6 Sustainability and settlements

Vision for Western Australia

Western Australia's settlements are among the most attractive places to live in the world, constantly becoming more innovative and efficient in their use of resources and management of wastes while simultaneously being more liveable and equitable.

Goal

Plan and provide settlements that reduce the ecological footprint and enhance quality of life at the same time.

Priority areas for action

We live in an urbanising world. Aside from the growth or urbanisation itself, urbanisation is the dominant demographic trend of our time. The 150 million people living in cities in 1900 swelled to 2.9 billion people by 2000, a 19-fold increase. Meanwhile, the urban share of world population increased from 10 percent to 46 percent. If recent trends continue, by 2007 more than half of us will live in cities. For the first time, we will be an urban species.

Lester Brown[28]

Western Australia is highly urbanised with about 90% of the population living in towns and cities. The quality of urban environments-both rural towns and cities–is therefore highly significant to the well being of Western Australians. Our settlements should be both healthy and positive places to live. They should provide ready access to services, employment and recreational opportunities for people of all ages and abilities. In addition, because of the proximity of people, there should be a strong sense of community, engendered in part by the urban form.

To be sustainable, settlements require the integration of environmental, social and economic dimensions. The world is littered with examples of unsustainable settlements. The drifting sands of depleted agricultural soils now cover towns in Northern Africa that once serviced the wheat belt of the Roman Empire, and the ancient Roman city of Ephesus was abandoned when its port silted up after the surrounding Turkish hills were cleared of vegetation.

Western Australia also has abandoned settlements: ghost towns left behind as the Goldfields were depleted and the forests cut out. More recently, Wittenoom was closed down because of environmental health concerns arising from the mining of asbestos. Some country towns are struggling to survive, for example one Shire has lost 48% of its population in the past 25 years, and Indigenous people in remote settlements have significant health problems. Parts of Perth are also facing significant decline. These places are seeking sustainable development, they are not able to change without it.

The draft State Sustainability Strategy promotes development for these places in a way that creates a more enduring future within global constraints. While there are important environmental considerations for these places, the fundamental problems are largely related to social and economic factors.

However, for other parts of Perth and for many coastal settlements the challenge for a sustainable future is in managing growth. These settlements and areas need new priorities, new policies and new technologies that can redirect growth more sustainably.

The development of the State Sustainability Strategy provides opportunities to improve public access and transport, restore amenity and create urban forms that support the development and maintenance of a sense of community.

[28] L Brown, *Eco-Economy*, Norton, New York, 2001, p. 187

Figure 5. Extended metabolism model of human settlements.

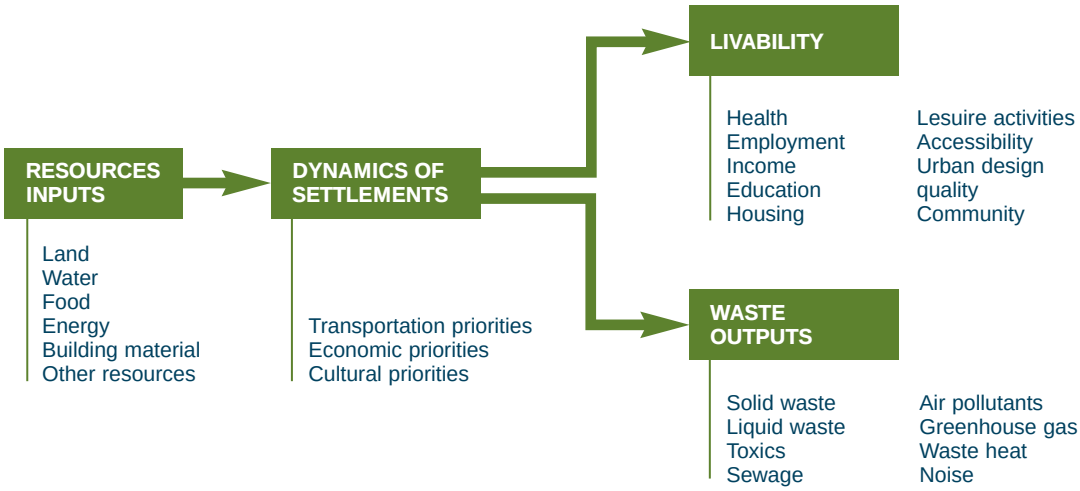


Figure 5 shows the Extended Metabolism Model[29] developed for the 1996 and 2001 Australian State of the Environment Reports[30] [31]. This model suggests that for a settlement to be sustainable, resource consumption (such as land, energy, water and materials) and waste (solid, liquid and gaseous) must be reduced, while simultaneously improving liveability (in areas such as income, housing, health, education and community). This model gives substance to the *Settlement efficiency and liveability sustainability* principle.

A range of current government initiatives and projects are addressing many aspects of settlement sustainability including:

- water supply (The Premier's Water Taskforce)
- waste (Waste Management Board)
- planning (Future Perth)
- freight (Freight Network Review)
- electricity (Electricity Reform Taskforce).

The draft Strategy discusses these matters from a sustainability perspective. Additional processes are required to consider sustainable community regeneration and sustainable building and construction.

Many settlement sustainability issues can be resolved through the proposed Implementation Model involving regional councils and local governments as discussed in *Governance and sustainability*. Regional Councils arose primarily from the need for local governments to form partnerships to solve their waste problems.

The Eastern Metropolitan Regional Council (EMRC), consisting of six local government authorities, is a very good example of how effective regional councils of local government can be in resolving sustainability issues. The EMRC has some forty staff working on a range of issues to do with sustainability including natural resource management and greenhouse. A recent study by EMRC has highlighted for the first time the lack of regional approaches to managing storm water runoff and drainage in the city and in rural areas. This has significant environmental implications for nutrient management and salinity near to the city. It has become even more critical now Perth's water crisis has focussed attention on the need to use all water, including runoff, effectively (see *Water supply*). This issue illustrates the importance of a regional local government approach to determining how best to ensure storm water recharges groundwater where it is needed. If water tables are too high, more rainwater tanks could remove excess groundwater recharge.

The necessity of such a 'fine-grained approach' to managing sustainability issues in urban environments is obvious for most of the issues considered in this section. The Implementation Model suggests that regional councils be the main driver to ensure that general strategies are given a regional perspective in different regions or rural areas through detailed planning. This could then be

[29] P Newman and J Kenworthy, *Sustainability and Cities*, Island Press, Washington DC, 1999.

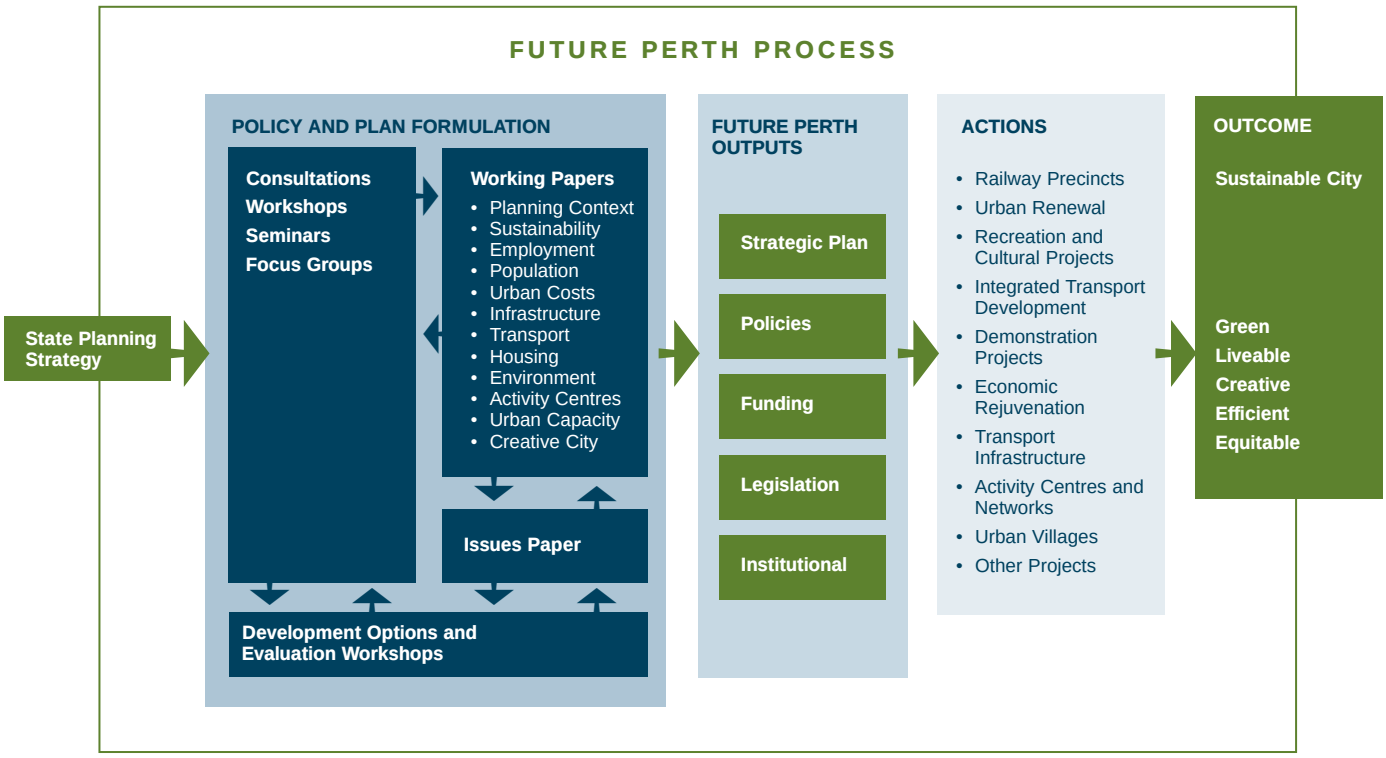
[30] PW Newton, S Baum, K Bhatia, SK Brown, AS Cameron, B Foran, T Grant, SL Mak, PC Memmott, VG Mitchell, KL Neate, A Pears, N Smith, RJ Stimson, SN Tucker & D Yencken 2001, Human Settlements, Australia State of the Environment Report 2001 (Theme Report), CSIRO Publishing on behalf of the Department of the Environment and Heritage, Canberra, 2001.

[31] State of the Environment Advisory Council, *Australia: State of the Environment 1996*, CSIRO Publishing, Melbourne, 1996.

reflected in statutory Statements of Planning Policy and local town planning schemes where appropriate.

Future Perth is a very significant planning process that is preparing a strategic plan for the future of the metropolitan region and will reflect sustainability principles (see Figure 6 and <http://www.planning.wa.gov.au>). The finalisation of *Future Perth* will occur after the draft State Sustainability Strategy and can build on similar principles.

Figure 6. Future Perth process



Source: Department for Planning and Infrastructure

> MANAGING URBAN AND REGIONAL GROWTH

There is a need to promote growth in some areas where there is clearly real social and economic disadvantage and to redefine growth in places where development is a threat to sustainability. Western Australian inland country towns are the settlements most in need of strategies to promote growth. Redefining growth needs to occur in Perth and coastal settlements.

> *The relative isolation and small populations of rural towns compared with closer settled areas along the coastal sand plain from Gingin to west of Albany makes them ideal opportunities to develop model sustainable communities.*
>
> Eco Town Inc.

> *With a high percentage of the population concentrated in Perth and the strong link between urban form and sustainable development, the priority sustainability issues for WA is focussed on future development of the city and other major centres such as Geraldton, Bunbury and Albany. The issues of economic vitality, social equity and ecological integrity are core elements of a sustainable approach to development within the city.*
>
> Royal Australian Planning Institute

Sustainability promotes growth (economic and social) in some areas where there is distinct poverty, for example in developing countries, and redefines growth for much of the developed world, which uses significant resources.

Country towns in decline have a range of environmental, social and economic needs. Regional development programs exist to address all of these needs, however there are few that are able to integrate all three. Eco Towns[32] is a project that is doing this through a partnership in several Wheatbelt towns. The project is creating local employment through environmental improvement, particularly the use of stored rainfall to reduce the impact of rising saline groundwater damaging towns. Other 'green job' projects are also being implemented. For example, Green Skills, a Denmark based organisation that trains people in land care, energy efficiency and other green jobs, also share the goal of sustainability employment opportunities.

Perth has pioneered the redefinition of urban growth through its internationally acclaimed Liveable Neighbourhoods Community Code (see case study on *Liveable neighbourhoods: guiding new developments for a more sustainable future).* This voluntary code has significant sustainability benefits through encouraging reduced car use, a greater sense of community, greater access to services and more efficient use of land.

The Western Australian Government has significant ability to manage growth through its land release programs, the Metropolitan Development Program and Country Land Development program. Perth's sprawling form has reached the stage where clearer guidelines for land release need to be developed. *S*haping city growth needs to be a key consideration for Future Perth. Another powerful growth management technique is redirecting growth to 'brownfields' rather than 'greenfields', that is to areas where growth is needed to overcome decline. This has many sustainability benefits and is considered under *Revitalising declining centres and suburbs.*

Growth management also relates to water issues, to air quality issues and to land use-transport planning all of which are discussed later in this document.

[32] See submission from Eco Town Inc.

In short...

Vision

Growth management is implemented to enable towns and areas of the city with significant decline problems to be developed in sustainable ways.

Objective

Create a sustainable balance of employment, transport, housing choice and community development by managing urban and regional growth, including population change, through better urban structure.

Actions underway include

- The State Planning Strategy is being progressed through Future Perth to develop visions for the long-term future of South West Urban systems.
- The Liveable Neighbourhoods Code is being finalised as the mandatory policy for structure planning and subdivision and is being applied at major projects on the urban fringe of Perth and in key regional centres.
- Models for the provision of district-level transit-supported development are being developed in the North West Corridor.
- Infrastructure provision and land supply is being coordinated through the Metropolitan Development Program and the Country Land Development Program.
- A strategic development framework is provided for local areas through coordinating and developing Local Planning Strategies with local government.

Strategies

4.1 Facilitate projects to provide sustainability gains for country towns including regional Sustainability Strategies that build on the 'sense of place' stories of each community.

4.2 Encourage employment initiatives such as small business incubator projects as a catalyst for 'growing' job opportunities in outer metropolitan urban areas.

4.3 Use Future Perth processes as a mechanism to generate region-wide community debate on urban growth and test implementation options to achieve optimal employment, residential and centre location and to reduce urban sprawl.

4.4 Develop strategies to proactively manage the location of urban development, including consultative agreements with local government on land release and using the Metropolitan Development Program and the Country Development Program to match land supply to the cost-efficient provision of infrastructure.

4.5 Progressively implement Bush Forever.

4.6 Protect designated groundwater mounds from incompatible developments and use water sensitive urban design (see *Our water future*) to rehabilitate urban wetlands.

Indicators and targets

Proportion of urban development (in cities and regional areas) considered revitalised.

In short cont'd...

Global opportunities

Many Western Australian urban services firms already have a presence in the Asia-Pacific region. If it can offer a model for how to manage urban and regional growth, Western Australia can build on the existing urban services exports.

Further information

Armstrong, R & Head, G 2002, *Liveable Neighbourhoods: Guiding New Developments for a More Sustainable Urban Future*, sustainability case study, Department of the Premier and Cabinet, Perth, viewed 15 August 2002, <http://www.sustainability.dpc.wa.gov.au/CaseStudies/LivableHoods/LiveableNeighbourhoods.htm>

Department for Planning and Infrastructure *Future Perth*, <http://www.planning.wa.gov.au/publications/futureperth/fp_content.html>

Murdoch University, Institute for Sustainability and Technology Policy <http://wwwistp.murdoch.edu.au/>

East Perth is a revitalised old industrial site that has, like many inner area developments, helped to reduce the sprawl of Perth and enable better use of urban infrastructure.

Source: Peter Newman

> REVITALISING DECLINING CENTRES AND SUBURBS

Some areas of Perth are in decline after the first phase of development has passed. Most inner areas have regenerated and the government is helping regenerate other areas through the Midland and Armadale Redevelopment Authorities and the New Living Program for public housing. However, there are whole urban regions where revitalisation is stalled and could be unlocked to achieve broad sustainability outcomes.

> *The social and cultural aspects of sustainability are of particular importance to Swan. Despite its proximity to the centre of Perth, the region is socially disadvantaged and lacks cultural focus (no major tertiary institution is one example). Sustainability needs to be considered in terms of the inter-and intra-regional inequities that exist in a City where growth is driven by demand for living near the coast and where investment in social infrastructure favours the wealthier areas, despite concerns about the sustainability of continued linear growth.*
>
> City of Swan

In sustainability terms there is a need to revitalise some areas where decline is apparent through significant poverty or diminishing opportunities. In these areas there is little chance to renew the housing, transport and other infrastructure in more sustainable ways unless there is a development rationale. What can occur is that an area continues to 'spiral down', causing significant social problems. After a period of decline the market forces redevelopment to occur. Around the world governments have actively pursued 'urban renewal' schemes. Some of these have had negative social impacts as they have displaced socially and economically disadvantaged people.

It is possible to assist communities that are in areas of decline to form partnerships with local and state government agencies and local industry, so that they can begin the processes of renewal themselves. The overlap of poverty and unsustainable patterns of urban development have been explored in many other cities and research studies.

This is discussed in the background paper prepared for the *State Sustainability Strategy* entitled *Sustainable Community Regeneration: Issues and Opportunities*. The paper sets out the rationale for regeneration and revitalisation in Perth. It shows that the inner areas of Perth (such as East Perth and Subiaco) have mostly been regenerated over the past twenty years through market forces but also through government assistance including some of the New Living areas (revitalised public housing estates) and Redevelopment Authorities such as the Midland and Armadle Redevelopment Authorities.

However there are also areas in Perth's eastern, middle and outer suburbs where the decline process has set in and there is significant relative social disadvantage. The paper shows that issues include: urban design, employment creation, housing, infrastructure, local environmental issues and most of all community development.

However, a model for how many of areas can be revitalised is not obvious. They cannot all be made part of a redevelopment authority as with East Perth or Subiaco and rarely is public housing provided. Therefore, an appropriate model for sustainable community regeneration needs to be developed and the draft Strategy proposes that a 'Reviving the Suburbs' trial be conducted.

The draft Strategy recommends that a demonstration project be established to develop a model for a community-based revitalisation process. State government processes to support this trial can then be developed including new development codes and other incentives for revitalisation.

In short...

Vision

A set of techniques are developed and trialed with community support that enables older, middle and outer suburbs to be revived and thrive.

Objective

To revitalise key existing centres and suburbs that are in decline to strengthen their local economies, increase their social capital and ensure sustainable use of existing infrastructure and services, including leverage from proposed government investment.

Actions underway include

- 'Enquiry-by-design' processes to promote revitalisation options for some centres and suburbs including Armadale, Midland, Claremont and Mirrabooka.
- The Middle Neighbourhoods Study is being developed by the Department for Planning and Infrastructure as a model for measuring the relative performance of suburbs against design and sustainability indicators.
- The Armadale Redevelopment Authority has been established
- Funding has been provided to support town centre renewal in Gosnells

Proposed actions

4.7 Develop a 'Reviving the Suburbs' initiative to revitalise declining suburbs based on community processes, innovative urban design, public-private housing ventures, co-location of services, improved infrastructure and community arts projects.

4.8 Trial 'Reviving the Suburbs' in partnership with a local government.

4.9 On the basis of this trial create an urban design Community Code for Revitalisation.

4.10 Enable more targeted government intervention and investment into local government areas of decline and opportunity though ongoing revitalisation programs.

4.11 In consultation with local government, progress higher density residential development by linking the provision of government infrastructure (infill sewerage program and underground power) and services (expansion of public transport) with commitments to local urban consolidation.

4.12 Research the techniques of urban revitalisation and their relevance to Perth in the context of the 'Reviving the Suburbs' trial.

Indicators and targets

Proportion of declining areas revitalised.

Global opportunities

Skills associated with revitalising urban areas would have considerable global demand.

Further information

RJ Armstrong, *Sustainable Community Regeneration*, background paper for the State Sustainability Strategy, CD-ROM, 2002

R Armstrong & G Head, *Liveable Neighbourhoods: Guiding New Developments for a More Sustainable Urban Future*, sustainability case study, <http://www.sustainability.dpc.wa.gov.au/CaseStudies/LivableHoods/LiveableNeighbourhoods.htm>

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Rebbettes, D 2002, *Fremantle: Thriving Economically through an Urban Heritage Focus*, sustainability case study, Department of the Premier and Cabinet, Perth, <http://www.sustainability.dpc.wa.gov.au/CaseStudies/Fremantle%20Heritage/fremantleheritage.htm>

> INTEGRATING LAND USE AND BALANCED TRANSPORT

Sustainability in settlements is strongly influenced by the priority given to transport modes and by how land use is integrated with these modes. Perth's development has been heavily influenced by our dependence on the car and truck and this needs to be more balanced with better-integrated land use and transport.

> *Eighty four percent of people in the metropolitan area want transport policy and planning to favour environmentally friendly modes, and half of the population believe planners have an exaggerated impression of the community's demand for car-oriented planning.*
>
> Subiaco Bicycle Users Group

Excessive freight movement is generated when land use is not planned to enable efficient freight movement and integrated freight terminals are not provided. This issue is dealt with under 'Freight and Regional Transport'.

Car dependence arises when cities are built with 'scattered' suburbs, forcing people to rely heavily on cars to reach services, jobs, schools and shops. Around the word, planning is being undertaken to avoid this phenomenon; to build and rebuild cities where land use is integrated with public transport, walking and cycling so that there is a much more balanced transport outcome and more focussed land use. As Professor Ian Lowe says, 'better urban planning would provide accessibility without requiring mobility'[33].

Overcoming car dependence is fundamental to sustainability in cities. In environmental terms this results in less land, transport energy, water use and pollution and greenhouse gases. In social terms, integrated land use and balanced transport can contribute to a reduction in crime, healthier people through increased walking and cycling, more community opportunities and enhanced 'sense of place'. This can also provide increased opportunities for people who don't own a car–over half of the total population. Integrated land use and balanced transport can also achieve economic gains by providing more efficient transport, less infrastructure (shorter pipes and cables) and better provision of community facilities. In addition, because of the reduced demand for infrastructure, more capital is available to the productive economy, greater employment opportunities arise, for example through the location of knowledge-oriented jobs. Finally, it has been estimated that individual households could save up to an additional $750,000 in superannuation over a lifetime by having one less car.

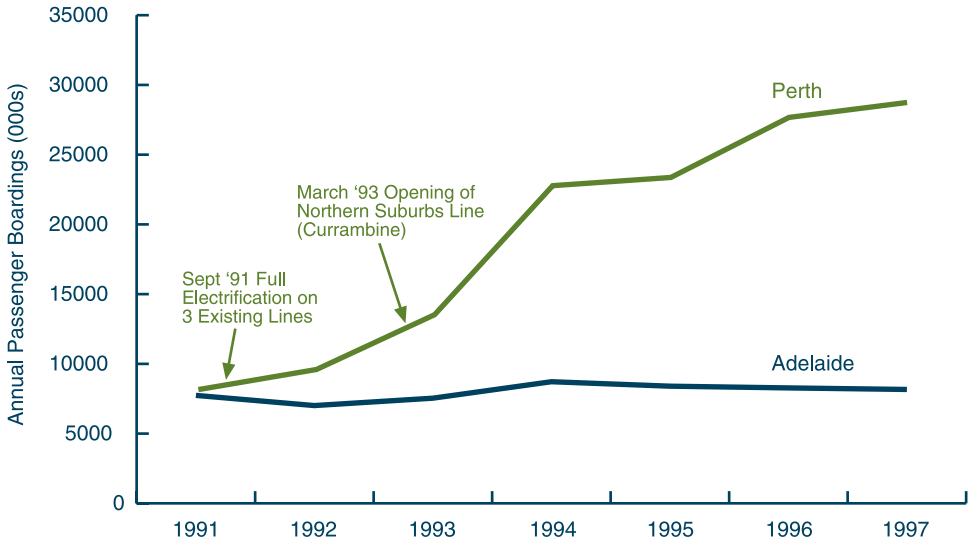
In Western Australia, there have been some important innovations in overcoming car dependence that have attracted worldwide attention, particularly the Liveable Neighbourhoods Community Code and the new electric train system. Liveable Neighbourhoods is the code for planning of new suburbs that enables development to be more sustainable. It requires solar orientation (see *Building sustainably*) and more particularly orients housing towards workable neighbourhood centres and public transport sub-centres. The Code has won several national and international awards and is increasingly becoming the norm especially in joint venture - state government projects like LandCorp's Atwell South and LandStart's Butler, Brighton, Clarkson and Leda developments.

The use of the Liveable Neighbourhoods Code needs to be expanded with a view towards making this mandatory. A new code also needs to be developed to apply to revitalisation projects (as outlined in *Revitalising declining centres and suburbs*) and both Codes could be integrated into the proposed Guide for Sustainable Planning, Building and Construction.

The Perth electric rail system has been an outstanding success story with patronage growing from six million passengers a year in 1992 to 30 million seven years later. This is likely to double again with the southern rail extension to Mandurah. No other city has achieved such growth (see Figure 7).

[33] Professor Ian Lowe in Sustainable Population Australia submission, p.13.

Figure 7 Rail patronage in Perth and Adelaide 1991-1997



Source: Jeff Kenworthy, Murdoch University

The train's success has been due to its speed, comfort and integration into a broader system. This major upgrading of transport infrastructure has provided the opportunity for revitalising sub-centres (and the city centre), to integrate other forms of transport into station precincts and to shape new development in less car dependent ways.

The new rail system provides a 'spine' of fast transport services but not all of Perth has access to this and increasingly journeys are across the city between corridors. There are successful cross-city bus services but some of these are reaching capacity. Integrated bus service expansion and extended rail services need to be planned into the longer-term. The potential role for light rail in providing links between corridors and sub-centres needs to be explored. A long-term public transport plan is needed to guide the city into the future. This can be done as part of the updating of the Metropolitan Transport Strategy.

Other forms of transport including cycling and walking are critical to sustainable urban development. The Physical Activity Taskforce (see case study) has demonstrated the multiple benefits of increased physical activity in our daily lives. Social benefits from an increase in walking and cycling are also being discovered (see case studies). The Pedestrian Advisory Committee of WA conducted a seminar in May 2002 called *Battery Reared or Free-Range Children*. This seminar considered a British study which found that children who are driven to school do not develop the same 'sense of place' and confidence in taking risks as those who walk and therefore are less able to mature in this area of their personal development.

The need to facilitate pedestrian activity and cycling requires more design and infrastructure (especially at the local level), support in the form of engineering codes and educational campaigns. This should include a revamped Perth Bicycle Plan and a focussed strategy of working with local Bicycle User Groups.

Individualised marketing and household travel management programs have been successfully demonstrated in Perth to help provide a shift towards more balanced transport.

Finding a better balance of transport modes and integrating these with land use planning can be controlled through the funding of infrastructure. An Integrated Funding Framework needs to be implemented to support the sustainability outcomes outlined in the draft Strategy.

In short...

Vision

Transport and land use decisions are so interconnected and synergistic that a more balanced, less car dependent city rapidly emerges and solves multiple urban sustainability problems.

Objectives

- Maximise the opportunity to increase residential, employment, retail, community and entertainment activity around key transport nodes and in major centres.
- Achieve a more sustainable balance between car use and other transport options through the promotion and provision of efficient and effective public transport and non-motorised personal transport alternatives.

Actions underway include

- Restructured agencies to integrate planning and transport functions into the Department of Planning and Infrastructure.
- The doubling of the Metopolitan railway system has begun including the 74km $1.4b southern rail line and rail extensions to Butler Brighton and to Thornlie.
- Through the *Building Better Stations* program, options have been examined to improve and implement transport land use integration for existing train stations. Opportunities are also being examined for maximising population and employment at future stations on the South West Metropolitan Railway.
- Established the WA Pedestrian Advisory Council.
- In consultation with the local communities, sub-regional Integrated Transport Plans have been prepared which prioritise improvements for public transport, cycling, and walking facilities over 5, 10 and 20 year time-frames.
- Programs to reduce car use through individualised marketing
- Concession fares frozen and time validity increased for public transport ticketing.
- Exploring new Smart Card ticketing.
- Alternative fuel vehicles are being introduced into the state's bus fleet and the use of Australian Design Rules are being fostered to achieve better vehicle emission controls.

Proposed actions

4.13 Move towards requiring all government and significant residential development projects to adopt the framework which has been used in the Liveable Neighbourhoods.

4.14 Examine pedestrian needs on all local streets and in town centres to create pedestrian friendly environments.

4.15 Update the Perth Bicycle Plan and work closely with local Bicycle User Groups to better resolve local and regional bicycling issues and assist with the provision of safe local bicycle routes, shared paths and end of trip facilities to encourage children to cycle and walk to school.

4.16 Build on the new metropolitan rail system by integrating all other transport modes to feed into it and actively prioritise new station precincts where better integration is possible.

4.17 Research and document vehicle trip behaviour to establish planning implications.

4.18 Research parking demand at suburban centres.

4.19 Develop programs that increase mixed-use development in strategic and other regional centres with good public transport provision.

In short cont'd...

4.20 Encourage local government to provide for flexibility in residential zoning, which allows small businesses and 'corner shop' retail facilities to locate in existing suburban communities.

4.21 Encourage flexibility in local government parking policy in areas where there is good public transport.

4.22 Review and update the Metropolitan Transport Strategy to accommodate the doubling of the metropolitan rail system, integrated bus, pedestrian and cycle networks with potential future upgrading and household travel management programs.

4.23 Investigate the extension of Australian Design Rules to cover noise and other environmental issues for all vehicles.

4.24 Work to remove inequity of taxation treatments and salary packaging arrangements that impact on public transport usage.

4.25 Within the Department of Planning and Infrastructure establish and implement a whole-of-portfolio Integrated Funding Framework to enable integrated landuse and transport planning and balanced multi-modal transport for sustainability objectives.

4.26 Expand research and training on the integration of transport and landuse for more balanced transport outcomes and make this a component of the proposed Masters in Transport Studies being established between the universities.

Indicators and targets

- Number of new dwellings within one kilometre of a rail station.
- Modal split.

Global opportunities

Cities around the world are attempting to better integrate land use and transport planning. Western Australia's experience could be globally significant.

Further information

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> MANAGING FREIGHT AND REGIONAL TRANSPORT

The Western Australian Government made a commitment to review the freight network and began this soon after taking office through a series of innovative public forums, built around the concept of sustainability. This process has been highly successful and has demonstrated that a transparent process, engaging all stakeholders with the goal of sustainability can come up with mutually supportive solutions that are better for the economy, the community and the environment.

> *It is ironic that the very cars and trucks that have made massive urbanisation possible are now contributing to the deterioration of cities.*
>
> Lester Brown[34]

The Freight Network Review began with a role-playing exercise involving the trucking industry and community groups in the Hills area that helped find solutions to a noise problem and did not require the construction of a proposed by-pass.

A Freight Congress was held involving 150 people from all major stakeholder groups as well as randomly selected members of the public. The Congress set the agenda for 9 months of intensive work by 6 working groups. The first group created a paper on *Sustainability in Relation to Freight*. This set the principles for the other groups and a Master Plan and also recommended the use of a public multi criteria analysis process to consider some major road planning proposals.

The Fremantle Eastern Bypass and the extension of Roe Highway through Bibra Lake have generated serious divisions in the community. The multi criteria analysis process was applied to these situations through a series of workshops involving Dr David Annandale from Murdoch University. This process identified 23 alternative options and developed 37 environmental, social and economic criteria. A Community Committee worked with experts to translate these criteria into measurable factors and weighted the criteria to reflect community and industry values. These weighted scores were then applied to the alternative routes.

The final workshop found that the four groups in the process–industry, community, environmental and government–all agreed on the best options. None of the options involved a road through the Bibra Lake wetlands that had previously been proposed as part of the controversial Roe Freeway Stage 8. This sophisticated and transparent process has pioneered a technique in Western Australia for applying sustainability to the resolution of a complex planning problem with practical outcomes. The multi-criteria technique can now be applied to any complex planning decision with confidence. Those involved in the process have developed capacity that is arguably world's best practice.

The particular road planning options need to be part of a broader strategic planning solution and this was developed by the Freight Network Review Working Groups, which was approved by a reconvened Freight Congress in June. The solution involved a strategy to increase the use of rail from the Port of Fremantle (the focus of many of the freight problems) from 3 to 30% as well as reducing the number of empty truck movements so that the growth of trucks could be curtailed to keep it at present levels. Other identified needs were for planning to begin immediately on the development of an Outer Harbour container terminal and determining rail and road connections and a freight interchange node.

The Congress also considered that the Freight Network Review should be more broadly applied to the development of road-rail nodal interchange points (to ensure that freight routes are clearly planned and not compromised) and that demand management should be put on the agenda. The review could be usefully extended to the rest of the state.

The process of developing Regional Transport Plans as part of the State-Local Government Roundtable, could be the mechanism for extending the Freight Network Review. It can also provide the opportunity to incorporate local and regional perspectives on passenger transport futures, particularly in light of the oil vulnerability issues (see *Oil vulnerability, the gas transition and the hydrogen economy*).

[34] L Brown, *Eco-Economy*, Norton, New York, 2001, p. 208

In short...

Vision

Freight becomes more efficient, more rail-based and more connected through inter-modal centers so that the expected large growth in trucks does not occur. Simultaneously, improved regional passenger transport also becomes available.

Objectives

- To achieve an integrated and safe freight transport system that is economically and environmentally sustainable and minimises community conflict.
- To enable transport to meet the needs of regional communities.

Actions underway include

- The Freight Network Review was undertaken in close consultation with community and industry.
- Accreditation for the road transport industry is occurring.
- Strategic planning to support freight rail in limited markets is being undertaken.
- The government is participating in national processes to achieve uniformity of regulations and standards.
- The new Australian Design Rules for vehicle emissions are being introduced.
- *The Prospector* train is being upgraded.

Proposed actions

4.27 Implement the Freight Network Review including the switch to rail freight in the Fremantle Port from 3% to 30% of all containers, the more efficient use of trucks through modal interchange nodes and an acceleration of strategic planning for the Outer Harbour.

4.28 Extend the Freight Network Review principles and concepts to the whole state.

4.29 Develop a mechanism to manage conflicts between freight and residential activity, using zoning options to create incentives for property owners and site management options where necessary.

4.30 Encourage the expansion of freight rail infrastructure to effect modal change.

4.31 Ensure that all complex and contentious road and rail planning is done using sustainability techniques such as the multi criteria analysis process developed for the review of Roe Highway, the citizen jury approach used for Reid Highway and landuse/transport modelling (see *Sustainability and governance: Sustainability assessment*).

4.32 Develop a long-term strategy for country passenger rail.

4.33 Create Regional Transport Plans with Regional Councils for freight and passenger services in country and city regions.

Indicators and targets

- Proportion of freight by rail.
- Reduction of truck movements per unit of cargo moved.

Global opportunities

The need to develop sustainable freight movement in cites and regional areas is a global issue.

Further information

Department for Planning and Infrastructure
<http://www.dpi.wa.gov.au/hotspots>

> PRESERVING AIR QUALITY

An Air Quality Management Plan has been developed for Perth and this needs to be implemented to prevent air pollution reducing quality of life in the city.

Perth is on the threshold of having an air quality problem. The levels of photochemical smog in Perth during summer regularly exceed guidelines established by international health experts and other scientific bodies. Likewise in the colder months, a smoke haze frequently hangs over Perth. In most cases these episodes of unacceptable air quality are perpetuated by weather conditions that prevent air pollutants from dispersing rapidly. The management of the key pollutant sources is therefore essential.

Department of Environmental Protection[35]

Perth's air quality has been a major concern since monitoring in the 1970's discovered that there were significant health threats on 10 to 20 days a year. This is because Perth has occasional atmospheric inversion layers that trap pollutants from motor vehicles, industry, domestic wood burning and bush fire smoke. The resulting problems are at various times photochemical smog, particulate pollution (or haze), and also certain toxic chemicals (usually at low levels but requiring attention as part of international efforts at reducing motor vehicle emissions).

The Perth Air Quality Management Plan has had bipartisan support and sets out priority actions in:

- land use transport and planning to reduce car dependence and enable more balanced transport options
- vehicle emissions programs that are part of the National Environment Protection Measures for each pollutant
- community education and behaviour change programs related particularly to the issue of domestic wood burning
- industry emissions, particularly those in the Kwinana region.

These programs need to be continued and accelerated where feasible. The innovations suggested in land use and transports are outlined in *Integrating land use and balancing transport*. The vehicle emissions programs are part of a Commonwealth Government process and the Western Australian Government needs to ensure that no attempt is made to weaken this and avoid compliance with world best practice.

Recent advances in the United States and Europe mean Australia must respond to ensure we are at the vanguard of this change. Domestic wood burning needs to be carefully monitored and if the educational process is not working sufficiently then mandating standards may be required. Industry emissions have been helped by the reduction in coal burning by Western Power in Kwinana and this is planned to continue. Monitoring should ensure industry emissions continue to improve.

The introduction of Clean Fuel regulations under the Environmental Protection Act saw Western Australia become the national leader in clean transport fuels. These regulations have seen:

- a reduction in sulphur from diesel fuel
- a reduction in benzene from petrol
- removal of the toxic additive MTBE
- complete removal of all lead from petrol
- reduction in the hydrocarbons that evaporate from petrol and cause smog.

The next stage will be to investigate in detail some of the air toxics from wood burning, industry and transport fuels.

The goal for Perth should be to ensure that the city's air is as clean as any other city in the world of comparable size. Careful monitoring will be needed under the goals established by the Commonwealth's National Environmental

[35] Department of Environmental Protection, *Perth Air Quality Management Plan*, 2000, Government of Western Australia, Perth.

Protection Measures, and if the results show the city is not reaching that standard then more drastic implementation procedures and policies will be required.

Outside Perth there are occasional air quality issues such as the sulphur dioxide levels at Kalgoorlie and the emissions from particular industries in rural areas. These need to be pursued by the Environmental Protection Authority as they will relate to industry conditions set by the Authority. If monitoring indicates a problem then action must be taken.

Although there are economic implications in addressing pollutants, the overall economic implications when health costs and property damage are considered as well as the social costs, generally lead to overall sustainability gains from improving air quality. The studies to back up this integrated view of air quality need to be reviewed and updated regularly.

Many actions that address air quality are included throughout other sections of the draft State Sustainability Strategy including *Sustainability and settlements: Land use-transport integration and balanced transport, Managing freight and regional transport, Sustainable energy and building sustainably.*

In short...

Vision

Perth's air is the cleanest of any city of its size in the world.

Objectives

- Maintain and improve air quality for this and future generations so Perth is the cleanest city of its size in the world.
- Allow economic and social development while not compromising air quality objectives.
- Protect human health and the environment, including biodiversity.
- Ensure future development recognises and manages air quality issues and reduce emissions to the atmosphere to the maximum practical extent.

Actions underway include

- Government is currently implementing the Perth Air Quality Management Plan, involving priority actions in the areas of land use transport and planning, vehicle emissions, community education and behaviour change and industry emissions.
- Government is developing a State Air Environmental Protection Policy to provide a strong legislative foundation to protect air quality around Western Australia.
- Monitoring programs for the National Environment Protection Measures for ambient air quality (for the priority air pollutants of NO_x, SO_2, lead, CO, PM10 particulates, ozone) are well established.
- Development of National Environment Protection Measures for air toxics is in progress and the government is implementating the National Environment Protection Measures for the testing of diesel emissions.

Proposed actions

4.34 Continue implementation of the Perth Air Quality Management Plan, focussing on coordinated action to ensure Perth is the cleanest city for its size in the world.

4.35 Develop a Statement of Planning Policy for Integrated Land Use Planning and Transport that demonstrates, among other things, how local planning can minimise air pollution. This is a matter that could be progressed through the State-Local Government Partnership.

In short cont'd...

4.36 Continue to provide community information and education to change behaviour, especially on the burning of domestic wood fires and to encourage a shift to non-car modes of transport.

4.37 Define and resolve the linkages potential conflicts or competing interests between air quality issues and Greenhouse issues.

4.38 Continue to monitor the air quality criteria set by National Environmental Protection Measures.

4.39 Continue to develop air quality guidelines and standards through national forums and further develop methods for assessing the impacts of air quality on human health and the environment.

4.40 Undertake cost benefit analysis of air quality decisions (i.e. the environmental and social cost of actions and decisions to assist in sustainability assessments).

Indicators and targets

Comprehensive analysis of air quality is undertaken on an annual basis and published by the Department of Environmental Protection and as part of the State of the Environment Reporting process. The key indicators are trends in air quality for the priority air pollutants of NO_x, SO_2, lead, CO, PM10 particulates, ozone and compliance with the National Environmental Protection Measure for Ambient Air Quality.

Global opportunities

Western Australia has developed world-class expertise and experience in managing air quality issues and there are opportunities for this expertise to be exported and offered to developing countries with similar air quality problems.

Further information

Department of Environmental Protection 2001, *Air Quality in Perth* 1992-1999, viewed August 2002, <http://www.environ.wa.gov.au/downloads/Technical_Series/109.pdf>

> REDUCING AND MANAGING WASTE

Reducing and managing wastes in settlements is fundamental to ensuring a healthy environment and good quality of life. Recent management experience has revealed continuing improvement and innovation in solid waste management but problems with hazardous waste.

> *... it is imperative that the State Sustainability Strategy for Western Australia take a deliberate and detailed look at the issues evolving in waste management particularly the importance of ensuring the maximisation of the recovery and recycling of resources from waste.*
>
> Amcor Recycling

The state government is committed to the elimination of all wastes. Sustainability requires a shift toward a closed loop economy, where the wastes from one part of society become the raw materials for another and where we extract the maximum value from our natural resources. The government will make significant progress toward achieving a zero waste society by 2020.

Achieving this vision will require major advances in product stewardship, technology and community commitment for waste reduction. The development of markets for recycled materials is also an essential component of moving to zero waste. Government can take an active role in stimulating the development of markets for recycled materials through its own purchasing requirements as outlined in *Sustainability and Governance: Embracing sustainability in government agencies.*

It is no longer acceptable to continue to disposel of waste to landfill, and the community is demanding preventative strategies to minimise wastes and particularly those that can enable the elimination of hazardous wastes. Technologies for treating and storing wastes and the location of waste facilities have been of great concern to many in the community, especially since the Bellevue chemical fire–one of the largest chemical incidents in Australian history.

In order to implement the vision for zero waste by 2020, the government has adopted the WAste 2020 Strategy and has committed to:

- achieve the commitment and participation of all stakeholders in waste reduction, re-use and recycling practices and processes
- prevent the generation of waste
- maximise the recovery and recycling of resources from waste
- establish effective frameworks and structures to coordinate and facilitate waste reduction, re-use and recycling, the recovery of resources and the safe management of remaining wastes.

The WAste 2020 Strategy provides a comprehensive set of strategies to achieve zero waste. The government has established a Waste Management Board to implement the WAste 2020 Strategy. It is expected that their plan will be based on achieving at least 70% of this goal through reduction, reuse and recycling, and 30% through secondary waste reprocessing. Life cycle cost analysis will be used to determine the most appropriate and cost-effective method of processing waste, incorporating the environmental and social costs of each method. Waste to Energy will only be used in accordance with the waste management hierarchy, State Bioenergy Policy and where it can be justified on the basis of lifecycle analysis. The Waste Management Board will establish guidelines and codes of practice for the selection, siting and management of secondary waste reprocessing facilities. This legislation will also provide a means to implement important components of government policy and the WAste 2020 Strategy. Waste management decisions to achieve zero waste will be based on a rigorous application of the waste management hierarchy (see Figure 8).

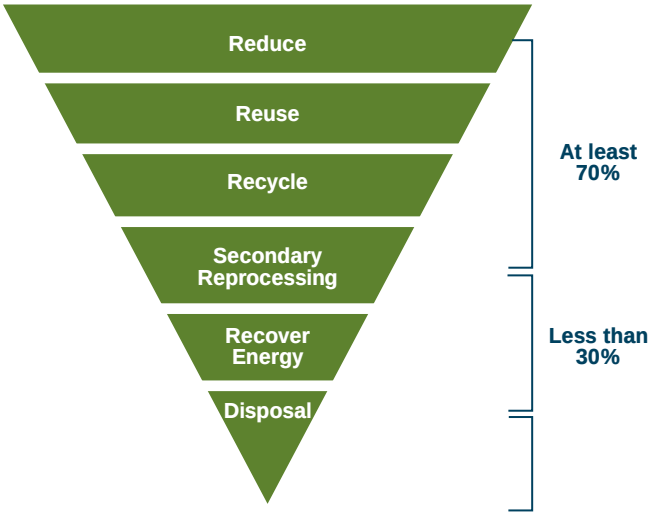
The Waste Management Bill will contain provisions for achieving world best practice in the sustainable minimisation and management of waste and resource consumption. The Bill will provide a statutory basis to the Waste Management Board, which will be responsible for providing independent advice on waste issues to the Minister for the Environment and Heritage, and for implementing the WAste 2020 Strategy. The Waste Management Bill will ensure a coordinated

approach across the state to maximise the recovery of waste resources, and will begin to establish requirements for extended producer responsibility of materials and wastes.

There is a need for consumers and producers to become more responsible for the life cycle of products and services. One key mechanism developing overseas for closing the loop is through requirements to extend a producer's responsibility beyond the point of sale of a product. This means that a producer is responsible for their products throughout their lifecycle.

At a national level a voluntary National Packaging Covenant has been established to reduce the amount of packaging being consumed in Australia. The Western Australian Government has prepared an action plan to implement the Covenant and will introduce the necessary regulations under the Environmental Protection Act.

Figure 8. Waste management hierarchy



In short...

Vision

Waste is simply regarded as another resource.

Objectives

- Achieve the commitment and participation of all stakeholders in waste reduction, re-use and recycling practices and processes.
- Prevent the generation of waste.
- Maximise the recovery and recycling of resources from waste.
- Establish effective frameworks and structures to coordinate and facilitate waste reduction, re-use and recycling, the recovery of resources and the safe management of remaining wastes.

Actions underway include

- Implementing the WAste 2020 Strategy.
- Establishing the Waste Management Board.
- Developing a whole-of-government procurement policy for waste paper recycling.
- Conductiing research on solid waste management through the waste levy.
- Conducting the Parliamentary Inquiry into the Bellevue Chemical Fire and acting upon its recommendations including initiating a comprehensive review into hazardous waste management in Western Australia.

In short cont'd...

Proposted actions

4.41 Continue to work towards a zero waste society and recognise the success of those regional councils who are showing how this can be achieved.

4.42 Explore the opportunities for increased engagement in sustainable waste management by local government and the Waste Management Board through the State-Local Government Sustainability Roundtable.

4.43 Introduce and enact the Waste Management and Contaminated Sites Bills.

4.44 Require the Waste Management Board to prepare a detailed plan for each waste stream outlining how Western Australia will achieve the goal of zero waste.

4.45 Encourage the use of recycled products by all government agencies, and the recycling of paper, glass, plastics, metals and organic waste, as part of government's Sustainability Procurement Policy and Sustainability Code of Practice.

4.46 Require all Regional Organisations of Councils, or Local Government Authorities, to prepare waste management plans.

4.47 Examine how the Waste Management Board's waste levy can better reflect environmental and social costs of the environmental and social costs of waste disposal.

4.48 Encourage all government agencies to reduce consumption and waste by undertaking a comprehensive audit of resource consumption and waste and setting targets for reductions.

4.49 Set mandatory hazardous waste targets for hazardous waste facilities and target cleaner production programs towards industries producing hazardous waste.

4.50 Conduct a comprehensive review of hazardous waste reduction and management in WA to assess behavioural change programs, producer and consumer responsibilities, quantities and sources of hazardous waste, current procedures for transport, storage and disposal of hazardous waste to ensure international best practice. Emphasis should be placed on rail transport of all hazardous wastes. Importing of hazardous wastes from interstate or overseas will be prohibited.

4.51 Require the Resource Recovery Precinct Team to nominate and establish 5 resource recovery precincts for the metropolitan region in conjunction with community organisations and the Waste Management Board.

Indicators and targets

- Progress to achieving zero waste by 2020.
- Reduce resource consumption by a factor of 4 by 2020.
- Achieve at least 70% of the zero waste goal through reduction, reuse and recycling, and 30% through secondary waste reprocessing, in accordance with the waste management hierarchy.
- Establish five resource recovery precincts by 2010.

Global opportunities in waste management

Western Australia has developed a number of innovative waste management technologies and with strong regulatory controls on waste this innovation will continue. The Waste Management Fund will lead to on-going research and development to assist this process. Global opportunities are considerable.

Further information

Department of Environmental Protection 2001, *Waste 2020 TaskForce Report and Recommendations draft*, Department of, viewed August 2002, <http://www.environ.wa.gov.au/downloads/WAste_2020/Controlled_Waste.pdf>

Murdoch University, Environmental Technology Centre, <http://wwwies.murdoch.edu.au/etc/ >

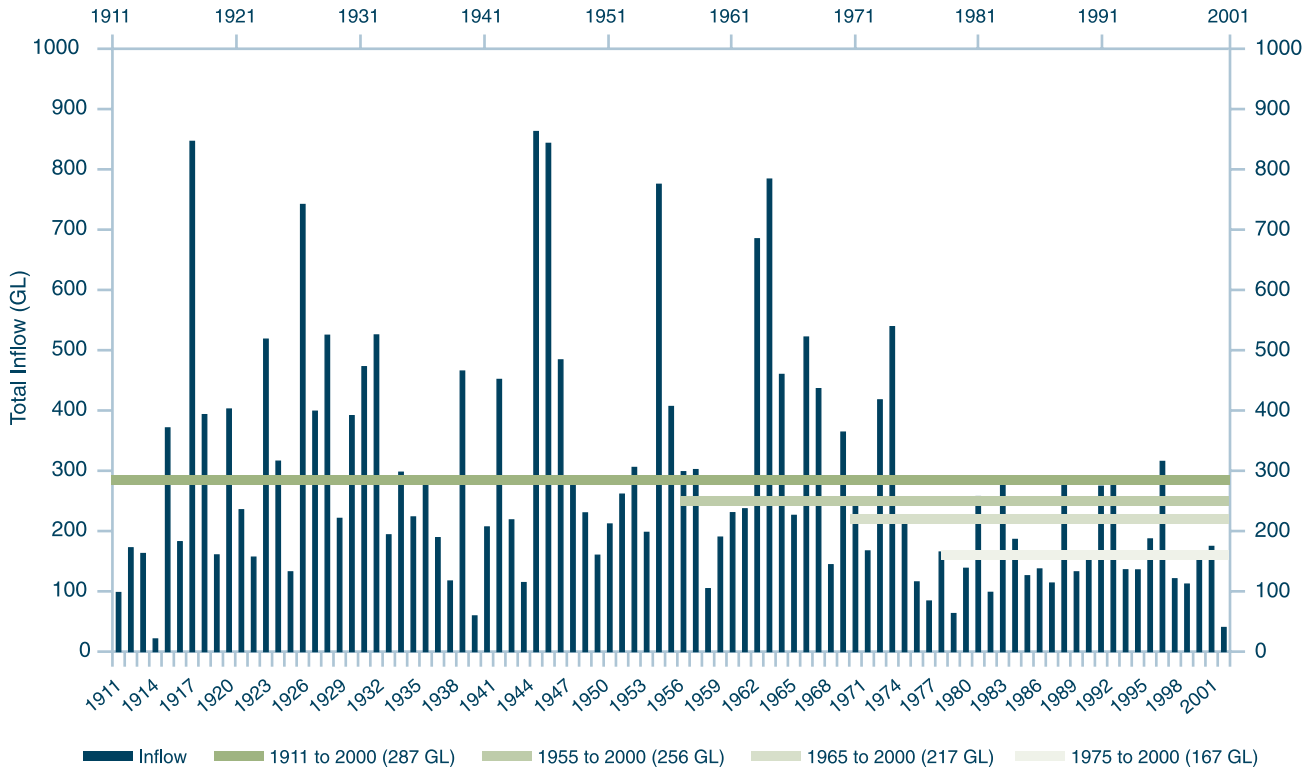
> OUR WATER FUTURE

The sustainability of our water supply is an issue of concern to many Western Australians, especially those who live in the South West. There is a need to provide a vision for the future, new sources of supply and new ways to save water.

> *Effectively managing water supplies is a key task for our state. It requires thorough investigation into the options, and commitment to tough choices and actions where necessary. We must ensure we have enough water to meet our needs.*
>
> *Meeting the challenge of creating and securing a sustainable water future for Western Australia is a high priority for Government and is a unique opportunity for us to work together in achieving this goal.*
>
> Hon Geoff Gallop, Premier of Western Australia[36]

Water supply is a major issue in the South West of Western Australia with a 50% decline in the run off to dams being experienced in the past 25 years (see Figure 9).

Figure 9 Yearly Streamflow for Major Surface Water Sources (Perth Water Supply System)



Note: A year is taken as May to April

Source: Water Corporation

Perth people have also increased their water use so that it has reached higher levels than in other Australian cities where demand has been falling or has remained steady, though they also demonstrated in the past summer how they can save water with a 25% reduction in water use. The 2001-02 drought resulted in 30Gl runoff compared to the recent average of 160 Gl (or the long term average of 320Gl). Climate change experts predict that the likelihood of low rainfall into the future is high.

The Premier established a Water Taskforce in April 2002 to investigate short and long-term solutions and to produce a State Water Strategy with widespread public consultation. This draft State Sustainability Strategy provides some interim solutions and suggestions that can be debated as part of that process along with the newly released draft of the State Water Conservation Strategy.

[36] Hon Geoff Gallop, Government of Western Australia, *Our Water Future: Its up to all of us*, 2002

Possible actions that are likely to have significant sustainability outcomes as well as helping solve the water problem include:

- Household oriented water management systems such as:
  - water wise gardens that have native plants and provide habitat for native birds and invertebrates and help in the development of a local - 'sense of place'.
  - Grey water that can be recycled into gardens providing nutrients and water for plants rather than into the ocean.
  - More efficient appliances for water usually also save energy.
- Water sensitive urban design that can contribute to the aesthetic of an area. In addition in some urban areas the water table is quite high, providing opportunities for bores, and community gardens as well as increased use of rain water tanks.
- Reuse of wastewater that can provide an assured supply to industry while saving scheme water and reducing waste into Cockburn Sound.
- Water supply options, such as revegetating the Gnangara Pine plantation with less water intensive plants, the desalination of salty water in the Wheatbelt that can prevent land degradation as well as provide water and desalination of sea water using wind power.

All of the above concepts enable us to turn the water crisis into an opportunity for sustainability at the local level and through the technologies and services developed, a global sustainability opportunity.

The government is holding seventeen community water forums that will coincide with the public consultation phase of the draft State Sustainability Strategy. The results of these and the development of the State Water Strategy will be included in the final State Sustainability Strategy.

In short...

Vision

Water is used with care and is provided sustainably to meet needs.

Objectives

- Reduce water consumption.
- Extend responsibility for water supply to the planning system (water sensitive when design) and to local government (Regional Councils) for groundwater supplies.
- Achieve significant waste water reuse.
- Investigate long term innovative water supply options that have broad sustainability outcomes.

Actions underway include

- The Premier's Water Taskforce has been established to develop a State Water Strategy.
- A draft State Water Conservation Strategy has been released for public comment.
- A draft Guidelines for the Re-use of grey water by households has been released.
- Government is holding seventeen community Water Forums throughout the State.
- The Water Corporation and Department of Environment, Water and Catchment Protection operate a number of programs directed at water conservation.

In short cont'd...

Proposed actions

4.52 Complete the State Water Strategy after full public consultation including a major public Water Symposium to set out a cost effective supply strategy, a conservation strategy and a research strategy for the long-term.

4.53 Establish initiatives to achieve a 10% reduction in per capita water use by 2012.

4.54 Establish guidelines for household use of grey water and encourage best practice in their application.

4.55 Develop partnerships with local government to ensure water sensitive urban design is built into all urban development.

4.56 Ensure local government and Regional Councils, co-ordinated by the Department of Environment Water and Catchment Protection, take more responsibility for managing groundwater, including household and municipal bores and storm water collection, through the development of Regional Groundwater Management Plans.

4.57 Construct the Kwinana waste water reuse facility with industry partners moving towards achieving in 10 years 20% waste water reuse and set out a long term plan for how all waste water could be reused.

4.58 Examine the potential for individualised marketing of water conservation and water supply options including rainwater tanks, bore and grey water systems.

Indicators and targets

- Annual water consumption per capita reduced from 170kl to 155kl by 2012.
- 20% recycling of waste water by 2012.
- Regional Council ground water management plans in place for metropolitan Perth by 2012.

Global opportunities in sustainable water

Other areas of the world have water constraints like Perth. If the city can overcome these in a sustainable way then the results will be seen globally.

Further information

Water Corporation
<www.ourwaterfuture.com.au>

> SUSTAINABLE ENERGY

The use of household electricity and gas, renewable fuels, transport fuels, commercial and industrial fuels are all opportunities for addressing sustainability through providing an efficient service to the economy, helping build communities and not harming the environment.

> *In addition to world coal use peaking in 1996, oil production is expected to peak either in this decade or the next. Natural gas use will keep expanding somewhat longer because of its generous reserves and its popularity as a clean-burning, carbon-efficient fuel. Because it is a gas, it is also the ideal fuel for the transition from a carbon-based economy to one based on hydrogen.*
>
> Lester Brown[37]

The need for sustainable energy is about the transition from fossil fuels to renewable energy sources, including wind, waves, solar photo-voltaic, solar thermal (such as solar water heaters), geothermal and various biomass based fuels, (such as bio-diesel).

Throughout the world there have been experiments and demonstrations of how to manage this transition. In Western Australia there are globally significant experiments and demonstrations in renewable energy technologies[38] including:

- solar water heating (Western Australia has led the world in this technology)
- remote area power systems that use solar photovoltaic and wind turbins combined with diesel generators for small, isolated communities[11]
- the Albany wind farm uses world best practice technology and operational systems
- the new 1 MW power plant at Narrogin will use oil mallee biomass and is a globally significant attempt to bring multiple sustainability benefits to rural Western Australia
- the hydrogen fuel cell bus project.

The Western Australian Government created the Sustainable Energy Development Office in recognition of the need to facilitate the transition to sustainable energy. The Office has a mandate to advise government on all policies in this area and to provide information and assistance regarding sustainable energy to business, government and the community.

BOX 28 GEOTHERMAL-BASED HEATING AND COOLING AT EDITH COWAN UNIVERSITY, JOONDALUP

The new Ecology and Health building at the Joondalup campus of Edith Cowan University is an eco-design that utilises geothermal energy. A deep bore provides hot water which provides air conditioning for the building and all other buildings on the campus through a heat exchanger.

Source: Edith Cowan University

There are a number of important initiatives occurring within the energy portfolio that have the potential to help move Western Australia towards more sustainable energy use. These include:

- Western Power's South West Integrated System (SWIS) Power Procurement Process which is designed to produce power at lower cost and with more sustainable outcomes.
- The Electricity Reform Taskforce which is designed to examine institutional aspects of electricity provision and which can enable greater renewable energy in the system.
- The West Kimberley power procurement process.

[37] L Brown, *Eco-Economy*, Norton, New York, 2001, p. 98

[38] In recognition of this expertise Western Australia was awarded the Australian Cooperative Research Centre in Renewable Energy (ACRE) based at Murdoch University.

Moving towards a more sustainable energy base for our society has almost universal agreement as it has the potential to reduce greenhouse gases, other air emissions and pollutants from fossil fuel use and other external costs. This needs to be done in ways that are economically efficient and socially beneficial.

Many other parts of the world have significantly higher proportions of renewable energy and have instigated large-scale energy management programs. But each place has its own potential, its advantages and its problems. For example, in milder areas like the South West of Western Australia, energy use for household heating and cooling is much lower than in areas with extreme temperatures, but there is still much potential for energy savings.

The innovations in Western Australia were listed above and programs to expand the efficiency of the generation system and the amount of renewable energy are under consideration. Strategies to ensure a more active attention to sustainable energy are linked to a number of other policy areas in this Strategy. They include the Greenhouse Strategy, the Oil Vulnerability Strategy, the Land Use-Transport Integration and Balanced Transport Strategy, the Freight and Regional Transport Strategy, the Air Quality Strategy, the Sustainable Building and Construction Strategy, and strategies designed to increase community as well as strategies for business. Proposed actions from each of these areas as well as additional strategies have been listed here to bring renewable energy more rapidly into the energy system in Western Australia.

In short...

Vision

Western Australia's transition to a sustainable energy future is globally innovative and locally responsible.

Objectives

- Ensure energy efficiency and renewable energy are an increasing part of the domestic, commercial and industrial sectors.
- Demonstrate the multiple sustainability benefits of more sustainable energy.

Actions underway include

- Western Power's increased use of gas and improved efficiency in electricity production has had benefits in more sustainable electricity generation.
- Western Power's wind power initiatives and other projects have demonstrated the relevance and potential of renewable energy technology.
- The establishment of the Sustainable Energy Development Office is assisting in creating significant opportunities for innovation in sustainable energy.

Strategies for sustainability

4.59 Develop further voluntary schemes with the housing industry to demonstrate at least 4 star energy rating on all new homes and move to a more mandatory scheme through a Guide to Sustainable, Planning, Building and Construction developed with local government and industry (see *Building sustainably*).

4.60 Develop a rating scheme for all home renovations that provides incentives for renovators who adopt certified energy efficient renovations.

4.61 Ensure Town Planning Schemes require solar orientation of new developments to achieve 80% oriented houses, and provides guidance on the re-orientation principles as part of all renovation approvals (see *Building sustainably*)

4.62 Encourage building design and management for energy efficiency for all government buildings.

4.63 Provide Eco-Loans as part of the existing KeyStart program with a requirement to save energy through the design and construction of the home.

In short cont'd...

4.64 Demonstrate government leadership in sustainable energy through Sustainability Action Plans.

4.65 Continue trialling innovations in transport fuels including gas, hydrogen fuel cells and biodiesel demonstrations.

4.66 Develop a State BioEnergy Policy.

4.67 Develop new initiatives to manage peak load demand.

4.68 Provide mechanisms in the electricity market structure for encouraging renewable energy and distributed generation which could include incentives to reduce line losses and providing priority dispatch for renewable energy in any trading market.

4.69 In meeting the Mandatory Renewable Energy Target investigate the scope for mechanisms to ensure that Renewable Energy Certificates are sourced locally.

4.70 Continue to support the use of renewable energy in Remote Area Power Supply (RAPS) systems.

4.71 Seek to minimise energy use by:

- household energy conservation information programs
- school curricula and management to demonstrate energy efficiency
- supporting mandatory national standards for energy efficiency in appliances and vehicles
- ensuring government procurement is based on life-cycle costing to properly account for the cost of energy
- using sustainability assessment to include life-cycle analyses on all such decisions.

Measuring progress

- Primary energy use per unit of Gross State Product.
- Amount and proportion of renewable energy use in Western Australia.
- Household energy use per unit of household income.

Global opportunities in sustainable energy

The world is in a very rapid phase of competitive development of sustainable energy solutions.

Further information

Carlton, J 2002, *Wind Energy in Western Australia*, sustainability case study, Department of the Premier and Cabinet, Perth, viewed 15 August 2002, <http://www.sustainability.dpc.wa.gov.au/CaseStudies/windenergy/windenergy.htm>

Combes, D 2002, *Gas as a Transition Fuel: Western Australia's Natural Alternative*, sustainability case study, Department of the Premier and Cabinet, Perth, viewed 15 August 2002, <http://www.sustainability.dpc.wa.gov.au/CaseStudies/gasastranstion/gasastransition.htm>

Garrity, L 2002, *Hydrogen Fuel Cell Buses: The Future for Sustainable Transportation in Western Australia and Around the World*, sustainability case study, Department of the Premier and Cabinet, Perth, viewed 15 August 2002, <http://www.sustainability.dpc.wa.gov.au/CaseStudies/Hydrogen.htm>

Passey, R 2002, *Biodiesel: A Fuel for the Future*, sustainability case study, Department of the Premier and Cabinet, Perth, viewed 15 August 2002, <http://www.sustainability.dpc.wa.gov.au/CaseStudies/biodiesel/biodiesel.htm>

Stanton-Hicks, E 2002, *Oil Mallees: Native Flora with Myriad Benefits*, sustainability case study, Department of the Premier and Cabinet, Perth, viewed 15 August 2002, <http://www.sustainability.dpc.wa.gov.au/CaseStudies/OilMallee/OilMallee.htm>

Cool Communities program <http://www.coolcommunities.org>

Electricity Reform Task Force <http://www.ertf.energy.wa.gov.au>

Sustainable Energy Development Office <http://www.sedo.energy.wa.gov.au>

Western Power <http://www.westernpower.com.au>

> PRESERVING CULTURAL HERITAGE, LANDSCAPES AND CREATING 'SENSE OF PLACE'

Western Australians have long been considered a group of people with a strong sense of local identity, who feel proud of their state and who prefer to live here rather than any other part of Australia. It is a state with a beautiful coastline, clean and orderly cities and towns. The Western Australian Government recognises that 'sense of place' is important in the psyche of Western Australians. Maintaining and building on this sense of place will contribute to sustainability by fostering a spirit of pride and optimism that will contribute to innovation and creative problem solving.

> *Cultural landscapes are … considered to be about people gaining and maintaining a 'sense of place' in their community, and people in a place feeling confident in that place. Our recognition of a site as being pleasant or important is a first step in planning how it can be preserved and managed for the enjoyment of people.*
>
> Coral Pepper, *Discussion Paper - Sustainability of Cultural Heritage and Landscapes*. Background Paper for the State Sustainability Strategy.

Over the years, however, there has been an erosion of the very values that informed these views, as the impacts of western-style development have manifested. The feelings of loss within the community have been mixed with feelings of powerlessness. These feelings reduce the capacity of individuals and the community as a whole to participate in, and contribute to solutions. This is a factor of vital concern in any discussion of sustainability.

A term often used to describe this sense of belonging, of attachment to and ownership of particular places, is 'sense of place.' The loss of a 'sense of place' within sectors of the community is a factor of vital concern in this discussion of sustainability of cultural heritage and landscapes (see Box 29).

Our cultural heritage is what we pass on to future generations and it is expressed in how we build and how we shape our landscapes. Beautiful and culturally significant buildings, townscapes and landscapes are preserved because we feel they are important expressions of who we are. The protection of cultural heritage and landscapes is a fundamental means of creating and maintaining a 'sense of place'.

Many factors can contribute to a sense of place. For example, a good knowledge of the geography of the area or region in which people live and of the state as a whole. People should feel free to move around and interact with others in the streetscapes and landscapes with which they are familiar. They converse freely with others about travels, and have some picture in their mind's eye of the places being described.

A sense of place can be generated by a familiarity with and fondness for particular streetscapes and landscapes across a range of scales, from the local precinct to a region to the whole of the state. Invariably the streetscapes are not dominant and overpowering–the buildings are on a human scale. And the landscapes do not feel threatening; they are vegetated with familiar plants and contain familiar animals.

Good relationships with other members of the local community including neighbours and near-neighbours and even local shop keepers engender a sense of being part of a community, with all the potential for support that this creates, especially for young people as they grow up.

Much can be done to facilitate the sense of place through a range of infrastructure improvements to minimise car use and maximise walking and cycling in a local area. However the social infrastructure of a community is also critical through various community services and the local expressions of culture and the arts, especially Indigenous arts (see *Sustainability and community: Sustainability through culture and the arts*). The local planning system can be a powerful mechanism for facilitating sense of place'. Heritage regulation in the past has been seen as an impediment to the economy just as environmental regulation once was. However, there are now many examples to demonstrate that once heritage values have been preserved in buildings (like the Fremantle

Arts centre) townscapes (like Fremantle or Subiaco or many other inner city areas) and landscapes (like the Swan Valley or the Hills), the economy and the community has benefited.

BOX 29 THE KOJONUP RECONCILIATION CENTRE: 'KODJA PLACE'[39]

An outstanding example of how a local community has strengthened the 'sense of place' within that community is the town of Kojonup's recently established Reconciliation Centre. This centre is named 'Kodja Place' after the stone axes that local Aboriginal people used in the past. The Centre has been planned and constructed as a combined reconciliation and community based project where a combination of facilities is provided for all members of the community to access.

Resources are being gathered to demonstrate the development of the town and the landscapes through to the present day within the museum and multi-media laboratory. The laboratory provides the facilities for interested members of the community to scan family photos and to blend them with scenes of the evolving townscape and landscapes to create videos that best represent their own life stories in and around Kojonup. The process of describing these stories will undoubtedly strengthen and enliven the sense of place.

Since its opening in April 2002, the multi-media laboratory has been used extensively by a broad cross-section of the community. Members of the community are working together so that capacity building is occurring within the community. Further, it seems that younger members of the community who formerly felt dispossessed are now finding their place.

There has been in recent times, something of a reaction to heritage because of concerns about individual property rights issues. At the same time, it is clear that residents of most of the older, established suburbs prefer the existing style and ambience of those suburbs and are not keen for these areas to be redeveloped with different architectural styles. A useful approach to dealing with these apparently conflicting issues is for residents of local precincts to develop guidelines for planning and development for their precinct that identify, protect and enhance the essential character of the precinct and identify opportunities for redevelopment. This has been the characteristic approach of successful heritage areas where development is facilitated by the guidelines and the heritage qualities become part of the full triple bottom line advantages to living or working in such places.

The integration of the social component of sustainability into economic and environmental considerations is never more obvious and necessary than in the careful consideration and protection of heritage. Transparency and engagement are essential to the proper development and acceptance of 'sense of place'.

Finally, it is important in discussing heritage and sense of place issues to emphasise the importance of Perth's city centre and other urban centres such as Fremantle, Bunbury and Geraldton. City centres are an expression of who we are. They are the soul of the city as they represent in the style of their architecture, their public spaces and their level of human interest and creativity, what the underlying values and priorities of the community are. They are in simple terms the physical expression of our economic health, our environmental sensitivity and our cultural and community values. They are sustainability profiles or indicators.

It is therefore important for us to focus attention on the city centre of Perth as well as Fremantle, other sub-centres in Perth, and regional town centres. These centres need a vision as to how they can become more sustainable, more interesting and attractive places to visit as well as to live and work in. They need to have cultural and architectural features that represent the community and its aspirations. They need community art and they need high culture as both are part of who we are.

The Future Perth program has had an important new element in its planning process by incorporating a paper on *The Creative City* by British author and consultant Charles Landry[40].

[39] Pepper, C. 2002. *Sustainability of Cultural Heritage and Landscapes*. Background Paper for the State Sustainability Strategy.

[40] C Landry, *Can Perth be more creative?*, Future Perth Working Paper.

In short...

Vision

Western Australia's special qualities in landscapes and townscape are valued and enhanced in all development.

Objective

Instil a strong sense of place in Western Australians through the preservation of cultural heritage and landscapes and the active development of quality public spaces.

Actions underway include

- The development of the multi-media laboratory and the use of it by members of the Kojonup community is an outstanding example of local activity leading to development of a strong sense of community.
- Fremantle is an example of a success story in the maintenance of urban heritage (see case study).
- Active involvement of the state and local governments in public spaces and community art in city centres.
- The Heritage Council and WALGA are working on a more standardised and consistent approach to municipal heritage inventories.

Proposed actions

4.72 Support Regional Sustainability Strategies as opportunities to develop 'sense of place' stories. This will provide opportunities for communities to document their own stories of place within their communities and landscapes so that the stories are not lost but are enlivened, for example, Kojonup's 'Kodja Place'.

4.73 Encourage local government's implementation of heritage to be consistent, transparent and builds on precinct plans that establish guidelines for how to protect and enhance the essential character of their area whilst allowing for sympathetic infill and redevelopment.

4.74 Provide opportunities for students to learn about their natural and cultural environments and their local histories.

4.75 Support opportunities for Indigenous people to promote cultural awareness within their own communities.

4.76 Develop a Built Environment Policy that focuses attention on Western Australia's architectural features that reflect our 'sense of place'.

4.77 Develop a Creative City Policy as part of *Future Perth* to ensure that community values are expressed creatively in the city centre and other centres.

Indicators and targets

Number of town planning schemes with zones and guidelines for cultural heritage and landscapes.

Global opportunities

Although needed most at local level, the principles and practices of cultural heritage can be applied everywhere.

Further information

Rebbettes, D 2002, Fremantle: *Thriving Economically through an Urban Heritage Focus*, sustainability case study, <http://www.sustainability.dpc.wa.gov.au/CaseStudies/Fremantle%20Heritage/fremantleheritage.htm>

Pepper, C 2002, *Sustainability of Cultural Heritage and Landscapes*, sustainability background paper, Draft State Sustainability Strategy CD-ROM, Department of the Premier and Cabinet, Perth.

> BUILDING SUSTAINABLY

Sustainable construction would result in buildings that are simultaneously less resource-intensive and provide a better environment in which to live and work. The Western Australian Government has a number of initiatives that share this goal including the Greenhouse Strategy, Future Perth, the State Planning Strategy, the State Housing Policy and the Built Environment Policy.

> *The pursuit of sustainable development brings the built environment and the construction industry into sharp relief. This sector of society is of such vital innate importance that most other industrial activities in the world simply fade in comparison.*
>
> Confederation of International Contractors' Associations[41]

> *In every country, the construction industry is both a major contributor to socio-economic development and a major user of energy and natural resources; therefore its involvement is essential to achieve sustainable development in our society.*
>
> United Nations Environment Program[42]

The benefits of designing sustainable homes and buildings are well understood. However, sustainable building also requires a sympathetic planning system and an enthusiastic market. Dispelling any myths or scepticism that industry or the public may have would require the efforts of government in partnership with key stakeholders to achieve a smooth and comprehensive transition.

Planning for building development, especially residential planning, requires rethinking the existing approvals process to explicitly support sustainable building guidelines in terms of placement, access, shape and orientation. This would give building designers a huge boost in delivering a passive solar, energy efficient, accessible and more liveable environment (see Box 30 and 31). Arguably appropriate improvements in the approvals process that support passive solar design could deliver a built product with no or minimal capital cost increases.

Building materials should be manufactured, produced and supplied within the framework of sustainability. This will require increasing effort to develop guidelines for manufacturers and for the building and construction industry. A key issue for government in creating a comprehensive sustainable building materials catalogue would be in enlisting and supporting private industries to develop their own environmental management systems. This could be achieved in partnership with industry peak bodies such as Royal Australian Institute of Architects, Housing Industry Association and the Master Builders Association.

Building and construction of sustainable homes requires an understanding of the impacts of construction methods and resource use by the builder and contractor. Specific training and short courses for builders in site and construction impacts, environmental management, (including waste minimisation and recycling) could be provided through TAFE colleges and industry based training programmes.

Education for the public on all aspects of sustainability is essential to successful implementation. The residential home is an excellent vehicle for understanding what sustainable living is and how to change attitudes and behaviour. The development of a comprehensive 'sustainable home living package' that addresses the key elements of sustainability that homeowners can adopt would be beneficial. This sustainable home living package should build on and support the Cool Communities initiative.

[41] Confederation of International Contractors' Associations, *Industry as a partner for sustainable development: construction*, Confederation of International Contractors' Associations and United Nations Environment Programme, United Kingdom, 2002, p. 7.

[42] United Nations Environment Program, *Energy and Cities: Sustainable Building and Construction*, International Environmental Technology Centre, Japan, 2000, viewed 15 August 2002, <http://www.unep.or.jp/ietc/Focus/Sustainable_bldg1.asp>

BOX 30 PLANNING FOR INCLUSIVE COMMUNITIES.

People with disabilities consistently report that, because of inappropriate planning, they are unable to enter public buildings and facilities to use the services available within these buildings.

Currently 19.5% of the population, or approximately one in five people in Western Australia, have a disability. While people may have a disability at any age, the likelihood of having a disability increases significantly as people get older. As our community ages it is predicted that the number of people with disabilities will significantly increase.

These changing demographics and increased community awareness has led to the introduction by both the Commonwealth and state governments legislation that recognises that people with disabilities have the same rights as other citizens, including access to premises.

It is being increasingly recognised that good access also benefits business and the overall economy as well as people with disabilities, their families, friends and carers. It is an important factor in the achievement of sustainable communities. Indeed inclusion of people with disabilities has become a 'touchstone' indicator of whether the 'human' component of sustainability has been included in development.

In response to a need for technical information identified by the design and construction industries, the Disability Services Commission formed a reference group that produced the resource manual 'Buildings-A Guide to Access Requirements.'

An accompanying pamphlet was also produced for local governments to distribute at the time a planning or building permit is requested. The manual, which is freely available from the Commission's website <www.dsc.wa.gov.au> was purchased by the Building Designer's Association for each of its members.

BOX 31 ATWELL SOUTH SCHOOL - A SUSTAINABLE DESIGN FOR A SUSTAINABLE SUBURB

The Department of Education has commissioned a 'sustainable' school to be built at South Atwell, 35km south of Perth in the City of Cockburn. South Atwell is a new subdivision that is being developed along the sustainable construction principles of 'Liveable Neighbourhoods' with solar orientation and 'GreenSmart' buildings. It will be adjacent to the new southern railway.

The South Atwell Primary School will be the first government school in Western Australia that aims to develop some of the key principles of sustainable building and construction. This project will push the benchmark for future developments and will provide a valuable test case study for environmental technologies and the involvement of sustainability in the curriculum through the school building and school grounds.

Although still in the pre-design stage, the key sustainability components that this school aims to incorporate include:

- Energy efficiency and some use of renewable energy.
- Transport efficiency; development of clean transport options.
- Water efficiency and reduced offsite waste water treatment.
- Landscaping with native species to moderate the micro-climate and for low water use.
- Materials sourced from local, recycled, and low impact sources.
- Construction waste management and low site impact.
- Waste management and composting.
- Low allergen, low emission materials and ventilation systems.

The South Atwell Primary School provides a great opportunity to develop sustainable institutional facilities and public spaces. Being such a highly visible site its success will do much to promote and enhance what the future of building and construction.

In short cont'd...

Vision

Innovations in sustainable building and construction rapidly become mainstream.

Objective

- Encourage the widespread adoption of sustainable building and construction.

Actions underway include

- The Housing Industry Association provides the Greensmart Accreditation Program.
- The Housing Industry of Australia's GreenSmart Program for sustainable building and construction is being used in projects such as Atwell South, Leda and Brighton as well as new areas of Ellenbrook.
- The Department of Education's new primary school at Atwell South will be a model eco-school built to sustainability principles.
- The Liveable Neighbourhoods Code.

Proposed actions

4.78 Promote a voluntary 4 star energy rating on all new homes.

4.79 Produce a Sustainable Planning, Building and Construction Guide through the State-Local Government Sustainability Roundtable and in close consultation with industry stakeholders.

4.80 Progressively incorporate the principles of the Sustainable Planning, Building and Construction Guide into relevant state government documents such as a Statement of Planning Policy, the Building Codes, the Design Codes, R-codes and local town planning schemes.

4.81 Work to ensure all government housing and construction occurs within the Sustainable Planning, Building and Construction Guide.

4.82 Continue to provide incentives for sustainable building and construction including renovation.

Indicators and targets

Proportion of new homes being built and renovations conducted according to sustainability guidelines.

Global opportunities

The building industry globally is looking for innovation in sustainability. The United Nations Environment Program through the Environmental Technology Centre at Murdoch University has established a Co-operation Centre that is primarily aimed at bringing sustainability innovations in building and construction to the Asia-Pacific Region. This is typical of the opportunities for Western Australian firms to be involved in this rapidly growing market.

In short cont'd...

Further information

Beyer, D 2002, *Sustainable Building and Construction: Initiatives and Regulatory Options towards a Sustainable Planning*, *Building, Design and Construction Sector in Western Australia*, sustainability background paper, Draft State Sustainability Strategy CD-ROM, Department of the Premier and Cabinet, Perth. 2002,

Beyer, D 2002, *Pinakarri Community: An Intentional Co-Housing Cooperative*, sustainability case study, Department of the Premier and Cabinet, Perth, viewed 15 August 2002, <http://www.sustainability.dpc.wa.gov.au/CaseStudies/pinakarri/PinakarriCommunity.htm>

Bourne, M 2002, *Piney Lakes Environmental Education Centre: an Innovative Project with Multiple Benefits*, sustainability case study, Department of the Premier and Cabinet, Perth, viewed 15 August 2002, <http://www.sustainability.dpc.wa.gov.au/CaseStudies/PineyLakes/pineylakes.htm>

Hart, R 2002, *Housing of the Future: Ellenbrook Solar Housing*, sustainability case study, Department of the Premier and Cabinet, Perth, viewed 15 August 2002, <http://www.sustainability.dpc.wa.gov.au/CaseStudies/Ellenbrook/ellenbrookhousing.htm>