

Creating a Sustainable Adelaide

ADELAIDE

thinkers
in residence



Herbert Girardet
Thinker in Residence 2003

Creating a Sustainable Adelaide

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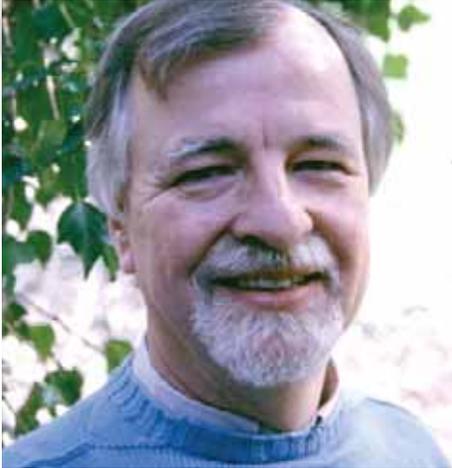
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Herbert Girardet



Anne Harvey, Director of the Office of Sustainability,
The truly committed staff of the Office of Sustainability.
Warwick O'Brien, Paul Downton, Leonard Cohen, John Maitland, Kathryn Bellette, Lachlan Mudge, Lachlan Jeffries, Wasim Saman, Joseph Mazzone, Stephen Hamnett, Heather Webster, Ross Oke, Jo Bishop, Georgine Duncan
The convenors and attendees at the very informative roundtable sessions.

All of the other kind, informative and incredibly hospitable people I met during my eight week stay in Adelaide.



Herbert Girardet
Adelaide, Australia
16 July 2003

A very warm thanks to:

The Premier of South Australia, Mike Rann (for initiating the *Thinkers in Residence Program*, for inviting me in the first place and for commissioning this report)

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The following partners were involved in the visit of Herbert Girardet

Department of the Premier and Cabinet
Department for Environment and Heritage
- Office of Sustainability
Department of Transport and Urban Planning
Capital City Committee
Adelaide City Council
The Body Shop

Foreword

I warmly welcome the release of this Second Edition of Herbert Girardet's groundbreaking *Thinkers in Residence* report.

Indeed, it is a credit to Herbert and the Thinkers program – and a testament to the popularity and quality of the report itself – that a second printing was necessary.

The State Government strongly supported the thrust of the report when it was first released, in August 2003. We felt he had addressed some of the most pressing environmental issues facing South Australia. These included the need for better waste and water management, improved urban design and use of energy, and more sustainable business practices.

More importantly, the Government adopted a number of Herbert Girardet's recommendations. In March 2004, the Premier announced that the Government would be pursuing, for example, the following programs:

- mandatory plumbed rainwater tanks on all new homes from July 2006;
- a five-star energy rating for housing built after July 2006;
- a four-year extension to the current solar hot water subsidy;
- use of solar power by 250 South Australian schools by 2014; and
- progressive installation of solar power to other Government buildings, including Parliament House.

Perhaps one of the most successful environmental projects has been One Million Trees. In response to Herbert's recommendation, the Government has expanded that program to the planting of three million trees by 2014. We are well on the way to reaching that goal, and the Premier was honoured to plant the 500,000th tree – in Adelaide's west parklands – in September 2004.

The burgeoning wind power industry, the drive to achieve zero landfill waste, Adelaide's Green City Program, and the Water Proofing Adelaide Project, are just some of the many other environmental initiatives occurring in our State.

South Australia is fast becoming a world leader in adopting a 'green' approach to the way we live, and much of the credit for that must go to Herbert Girardet. His period as the inaugural Thinker In Residence set an extremely high standard, and we welcome his return to Adelaide in November 2004. I commend this Second Edition of Herbert's report to you.



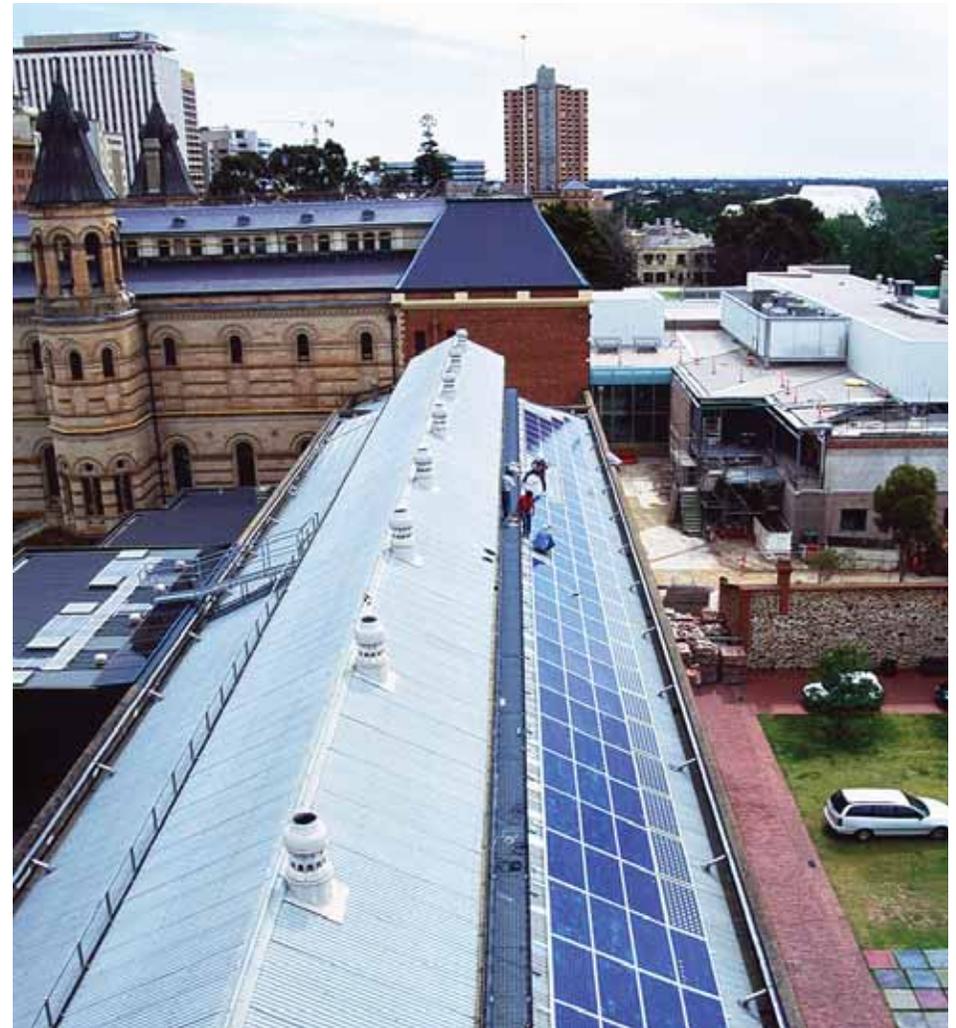
Warren McCann
Chief Executive
Department of the Premier and Cabinet
Government of South Australia



Above: This montage highlights the potential for siting turbines close to the city.
Source: PlanningSA/Herbert Girardet

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Above: The SA Museum's solar photovoltaic panels, plus energy efficiency initiatives mean reduced energy use of 10% and savings of \$40,000.
Source: SA Museum

Executive summary

This report is the product of two months work by a group of people under the umbrella of the Adelaide Green City Program. As 'Thinker in residence' I have been asked by South Australian Premier Mike Rann to explore policy options for making Adelaide a green, sustainable city. Here are the results.

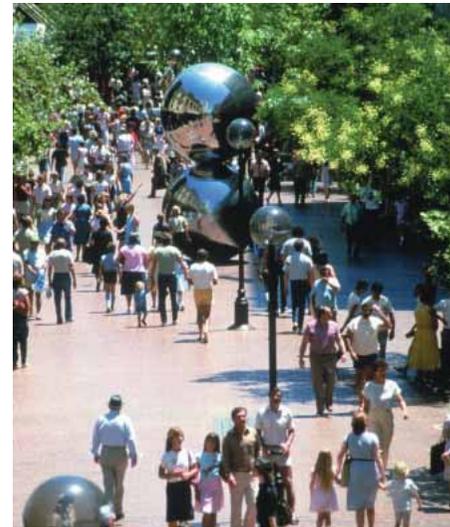
Metropolitan Adelaide is a place of great prosperity, a city of parks, of trees, of remarkable architectural heritage, a city of culture, creativity, hospitality and a high quality of life. But it also has deep seated problems regarding sustainability. Concern about water has greatly raised the awareness of the need for change. Adelaide now needs to develop an overarching sustainability perspective and a targeted program for implementing relevant policies. This could also become a major intellectual asset for advising other cities on implementing sustainability principles.

Policy makers and the general public need to jointly develop a much clearer understanding on how Adelaide can reduce its impact on the natural environment. This report shows that a wide range of new businesses and many new job opportunities could be created from a steady increase in the efficiency of resource use. This will also help reduce Adelaide's 'ecological footprint' at the same time.

It was beyond the scope of this report to produce an ecological footprint analysis for Adelaide. This should be undertaken soon. However, a provisional figure for the per capita ecological footprint of the citizens of Adelaide, drawing on statistics for the whole of Australia, is around eight hectares per person. If everybody on Earth lived and used resources like Australians do, four planets would be required, yet we have only one increasingly damaged planet available for us to live on.

Major steps towards increasing resource productivity are therefore needed. Just in terms of its discharge of carbon dioxide from burning fossil fuels, metropolitan Adelaide, with a population of 1.1 million people, currently discharges 25 million tonnes of CO₂ into the atmosphere. If this were to be reabsorbed by growing vegetation, it would require planting trees on some 100,000 ha of land every year for 30 years, or a total of some 39 times the metropolitan region.

Adelaide will be well served to become a world leader in sustainable urban development. The political will to make this happen appears to be there, and our work has established that it need not cost the public purse significant amounts of money to implement the relevant measures over the coming years. By progressively 'solarising' and 'localising' the city's energy system, creating new solar industries, making buildings more energy efficient, water-proofing Adelaide and creating a zero waste system, up to 9,000 new white and green collar jobs could be created.



This report explores the scope of the challenges and opportunities for Adelaide and the Government of South Australia. The main conclusions are listed on the following pages:

The challenge of sustainability

Enshrine sustainability in South Australia as an organising principle for Adelaide's future development law, using –

- Environmental sustainability as a driver for social and economic sustainability
- Make sustainability attractive to the community as a viable option for Adelaide
- Report monthly to the Premier and to Cabinet on the development and implementation of sustainability policies and practices

Efficient use of energy

- Make the efficient use of energy by all sectors a key focus of government policy
- Make it clear to the property sector that the government will only lease energy efficient office buildings
- Modify building codes to make sustainable building practice the norm, if possible working in conjunction with other Australian state governments
- Create exemplary projects to demonstrate the benefits of green architecture

Solar City Adelaide

- Support wind power development as an important new manufacturing industry and as a key technology in a sustainable energy system
- Mandate the installation of solar hot water systems on all new buildings, emphasising their short payback periods
- Mandate retrofitting of existing buildings with solar hot water heaters, particularly when old boilers need replacing
- Introduce a feed-in law for solar PV systems, allowing owners to sell electricity to the grid at up to four times the rate charged by conventional power generators
- Explore linkages between renewable energy and a future 'hydrogen economy'

Executive summary

Water security

- Initiate a public debate about the balance between urban, agricultural and commercial uses of water, and their relative social, economic and environmental benefits
- 'Waterproof' Adelaide by encouraging water efficiency and rainwater collection in all households and businesses
- Make waste water recycling and storm water reuse a central plank of water policy

Implementing zero waste

- Take advantage of the closure of Wingfield landfill for implementing a zero waste policy
- Draw up a detailed, targeted action plan for developing new recycling industries
- Use the zero waste policy to create new green businesses and jobs

Sustainable transport

- Encourage the use of public transport by improving attractiveness, marketing, frequency, speed and flexibility of routes
- Create a comprehensive network of dedicated cycle lanes across metropolitan Adelaide, with secure bike parking in key locations
- Stimulate development of new electric, air powered and fuel cell vehicle technology to create new jobs and to reduce transport air pollution

Nature and the city

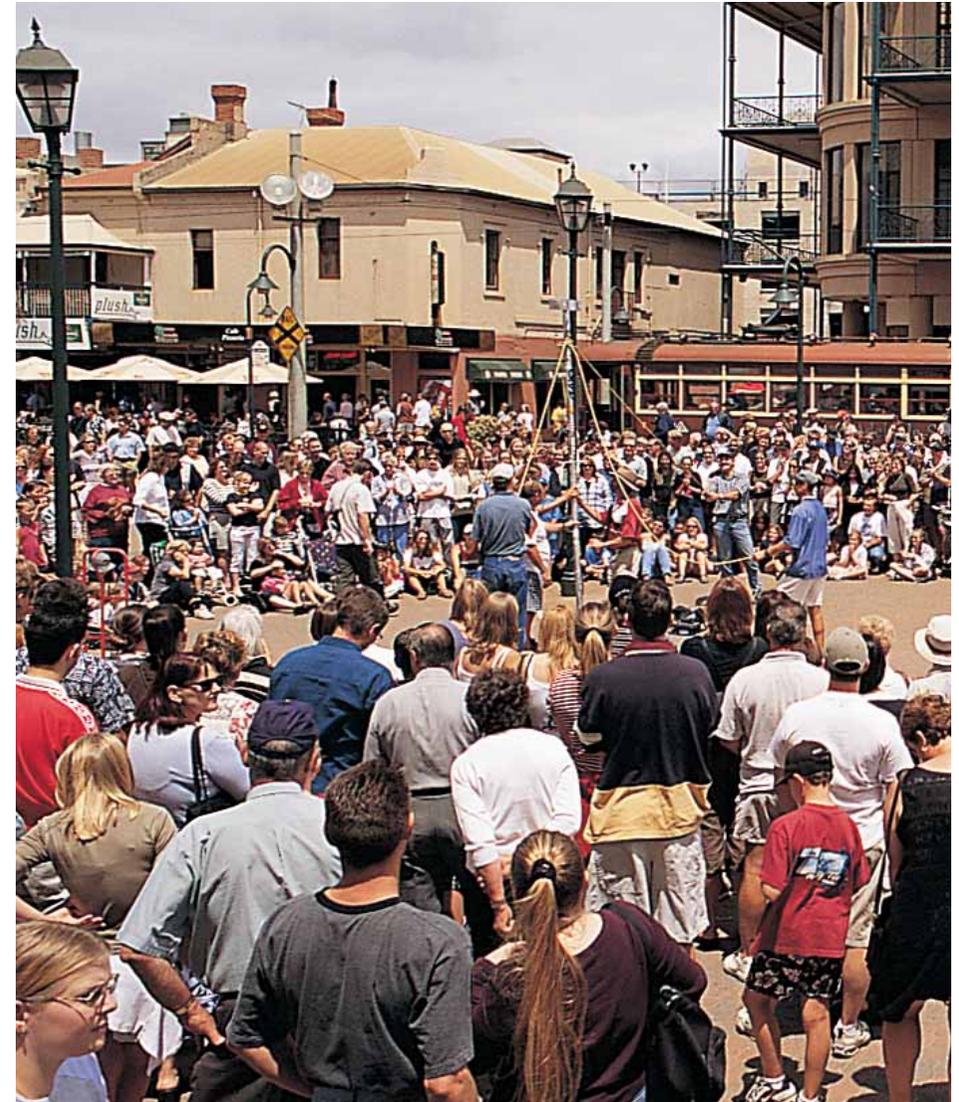
- Further support popular tree planting, including nurseries in people's gardens
- Encourage tree planting with native species for biodiversity, soil erosion and salinisation control – in and around the city
- Make carbon sequestration a key aspect of further tree planting initiatives

Green business

- Boost the creation of green business by effective use of government procurement
- Encourage resource efficiency in all businesses across metropolitan Adelaide
- Create 'green business incubators' across the city
- Make environmental sustainability the basis for new businesses and jobs

A culture of sustainability

- Link actively into the international community and use Adelaide's expertise in sustainability as a resource
- Ensure that sustainability issues are strongly addressed in the education system and through meetings and events
- Encourage the media to do imaginative reporting on sustainability
- Ensure that all citizens have a clear understanding of their environment and take a stake in sustainable development



The challenge of sustainability



Above: Adelaide is one of the world's lowest density cities but the city's urban sprawl must be curtailed if Adelaide is to become a sustainable and green city.
Source: Planning SA

Ever since the 1992 UN Rio Earth Summit the term sustainable development has been widely used yet also widely challenged as inaccessible and remote from most people's experiences. This report seeks to help give it greater credence as a useful concept for assuring the sustained wellbeing for the people of one city – Adelaide.

Urbanisation has transformed the relationship between people and planet. Cities, built on just 2% of the world's land surface, use about 75% of its resources and discharge similar proportions of waste². In a world in which 50% of the world's people now live in cities - and over 80% in the world's most industrialised countries - sustainable development must be sustainable urban development.

Cities all over the world are wrestling with the implementation of sustainable development. How can they merge environmental and social responsibility together into a compelling win-win scenario? How can we all lead our urban lives in comfort whilst simultaneously reducing our impact on the local and global environment? How can cities such as Adelaide use resources as efficiently as possible?

This report is primarily concerned not with 'land use planning' but with 'resource use planning'. This is a new challenge to governments who, in the age of globalisation, are strongly encouraged to operate under the auspices of economic rationalism, 'the dogma which says that markets and money can always do everything better than governments, bureaucracies and the law.'³ This report acknowledges the importance of markets but emphasises that new markets – including those for 'green' products and services – have often emerged as a result of enabling legislation and government support.

It argues for the adoption of ecological rationalism, emphasising that human affairs, including markets, can prosper only by establishing a sustainable relationship with the environment. The environment can exist without our economies, but these cannot exist for long without a healthy environment. What does this mean for Adelaide?

The challenge of sustainability

Creating a Sustainable Adelaide | Herbert Girardet

There is much evidence that Adelaide makes very inefficient use of the resources that are used to run it – particularly energy, but also water, timber and other materials. As the imperative of environmental sustainability becomes ever more apparent, the market for new, emerging green products and services needs to be actively helped along by public policy support.

Sustainability is just as relevant to developed as to developing countries. Australia, with its unprecedented dependence on fossil fuel-based technologies and processes, its complex technical infrastructure and its ever-growing consumerism, like other developed countries is presently also among the most unsustainable regions of the planet. It is becoming crucial to redevelop its industrial, energy, urban and farming systems to assure that they become 'futureproof'.

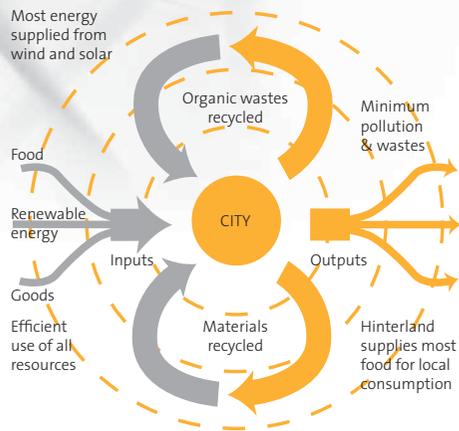


Above: Wingfield landfill closes in 2004. Can it become a recycling centre instead?
Source: Herbert Girardet

Worldwide, national economies are embedded in and controlled from cities, where governments and companies have their 'control centres'. Major factories are located in and around cities and smaller companies are also concentrated there. Not surprisingly, metropolitan Adelaide, with a population of 1.1 million, is the employment centre of South Australia. Major industry sectors include: Manufacturing (14.8%), Retail (14.6%), Health & Community Services (12.5%), Community Services (10.9%). However in 2003, unemployment, at 6.5%, was also higher than the State average of 6.2% and the national average 6.0%. Youth unemployment across metropolitan Adelaide is worryingly high at 32.4% and, not surprisingly, young people have the tendency to move away from Adelaide⁴. The region's unemployment among indigenous people is even higher at 24.5%.

Can environmental sustainability become a driver to deal with some of these deep seated problems? Most of our cities are the products of 19th century fossil-fuel based technologies, based on extraction and combustion of coal, oil and gas. Concern about the environmental impacts of fossil fuel combustion has spawned many conferences, reports and international task forces that have sought to come up with sustainable solutions. 21st century cities need to fundamentally reconfigure the way they use energy technology, ensuring that renewable energy, and efficient and circular systems of resource use, underpin their existence.

The challenge of sustainability



Above: Modern cities have a linear metabolism, demanding huge quantities of resources and discharging wastes into nature. Future cities need to develop a circular metabolism to become sustainable, using resources efficiently, recycling waste and running on renewable energy.

Steps towards a sustainable Adelaide

Adelaide has a tremendous opportunity to reinvent itself as a sustainable city. Its excellent climate, its relatively limited population size, its cosmopolitan cultural diversity and its intellectual vibrancy make it particularly suited to implement a vigorous sustainable development program. Many initiatives and projects are already in place to help facilitate this process. The key issue now is how to bring these together into a synergistic whole. Are people, businesses and public authorities prepared to make Adelaide a world leader in sustainable urban development?

This report centres on the City of Adelaide (population 17,000) whilst acknowledging that its sustainable development cannot be envisaged without taking into account the bigger picture of metropolitan Adelaide (population 1.1 million) and, indeed, the wider context of South Australia as a whole (population 1.5 million). Strategic planning for sustainability at the local level needs to be informed by the regional, national and global context in which Adelaide finds itself.

At the local level, the City of Adelaide has many options to set the scene for the whole metropolitan region. As the centre of government, business, commerce, education, research, communication, culture and exchange of ideas, it has special opportunities and responsibilities to drive the agenda for state-wide sustainable development. A new 'green buzz' emanating from Adelaide can have tremendous effects, even beyond the boundaries of South Australia.

This report is also strongly informed by the view that public policy can only work with strong popular participation. In fact, the most successful examples of policy development and implementation are driven by strong public demand. Many of the findings in this report arise out of intensive discussions with a wide range of stakeholders in Adelaide in dozens of round tables and meetings in May and June 2003.

The text deals with seven subject areas: energy efficiency, renewable energy, water security, zero waste, sustainable transport, nature and the city, and green business. To summarise, it makes the following **recommendations:**

- enshrine sustainability in South Australian law, as an organising principle for Adelaide's future development
- use environmental sustainability as a driver for social and economic sustainability
- make sustainability attractive to the community as a viable option for Adelaide
- report monthly to the Premier and to Cabinet on the development and implementation of sustainability policies and practices



Above: Produce grown locally provides an efficient, fresh food source for the city
Source: Planning SA.

Office of Sustainability

The Office of Sustainability, located in the Department for Environment and Heritage, was established in July 2002 with the brief to drive strategies for sustainability across government and the state. The Office is doing this by working across the private, business, industry and community sectors to encourage consistency and cooperation. The Office of Sustainability is also the centre for environmentally innovative thinking for the whole of the government.

Institutional change to deliver sustainability is a key goal of the government and the Office of Sustainability plays a role in this by addressing issues of integration across government towards common goals.

Establishing a greening of government operations framework, and contributing a sustainability perspective to all cabinet submissions are particular areas where the Office has made its mark.

The Office covers a range of activities, including reporting on environmental and sustainability indicators; developing environment policy and legislation; community and local government relationship building; working on green business; and developing a model of integrated demand management. The membership of a 'Sustainability Round Table' advising the Minister for Environment and Conservation will shortly be announced.

Anne Harvey, Director, Office of Sustainability

Efficient use of energy

The bulk of the world's energy is used by cities and their production, consumption and transportation systems. It is becoming increasingly apparent that energy could be used much more efficiently than is currently the case. In the light of this, many cities have started to take vigorous steps towards reducing their energy demand by appropriate policy measures. Worldwide associations such as the International Council for Local Environmental Initiatives (ICLEI) and its Cities for Climate Protection Program have set the scene for relevant initiatives⁵.

South Australia's energy use, and its exceptionally high electricity consumption, is surprisingly large, and rising at a rate of 3 to 4% a year⁶. And yet, population is stable and economic growth has been well below this figure. In a world facing major problems of climate change, this is quite unacceptable. If anything, energy consumption should be reducing at a rate of perhaps 3% a year!

In the very hot weather conditions of February 2001, South Australia's electricity consumption reached its all-time peak demand of 2,833 MW, nearly 1.5 KW per person. Mainly because of domestic air conditioning demands, South Australia has the most 'peaky' demand profile of any Australian State. The need to supply large quantities of electricity for very short periods of time causes a large peak requirement in generating capacity that will lead to significant increases in energy costs for South Australian consumers. One third of the State's existing generation capacity already operates for just 5% of the year or less.

The residential sector consumes approximately 35% of the State's electricity usage and contributed a disproportionately high 43% of the State's peak demand in February 2001. However, much of the heavy industrial load is continuous and can be supplied at lower cost than the 'peaky' loads seen in the commercial and residential sectors. In all sectors taken together, a combination of load curtailment, through contracts for reduction in demand,

and load shifting, delivered through time-of-use tariff incentives, could deliver savings in peak demand of some 250 MW in the long term. This could avoid one-off additional generation and infrastructure costs of some \$100 million per annum, although this would take a number of years to achieve⁷.

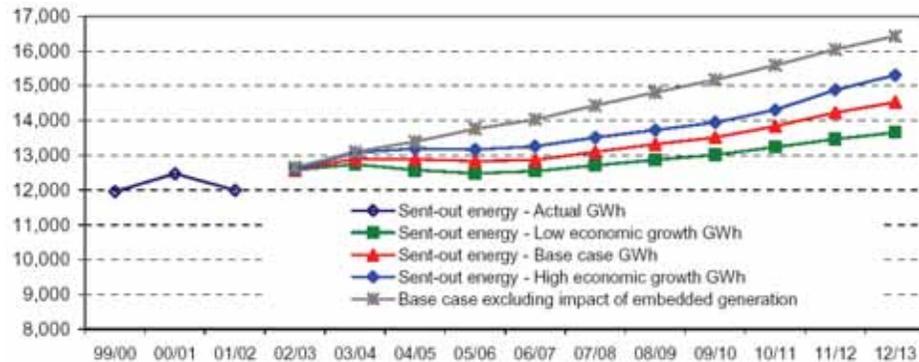
The potential for making demand side measures more effective in the commercial, government and domestic sectors is already well established worldwide. Particularly across Europe, insulation programs for existing buildings, more efficient energy use in new buildings and lighting and transport systems are becoming common place. Impressive results have been achieved in smaller cities such as Freiburg, Bologna and Leicester but also in major ones such as Vienna, Copenhagen, Helsinki and Stockholm. They all share substantial programs for retrofitting existing residential and commercial buildings with better insulation, more efficient boilers and passive solar technology, often using performance contracting as a cost effective tool for achieving significant results. Similar measures have also been used to help small and medium businesses to substantially cut their energy demand⁸.

This process is also increasingly used in Australia: 'Energy Performance Contracting is a smart, affordable and increasingly common way to make building improvements that save energy and money. Any large building or group of buildings is an ideal candidate for performance contracting, including council, state and federal sites, schools, hospitals, commercial office buildings and light industrial facilities.'⁹



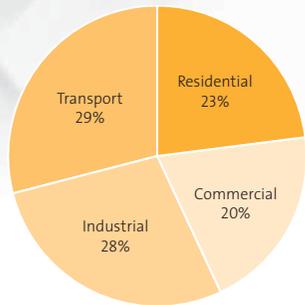
Above: New 'city living' development offers great opportunities for energy efficient housing.
Source: Herbert Girardet

An interesting example from Adelaide of how the energy consumption of an office building has been significantly reduced is the Colonel Light Centre in Pirie Street. Built in the 1970s, it houses the City Council's administrative centre. Five floors have now been refurbished and have delivered significant reductions in both energy use and greenhouse gas emissions. Once the entire building has been fully retrofitted, it will achieve a Five Star Greenhouse Rating.

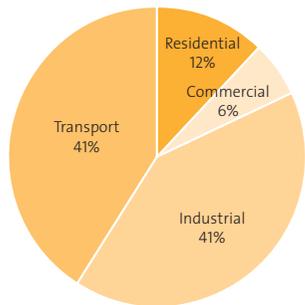


Efficient use of energy

Greenhouse gas emissions



Energy use



Above: South Australia's Energy flow data 1998-99.
Source: Energy SA

Features of the Colonel Light Centre include:

- An innovative 'active chilled beam' air-conditioning system that consumes at least 30% less energy than traditional systems
- A new lighting system that has reduced energy consumption by 75%, from 24 Watts per m² to 6 Watts per m²
- Managed lighting system control
- Energy efficient cold cathode exit lights and emergency lighting
- Energy Star office equipment¹⁰

In South Australia, the building industry represents about 38% of total CO₂ emissions, with the housing sector contributing 55% of this. Making Adelaide's buildings more energy efficient is desirable for many reasons, particularly climate change.

There is no doubt that the energy consumption patterns of office buildings across Adelaide could be influenced by government policy, particularly if it decided only to rent highly efficient buildings for its own use. But it would also be important to influence energy consumption in other commercial buildings, such as shopping malls. Could an increase of inside temperatures be mandated in the summer months, from 18°C to, say, 21°C, when outside temperatures are 30°C to 40°C?

As has been done with water use, public concern about energy use and its environmental impacts could be stimulated through public awareness campaigns. Government policy could also do much to influence energy use in the domestic sector, by an active information program on how householders could reduce their energy consumption and therefore bills – by efficient lighting, insulation, water heating, and domestic appliances. Energy SA is currently conducting a major study on this.

Few people are currently aware that the release of carbon dioxide from energy use in South Australia is exceptionally high. In 2002, total CO₂ output from burning fossil fuels in both power stations and vehicles was 34 million tonnes. Metropolitan Adelaide's share in this was 25 million tonnes. The per capita CO₂ figure of 22.7 tonnes per person/ year is unusually high by international standards, even if the fact that Adelaide has a substantial manufacturing sector is taken into account.

Beyond awareness campaigns, a major energy efficiency program is likely to require new policies on demand management by business, commerce and private households across the city. This can have significant environmental as well as economic benefits. Not only is energy efficiency a highly cost effective alternative to the use of energy, it can also provide substantial employment. According to Energy SA, a substantial 850 to 2700 new jobs could be created in South Australia¹¹ by a major program of making buildings more energy efficient.



Above: Mawson Lakes is an example of compact urban development in metropolitan Adelaide.
Source: Herbert Girardet

Green building codes and projects

As far as new building stock is concerned, it seems clear that not enough has been done in recent years to implement mandatory standards to reduce energy consumption. Many architects regard the existing building codes as insufficient. It seems that new, more rigorous codes are urgently needed to give significant incentives to house builders to adopt energy efficient designs and products. Architect Warwick O'Brien explains why he considers existing building codes to be inadequate. (*see next page*)

Adelaide City Council is also using the City Living initiative for showcasing new environment-friendly buildings within the City. By offering development land, such as the Balfours and Bus Station sites to developers at favourable rates, they are in a position to stipulate highly energy, resource and transport efficient building designs and urban lifestyles that can then become a benchmark for the City.

The relationship between current legislation and sustainable outcomes in SA

The Building Code of Australia now requires all new houses, alterations and additions to meet a 4 star energy rating to help abate CO₂ emissions. In South Australia four methods of assessment of submissions to Council for Building Rules Approval are applicable. These are:

1. Deemed to comply – Building Code of Australia
2. Computer simulation – NatHers and First Rate assessment program
3. Reference house comparison
4. Expert committee determination – Assessment Board established by Planning SA

Assessments undertaken since January 2003 by this group reveal the following:

1. Most housing produced by volume builders will be assessed under the 'deemed to comply' process. Most applications will attain an approval under this system by, for instance, simple manipulation of insulation - but still perform very badly in terms of real sustainability outcomes.
2. The computer assessment system is known to be flawed and occasionally produces erroneous results. Interpretation/manipulation can be used for favourable results.
3. Most applications that don't attain 4 stars by other methods can be made to comply using the 'deemed to comply method', again, resulting in little improvement in real outcomes.

4. Most architecturally designed houses will fail to attain the 4 star rating due to larger areas of glass relative to the floor area, even though they are generally likely to perform in real terms to a much higher level of sustainability than standard tract housing.

The BCA requirement relates only to the internal comfort of buildings achieved by materials and construction. No consideration is given to pollution generation, use of resources or visual impact. Therefore the process is extremely limited in terms of its real impact on sustainability. With respect to commercial building, no regulatory controls exist whatsoever in terms of energy usage or any other aspect of sustainability. Also, any relevant policies regarding town planning have not filtered down into any change in regulations that would encourage sustainability.

A far more scientifically rigorous process is therefore required to achieve a reduction of greenhouse gas emissions and enhance sustainability practice.

In other words, in South Australia, sustainability is presently not addressed in any significant manner whatsoever in relation to commercial or domestic construction.

Warwick O'Brien,
Atelier Urban & Environmental

Christie Walk case study

The Christie Walk project in south-west Adelaide is a living demonstration of the 'ecocity' vision pioneered by Urban Ecology Australia Inc. Its inner-city location supplies solutions as well as challenges - it's close to public transport and has walkable proximity to all major urban facilities, including the Central Market, which greatly reduce transport energy. By showing that all the key issues of sustainability can be addressed on a tightly constrained urban site, it proves that socially and environmentally successful urban transformations can be implemented in almost any urban location.

The 2,000 square metre site, equivalent to two traditional quarter-acre blocks, will comprise 14 dwellings of various types, including one of the world's first urban multi-storey straw bale houses. The next stage will be a 13 unit apartment building that will include 'co-housing' facilities to serve all Christie Walk residents.

The sustainable landscaping and community gardens - including South Australia's first 'true' roof garden - are designed to increase biological productivity and biodiversity, to be attractive, productive and water and energy conserving.

Solar energy powers the passive heating and cooling of the houses, provides hot water, and will eventually generate electricity on-site. The non-toxic construction systems favour materials with low embodied energy to achieve efficient, healthy building. Materials re-use, recycling and resource conservation have been essential components of the project. Stormwater is captured in underground tanks for use in irrigation and toilet flushing. A Coast & Clean Seas grant supported the provision of a 'sewer mine' to further reduce water wastage and irrigate the community landscape.

Paul Downton,
Urban Ecology Australia Inc.



Above: Overseas students view Christie Walk townhouses following in the footsteps of thousands of visitors who have enjoyed the story of Christie Walk and its architecture.
Source: Urban Ecology

Recommendations

- Make the efficient use of energy by all sectors a key focus of government policy
- Make it clear to the property sector that the government will only lease energy efficient office buildings
- Modify building codes to make sustainable building practice the norm, if possible working in conjunction with other Australian State governments
- Create exemplary projects to demonstrate the benefits of green architecture

Solar City Adelaide

Steam and internal combustion technologies, first implemented in the 19th century, still provide the bulk of the energy used to power our cities. These technologies have contributed to the dramatic economic and urban growth that made the modern world possible. Historically, there's never been a city of more than a million people not running on fossil fuels – powering their transport systems, their industries and their electricity supply, and heating and cooling their buildings.

However, the environmental problems associated with fossil fuel burning are becoming ever more apparent. Whilst local air pollution and acid rain damage from fossil fuel combustion have been dealt with quite effectively by many cities, increases in carbon dioxide in the atmosphere have not slowed down at all. There is no doubt any longer that fossil fuels cannot be the primary energy suppliers to our cities in the medium or long term. The International Panel on Climate Change (IPCC) predicts that climate change will affect most of the 50% of the global population living close to the sea. Sea level rises of up to one metre this century and temperature increases of up to 5.8 centigrade will profoundly affect the lives of billions of people across the planet¹².

This situation is acknowledged in a speech by Premier Mike Rann on 18th February 2003: 'Our government firmly believes that it is in the best interest of our State, the nation and the world to support the Kyoto Protocol. ... At the state level, SA is playing its part and wants to do more. ... Renewable energy... will be a key driver for future sustainable economic development. ... We have announced a wind farm strategy and we are promoting the use of solar power....'

A key question to which we need to find urgent answers is whether large modern cities such as Adelaide can make a systematic switch from combustion based energy technologies to the routine use of 21st century renewable energy technologies such as solar energy, wind power and fuel cell technology? How soon can they power themselves sustainably? We need to create solar cities and few cities are better placed than Adelaide to rise to this challenge.

This section proposes a substantial range of policies for a sustainable energy system for Adelaide. The bulk of these policies could be implemented without significant Treasury spending or other additional costs to society. A great deal can be done to accelerate a sustainable energy system by creating new policy frameworks by regulation and by new, more creative approaches to consumer information.

Wind power

Wind power is a form of solar energy in that wind currents are generated by the heat of the sun. Wind power is the fastest growing energy industry in the world with average growth at over 22 percent per annum for the past 10 years¹³. A growing number of European cities are now implementing active measures to power themselves by renewable energy technologies. Copenhagen, for instance, currently supplies 20% of its electricity from wind turbines, located both on-shore and off-shore. In California, in places such as the Altamont Pass, thousands of small and large wind turbines can be seen, producing electricity for cities such as Desert Springs.

So far, the uptake in Australia has been much slower than in other countries despite its enormous wind potential. The wind profile in South Australia is driven by seasonal variations however it appears most consistent over the summer months. Given the State's peak electricity demand and the anticipated shortage of peak energy by summer 2004/05 the case for supporting this industry is compelling¹⁴. SA's great wind profile and the significant environmental benefits that could be achieved through wind turbine generated electricity seem a strong enough reason to support wind technology. In addition, experience overseas suggests that 6.6 times as many manufacturing and installation jobs are created for wind power as compared with coal fired power stations.

It appears that Australia's low-cost open cast coal mining industry has slowed down investment in renewable technologies, such as wind power, compared with Europe and America. However, in the last couple of years permissions have been granted for substantial wind power development, mainly along South Australian coast line. The first wind farm at Starfish Hill, with a capacity of 34.5MW, came on stream in 2003.

A major problem experienced by the wind power industry is that unlike coal or gas fired electricity, which have received large government subsidies for the construction of transmission lines, it has received no such support. More generally, renewable energy sources are competing with fossil-fuel technologies that have reached their economies of scale and which have benefited

from extensive government subsidies over many years. A method of creating a level playing field would be to price in the externalities of generation emissions, particularly environmental costs. This could be done at the national level to avoid the complex process of creating unified systems across countries worldwide.

South Australia's geographic disposition means that the electrical network (transmission and distribution) necessary to link distant generation sources to Adelaide and regional areas requires a proportionally higher investment in network to similar quantum loads interstate. Participants in an Energy Roundtable suggested that without a change in policy this would have a substantial impact on the socio economic position of the State¹⁵.

In Australia, much more could be done to stimulate renewable energy technology. Firstly, the Federal Mandated Renewable Energy Target (MRET) which is currently the only market stimulus, should be increased from the existing 2% target and stretched to at least 5% by 2010. By this method all renewable energy developments, including wind power, would be encouraged to grow and become more robust.

Solar City Adelaide

Also at the Commonwealth level is the National Electricity Code and the difficulty experienced by wind farm operators in meeting Code requirements relating to grid connection. Advanced modelling needs to be undertaken to verify the claims that the intermittency of wind power generation could lead to instability of the electricity system. This will help South Australia to plan for where and at what capacity wind farms should be located. For example, is it best for several small farms to be located throughout the State or should a couple of very large farms be set up at each end of the grid?

Knowledge gleaned from such a model should be fed into the State planning system and correlated with transmission corridors, visual impacts, and landscape issues to determine the ideal location and size for wind farms. This would give certainty to the industry and help the community to understand the reasoning behind why certain locations are promoted as wind farm sites. Within this equation sites close to Adelaide should not be discounted. Such sites might include Wingfield, Port Adelaide, Salisbury, Lonsdale and Port Noarlunga.

Wind farm development can have many benefits. Substantial wind farm development could lead to significant numbers of jobs being created in the manufacture of towers, blades and electrical equipment. According to the Passey Report, if SA were to secure 500MW of wind, a total of 2,325 new jobs would be created - 2,250 in manufacturing and installation jobs and 75 in operations and maintenance.

Direct employment generation from energy developments per million dollars invested¹⁶

| Technology | Jobs per A\$ million invested |
|-----------------------|-------------------------------|
| Oil Shale (1) | 0.5 |
| Solar Electric (2) | 3.5 |
| Energy efficiency (3) | 35-50 |

Direct employment generated per megawatt-hour¹⁶

| Technology | Jobs per million megawatt-hours per year produced |
|--------------------------------------|---|
| Oil Shale (4) | 46.3 |
| Coal Mining and power generation (5) | 116 |
| Solar Thermal electricity (6) | 35-50 |
| Wind (7) | 542 |
| Energy efficiency (8) | 400 - 860 |

There is potential to link the wind industry with the emerging hydrogen economy. Fuel cell technology for vehicles, buildings and urban infrastructure will be of ever growing importance in the coming years. Again, there are both environmental and economic opportunities. South Australia is well placed to position itself to capture a sizeable slice of this important emerging technology.

Wind farm approvals

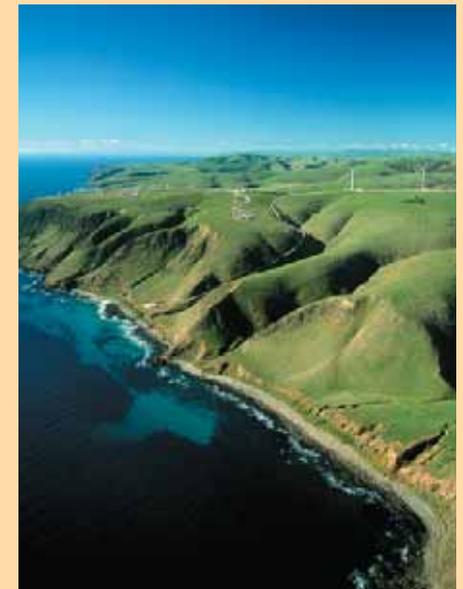
By July 2003 ten wind farms had received planning approvals, totalling over 700 MW and representing a total capital investment of some \$1b.

- Starfish Hill, Cape Jervis, 34.5 MW (70% complete)
- Lake Bonney Stage 1, South East 80.5 MW (awaiting transmission corridor permit)
- Lake Bonney Stage 2, South East 120 MW
- Lake Bonney Central, South East 40 MW
- Yabmana - Eyre Peninsula 40 MW
- Green Point - South East 40 MW
- Troubridge Point - Yorke Peninsula 20 MW
- Tungketta Hill - Eyre Peninsula 65 MW
- Sheoak Flat - Yorke Peninsula 81 MW
- Wattle Point - Yorke Peninsula 90 MW
- Clements Gap - Mid North 80 MW

Wind farms offering a further 500 MW were going through the planning or community consultation process, and others, with another 500 MW, were under consideration. A recent economic impact study shows that a 600MW wind farm development would deliver a \$562m economic benefit for the State during construction, plus an annual \$85m operating benefit.

To maximise local expenditure, negotiations are being conducted to establish a manufacturing base in South Australia for European wind technology. A successful trade mission to Europe was held in April 2002, with SA manufacturers securing contracts totalling up to \$100 million. A second trade mission visited Europe in July 2003. Several biomass electricity generation facilities are also under serious discussion.

Information provided by the Department of Business, Manufacturing and Trade



Right: Starfish Hill Wind Farm Cape Jervis, South Australia.
Source: Tarong Energy

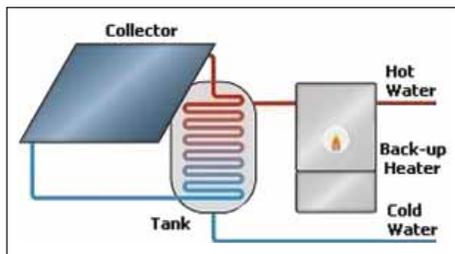
Solar City Adelaide

Solar heating

Making Adelaide into a world leading 'solar city' in the coming decades requires the implementation of both solar electricity and solar hot water technologies. In fact, as I write this, the State of Victoria has just announced that it will mandate solar hot water systems for new buildings from 2005.

Solar hot water systems are a mature technology that has been gradually developed and improved all over the world. Around the Mediterranean, in particular, use of solar hot water systems has become common place. In 1999, the city of Barcelona adopted an innovative solar law called 'Barcelona Solar Ordinance' which became mandatory in 2000. All new buildings in the city now have to install solar hot water systems¹⁷.

In other 'blue sky' countries, such as Israel, solar hot water systems are mandatory for residential use and most homes now have such systems. Greece has developed a very large solar hot water systems industry. Technologies developed there also include solar absorption chillers that convert the energy in hot water from solar collectors into 'coolers' to be used for air conditioning.



But solar hot water systems are not exclusive to hot, sunny countries. In Austria with its colder and cloudier climate, solar hot water systems have been widely adopted. Even in rainy London, a new initiative, 'Solar for London', is about to significantly increase the uptake of the technology.

According to one report, the solar hot water market in Europe has 'grown by 11.7% a year over the past decade. And still the technical potential for this clean technology is largely untapped'. The solar thermal industry estimates that '1.4 billion m² of solar thermal collectors could be installed in the EU. This is 100 times more than the current capacity of roughly 14 million m². We propose a detailed action plan to help Europe realise this vast potential and thus reduce our dependence on fossil fuels, nuclear power and imported energy.'¹⁸

Adelaide's Mediterranean-type climate is ideally suited to the ubiquitous use of solar hot water technologies. Hot water is one of the largest users of electricity in most Australian homes. And yet free energy from the sun could meet 70% or more of most householders' hot water requirements. Replacing an electric water heater with a solar one is also a most effective action by which most households can take to reduce their greenhouse gas emissions. A solar heater will reduce a household's CO₂ emissions by about 3 tonnes per year, equivalent to taking a small car off the road.

This report therefore proposes a government mandate for installing solar hot water systems on all new buildings or for retro-fits in existing buildings.

At present, an investment in a solar water heater is the largest contribution most families can make to the use of renewable energy. It is also a highly cost effective measure with a payback, typically, of only 2.4 years. The greatest barrier to widespread uptake is lack of adequate knowledge. Changing this is a challenge for government, the solar hot water industry and for house builders. The home building industry currently tends to install the cheapest and shortest life conventional water heater without regard for either life cycle costs or the environment. It is critical for government mandates to fundamentally change this situation. Added costs will easily be absorbed in mortgage payments and lower running costs for homes.

The Commonwealth Government's Renewable Energy Certificates and The State Government's own rebates are currently a substantial help with investment costs. Currently, grants of up to \$700 are available in South Australia for the installation of solar hot water systems on domestic buildings. Not surprisingly, the industry has grown by about 30% pa in recent years. A solar mandate for Adelaide would massively increase the demand for such grants which might cause government to reduce or abandon grant payments. It would therefore be wise to explore the cost effectiveness of solar hot water systems even without top-up grants.

Beasley Solar are South Australia's only solar hot water systems manufacturer based in Adelaide. They say that once awareness of such favourable figures spreads, the significantly reduced energy costs resulting from installation of solar hot water systems could

become a major incentive for householders to install them. This would apply particularly at the time when hot water tanks need to be replaced anyway.

As solar hot water systems become common place, their production and installation costs will come down with the economics of scale. Because of this, Beasley Solar expect that the payback for their hot water systems will not increase even if grant schemes are gradually phased out, providing there is a continuous increase in uptake through measures such as a government solar hot water mandate. Not surprisingly, Beasley expect a rapid increase in employment in their industry sector despite the likelihood of increased competition from other manufacturers.

Saving money with solar heat

If all electric water heaters were replaced (as they fail) with either solar water heaters or heat-pumps, then over 12 years, energy savings would rise to 1.2 petajoules (PJ) per year. A similar program of replacing failed gas (mains and LPG) water heaters with 5-star gas would achieve energy savings of 1 PJ/yr in 12 years. Combined, these two measures would save 2.2 PJ/yr at the end of a 12 year program. This would be sufficient to stop projected growth in annual SA residential energy use.

Information provided by Energy SA

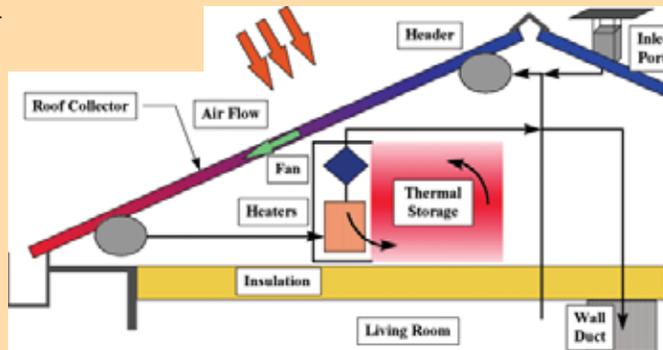
Solar space heating

This revolutionary heating system is effective, cheap to run, environmentally friendly, uses air instead of water and is designed to be tucked away inside the roof of the home or office. It is based on simple principles that complement contemporary urban housing design, providing a practical alternative to fossil fuel dependent heating systems. The UniSA Solar Space Heating System was developed in partnership between UniSA, the South Australian Housing Trust and BHP Steel through a shared commitment to creating sustainable communities.

The system comprises an air based solar roof collector which is integrated with the BHP Colorbond steel roofing.

The air transfer system is contained within the roof space and the sun's heat is captured during the day in a storage facility that uses an innovative process phase change material (like wax which is solid but melts when heated) maximising the heat and storing it efficiently and easily in the roof space. The heat is released during the evening when it is needed.

Wasim Saman, University of South Australia



Solar electricity

Solar electricity is still much less cost competitive than solar hot water systems. However, this problem can be overcome by the use of appropriate government policies. The potential exists to create a market-driven program to accelerate the uptake of Solar Photovoltaic (PV) installations on South Australian roofs. The climate in South Australia is a major advantage, receiving nearly twice the sunlight compared with northern Europe!

In German cities, solar PV panels are becoming commonplace, despite the country's relatively cloudy skies. New legislation was introduced in 2000 that fixed both the payment and the number of years during which the owner of a PV roof would receive payment under so-called 'feed-in' legislation. Under this, owners of PV installations are paid about 50 cents/kwh for selling their electricity to the grid, four times the price of conventional electricity generators. (Owners of wind turbines are paid about 10 cents/kwh). The law requires that the tariff paid for solar electricity be reduced by 5% per year. The policy has been a massive success and led to a substantial growth in demand for solar PV technology across the country.

A feed-in law provides a preferential tariff for the owners of residential and community PV systems. This tariff recognises the additional benefits of solar-generated electricity over pool-supplied power, and provides a return sufficient to encourage more wide-spread investment in photovoltaic system. The cost of this higher tariff is distributed across the whole residential market, in a similar way to the current federal MRET scheme.

The German program aims to install a total of 1000 MW of PV capacity. In 2001 and 2002 it resulted in 80 MW of installations. As a result, German companies have now taken globally significant positions in the solar industry. The German solar market reached 0.75 billion Euro in 2000 and is expected to reach 3.5 billion Euro by 2010.

Over 3,000 jobs in production, distribution and installation have been generated so far and this figure will quadruple by 2010. The great success of the legislation has been widely acknowledged and similar schemes have now been introduced in other EU countries such as Austria and France.

Calculations for South Australia should warm the heart of even the most hard-headed economic rationalist. A program that results in 100 MW of PV installations, say, within 10 years can be achieved at an insignificant cost to electricity users or tax payers, yet help create a vibrant solar industry with significant employment gains and make Adelaide a world-leader in the adoption of solar energy.

Modelling has shown that a program starting in 2005 and running for 20 years, with a 10 year solar power buy-back tariff of 99c/kwh and reducing 5% per year as solar PV prices fall, results in:

- Increased domestic demand for solar PV power sufficient to create 10 MW per year of Solar installations (currently approximately 150 KW in South Australia).
- The creation of approximately 400 new positions directly employed in system manufacture or installation, and an even greater number employed in secondary industries.
- A maximum increase in average residential electricity costs of 0.02c/kwh (less than one one-thousandth of the current summer peak).²¹

Solar City Adelaide

Solar intensity in various cities

| city | Output KWH/m ² /year |
|-----------------|---------------------------------|
| Los Angeles | 233 |
| Adelaide | 210 |
| Athens | 183 |
| Melbourne | 182 |
| Rome | 191 |
| New York | 169 |
| Tokyo | 149 |
| Berlin | 121 |
| London | 111 |

A program of this size would be the catalyst for the development of a strong PV industry in South Australia and create new jobs in manufacturing and downstream activities, develop R&D expertise in silicon processing, and export into a rapidly growing global PV market, at a minimal cost to South Australians and their Government.

In South Australia, solar PV electricity is currently three to four times more expensive than 'conventional' electricity – around 70 cents/ kwh as compared with 18 cents/ kwh. We recommend a scheme by which solar owners of PV 'power stations', such as those mounted on roofs, could sell their electricity back to the grid at four times the current unit price, as well as receiving the Commonwealth Government Photovoltaic Rebate Scheme (PVRP) subsidy.

A feed-in law implemented in South Australia would reduce the payback period for PV systems to an average of 10 years, massively stimulating demand for solar PV systems and greatly increasing the numbers of businesses and jobs in this sector. It would potentially help to make Adelaide into a major centre for PV technology production. Already Pilkington Glass, based in Adelaide, is a leading supplier of glass casings for PV systems to the solar industry in Japan.

Fuel cell technology

There has been much talk in recent years about the development of a hydrogen economy using fuel cell technology. Hydrogen fuel cells could be used in both transport and stationary applications, replacing international combustion technology. Many billions of dollars have been invested in the technology in recent years.

Hydrogen is an energy carrier rather than an energy source. It can be generated from fossil fuels by stripping out hydrogen or, preferably, by splitting water (the process of hydrolysis) using a renewable energy source such as wind or solar power. A major reason for large recent investments in hydrogen fuel cell technology is that it is a clean energy system which releases no fumes into the atmosphere. Increasingly, countries want to get away from oil dependence and the pollution associated with combustion technology.



Above: In London smoking taxis have been retrofitted with fuel cell technology. South Australia is well placed for producing hydrogen for fuel cell powered vehicles.
Source: Herbert Girardet

A growing number of cities are now experimenting with fuel cell powered buses as a first step towards more widespread adoption of fuel cell technology. The latest of these is London, which will have three hydrogen powered buses running this year under the auspices of the London Fuel Cell Partnership that was created by the Greater London Authority. Two major advantages are that the engines don't burn any fuel when stationary and that the only 'waste gas' coming out of their exhaust pipes is steam.

South Australia is particularly well placed for producing hydrogen for fuel cell powered vehicles and buildings through solar and wind power. These energy sources are exceptional in this State and it would be tragic if this were not rapidly utilised in the use of clean energy technology.

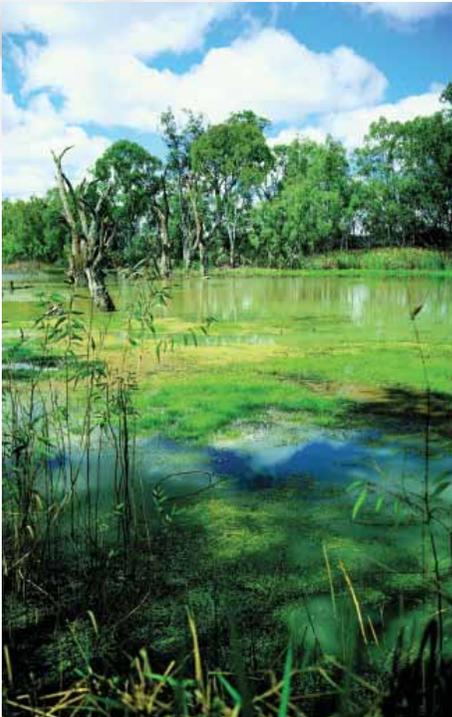
For the moment it would be important to ensure that all gas pipelines laid in South Australia were specified as 'hydrogen ready', ensuring that they could be used for transporting hydrogen in the coming years and decades.

Recommendations

- Support wind power development as an important new manufacturing industry and as a key technology in a sustainable energy system
- Mandate the installation of solar hot water systems on all new buildings, emphasising their short payback periods
- Mandate retrofitting of existing buildings with solar hot water systems, particularly when old boilers need replacing
- Introduce a feed-in law for solar PV systems, allowing owners to sell electricity to the grid at up to four times the rate charged by conventional power generators
- Explore linkages between renewable energy and a future 'hydrogen economy'

Water security

Water security



Above: The River Murray is vitally important for Adelaide's future, but it is a river in deep trouble.

Source: DWLBC

Sustainable water use is one of the great challenges for the 21st century. Worldwide, a third of humanity does not have access to good quality water. Adelaide is doing very well for itself in comparison, with water seemingly available in abundance at the turn of the tap. However, it is frequently said to be a city in the driest state in the driest continent. In most years, Adelaide gets 60% of its water supply from the Mount Lofty Range, though with increasingly erratic rainfall patterns this is becoming precarious. In average years Adelaide also draws about 40% of its water from the Murray River but in dry years this can increase to 90%.

There is ever growing concern about the viability of continued large-scale abstraction of water from the Murray. Too much water is drawn out of the river for an ever greater variety of uses. Like the Colorado River in the United States, the Murray now rarely reaches the sea and most of it ends up in irrigation pipes, and in factory and domestic water systems instead. The quality of its water has been declining as a result of inadequate recharge, and tainted run-off from the land. 'The quality of water in the River Murray and its tributaries has declined. Turbidity and nutrient concentrations are high, and disease-carrying organisms are a particular problem in the Lower Murray. But perhaps the most important issue is the rising salt level in the river and on the land, a problem that will take many decades to solve.'²³ The vision of the River Murray Catchment Water Management Plan is to ensure 'a healthy catchment and sustainable uses' of the river's water.

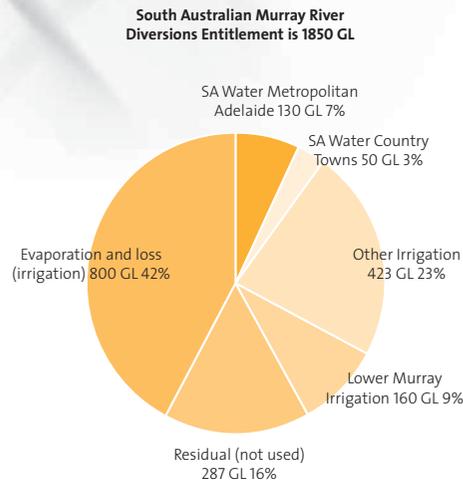
The Murray-Darling Basin covers over a million square kilometres of south-eastern Australia and is its largest and most developed river system, encompassing much of the country's best irrigation, farming and grazing land. The basin provides 75% of Australia's irrigation and 40% of the total gross value of Australia's agricultural production, including 45% of its wheat, 56% of its fruit, and 9% of its cotton production.²⁴ In the light of other water needs, it is clearly of the essence for irrigation water to be used as efficiently as possible. Inefficient water use on farms may make little sense in the production of low-value crops for export.

In addition to agricultural use, tourism and recreation valued at more than \$3.5 billion, 5% of Australia's mineral and mining production depend on water from the Murray. Three million city people draw their water from the Murray, in places such as Canberra, Toowoomba, Broken Hill, Albury, Roma, Murray Bridge and, of course, Adelaide. A 60 km pipeline links Adelaide from Mannum on the Murray, with a capacity of 380 megalitres a day.

Extracts from the Adelaide Declaration, 25th February 2003

Major environmental damage to the River Murray is occurring throughout the length of the River Murray, but particularly below Wentworth in NSW. A major part of the solution to this problem is more water for the Murray. The overuse of water from the River Murray and its tributaries will soon also impact on the sustainability of the very industries that depend on the water resource. Irrigated crops, urban water supplies, tourism and recreation are all threatened by the continued decline in the health of the Murray. A crucial issue is the Murray Mouth and the Lower lakes. An additional average annual flow for the River Murray system of 750 gigalitres (GL) per annum would provide a low to moderate likelihood of restoring the health of the river system. 1600 GL per annum of additional flow would provide a moderate likelihood of achieving this goal. The River Murray is no longer functioning as a healthy river and its condition is continuing to decline. The restoration of any additional flow will require a substantial transfer of the rights from consumptive users to environmental uses in the River Murray system, and this will require a robust water entitlements and allocation system on which a vibrant water market can be built. A water market is required that encourages the movement of water to its most efficient use.²⁵

Use of River Murray water in South Australia:



This diagram shows clearly that most of the water abstracted from the Murray is actually used in farming rather than primarily for urban water consumption.²⁶ It seems only fair for the citizens of Adelaide to insist that farmers use irrigation water in the most efficient way possible. In their turn, they should ensure that their own consumption of water is efficient as possible and that water is routinely collected from roofs for use in houses and commercial and public buildings, and that urban storm and waste water is used for irrigation purposes within the city wherever possible. The SA Government's \$30 Save The Murray Levy, introduced in June 2003, will help to raise public awareness of the importance of efficient water use and, despite being a financial cost, has enjoyed a very high public acceptance.

Salisbury Wetlands

The City of Salisbury in metropolitan Adelaide has developed an extensive network of wetlands that provide an excellent example of how economic development and environmental sustainability can go hand in hand. Stormwater, seen as a problem in the past, is now harnessed and utilised.

This innovative water management scheme includes some 36 wetlands covering 250 hectares in total. All new residential subdivisions are required to install wetlands to contain as much stormwater as possible, while large industrial developments must develop wetlands for the same reason and also to contain potential industrial spills on site. These initiatives have dramatically reduced flood risk in a flood-prone area, whilst also providing wildlife habitats. In addition, recycling stormwater through wetlands reduces polluted water discharges into the sea.

Salisbury is also involved in the process of aquifer storage and recovery - injecting water into underground aquifers for storage and later use. Large quantities of water can thus be stored without losses from evaporation and with reduced risk of contamination.

Stephen Hamnett, Professor of Urban and Regional Planning, University of South Australia



Adelaide currently consumes about 200 billion litres (200 million tons) of mains water and generates almost 100 billion litres of waste water a year, while 110 billion litres of stormwater drains into the Gulf of St. Vincent. These resources could increasingly be put to productive use. The city's groundwater could also be used more actively. In metropolitan Adelaide, high-quality groundwater from a deep aquifer beneath the city is increasingly used by the soft-drink and beer industries. Many local recreation and sports fields also rely on pumped water to stay green. Some households have sunk their own bores to tap into groundwater supplies. In addition, reclaimed water has started to be 'banked' in aquifers to later be recovered for use in irrigation. This technology is known as aquifer storage and recovery.²⁷

An interesting option for efficient urban water use is to use it first domestically, and then to reuse the waste water in urban irrigation, including farming. In fact, metropolitan Adelaide continues to be the location for production of irrigated crops, particularly at Virginia on the Northern Adelaide Plains. Food production in this area takes place on nearly 7,000 hectares. Treated waste water is used here by growers in a pioneering scheme funded by the Commonwealth government. Nearly 10,000 megalitres of 'class A' reclaimed water was made available in 2001 / 2002 via the Bolivar-Virginia pipeline. The underlying aquifer is used to supply irrigation water every year.

A great range of crops are grown at Virginia, including a wide variety of vegetables, as well as olives, almonds and grapes. There is also a significant nursery and cut flower industry in the area. It is estimated that there is potential for production to increase by an additional 2,000 ha over the coming years whilst using water resources sustainably.

| | |
|-------------------------|--|
| Broad-acre cultivation: | (potato, onion, carrot, brassica) 4,388 ha |
| Greenhouse cultivation: | (tomato, capsicum, cucumber) 597 ha |
| Tree Crops: | (almond, olive) 857 ha |
| Vineyards: | (grapes) 528 ha |

Areas such as Virginia show the tremendous potential of locating commercial food production in and around city regions, making effective use of land and waste water irrigation. It is interesting to speculate whether 'permaculture' community food growing schemes could also be established in some parts of metropolitan Adelaide, particularly in areas of high unemployment.

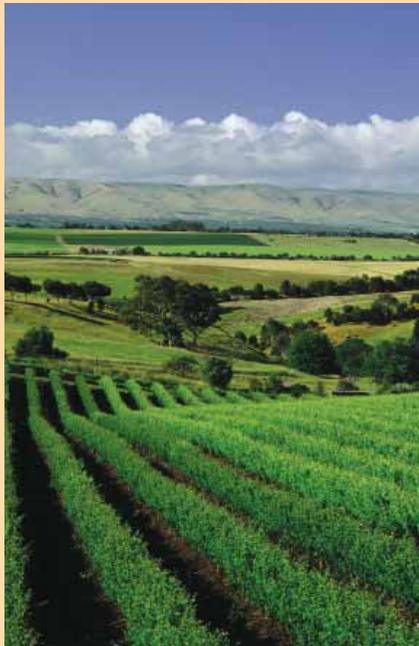
Community participation for the McLaren Vale groundwater allocation

In recent years, an interesting process of negotiating efficient water use by irrigators took place in the McLaren Vale. The irrigation community here worked closely with the Onkaparinga Catchment Water Board to determine an equitable method of re-allocating groundwater, the main source of irrigation water in the area. The Board was responsible for determining appropriate levels of water use, and to reduce existing allocations to be no higher than the sustainable yields. For some irrigators the required reduction in water allocation was up to 50% of their existing licence, so much was at stake. To resolve these matters, the Board formed the McLaren Vale Water Allocation Subcommittee, half of which consisted of local almond and grape growers.

The subcommittee's work was highly successful, and its recommendations were accepted by the Catchment Board, and the Minister for Water Resources. The Board initiated a significant reduction in groundwater allocations, whilst facilitating research and development into alternative water resources such as stormwater capture and the expansion of treated wastewater irrigation already operating in the area. No compensation for the reduced allocations was provided to the irrigators, as they understood that these were necessary for assuring their long-term livelihood. The water allocation plan has been successfully implemented for the past two years.

The Catchment Board provided a direct link between the community and the Minister for Water Resources, and in acting as educators, facilitators and enablers. It has negotiated a strategic catchment framework based on ecological capacity and continues to collaborate closely with the local community to assure sustainable outcomes.

Kathryn Bellette



Above: Water for vineyards in the McLaren Vale is becoming scarce so other options are being explored.

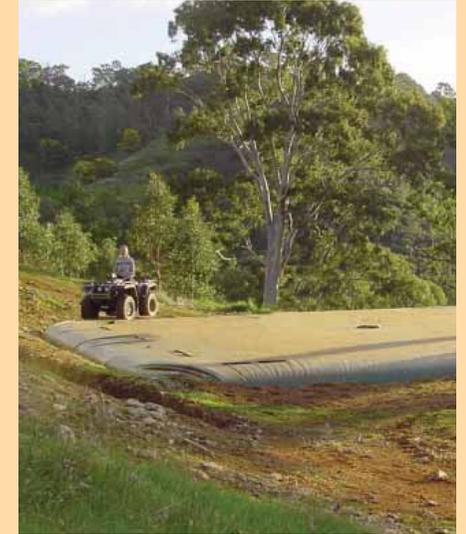
Source: Planning SA

A new water storage system for rural areas

Seen here is a new water storage concept developed by Waterfall View Pty Ltd to store small to medium volumes of water in a cost effective manner while minimizing water losses. The bladders are available in sizes from 100kL to 2mL. The construction is highly mobile and allows for location in inaccessible places where traditional tank construction is not feasible.

The construction is based on a waterproof membrane that is welded into a totally enclosed storage vessel. This eliminates water losses both through ground seepage and evaporation. The total exclusion of oxygen and sunlight minimizes traditional problems of water quality deterioration due to algae growth. The sealed design further eliminates contamination from silt, mud, tree debris as well as the risk of botulism or other bacteria caused by decaying animals drowning in open water sources. The improved water quality allows for the use of sophisticated and precise irrigation systems with lower capital expenditure in filtration systems.

The bladders are produced in a high strength material that is flame-retardant and UV stabilised. As the system is totally sealed it is also much safer for children and livestock compared to traditional dam construction.



Recommendations

- Initiate a public debate about the balance between urban, agricultural and commercial uses of water, and their relative social, economic and environmental benefits
- 'Waterproof Adelaide' by encouraging water efficiency and rainwater collection in all households and businesses
- Make waste water recycling and storm water reuse a central plank of water policy

Implementing zero waste



Above: 'Old cars are an excellent source of steel for new industrial products'.
Source: Herbert Girardet

In an urbanising world, in which cities use the bulk of the world's resources and discharge most wastes, conventional 'linear' waste disposal is regarded less and less as a viable option. City authorities are faced with ever increasing waste disposal costs as old dumps fill up and holes for new landfills become more difficult to find.

Until recently, incineration was seen as the most convenient method of 'modern' waste management. It certainly has the advantage of reducing waste materials to a small percentage of their original volume, with energy recovery as an added bonus. But incineration has been falling out of favour as the main option for waste disposal. The release of dioxins and other poisonous gases from incinerator smokestacks has given them a bad name. Whilst incineration and pollution control techniques have made considerable advances, the problem of waste gases refuses to go away and, in addition, there is the problem of disposing of toxic incinerator ash.

In the last few years other objections to incinerators have been voiced. Recent research shows that they compare badly with recycling in terms of energy conservation. Because of the high energy content of many manufactured products that end up in the rubbish, recycling paper, plastics, rubber and textiles is three to six times more energy efficient than incineration. These are very significant figures given that the energy and resource efficiency is regarded as critical for future urban sustainability²⁸. Many European cities, including London, are increasingly deciding against investing in new incinerator capacity, and they are opting for a combination of recycling and composting instead, with minimal incineration of residual wastes.

It is sometimes said that recycling is a 'red herring' because of the difficulty of matching the supply of recycled materials with a sustained demand for them. But experiences in Europe indicate that carefully targeted market incentives and the right policy signals at national and local level can make recycling economically advantageous. As concern grows about the integrity of the environments on which cities ultimately depend, solid waste reuse and recycling is becoming the rule rather than the exception in many parts of the world. It is becoming widely accepted that in our resource use we should deliberately mimic natural ecosystems in which all waste is reused as the basis for new growth. In our economies we should deliberately create such 'chains of use' or 'eco-cycles' for waste materials in a deliberate step towards creating sustainable systems of industrial and urban ecology.

Some cities have already made this a top priority. Household waste recycling of 50% to 60%, and rising, is becoming the norm across Europe, and the US is not far behind. European cities are implementing ambitious programs for developing zero waste eco-cycles, minimising the 'leakage' of wastes and toxic substances into the environment. An important aspect of this is to find ways of helping companies to develop and use appropriate technologies for advanced non-polluting production processes²⁹. The issue is not only to recycle as much as possible but also to avoid waste being generated in the first place and to create closed loop 'eco-economies' through enabling legislation.

Legislation across Europe is initiating zero waste development. In Germany the pioneering Recycling and Waste Management Act of 1996 was a first significant step towards establishing a zero waste eco-economy there, laying down principles that apply to the whole of economic life. Manufacturers became responsible for the entire life-cycle of a product, from the moment materials leave the ground to the time products are discarded. The Act gives priority to waste avoidance by requiring the use of low-waste product designs, eco-cycle waste management, and consumer behaviour oriented to the purchase of low-waste and low-pollution products. In the manufacturing sector, entire production processes have been redesigned to improve recycling of end-of-life waste products. Companies now have to label all components to ensure easier recycling when products have reached the end of their life.

'Zero Waste' has become a world-wide movement. As waste is increasingly regarded as a valuable resource in disguise, dumping it is ultimately a waste of money and a failure to design sustainable products and processes. The concept of waste should thus be eliminated from our thinking and should be substituted by the word resource instead. For companies this has important implications. Environmentally, it implies the recycling of wastes into materials for production processes. Economically, it implies increased profitability and competitiveness through minimising wastes and toxins.

Implementing zero waste

Zero waste strategies are being adopted by businesses all over the world – driven by legislation as well as voluntary action. They have led to significant cost savings, increased profits and improved environmental performance. In the United States several major companies are moving towards zero waste strategies:

- Interface Inc., Atlanta, Georgia, eliminated over \$165M in waste a year by designing new 'industrial ecology' methods for making carpets.
- Xerox Corp., Rochester, New York, had savings of \$45M in 1998 by minimising wastes, emissions, energy consumption and by maximising recycling.
- Hewlett Packard, Roseville, California, saved \$870,000 in 1998 by reducing its waste by 95%.
- Epson, Portland, Oregon, saved \$300,000 in 2000 by moving towards zero waste.

Industrial ecology at Adelaide Brighton Cement



Above: Adelaide Brighton Cement aims to reduce its fossil fuel energy use by up to 30%.

Source: Adelaide Brighton Cement

Adelaide Brighton, a cement, lime and building construction materials company, is well progressed into improving its use of fuels and raw materials in a more sustainable manner and has embarked upon a concerted 'industrial ecology' program. The use of another company's by-products or waste and turning that waste resource into alternative fuels and raw materials is central to the future growth and sustainability of the company. Trials have been conducted on the use of the following alternative fuels and raw materials:

- Black Sand – a by-product of lead and zinc smelting. Up to 50,000 tonnes per annum is planned. This material is currently land filled.
- Demolition waste wood – an industrial and domestic waste. Up to 40,000 tons per annum with the potential for up to 100,000 tonnes per annum. This material is also currently landfilled.
- Carbon Powder – a by-product of aluminium smelting. Up to 6,000 tons per annum. This material is now being stored, as there is no current alternative safe use or disposal option.
- Winery waste water and treated waste water – as a substitute for mains water. A total of 140 ML per annum to be substituted.
- Recycled waste oil – currently up to 6 million litres per annum of recycled waste oil is now being utilised for kiln fuel in its operations.

Detailed environmental assessment has been conducted on these alternative fuels and raw materials to ensure safe handling and acceptable environmental impacts. Extensive emissions testing and computer modelling of emissions has also been conducted to ensure emissions at ground level conform to State and National air quality standards. Adelaide Brighton has now embarked on upgrading its plant infrastructure to fully utilise these alternative fuels and raw materials.

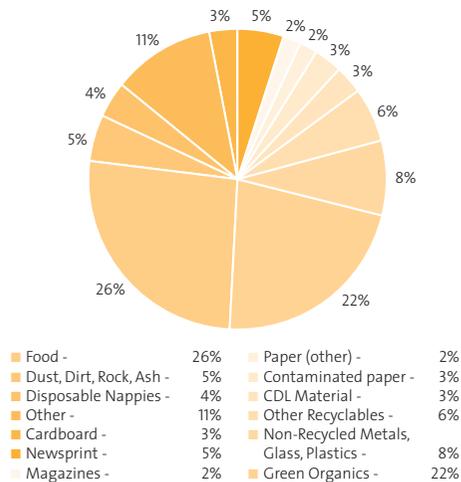
The benefits to the company include reduction of primary energy use as well as reducing the use of its quarried raw materials. Adelaide Brighton plans to reduce primary fossil fuel energy use by up to 30%. Savings also occur on reduction of greenhouse gases. The benefits to the state include a reduction in landfilled materials of up to 20%, but also the development of new environmental technologies in utilising waste materials in a safe and effective manner.

**Joseph Mazzone, Environmental Manager,
Adelaide Brighton Ltd.**

Implementing zero waste

In the southern hemisphere, New Zealand's Zero Waste Network has been campaigning for waste management since 1999. It regards strong community involvement as crucial in the successful implementation of zero waste. As a loose affiliation of stakeholders, it is aiming for the complete redesign of the country's production, consumption and waste management system. 50% of New Zealand's local authorities have adopted Zero Waste targets, most aiming to reach them by 2015.³⁰ In Australia, Canberra has adopted similar zero waste targets.³¹ Melbourne and Newcastle are also pursuing similar initiatives. In Sydney, the first facility for highly mechanised zero waste recycling is currently being built.³²

Total Waste Stream Composition (By Weight)



Note: 'Other' includes dry-cell batteries, household chemicals, pharmaceuticals, medical/hygiene, oil (motor & food), timber, ceramics, textiles, other glass & broken glass. 'Other Recyclables' includes all non-CDL metal, glass & plastic.

Stepping up organic recycling

South Australia can no longer afford to bury its valuable organic resources in landfills. We have a growing horticulture, viticulture and broad acre farming community dependent on productive soils. Our state needs as much quality organic matter as possible to improve and sustain our fragile and carbon depleted soils. In addition to soil quality problems, water restrictions could have a significant effect on the yields and quality of crops in the future. Growers are increasingly looking to organic composts to aid in water conservation, weed suppression, and soil conditioning. Demand for organic composts and mulches in South Australia is increasing as growers realise the importance of improving their soils.

Jeffries has supplied soils, mulches, composts and landscape materials since the 1920's. Eight of our products are now certified to Australian Organic Standard. Jeffries site at the Wingfield Waste Management Centre processes over 50,000 tonnes of recyclable organic material per year. With a team of 35 staff Jeffries is South Australia's largest organic recycler. The company now needs more space to allow to recover even more organic material from the waste stream. We are now intending to expand out activities at a second site, in a 10 year development and capital investment of around \$11 million. Within five years, we are hoping to have the capacity to process a further 150,000 tonnes of organic material per year and to employ a further 30 - 35 people.

Lachlan Jeffries,
Managing Director, Jeffries Group



Above: Recycling of road materials has just begun in London. It has been happening in South Australia for some years.
Source: Herbert Girardet

The SA Government is clearly in good company with its new zero waste policy. The draft Zero Waste SA bill 2003, now before Parliament, is a very significant piece of legislation. Its principle objective is to 'promote sustainable waste management practices that, as far as possible, eliminate waste or its consignment to landfill; and operate in a consistent and integrated manner throughout the State; and advance the development of resource recovery and recycling industries'.

In Adelaide, waste management is becoming an acute issue as the Wingfield landfill site will be full to capacity by December 2004 and the bulk of wastes would have to be disposed 60 km north of the city at Dublin or Inkerman. This, in turn, will increase the cost of waste disposal to Councils from \$26.4 to \$37.9 million, due to additional transportation costs to the new site.³³ These increased costs could be beneficially diverted into investment in an Integrated Resource Recovery and Renewable Energy Centre at Wingfield instead.

It could include a:

- Transfer station
- Material recovery facility
- Recycling Centre
- Green waste transfer
- Bio-reactor and composting unit
- Domestic hazardous waste drop-off
- Transport fuel production unit
- Water harvesting & re-use facility
- Landfill gas extraction unit
- Process heat & electricity unit
- Education center

Converting Wingfield from a waste dump to a zero waste centre for Adelaide is an exciting challenge. It will be fascinating to see how these ideas will be implemented in the coming years.

Recommendations

- Take advantage of the closure of Wingfield landfill for implementing a zero waste policy
- Draw up a detailed, targeted action plan for developing new recycling industries
- Use the zero waste policy to create new green businesses and jobs

Sustainable transport



Above: The State Government is investing in modern new trams to make the trip from the City to Glenelg comfortable and efficient.
Source: PlanningSA

Metropolitan Adelaide is one of 400 cities of over a million people – similar in size to Rotterdam, Seville, Antwerp, Sheffield, Helsinki, and slightly smaller than New Orleans and Copenhagen.³⁴ On 76,546 hectares of land it has a population of 1.1 million people and, together with Perth and Brisbane, is one of the world's lowest density cities.

Urban densities

| City | Area, ha | population | pop density/ha |
|-----------|----------|------------|----------------|
| Hong Kong | 107,500 | 6,200,000 | 57.6 |
| London | 158,000 | 7,500,000 | 47.5 |
| LA | 678,000 | 15,200,000 | 22.5 |
| Phoenix | 176,600 | 2,800,000 | 15.8 |
| Adelaide | 76,000 | 1,100,000 | 14.5 |

The low-density expansion of Adelaide has been made possible through the release of land by the State Government for building which was previously used for farming. It clearly makes sense to try to curtail this sprawl, and the recent decision by the SA Government to define an urban growth boundary will gradually lead to more intensive land use, particularly in already built-up areas.

Adelaide's existing urban sprawl is directly linked to the fact that quarter-acre housing plots are the norm in the suburbs. The freedom and privilege of having a large garden is closely linked to high car ownership, with most people using cars for many of their journeys. There are 475 cars for every 1000 Adelaidean one of the highest concentrations of car ownership in the world. In a city 'designed for the car', personal transport is clearly favoured over public transport. At present only 5% of passenger trips are made by public transport, rising to 10% in the morning peak hour. But there has been a huge cost of providing the road infrastructure for a vast car fleet which has affected the provision of other facilities.³⁵

The heavy reliance on the private motor car for routine travel is a major environmental issue. Some 20% of Adelaide's carbon dioxide discharge, or a total of about five millions tons, comes from the exhaust pipes of motor vehicles. A huge area of forest would need to be planted to absorb so much CO₂. (see pg 51)

A social downside of high car dependence and low density is that travelling is rather difficult for some. Many young and old people are particularly disadvantaged by having to rely on those with driving licenses and routine access to a car to get around. The sense of freedom for some can become loneliness, frustration and disadvantage for others. The situation for children is not helped by the fact that they are generally discouraged from cycling on busy streets whether to go to school, to go to the shops or to visit their friends', for fear of accidents.

Cycling is a vexed issue in metropolitan Adelaide. There are some 2,100 kms of signed routes across the city. Some of these are exclusive bike lanes whilst others are shared walking/cycling paths or bicycle lanes on arterial or local roads. Yet cycling is not a common mode of transport, despite a very suitable terrain. Only 25% of people own bikes. People say they would cycle a lot more and over longer distances if continuous, well maintained and safe bicycle lanes were provided, particularly on arterial roads.³⁶

The government intends to respond to this. In its recently released 'Draft Transport Plan' it sets out new targets for doubling cycling trips by 2018 by providing suitable new infrastructure and promoting cycling as a viable alternative to cars. Key destinations such as shops, schools, transport nodes and shopping centres are included in the proposed new systems of cycling routes. Benefits would be experienced by commuters and sports cyclists as well as children whose parents would feel safer about letting them cycle in the city.³⁷

One interesting way in which Adelaide can counteract its low-density sprawl is to create more 'nodes of activity' across the metropolitan region. A new opportunity for this is the redevelopment of government owned waterfront land at Port Adelaide, the largest urban development project likely to be undertaken in South Australia over the next ten years. The \$1.2 billion project is set to revitalise the area by providing a mix of residential, commercial, cultural and tourism opportunities. It will offer the option of high-density water front living with a great variety of local facilities and as an alternative to low-density suburban living.³⁸ Linked to this project is the potential for new public transport development.

In the City of Adelaide itself, the City Living initiative will doubtlessly enable people to use cars far less than in the suburbs. The City's intention is to double the current number of residents to 34,000 by making inner city living attractive to people.³⁹ Incentives include different rates for owner occupiers, site consolidation and partnering with the private sector, conversion of underutilised sites or commercial sites for residential and the development of a range of affordable housing initiatives. To increase resident numbers is seen as helping to generate more activity at night and at weekends, making the City more attractive and more secure at the same time. It is also an appropriate way of retaining shops, restaurants and markets in the central city. The policy should now be enhanced by giving a much greater area in the City over to pedestrian precincts, as has recently been proposed by the Danish planner Jan Gehl in a report to the City Council.⁴⁰

Sustainable transport

To make the public transport system more viable and competitive, it is clearly of the essence to increase the number of passengers. A comfortable, clean, high frequency service is essential for buses to be used more widely. High quality mass transit is the only option and further investment is therefore of the essence. A good start has been made. The low-pollution gas-powered buses now evident across the city seem to be a great success. These buses have a high level of customer comfort, are fully accessible and air conditioned. The SA Government has committed \$81m over the next five years to purchase new buses.

The government is currently in the process of developing its new 'Transport Plan' for metropolitan Adelaide, in consultation with key stakeholders. This process encompasses regulation, policy and operational matters and seeks to address all transport modes in both metropolitan and regional areas. 'It reflects the government's commitment to social inclusion, economic development, science and innovation, and sustainable development. It is important to note that the plan is not 'the answer' but rather the start of a new way of thinking about transport decisions'.⁴¹

Much can be done to further improve public transport and to encourage more people to choose this over their private cars. To improve the speed of buses, special key transit corridors could be created for buses (as well as for bicycles). Adelaide has several corridors that could be developed in this way. They could also provide improved bus priority at traffic lights which would improve speed and punctuality of services.

Healthy people/healthy communities

People want high quality public services – our responsibility is to provide cost-efficient services, particularly in the face of urban congestion. Congestion is an economic and environmental cost and yet one bus can replace 40 cars, lowering the need for costly additional road space.

Good public transport contributes to a cohesive society. It enables people to access the services, jobs, education and social connections they need for a high quality of life. Public transport use by students promotes independence and health, and protects them from the road trauma implicit in car travel.

Public transport has a major role in social equity, providing access for those who are young, old, or can not have access to a car or drive. It can also assist people live a healthier life by regularly incorporating exercise into their daily routine. Links between mass transit, walking, cycling ultimately means healthier people and lower transport costs. Public transport is safe and healthy – less trauma means less hospital costs.

Air pollution from vehicles is highly unpleasant and a major cause of illness and death. Greenhouse gas emissions from vehicle fumes are also an international embarrassment. Adelaide should become the first carbon neutral public transit city in the world.

It can achieve this by:

- Use of clean fuels
- Revegetation programs (especially along transit corridors and along highways) as part of a wider carbon sequestration program

Heather Webster, Transport SA

To improve the environmental sustainability of transport, many avenues need to be pursued simultaneously. They include the need to accept that low density sprawl is a fact of life in the city region and that many people will continue to favour use of private vehicles. In this context, the use of alternative propulsion technology for vehicles, particularly electric and hybrid electric motors, and in the coming years, air-powered and fuel cell engines, should be actively pursued.

Electric vehicles are currently mainly made in Europe, by manufacturers such as Daimler Chrysler, Peugeot and Citroen.⁴² They are particularly appropriate for metropolitan Adelaide because most car journeys here are clearly defined and limited to the city region. Few people regularly drive to distant places such as Melbourne or Sydney. In Adelaide, electric cars should be strongly promoted as particularly suited to journeys into the City with its many car parks. Electric charging points should become a prominent feature of these, offering low cost recharging for users of electric cars or, indeed, scooters.

Hybrid petrol-electric cars such as the Toyota Prius, are another option. They are already on the market, though at a higher price than conventional petrol cars. However, they are bound to become cheaper in the coming years as demand grows for these low-mileage low-pollution vehicles.

Fuel cell cars running on hydrogen are not yet available for use by the ordinary mortal. However, they will be widely available by the end of the decade, when they will offer highly energy efficient, pollution free travel for most car users. All these new, low-pollution propulsion technologies are significant new options for private transport in a low-density city such as Adelaide. As demand grows, local manufacture may become an attractive proposition which could also offer significant new job opportunities.

Recommendations

- Encourage the use of public transport by improving attractiveness, marketing, frequency, speed and flexibility of routes
- Create a comprehensive network of dedicated cycle lanes across metropolitan Adelaide, with secure bike parking in key locations
- Stimulate development of new electric, air powered and fuel cell vehicle technology to create new jobs and to reduce transport air pollution

Nature and the city

Nature and the city



Above: Our city should be a good place for animals and plants to live in as well as for people.
Source: PlanningSA

In recent years, cities all over the world have sought to increase urban biodiversity. In Europe it was found that cities often contain greater biodiversity than the surrounding farmland, with monocultures and pesticides contributing to a depletion of plant and animal species. Urban gardens, particularly those 'benefiting' from a state of neglect, can harbour an astonishing biodiversity. Initiatives by city authorities and community groups have often ensured that biodiversity is also enhanced in public spaces.

Adelaide has a remarkable green inheritance, particularly in the Parklands so wisely and generously created in and around the original city. It is remarkable that most of it survives to this day. Of course, the emphasis in William Light's original design and layout was to implant an English landscape into South Australia, with European lawns and trees dominating the cityscape. Today the Parklands, with 1700 acres, are one of the largest urban parks anywhere in the world and nearly three times the combined size of London's Hyde Park and Kensington Gardens. It is not surprising that the protection of the Parklands arouses much passion in Adelaide.

But metropolitan Adelaide has also benefited from much greening in recent years. Seen from above, it looks like a city in a forest. Some 20 million trees now grow in the city.⁴³ There is no doubt that the presence of so much vegetation helps to keep Adelaide's summer temperatures from soaring even higher, with over 40 Centigrade now a regular occurrence in January and February.

But it is not surprising either that there is a strong lobby to bring more of Australia's own vegetation to the city, to help people, and young people in particular, to develop a close relationship with the botanical diversity of their own country.

'People shape gardens and landscapes to provide the sort of environments they most strongly yearn for. Changes in landscape design and landscape management inevitably arise out of changes in our attitude towards nature and changes in our understanding of how the natural world functions.'⁴⁴

In Adelaide, a growing concern about sustainability has also led to a concern about less irrigation dependent planting. Vigorous initiatives are now underway to 'Australianise' Adelaide's vegetation cover. Closely linked to this is the idea that Adelaide now requires 'browning' rather than 'greening': planting primarily indigenous Australian, less water dependent species.

Much of Adelaide looks like a city in a forest. In 2003, a further 120,000 trees will be planted at 16 sites across Adelaide at the start of beginning of a major new tree planting initiative involving exclusively native Australian species. The SA Government's 'One Million Trees Program' is the largest revegetation scheme ever undertaken in the Adelaide region. It is working with a range of State Government departments, local councils, catchment boards, non-government agencies, local community groups and schools to reinstate over one million native trees and associated understorey plants on 1,000 hectares of Adelaide's Metropolitan Open Space System (MOSS).



Above: The first of a million seedlings planted by the Premier, Mike Rann, at the launch of the Million Trees program in June 2003.
Source: UFBP

SA Urban Forest Biodiversity Program (UFBP)

Prior to European settlement the Adelaide metropolitan area had rich biodiversity. Today, with just 3% of the original native vegetation remaining, protection of remnant native species is extremely important. Over the last six years UFBP has coordinated biodiversity conservation across the region, aiming to -

- identify priority biodiversity sites and linkages
- develop and implement management plans for those sites
- contribute advice to Planning Amendment Reviews
- support an integrated approach to the conservation and biodiversity reinstatement
- increase knowledge and awareness levels
- promote organisational change through education, training and communication
- evaluate projects so that outcomes can be measured and documented

The UFBP's actions are targeted at both priority sites and educational projects. Projects are implemented in line with the Regional Biodiversity Plan Conserving Adelaide's Biodiversity published by UFBP in 2001. This has encompassed more than 250 projects covering over 1,000 hectares across Adelaide. A number of excellent resources have been produced cross-referencing vegetation types with fauna species lists.

An important aspect of the program's work is in the monitoring and evaluating of projects so that outcomes can be measured and 'best learning' techniques documented.

Unique to UFBP's approach is to involve all stakeholders in the decision making process. It manages a small grant and advisory scheme for community groups. It has also done much work with schools with a particular focus on environmental literacy.

'Backyards For Wildlife' has been developed to encourage Adelaide homeowners and residents to consider planting suitable local native plant species in their gardens and to avoid planting known or potential environmental weed species. It is delivering multiple outcomes that include greater awareness along with increased habitat and larger populations of native flora and fauna species across the metropolitan area.

Ross Oke, Director, UFBP

The Program focuses on indigenous species that were once part of the original, pre-European vegetation community, including low shrubs, groundcovers and grasses. Adding a million trees to the 20 million already within Adelaide will offer residents real benefits, providing greater biodiversity as well as closer contact with nature.

It is clear that, in a sustainable world, greenhouse gases need to be dramatically reduced whilst improvements to air and water quality can be made at the same time. Planting trees for biodiversity is of crucial importance, both within and beyond the boundaries of the city. Trees should be planted not only for enhancing biodiversity, for erosion and salinity control, but also for carbon sequestration.

Funding the future

Annually, vehicles in Australia discharge 60 million tonnes of CO₂; at the same time, 3 million tonnes of salt flows down the Murray. Planting 240,000 ha of trees annually would absorb that CO₂. The Wentworth Report and CSIRO agree that revegetation is also essential for combating salinity.

By donating one cent per litre on all fuel used in vehicles to a dedicated Trees Fund, and with a further half a cent per litre each from the Federal Government and the oil companies, we could afford to plant 240,000 ha of trees annually.

Federal collection and distribution systems already exist and all the money collected can go towards planting trees. Five partner NGO's that have the knowledge, programs and capacity to involve the community would design the Fuel for the Future (FFF) partnership with Government, the community and the oil companies.

Under FFF everybody wins: volunteerism leverages Federal dollars 10:1; our cities support rural development; we invest in agroforestry, biodiversity, plantations, farm forestry, salinity control and erosion planting.

Education and community action together are the keys to making carbon sequestration happen and to bringing denuded landscapes back to life.

Leonard Cohen, Fuel for the Future

As stated in the Executive Summary, some 25 million tonnes of carbon dioxide emanate from Adelaide every year. This total figure has increased by over 10% in the last three or four years, yet in a sustainable world it should be reduced steadily every year instead. Worldwide greenhouse gases are going up, whilst the capacity of the biosphere to absorb them is actually being reduced as forest cover, particularly in the tropics, is being decimated by logging, mining and expansion of farmland.

In the Executive Summary I am suggesting that some 39 times Adelaide's surface area would need to be planted if Adelaide was to fully absorb the CO₂ it emits at current rates.⁴⁵ This is unlikely to happen on such a huge scale but it indicates the magnitude of the challenge facing people in developed regions such as South Australia.

Recommendations

- Further support popular tree planting, including nurseries in people's gardens
- Encourage tree planting with native species for biodiversity, soil erosion and salinisation control – in and around the city
- Make carbon sequestration a key aspect of further tree planting initiatives

Green business

Green business

Murdoch University, on behalf of the Federal Government, has estimated that the global market for environmental goods and services is about US\$500 billion. In Australia, like elsewhere, the environmental industry sector is a significant growth sector. Already environmental management, products and services industry contributes A\$11 billion annually to the national economy.⁴⁶

In the US, Clean Edge Research in San Francisco stated in a 2002 report: 'In the US alone, energy represents an annual US\$350 billion market. Clean-energy technologies including solar photovoltaics, wind power, microturbines, and fuel cells - represent a fast-growing segment of the marketplace. Wind power and photovoltaics are two of the highest-growth technology sectors on the planet, growing by more than 30% annually. In many regions, wind power is now the most cost-competitive new energy source, averaging US4.5 cents per kWh with construction, operation, and maintenance costs running less than most fossil fuel-powered plants.'

Our most recent forecasts see clean-energy markets growing from less than US\$7 billion in 2000 to more than US\$82 billion by 2010. The market for energy-efficient goods and services ²³, already US\$33 billion in the US, will grow by more than 8% a year for the next three years and will include a growing percentage of clean-energy goods and services.⁴⁷

A report from Essex University in the UK makes similar claims: 'It is clear that environmental spending has had a positive effect on jobs in a number of countries. In the USA, some \$170 billion of environmental spending in 1992 generated 3.9 million jobs (3% of workforce). This is predicted to rise to \$292 billion by 2005 and so support some 5.4 million jobs. In Germany, some 956,000 jobs were supported in 1994, rising to 1.12 million by 2000. In France, there were 418,000 jobs supported in 1992, some 1.9% of all in the country. Most of these jobs are in the so-called brown sector - cleaning up end-of-pipe pollution problems or remediation of past problems, such as 1000 firms and 100,000 jobs in the Ruhr area of Germany alone.'⁴⁸

There are no reasons why the prospect in South Australia should not be similar. The main growth potential we have identified is in sustainable energy, waste recycling and remanufacturing, water and waste water treatment and alternative transport. Development of the green sector will be driven by public policy, followed by business itself, but also by popular opinion, with the local community increasingly demanding cleaner production industries and greener technologies. In some instances companies are likely to take their own initiatives. But enabling policy is crucial. Wherever governments have regulated, such as in countries like Germany, major new job opportunities have followed.

As indicated in previous chapters, the potential for new jobs in the green sector in Adelaide is very substantial indeed.

We cautiously suggest that a total of up to 9,000 new jobs could be created in metropolitan Adelaide in new green industries and businesses.

Energy efficiency

Between 850 and 2700 new jobs in South Australia.

Source: Energy SA⁴⁹

Wind energy

2,325 new jobs, based on 500MW installed

Source: Passey Report 2003 ⁵⁰

Solar Hot Water

750 new jobs, if solar hot water mandated for new homes.

Source: Beasley Hot Water Systems: ⁵¹

Photovoltaic Cell Production

200 new jobs

Source: Department of Business, Manufacturing and Trade ⁵²

Waste Recycling and Reprocessing

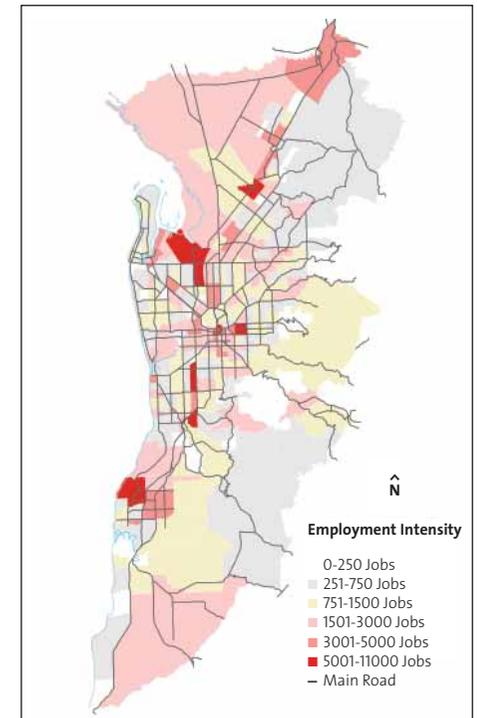
2,000 new jobs⁵³

This is a cautious estimate based on a variety of sources from around the world. It is based on the assumption that Zero Waste Policy initiatives are implemented.⁵³

In addition, it is assumed that environmental research and consultancy, water recycling, water equipment manufacturing, transport, market gardening, tree care, and other smaller green industries and businesses could generate a further 1,000 jobs if sufficient policy stimuli would be given by the SA Government and there was a further increase in public demand.

Recommendations

- Boost the creation of green business by effective use of government procurement
- Encourage resource efficiency in all businesses across metropolitan Adelaide
- Create 'green business incubators' across the city
- Make environmental sustainability the basis for new businesses and jobs



Left: Development of new, green businesses should be encouraged in areas of low employment.
Source: PlanningSA

Culture of sustainability

This report has sought to summarise and highlight the challenges and opportunities inherent in sustainable development. Can Adelaide seize these opportunities? Can and will it become a world leader in sustainable development?

If all the various proposals presented in this report - those drawn from existing initiatives and policies and those that I have added from my own thinking and observations - were implemented, Adelaide would find itself in the forefront of environmentally urban development. It would dramatically reduce its ecological footprint by creating an efficient increasingly 'circular' urban system in which, through recycling and reuse, wastes become a valuable new resource. Consumption of fossil fuel energy would drop dramatically. Consumption of river water would go down substantially and waste water would be put to good use.

However, developing a culture of sustainability means that any program needs to go beyond specific initiatives - each of which may be worthy in its own right to influencing the attitudes, aspirations, practices and values of local people. These so called 'intangibles' are critical.

Youth Environment Council of South Australia (YEC)

The YEC was established in 1997 as a joint initiative of the Environment and Education Ministers to link government to the environmental perspectives of young people. It is a group of 10-21 year olds who are committed to being active in caring for our planet. They conduct 2-day 'Youth for Environmental Action' workshops to aid them to develop the communication, presentation and project management skills needed to establish and maintain their own environmental projects. To date over 30 ongoing initiatives have been established.

YEC is run by young people with the assistance of adults. It encourages a youth voice and youth decision making at all levels of society through innovative workshops, quarterly meetings with ministers and other officials. It contributes to other policy initiatives, conferences and publications and has its own website at www.ecosyay.sa.gov.au.

Jo Bishop, Manager, Environmental Education

South Australian organic food production

Organic agriculture combines natural processes and human skills to produce a sustainable agricultural system to feed our society and leave our descendants with a fertile and economically viable (ie sustainable) agricultural landscape.

The industry has grown quite significantly in South Australia. Organic food production in SA now exceeds \$10M annually with sustained growth expected as consumer demand continues to accelerate.

More than 45 farmers and 20 processors in the State are now producing potatoes, carrots, citrus, apples, herbs, nuts, berries and bio-dynamic beef on more than 3M hectares of land. Certified organic food is sold at more than 25 retail outlets in the Adelaide metropolitan area and interest from overseas markets continues to grow.

Certified Organic agriculture uses natural processes where possible, and by developing knowledge and expertise in appropriate technology (such as biotechnology) along with sufficient recognition, South Australia is potentially a major leader in this area.

Adelaide will host the 2nd National Organic Conference (Organic Futures for Australia) on behalf of the Organic Federation of Australia in October 2003. This will be the year's major domestic organic conference in Australia.

Up to 4000 delegates from around the world are expected to come to the 15th International Conference of IFOAM (the International Foundation for Organic Agriculture Movements) being staged at the Adelaide Convention Centre in 2005.

Resource consumption in metropolitan Adelaide

| Inputs | Tonnes |
|---|---------------------------------------|
| Food | 716,320 |
| Wine | 28,404 |
| Forestry Products - Wood | 2,572,731 |
| Forestry Products - Paper | 3,916,277 |
| Energy | 4,877,681 (tonnes, oil equivalent) |
| Water - Total water consumed | 173,000,000 |
| Outputs | |
| Waste - Waste to landfill | 1,110,000 |
| Greenhouse Gas Emissions (CO ₂ -e) | 24,970,000 |
| Population of Metropolitan Adelaide = | 1,110,547 |

Thanks to Lachlan Mudge, UniSA and Dr Jackie Venning, Office of Sustainability

There is already a groundswell of enthusiasm and energy here - people in Adelaide want to help achieve a green city and a sustainable metropolitan area. This is apparent from the level of interest in all the meetings I attended - from traditional private sector interest groups, to school students, members of Parliament, government officers and many highly motivated individuals across the community. You already have a talent bank of people here. The size of Adelaide is well suited to achieving progress in sustainability - the task is not out of reach.

Sustainability is not something that the Government and the Adelaide City Council can or would want to achieve in isolation.

There has been a sea change in this area of sustainability. It is no longer only of interest to environmental activists and 'greenies'. It is something that is becoming more and more mainstream.

There needs to be careful thinking about how to work with and help reinforce this energy and to help people develop and implement the many good ideas already here.

Some of my suggestions include:

Find creative ways to let people know how we are performing as a city and how things that may not be visible – like solar panels on tall buildings – are helping to improve our planet. Good examples of interactive environmental displays which provide this information in real time, can be found in several cities, such as Curitiba, Brazil, and in Vienna, Austria.

Help to organise events and opportunities for these people to meet – and to meet across sectors so that a critical mass of 'friends of the green city' can develop.

Work to link Adelaide to the international community of thinking in this area and use that as an opportunity to promote the good things being done in Adelaide. Promote the work of local experts locally and internationally.

Work out how to get young people and school students to help drive the agenda for sustainability – I have been very impressed by the quality of thinking of young people here and their enthusiasm to be a part of this work.

Adelaide can use its commitment to become a sustainable city to reinforce its strong brands in food, wine, services and manufactured products. This is a strong growth sector for the economy – it is at the forefront of innovation – it is closely aligned to the natural strengths already here and can differentiate Adelaide internationally.

Cities all over the world are now striving to meet this challenge. Adelaide can certainly aim to be right at the forefront of these cities. Much will depend on whether a climate of opinion can be created in Adelaide that will powerfully convey the importance of sustainability in the daily lives of people, as well as in the economy, in culture and in politics.

In Curitiba, Brazil there is a 'University of the Environment' where school students learn about sustainability in an atmosphere of creativity and fun. Adelaide could aim to develop a demonstration building – a solar powered environment centre designed by an eco-architect - a green building to promote the green city. It would be wonderful to have such a visible and symbolic centre where people could get information, see interactive displays, and have all manner of exciting experiences to do with sustainability. Key environment agencies could be located here under the one 'green roof'. Of course, there should also be a Adelaide's best, yet affordable, organic café/ restaurant. While this may seem idealistic I hope all or part of this set of ideas can be realised in the not-too-distant future.

Aldinga Arts Eco-Village

This innovative residential, arts, community and commercial development is now being built on previously farmed 33 hectares within a rural township area, 40 minutes from Adelaide. Sustainable design principles are employed throughout the development: 17 hectares will accommodate 150+ dwellings. Open space enables development of village commons, community gardens, horticultural and recreational areas. Through Community Title, purchasers own their plots outright, together with a share in the common land, farm and cultural facilities. They are obliged to respect by-laws requiring environmental and social responsibility. Houses must be energy efficient, and served by a 10KL rainwater tank.

16 hectares will accommodate the 'village farm', also containing recycling sewer treatment, lagoons, tree buffers (wood lots) community plots for individual plantings, and organic food crops, all developed on Permaculture principles. All road reserves will be planted with food bearing trees and with understory and ground cover vegetation. The heart of the village design is the Community Facility, which will offer recreational, educational, arts and community activities, 'plaza' areas for markets, festivals, displays, performances and celebrations, a restaurant and an interpretive centre. Public access to the village is via walking paths. Visitors will be able to participate in community arts, food and social events with an emphasis on environment, community and design innovation.

The village has the following design features:

- Renewable energy – solar hot water, PV and wind power
- Water supply based on household rainwater tanks; mains needed only occasionally

- Storm Water retention in ponds, fed by swales from roads and buildings
- Sewerage to be treated and reclaimed water used for irrigation on site
- Underground services, in Polyethylene (non PVC) pipes and conduits
- A sophisticated communications network to support home industries
- Internal roads constructed for safe travel by pedestrians and cyclists
- Edible and indigenous planting in common areas and private gardens
- Health, financial, building and gardening services provided on site
- A Central Facility for visual and performing arts and culture
- Centralised postal services; refuse and recycle collection

Aldinga village started construction in 2003 and will be completed by 2005.

John Maitland

Recommendations

- Link actively into the international community and use Adelaide's expertise in sustainability as a resource
- Ensure that sustainability issues are strongly addressed in the education system and through meetings and events
- Encourage the media to do imaginative reporting on sustainability
- Ensure that all citizens have a clear understanding of their environment and a stake in sustainable development

Footnotes

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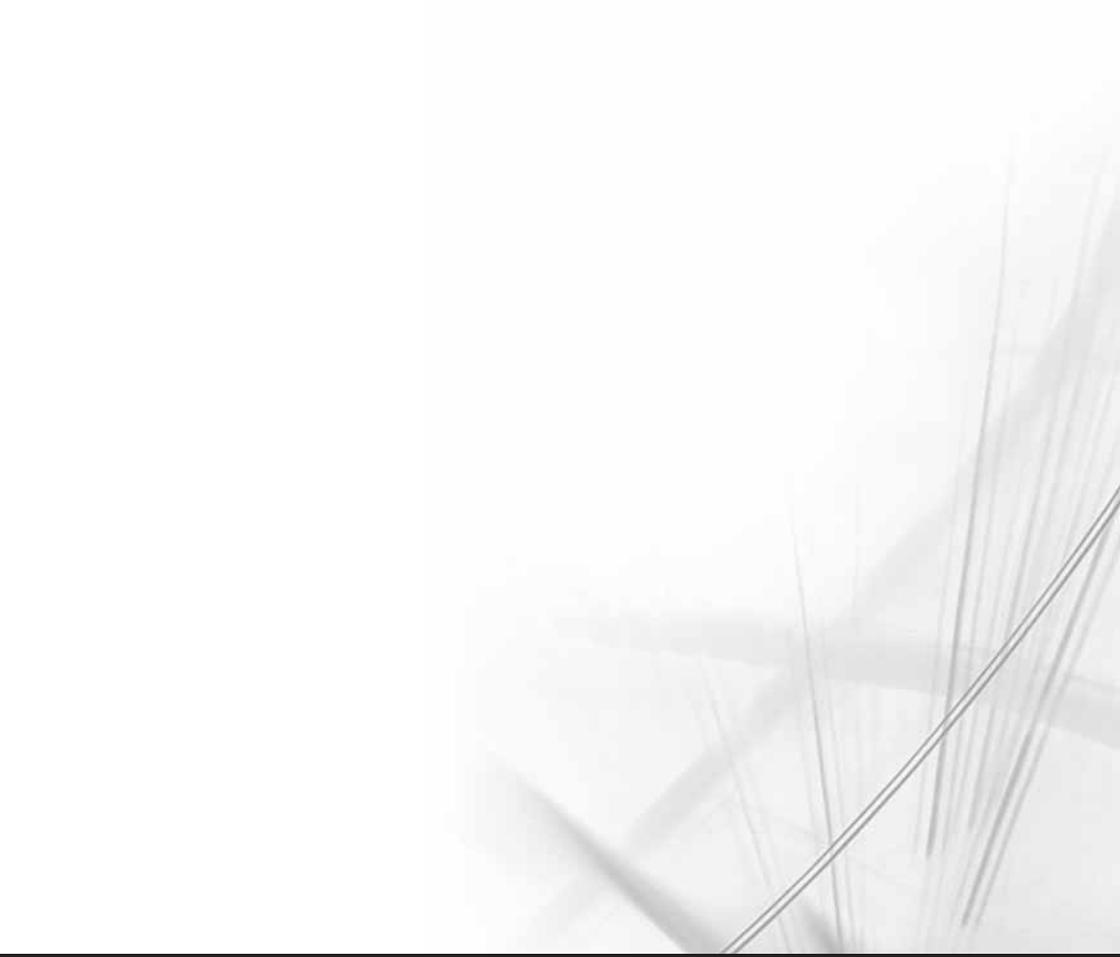
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Image Source Acronyms

| | |
|---------------|---|
| ACC | Adelaide City Council |
| SATC | South Australian Tourism Corporation |
| DEH | Department of Environment and Heritage |
| EPA | Environmental Protection Authority |
| PTB | Passenger Transport Board |
| RMUUG | River Murray Urban Users Group |
| Urban Ecology | Urban Ecology Australia Inc |
| UFBP | Urban Forest Biodiversity Program |
| DWLBC | Department of Water, Land and Biodiversity Conservation |



Above: Adelaide architect Lothar Brasse's concept for a glass dome atop Parliament House. It could incorporate 2,500 square metres of solar photovoltaic cells, generating energy as well as letting in light.
Source: Lothar Brasse



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