

Sustainable landscapes: making the critical cultural shift

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There *are* solutions to the major problems of our time, some of them even simple.

But they require a radical shift in our perceptions, our thinking, our values.¹

Fritjof Capra, 1996

In South Australia and indeed in many parts of Australia, semi arid and arid landscapes largely define our natural heritage. Since European settlement however we have not behaved as though we are living in such landscapes, we have been slow to understand their ecological function and we have generally excluded their colours, shapes and forms from our perceptions of what is beautiful and harmonious.

Since reticulated water became available in the late nineteenth century we have used water lavishly. We also use considerable quantities of chemicals and fill our parks and gardens with unsustainably sourced materials. We still design hungry and thirsty urban landscapes with plant selections that would better suit places with plenty of summer water, deep and fertile soils and soft sunshine. We rarely consider how well the local native fauna will be able to feed, shelter and breed in urban landscapes.

The cultural shift we need to make is to adapt our thinking and behaviour, both individual and collective, to our environment rather than compel the landscape to adapt to us. This paper looks at why and how South Australia's innovative *Sustainable Landscapes Project*, a public/private partnership, is facilitating this shift in thinking - in practice! The purpose of this paper is to highlight ways in which we can all achieve sustainability in urban landscapes.

Urban unsustainability

The current 'unsustainability' of our urban landscapes is caused by excessive demands for, and consumption of, resources. We consume land, water, energy, soil, plants and animals in quantities that cannot be sustained, and with the consequent waste production.

As an example, since settlement less than 200 years ago, much of Adelaide, the capital city of South Australia, has been totally transformed from a series of functioning ecosystems including open forests, grassy and open woodlands, shrublands, wetlands, reedbed sedgelands and grasslands to something more akin to a forest dominated by tall trees, a predominantly more heavily vegetated place inclusive of a great influx of flora and fauna from Europe, Africa, America and Asia. In the transformation and loss of ecosystems many of the original plants and animals have also been lost.

The plants and practices from northern hemisphere European countries have heavily influenced our parks and gardens. Many traditional and popular plant selections and horticultural practices are unsuited to the semi-arid and arid landscapes of South Australia with relatively low and variable rainfall, long dry summers, wind and shallow, saline soils. Plant selections unsuitable for our soils and climate have led to heavy use of supplementary water, fertilisers and other non-organic chemical based, often toxic, products.

Water use is one critical issue. Australians, per capita, use more water than most of the world's population. Almost half of domestic water use is on gardens and many public gardens are just beginning to reduce water use.

During the past 200 years more than 28,000 plants have been introduced to Australia with about 3,000 of these being sufficiently invasive to become well established as weeds throughout the country. The impact of invasive plants costs the country billions of dollars each year.

Large areas of lawn that require significant water, nutrient and energy inputs are features of many urban landscapes.

Parks and gardens, public and private, consume considerable amounts of materials such as rocks, pebbles and wild timbers, threatening and destroying vulnerable landscapes from which they are removed. Materials are imported and transported over long distances without regard for energy consumption or gas emissions.

Approximately 90% of South Australian homeowners use pesticides, and apply more per hectare than farmers, inadvertently contaminating water and destroying beneficial insect populations and soil fauna.

For the 25 million tonnes of CO2 currently discharged into Adelaide's atmosphere each year to be reabsorbed by growing vegetation, we would need to plant trees on 100,000 hectares every year for 30 years. This would require an area of land 39 times greater than the current metropolitan region.

As in many of the world's cities and towns, Adelaide's public and private gardens, parks and other open areas provide essential space where plants can grow and animals can live, people can recreate, water can flow and air can regenerate. Unfortunately but not surprisingly however, the parks and gardens of our cities frequently consume more resources than the agricultural and pastoral lands that supply much of our food.

When we add together the consumption of land, chemical fertilisers and soil additives, insecticides and fungicides, soils, rocks and landscape materials, non-renewable fuels, supplementary water, and the spread of pest plants and pest animals, our urban landscapes soon become gross consumers and contaminators.

While the world's cities physically occupy 2% of the earth's land surface they consume 75% of the global resources used by humans each year. The inhabitants of cities make enormous demands on soils and water supplies for food, and on forests for timber and paper.

It is calculated that a sustainable ecological footprint that shares the world's resources among human inhabitants would be 1.8 hectares per person. Currently the average in rural China is 1.6, in Shanghai it is 7, the American average is 9.7 hectares, the New Zealand average is 6 hectares and the Australian average is 7 hectares.

We have many challenges in our cities, and their 'unsustainability' in terms of resource consumption is not the least of these. Our cities need to become less intensive in resource use and more cognisant of ecological imperatives; this means that we as inhabitants need to change the way we perceive and treat our landscapes. How can we do this?



Resource consuming urban landscapes contribute to the unsustainability of urban environments

Managing the landscape

We are all managers of our landscapes. Everyone from developers, architects, designers, builders, businesses, industries, governments, government agencies, horticulturalists, families and home gardeners manage landscapes. To make them sustainable every phase including planning, design, construction and maintenance of urban landscapes needs to be informed and guided by sustainability principles and practices. Every sector of the community needs to take responsibility for the sustainability of our urban landscapes.

While developers, designers and builders manage landscapes at one level, horticulturalists and gardeners manage them at an equally important level. Professor George Seddon emphasises this point:

...gardeners are, in fact, one of the most important groups of land managers in this country, since between us we manage more than 50% of all urban land in Australia, that is, the land that carries 80 per cent of the population: land that is not vast in area compared with that managed by farmers, pastoralists, miners and state agencies, but greater in value and in resource consumption than all of them. Gardeners are key land managers. Our choices therefore lie not in whether but in how we manage the land. We would all agree that we must do it in an ecologically responsible way.

We are not yet achieving responsible ecological management. When we look at what we need to do to address the problems arising however, the solutions seem surprisingly simple, and they are! The difficult part is to communicate effectively to the community so we all understand what we can do to contribute to change. While it is relatively easy to convince people that water quantity and quality is declining, or that CO2 emissions are way too high, achieving behavioural change is the greater challenge.

There has been minimal movement towards considering ecological footprint in landscaping. The issues of climate change and biodiversity loss and the incredible costs of invasive plants and animals have barely made it into urban landscape thinking, and yet this is the very place where a great difference can be made.

Landscape managers, including all of us, need to adopt the principles of landscape sustainability into our strategies and policies, become more creative in design, develop a market demand for sustainably sourced materials and appropriate plant selections and, most importantly, learn to understand and respect our natural landscapes.

Professor Chris Daniels is adamant on this last point:

The types of soils we stand on, the location on the plain, the height above sea level, the original floral assemblage, the risk of flood or fire, and the rain, wind and thermal profiles all should be considered when housing estates are designed and even when individual houses are built. It behoves us all to include the local environment in our planning and it is not just a government, or estate constructor responsibility. We must 'know our land'

Sustainable landscapes

A sustainable landscape is a healthy and resilient landscape that will endure over the long term without the need for high input of scarce resources such as water. Ideally the natural functions and processes of the landscape are able to maintain themselves into the future. Our South Australian urban landscapes are sustainable when they are in harmony with local environmental conditions.

This definition of a 'sustainable landscape' has been developed by the Sustainable Landscapes Project in South Australia. Health, resilience, endurance and harmony are essential concepts in thinking about sustainable urban landscapes. They open up to a world of possibilities in design, plant and material selection and use of resources.

The eight principles for urban landscape sustainability, brought together by the Sustainable Landscapes Project to guide the design and assess the sustainability of urban parks and gardens, relevant to all urban environments, are as follows.

A sustainable park or garden:

- Is well designed to suit local environmental conditions.
- Contains plants that require little more water than natural rainfall provides.
- Contains plants that will not become environmental weeds.
- Utilises water conservation measures such as mulch, efficient irrigation, watering only when necessary, grouping plants with similar water needs together and the capture and re-use of water on site.
- Provides suitable habitat for local native fauna such as small birds, butterflies, bats, lizards and frogs.
- Avoids use of pesticide or chemicals that could harm natural insect populations and other beneficial organisms, or could contaminate soil and water.
- Consumes minimal non-renewable energy in construction or maintenance, and requires minimal transportation of materials and products.
- Uses sustainable and locally sourced materials and products, and avoids materials such as rocks, pebbles, timber or plants collected or harvested from wild landscapes such as riverbeds or bushland.

These principles address ecological sustainability in particular, for the reason that a healthy ecological system underpins the ultimate success of economies and cultures. They are simple to understand, to incorporate in planning and to act upon. They have relevance to landscapes around the world. Fundamental to their packaging and promotion is the ultimate goal of improving the ecological literacy of urban communities.

The first principle, for example, is about good design for local environmental conditions. Good design respects and considers all aspects of the natural landscape including climate, soil and hydrology, while making the best use of space to suit culture and lifestyle.

The second principle relates to plants and their need for water. Where fresh water is in short supply, plant selection is critical. Plants that require frequent supplementary water are unsuited to the climatic conditions of the local landscape.

As we teeter on the edge of a climate change event of enormous consequence, it is worth remembering that climatic predictions for many places, including South Australia, suggest the need to be prepared for an even more arid environment that we have at present. Thus we need to consider, in design and construction of our landscapes, the possibility and consequences of higher temperatures, less rainfall, increased evaporation, more frequent drought and generally more intense weather events.

The third principle addresses the issue of invasive plants and introduced plants that have escaped to cause havoc in agricultural land, bushland and waterways. It is a global issue; the plants and animals of the Earth have become shambolic, with species invading and running rampant in places where there are no natural checks or predators. Weed invasion in Australia is ongoing and we will never eradicate the plants originally brought here in good faith but that have escaped beyond the confines of their original gardens and pastures into rivers and creeks, bush, dunes and farmland. Seventy per cent of Australia's environmental and agricultural weeds are escaped invasive garden plants, one example being Lantana, which significantly affects 4 million hectares. While the economic impact of invasive plant species to Australia was calculated at \$4 billion in 2004, 'the cost of weeds to the environment and biodiversity is largely incalculable.'

The fourth principle addresses the issue of conserving water in urban landscapes and relates back to relevant and effective design. Not only do we need to consider the water needs of plants, but in dry climates we also need to conserve moisture in the soil and learn how to capture and re-use excess and wastewater. Many new technologies are developing and available to refine the amounts of supplementary water applied to landscapes and to improve moisture retention and plant survival.

The fifth principle relates to provision of habitat. The South Australian government's draft No Species Loss biodiversity strategy was developed because the state's flora and fauna are under threat and in decline. The Adelaide Plains once was the most biodiverse area of the state, but with the building of Adelaide city and subsequent urbanisation, many species have been lost and many more are threatened. Urban landscapes including parks and gardens have the potential to make a great contribution to biodiversity conservation by providing suitable habitat for small birds, butterflies, insects, small reptiles, frogs and soil fauna. Flora and fauna work together and their conservation goes hand in hand.

Minimising chemical use is the sixth principle for a sustainable landscape. Pesticides such as insecticides and fungicides are designed to kill. Apart from the effects on human health and water supplies, by destroying insect populations chemicals destroy the food source of many creatures such as bats, birds, lizards and frogs. They also kill off soil fauna such as earthworms and arthropods that condition and recycle nutrients in the soil, as well as harming insect populations directly beneficial to plants through pollination and natural pest control.

A landscape cannot be sustainable if it consumes high quantities of non-renewable energy. Energy is consumed by urban landscapes during construction, maintenance, transport and in materials. Fuel powered tools and equipment, lighting and transport all consume energy. New creative energy saving technologies are developing quickly. The seventh principle acknowledges that a sustainable landscape consumes minimal non-renewable energy, and should be designed to minimise energy use along with heat and gas production.

The eighth principle addresses the use of sustainable materials and products. Urban landscapes consume vast amounts of materials and many of these are not sustainably sourced. Collecting landscaping materials such as moss rocks and river pebbles from wild landscapes results in habitat destruction and erosion, while transporting landscaping materials such as pebbles from overseas consumes significant amounts of energy. Using timbers that are recycled or grown in plantations is more sustainable than using old growth timbers or timbers from natural bushland or forests. There is room for much creativity in design using sustainably and locally sourced and produced materials and products.

When urban landscape planning, design and construction are guided by these sustainable landscapes principles, we will achieve a significantly higher degree of sustainability than we currently have.



Some plants with low water requirements have the potential to escape and invade natural and agricultural areas - careful selection of non-invasive plants reduces this risk

Sustainable Landscapes Project

The Sustainable Landscapes Project is a timely recognition of the need for urban landscapes, including gardens and parks, to cease generating such a significant ecological footprint, and to become more

responsible and creative. The project is a collaborative partnership between private and public enterprise and is hosted by Botanic Gardens of Adelaide (Department of Environment and Heritage) in partnership with Land Management Corporation, Innovation and Economic Opportunities Group (through the Mawson Lakes Economic Development Project), Adelaide and Mount Lofty Ranges Natural Resources Management Board and SA Water.

The project educates and assists the South Australian community to adapt to a world in which we need to use resources more efficiently, develop sustainability skills and employ best practice environmental principles in all that we do. The project demonstrates and promotes appropriate park and garden design, plant species selections and sustainable horticultural practices for South Australian environments including effective, efficient and appropriate water use. It leads the direction of sustainable public and private landscapes in South Australia.

Project partners work together to integrate research, demonstration, communication and education. Seminars, forums, workshops, conference presentations, poster presentations, brochures, website, use of electronic and print media, and well-interpreted demonstration landscapes all contribute to the project's education and communication activities.

The Sustainable Landscapes Project is a true partnership, not only between its major funding partners, but also in its vigorous engagement with every sector of the community including business and industry, government, schools, universities, horticulturalists and home gardeners. The work and achievements of the project demonstrate that sustainable landscapes can be achieved simply and effectively.



Urban landscapes designed to conserve water and energy, provide habitat and use sustainably sourced materials

In Summary

There is no avoiding the fact that environmental problems are a matter of perception. As George Seddon says, 'If I were an ant, my environmental problem would be the anteater'.

Our environmental problem is not drought, flood, soil degradation, air pollution, water shortage or loss of biodiversity. Our environmental problem is the unsustainability of the way we live. Our 'anteater' is the huge demand we put on the landscape for resources, and the enormous waste we produce in the consumption of these resources.

Our challenge is to change our approach to the landscape and to think and behave differently. We need to cease treating land as an enemy to be conquered or as a 'consumable', but instead to value and respect its ecology and character. If you think for a minute that treating land badly is a thing of the past, just look at how we design, what we plant, the materials and resources we use and the continuing decline of native birds, butterflies, fish, reptiles, frogs and soil fauna in our urban environments.

Aldo Leopold's famous quotation from *A Sand County Almanac* is highly relevant here:

We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect.

It is time to cease incurring environmental debt, to cease living beyond the means of the land to sustain us. The potential of urban landscapes, including Botanic Gardens, to help us achieve a sustainable future is significant. We can do this by incorporating each of the principles into all planning, decision-making and action, and by demonstrating and interpreting what can be done, why and how. It is our responsibility to encourage all sectors of the community to understand and take on these principles and apply them in urban landscapes. Both public and private gardens and parks are perfectly situated and suited to demonstrate a different and more sustainable way forward.

As Professor George Seddon eloquently writes:

This is our garden of earthly delights. The earth is home. If we are at war with it, it is a war we cannot win; better to think of it as our partner, for richer or poorer, in sickness and in health, 'til death us do part.

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