyond 'business as usual' is too big a risk. However, opportunities are arising to overcome this barrier.

Firstly, it looks like some of the easy-to-do sustainability measures will soon become regulation, with the support of the building industry. Mandating the easy measures or 'low hanging fruit' is a solution that suits industry, because it allows developers to build greener without losing their competitive edge. Planning NSW has developed a sustainability index called 'BASIX', to be linked with the approvals process for residential building. Mainstream developers have said they're willing for a certain level of performance on BASIX to become mandatory- the key is having the same rules for everyone.

Secondly, some of the smart developers are starting to see the advantages of innovation- above and beyond the 'low hanging fruit'. The very 'green' 60L office building in Melbourne, headquarters of the Australian Conservation Foundation, cost about 5% more than a conventional office building but has reduced its operational energy use by around 65% and its scheme water use by around 90%. In addition, the productivity increase is estimated at 5-15%- which translates to a huge cost saving! Measures are being developed to encourage and reward performance like this- the Green Building Council of Australia will introduce an environmental rating system for commercial buildings this year.

*Lack of financial incentive?* Last year, Sydney Water asked us to undertake a study with CSIRO to map out what was possible on greenfield sites - what might it mean for Sydney Water to 'do water services differently?' We looked at water, stormwater, and sewer provision across the full range of scales; from completely centralised technologies as we have now, to completely distributed technologies with raintanks, on-site detention devices, grey and black water treatment and reuse at the allotment scale. What we might

expect is that the allotment scale is much more expensive... but it isn't. If you consider all the capital costs to supply the service - that is, water to the tap, and waste treatment from the toilet, then there's basically no difference in the total. The key is how we think about who pays. Traditionally, the water authority pays up to the estate boundary, the developer pays up to the house boundary, and the householder pays for things on their property. But it need not be so. We don't need more money to do water servicing differently, we need a conversation about re-thinking the distribution of costs.

Barriers or opportunities? The choice is ours.