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MEIP City Working Paper Series

Environmental Innovations in Australian Cities

May 1997



Metropolitan Environmental Improvement Program
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This preliminary report focuses attention on urban environment management approaches that could assist planning decision makers in Asian cities and stimulate discussion through exchange programs and forums.

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The **MEIP City Working Paper Series** are informal reports by the Metropolitan Environmental Improvement Program (MEIP), in an effort to share and exchange experiences in urban environmental governance among metropolitan cities in the Asia-Pacific Region. This paper was prepared by a team of Australian experts under the coordination of Mr. Richard Searle. The paper offers experiences in urban environmental programs in Australian cities and provides a guide for a future workshop and city tour for Asian city planners and managers through MEIP.

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Table of Contents

ACKNOWLEDGMENTS iv

FOREWORD..... v

PREFACE: MEIP AND THE AUSTRALIAN ENVIRONMENTAL EXPERIENCE vi

ENVIRONMENTAL INNOVATIONS IN AUSTRALIAN CITIES 1

POPULATION PROFILE..... 1

PHASES OF URBAN DEVELOPMENT 1

THE OUTWARD SPRAWL 1

THE VILLAGE REVISITED 2

INTEGRATED LAND USE AND TRANSPORT SYSTEMS 3

ECONOMIC AND EMPLOYMENT TRENDS..... 3

ENVIRONMENTAL ISSUES 5

CONCLUSION 14

SYNOPSIS OF THE FIVE CASE STUDIES... 16

1. INDUSTRIAL POLLUTION AND MELBOURNE’S WEST 16

2. URBAN ENVIRONMENT RESTORATION..... 16

3. CLEANER PRODUCTION IN VICTORIA 17

4. REDUCING, REUSING AND RECYCLING WASTE .. 17

5. PLANNING FOR SOUTH EAST QUEENSLAND 18

INDUSTRIAL POLLUTION AND MELBOURNE’S WEST 21

INDUSTRY, POLLUTION AND COMMUNITY UNREST 22

THE ALTONA CLEAN AIR PROJECT 24

THE HABITAT PROJECT 34

URBAN ENVIRONMENT RESTORATION

TRANSFORMING A WASTELAND 43

THE WETLANDS 44

THE VIRGINIA PIPELINE AND WATER RE-USE..... 48

NEW HAVEN VILLAGE..... 53

CLEANER PRODUCTION IN VICTORIA 59

FROM CONTROL TO PREVENTION..... 59

FROM SMALL BEGINNINGS..... 60

ECONOMIC BENEFITS 61

CUTTING OUT WASTE 61

A DEMONSTRATION PROGRAM..... 62

A NATIONAL APPROACH..... 64

CONCLUSION 65

LESSONS LEARNED FROM COMPLETED DEMONSTRATION PROJECTS 66

REDUCING, REUSING AND RECYCLING WASTE..... 69

A PROGRAM SLOWDOWN 70

NEED TO MINIMIZE WASTE AT SOURCE 71

RECYCLING ECONOMICS 71

MAINTAINING THE PACE 72

SUCCESS STORIES 73

PLANNING FOR SOUTH EAST QUEENSLAND: AUSTRALIA’S FASTEST GROWING REGION 85

POPULATION GROWTH 85

THE PATTERN OF URBAN DEVELOPMENT..... 85

THE SEQ REGION..... 86

ENVIRONMENTAL CHALLENGES IN SEQ 86

THE SEQ2001 PROJECT..... 87

SEQ PROCESS..... 88

‘THE PLAN’ 89

IMPLEMENTATION..... 90

CRITIQUE OF SEQ2001 91

SUB-REGIONAL PLANNING – *BRISBANE 2011* 92

APPENDICES 99

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Foreword

The World Bank's Metropolitan Environmental Improvement Program (MEIP) began work in 1990 with the assistance of the United National Development Programme to tack the rapidly growing environmental problems in Asian urban areas. The program has been active in six cities: Beijing, Bombay, Colombo, Jakarta, Kathmandu, and Metro Manila.

The MEIP approach emphasizes the cross-sectoral nature of environmental problems and addresses the failure of traditional, sectoral development strategies to adequately address urban environmental deterioration or the linkage between industrial and urban development.

The work program in each city is therefore guided by steering committees and technical working groups that reflect the cross-sectoral, interagency nature of urban environmental issues. Each MEIP city, except Kathmandu which joined later than the other five, has developed an environmental management strategy for their metropolitan region. With guidance from the steering and technical committees, the cities also incorporate environmental considerations into the work of economic and planning agencies, contribute to the strengthening of environmental protection institutions, and identify high priority environmental investments.

The MEIP city office services as secretariat to the steering committee and is managed by the national program coordinator (NPC). The NPC coordinates all MEIP activities and is responsible for developing the environmental network of government, private sectoral non-governmental organizations, research institutions, and communities. MEIP supports workshops, demonstration projects, and

community environmental actions, and links these growing environmental network efforts with government policy and investment initiatives.

Furthermore, MEIP puts a high priority on the exchange of experiences and sharing of information among MEIP cities. This has been carried out through intercountry workshops that review the city work programs, exchange useful experience, and develop intercountry projects.

MEIP has established the city programs, set in motion a variety of city subprojects, and mobilized the intercountry exchange. MEIP publications are intended to share insights and experiences developed from the MEIP process and its projects. The six MEIP city programs work independently, with each other, and with international partners to reverse urban environmental degradation and provide useful and replicable lessons in urban environmental management.

David G. Williams

Program Manager, MEIP

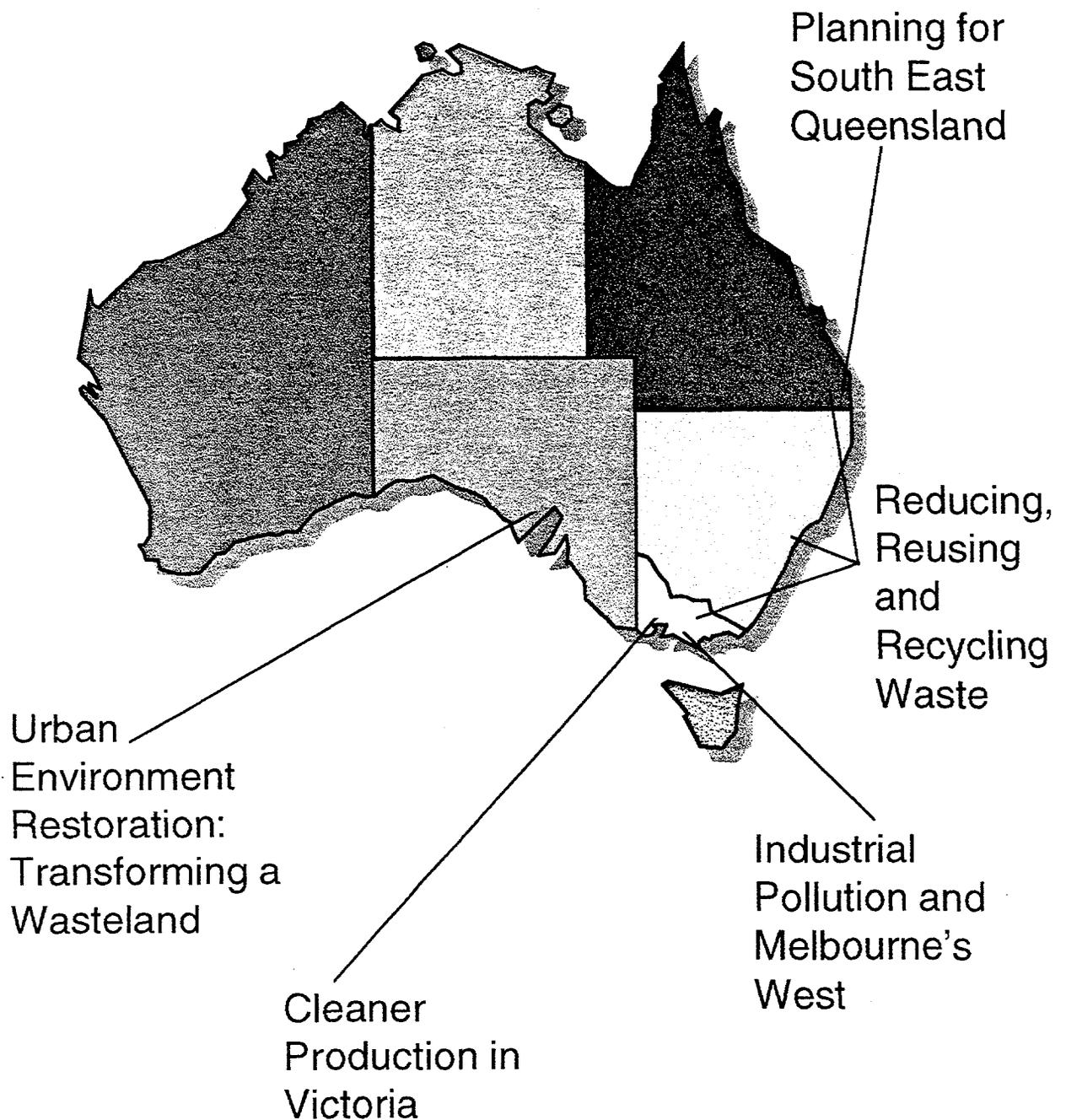
Preface: MEIP and the Australian Environmental Experience

In the field of environmental management and pollution control, learning from developed countries and cities which have experienced problems and tried various solutions is particularly useful for developing countries which are now facing a similar crisis.

MEIP is exploring with Australian cities how their experience in environmental management can benefit Asian cities that are undergoing rapid industrialization and urbanization. The case studies were chosen with a view to their relevance to cities in Asia and it is hoped that some useful conclusions concerning the applicability of this experience can be used.

This study provides a look by MEIP at some of the successful initiatives in several Australian cities. A study tour of Australian cities and workshop for city managers and planners from developing countries is planned for the next phase of this study. A final report based on this study, the workshop and the city tour will complete the second phase of this intercountry effort.

Environmental Innovations in Australian Cities





ENVIRONMENTAL INNOVATIONS IN AUSTRALIAN CITIES

Like most of the world's urban growth centers, Australian cities are facing major environmental problems. Their structure and car dependence have contributed significantly to land and habitat degradation, adverse impacts on air and water quality, high energy use and greenhouse gas emissions. Case studies in this document show how some of the problems are being tackled through cooperative ventures using ingenuity, innovation and new technology to bring about change.

Population profile

Australia's population of 18 million people is predominantly urban. Forty percent of people live in the two biggest cities, Sydney and Melbourne. Seventy-one percent live in the state and territory capitals and six other major cities of 100,000 or more people. This concentration of population is a continuing trend, with two thirds of population growth occurring in and around the five metropolitan capitals.

All major urban areas with the exception of the national capital, Canberra, adjoin the coast. Most growth is projected to occur in the south-

The present population (and percentage of state's population) of the major cities

- Sydney 3.8 million (62 percent),
- Melbourne 3.25 million (71 percent),
- Brisbane 1.45 million (45 percent),
- Perth 1.25 million (72 percent),
- Adelaide 1.08 million (73 percent).

eastern area of Queensland, where population is estimated to increase by more than a million people between 1991 and 2011, with net interstate migration accounting for about 40,000 a year. About 25 percent of Australia's yearly population growth is occurring along the north-eastern non-metropolitan coastal fringe, particularly on the Queensland Gold Coast, Sunshine Coast, and coastal areas of northern New South Wales. In 1991 these areas contained only eight percent of the population.

Phases of urban development

Most Australian cities are characterized by three different forms and phases of urban development. The first was the traditional neighborhood design in the inner areas developed in the nineteenth century and characterized by mixed uses, a housing density of 20-25 lots per hectare, extensive local employment and good access to public transport. The second, which followed the post-World War Two population boom and increase in private car ownership, was further from the inner areas, generally with separated land uses and lower housing density of about 15 lots per hectare, but still with reasonable access to public transport. The third was the post 1960s urban form of 5-10 lots per hectare on the extending urban fringe which has become the conventional form of suburban development.

The outward sprawl

Outer urban residential development has created cities dependent on motor vehicles, and this in turn is producing adverse socio-economic and environmental impacts. This conventional urban design has occurred typically in low-density housing estates of 10 or fewer dwellings per hectare in curvilinear street patterns and with

little local employment. Residential, retail, commercial and industrial uses are rigidly separated. As cities have spread outward access to public transport has lessened. Even where development has generally followed heavy rail corridors, as in North Adelaide or Melbourne, or where rail service has been planned to proceed with development such as to Cranbourne in Melbourne, the Beenleigh to Robina line in Queensland, and in Perth, most housing is built far beyond walking distance – generally judged to be 800 meters or a 10 minute walk – from a public transport station.

In these outer areas residents have to rely on motor vehicles for travel to work, to shop and for recreational and social reasons. Consequently in Melbourne, for example, car ownership rates are high at one car to 2.1 people and distances traveled are long at an average journey to work of 14 kilometers each way. Travel within estates is similarly dependent on motor vehicles because of distances between housing and amenities such as schools and shops. Those without access to a car are consequently disadvantaged and often socially isolated.

Some inner city renewal and infill development and medium density suburban development is occurring, but most development in Australian cities is taking place on the urban fringe. About 90 percent of urban population growth is expected to occur near or beyond the existing boundaries of the major metropolitan areas up to the year 2011. Populations in the inner and middle ring suburbs have been declining since the 1960s and this decline will continue primarily because of declining average household sizes. One half of all households now consist of only one or two people, yet four out of five dwellings are detached houses, which are often unsuitable for the needs of elderly couples and singles, sole-parent families or couples without children. Sydney has achieved the highest increase in the proportion of approvals

for multi-dwelling residential units compared with detached houses, at over 50 percent of new dwellings. Melbourne, however, has managed to reduce significantly the proportion of housing starts on the urban fringe from 80 percent of the metropolitan housing total in 1991 to 60 percent in 1995.

The village revisited

There is increasing interest, however, in the advantages of high quality medium density developments, and adoption of traditional neighborhood or 'urban village' principles both for new greenfields centers in fringe areas and for redevelopment of established metropolitan areas. Like the early form of urban development, these villages have a mixture of housing, shops, businesses and public facilities grouped around a public transport stop. Their design promotes energy efficiency, pedestrian activity and social interaction.

There is also interest in linking water reuse and stormwater management to traditional or urban village design. New Haven Village, near Port Adelaide, for example, integrates new energy and water management technology, focusing on energy efficient house design, priority for pedestrians, higher density housing and reuse of storm water.

A major regional strategy planning process has been completed for South East Queensland, the SEQ2001 regional plan, to address and prevent the planning and environmental problems potentially associated with major urban growth. Brisbane City Council has also demonstrated the benefits of developing a comprehensive Environmental Information Management System to assist its land use planning process. These matters are examined in the case study Planning for South East Queensland.



Integrated land use and transport systems

No Australian government has developed a comprehensive strategy designed to integrate land use and transport planning. Brisbane City Council has adopted a Traffic Reduction Plan based primarily on 46 kilometer of designated bus lanes, and an expanded commuter rail network. This strategy aims to reduce the proportion of car trips from 75 percent to 60 percent and increase public transport use from 8.5 percent to 17 percent of trips by 2011. The Victorian State Government has released a draft Transport Strategy which contains public transport incentives but which also proposes construction of an outer ring expressway, improved road-based freight access, and development of expressway interchanges. This will inevitably lead to increased road use and road-induced outer suburban development.

Large expansions of expressway networks are under way in Sydney and Melbourne. Car travel dominates motorized travel and is increasing faster than population growth. Even in Melbourne, with its world class public transport facilities, public transport accounts for only 6.7 percent of motorized groups.

The Commonwealth, Queensland and Victorian governments have shown interest in the use of assessment procedures to consider all impacts before proceeding with road projects. However, Australian governments are not using a strong mix of regulatory, pricing, investment, organizational or marketing measures to reduce road travel demand. Policy measures such as the United States Intermodal Surface Transport Efficiency Act or the United Kingdom 'package approach,' which apply funding mechanisms to achieve transport, environmental, or land use outcomes, are not used. Even relatively simple regulatory mechanisms such as effective controls over central city car space provision are generally not in place.

Economic and employment trends

Australian cities have traditionally provided the majority of jobs and employment growth in manufacturing and service industries. Manufacturing, based largely in the cities of Sydney and Melbourne or nearby cities with resource-based industries, has provided most of the country's exports. Job generation, particularly in Sydney, Wollongong, Newcastle, Melbourne and Geelong, has depended heavily on the strength of the manufacturing sector, both for its contribution to employment and its large share of net exports overseas and interstate, which support the services sector as well as providing export income.

New South Wales, specializing in basic metal products and chemicals, and Victoria, specializing in textiles, clothing, footwear and transport equipment, dominate Australian manufacturing. Victorian manufacturing contributes 18 percent of the state's employment and still makes the largest contribution to gross state product at more than 18 percent, compared with public administration, defense and community services at about 17 percent and wholesale and retail services at 14 percent. New South Wales manufacturing employs 14 percent of the work force compared with 15 percent for the retail trade and nine percent for the property and business services sectors.

The efforts being made by these traditional manufacturing industries to introduce cleaner production methods, is outlined in the case study, Cleaner Production in Victoria.

The decline of manufacturing

The relative importance of manufacturing, however, is declining, losing 12.1 percent of its jobs in New South Wales between 1988–1993. Its contribution to Gross Domestic Product (GDP) declined from 25.8 percent in 1964 to

14.7 percent in 1992–93, and these figures have remained steady (Table 1). Between 1974 and 1996, Australia lost 400,000 manufacturing jobs, 170,000 of these in Victoria; and manufacturing output grew by only 33 percent. Job generation in Australia is now primarily in the service sectors in the major capital cities. Financial, property and business services contribution to GDP, for example, has almost doubled in that time to 13.6 percent.

In Queensland the same trend is evident, with

between 1981 and 1991, 338,000 were outside the central cores of cities, often far from public transport, while the city cores' increase was only 12,000. Jobs are tending to follow population distribution, occurring in major regional shopping centers, in strip retail and light industrial developments along major arterial roads, in new industrial parks in developing areas and in small home-based industries. The proportion of jobs in city cores has fallen from 27.5 percent to 24.2 percent. Most of these new

jobs have been in the social, producer and personal services, transport and communication, accompanied by a loss of 115,000 trade and 100,000 operator and driver jobs. The decentralization of jobs is leading to an increase in car ownership, longer average trip lengths, a dramatic fall in public transport mode split with cross-town car journeys replacing radial public transport commuting.

The dominant design model of Australian cities is a network of suburbs fostering decentralized employment dependent on private motor vehicles and long road-based home-to-work journeys. Yet there are strong new emerging employment and social trends based on home-based, or part-time work integrated with local neighborhoods and especially suited to areas near public transport. There is an obvious mismatch here which land use planners are not acting upon. The trend to part-time employment is related to the change in composition of the workforce, with women

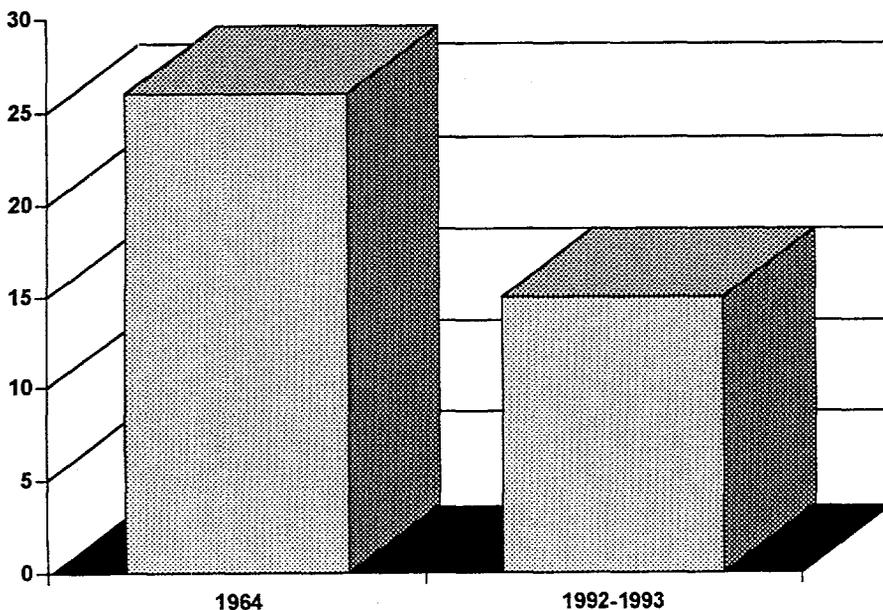


Table 1. Manufacturing contribution to GDP in New South Wales, 1964 to 1992-93
(Percentage)

manufacturing falling from 14.8 percent of gross state product to 12.2 percent in the 10 years preceding 1992–93. Financial services made a smaller contribution than in the south-eastern states, but the levels of tourism, community and other services was high. The combined growth of jobs in Brisbane and Perth at 251,000 in the decade to 1991 comfortably exceeded that of Sydney and Melbourne's 221,000 new jobs.

The pattern of new job creation has important environmental impacts. Of new jobs created



gaining 80 percent of the net increase in new jobs and rising to 43 percent of workforce in 1991. The redesign of suburban centers as higher density mixed use activity areas focused on accessible local employment linked to public transport is more consistent with these emerging trends.

Environmental issues

Urban encroachment

Urban development has destroyed and modified habitat over large areas, causing species extinction and decline. In all cities only small remnant areas of original forest woodland and grassland remain. In Sydney, for example, less than one percent of the original blue gum forest and less than five percent of native vegetation in western Sydney remain. This loss has caused the extinction of at least seven species of terrestrial fauna and endangered most remaining species. Wetlands and coastal vegetation such as mangroves have also been severely affected. About 40 percent of littoral vegetation was lost in south-eastern Queensland between 1974 and 1989. Urbanization has contributed significantly to the loss of more than 60 percent of coastal vegetation in southern and eastern Australia.

Australian cities also exert constant pressure on valuable agricultural land. Some of the country's richest agricultural soils are on the fringes of large cities, but they are constantly being lost to urban encroachment. In Melbourne, for instance, prime agricultural land in Werribee South and the Dandenong Ranges is under renewed threat of subdivision for housing, despite planning policies aimed at their preservation which have been in place for more than 20 years.

Air quality and transport

Motor vehicles are the major source of air pollution in cities, as the main producers of most

class one indicators (ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide, particles and lead). Substantial freeway and arterial road construction now occurring in Australian cities will inevitably increase vehicle use, which has the potential to significantly affect air quality.

Melbourne, Sydney, Brisbane, Adelaide and Perth either have or are establishing sophisticated air monitoring systems based on emissions inventories, modeling and airshed studies. The Bureau of Transport and Communications Economics estimates that improvements in new passenger vehicle and fleet average fuel economy will reduce passenger vehicle emissions. Emissions from expected growth in truck numbers, however, will increase substantially. Road traffic is increasing by about two percent a year.

While greenhouse gas emissions in CO₂ equivalents are expected to decline between 1991 and 2015 by nine percent, vehicle emissions are high by international standards. Average fuel economy did not improve between 1971 and 1991. Australia's fuel consumption for new passenger vehicles at 8.9 liters per 100 kilometers is one of the worst of the OECD countries and compares unfavorably with the United States, Germany and Japan. The average on road fuel economy rate was 12.3 liters per 100 kilometers in 1991 and is expected to still be 10.6 liters per 100 kilometers in 2005, just below the United States figure for the late 1980s (Table 2). A 1991 Senate Standing Committee report recommended a minimum new passenger vehicle standard of 8 liters per 100 km by 1998. Estimates of 6.5 liters per 100 km by 2005 are practical, but achievement of this target will require a major change in approach by the Federal Government and intergovernmental action.

Car travel increased substantially in the 10 years to 1991. Per capita motor vehicle travel is about 20 percent higher than the OECD average. The number of motor vehicle kilometers traveled in Perth, for instance, is projected to increase by 80 percent between 1991 and 2011. Carbon monoxide and hydrocarbon emissions there are expected to decline but other emissions will rise. Particulate emissions are expected to increase by up to 80 percent. Emission increases are also forecast for the Brisbane airshed. Major freeway building programs are under way in Melbourne and Sydney, and this emphasis on road transport with consequent increases in road use, congestion and fuel consumption will also add to urban greenhouse gas emissions.

Motor vehicles account for 80–90 percent of carbon monoxide emissions in Australian cities, 40–50 percent of hydrocarbon and 50–80 percent of nitrogen oxides (Table 3). Carbon monoxide levels, however, are stable or falling because of the increasing use of catalytic converters and this trend will continue. The number of days on which indicator levels were

exceeded fell from 120 in 1984 to 10 in 1990 and declines in Brisbane and Melbourne are greater.

Lead emissions are also falling in major Australian cities because of the introduction of unleaded petrol. This trend will continue with lead emissions in Victoria, for example, expected to fall by 88 percent by the year 2000 from 1988.

Maximum ozone and airborne particles (API) levels are falling but are still high compared with acceptable levels. Both remain problems but have decreased in frequency and severity in recent years in Melbourne, for which the most extensive data exists. There are frequent breaches of policy expressed in terms of the eight-hour average standard (0.09 ppm) for ozone in major Australian cities (for example, 23 for Melbourne in 1991). There is a worldwide trend towards more stringent ozone policy levels. The presence of air toxins such as benzene and butadiene is also a concern but little is known about their levels of distribution.

Based on diesel use trends particulate emissions could increase by between 17–30 percent in the next 30 years. Fine particles can be inhaled deep into lungs and are a major concern to health. There are no policy objectives or comprehensive data bases for air toxins or respirable particles and these indicators are not routinely measured. High levels of sulfur dioxide can be recorded in industrial areas but are generally well below

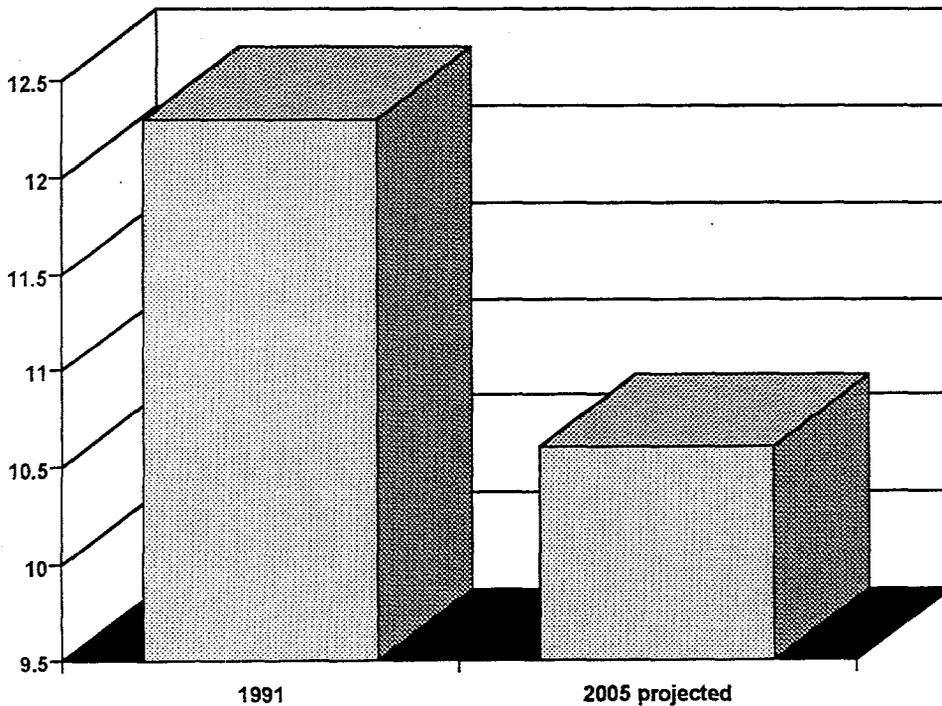


Table 2. Australian average on-road fuel economy rate (liters per 100 kilometers)

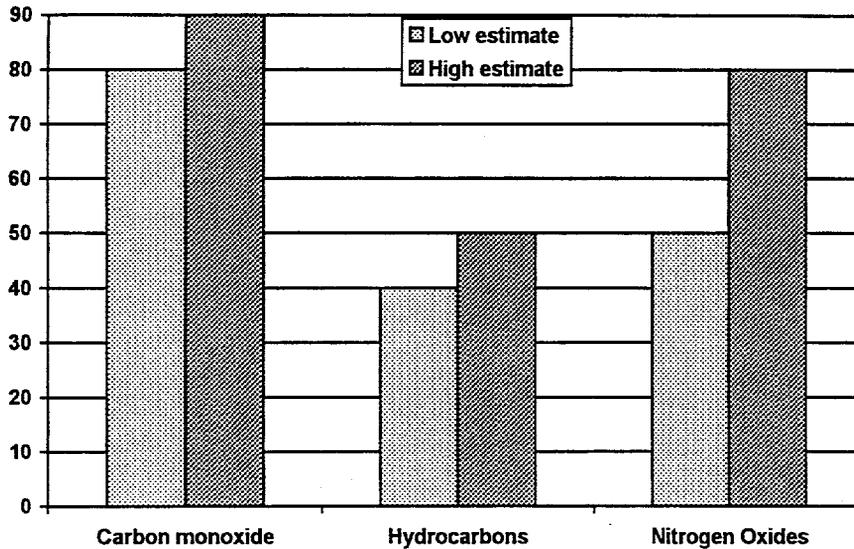


Table 3. Motor vehicle contribution to atmospheric emissions in Australian cities, 1996 (Percentage)

current one-hour and ten-minute goals. Levels of oxides of nitrogen may increase in the next decade in common with other cities internationally where nitrogen dioxide is often emerging as a major pollutant.

Australian cities record lower carbon monoxide and nitrogen dioxide levels than many United States, Canadian and British cities, though different locations of monitoring stations near or away from major roads can affect results. Ozone levels are comparable. For example, for the highest recorded one-hour ozone levels, Melbourne records higher peaks than Toronto and London. Melbourne and Sydney have more extreme concentrations of ozone than most United States cities, but compare favorably when the comparison is based on the number of times standards are exceeded.

There have been improvements in air quality generally in Australian cities in recent years, particularly in levels of lead, ozone and visibility-reducing particles. This trend has been

greatly assisted by technological improvements such as the increasing use of unleaded petrol and catalytic converters. Prevailing weather patterns also often help maintain acceptable air quality standards although these patterns vary between cities. These are, however, continuing breaches of policy standards and significant emerging issues and gaps in information, particularly for levels of air toxins and fine particles. Inevitable

increases in motor vehicle use in Australian cities pose further threats to air quality standards without major technological improvements.

A community solution

In Victoria, the Altona community west of Melbourne, has developed cooperative solutions to environmental problems associated with emissions from industry, including air emissions. Local government, residents' organizations and industry are participating in programs to achieve improvements to local environments. The work of the Altona Complex Neighborhood Consultative Group, company Environment Improvement Plans, licenses and works approvals, pollution prevention programs, establishment of habitat and the City of Altona Clean Air Project have all led to a major improvement in industry's environmental performance. The way in which this was achieved is outlined in the case study **Industrial Pollution and Melbourne's West**.

Energy use

Australia has one of the world's highest per person levels of energy and resource use and growth rates, and of greenhouse gas emissions.

These high levels are the result of a reliance on coal for electricity generation, high motor vehicle use and poor fuel economy, motor vehicle dependent urban structure, and low levels of industrial, commercial and domestic energy efficiency. Australia's performance on energy efficiency improvements is significantly worse than its competitor countries, declining by about four percent from the mid 1980s to the early 1990s. Industry has generally been reluctant to implement energy efficiency measures and the preferred urban form continues to promote private vehicle use. Despite some successful projects, governments have not generally promoted demand management successfully. National leadership has been lacking. The Auditor-General's reports in 1992 and 1993 and a report of the House of Representatives Standing Committee on Environment, Recreation and the Arts in 1994 have criticized the performance of national development and implementation of energy efficiency programs. The same failure is also apparent in national implementation of greenhouse gas reduction measures. A strengthening of intergovernmental implementation of the National Greenhouse Response Strategy is needed.

Solid waste management

Australians are among the world's highest per person producers of waste. Victorians for example, dispose of about one ton of waste per capita a year, about the same rates as the United States and Canada and well above those of European Union countries.

Australian governments have adopted a target of halving the amount of waste disposed to landfill by the year 2000, and have begun programs

using different means to achieve this target. The Victorian Recycling and Resource Recovery Council uses a largely voluntary approach relying on enabling legislation. Victoria has introduced a range of successful local initiatives with a heavy emphasis on community education and small community grants. Brisbane City Council has introduced a more centralized and technologically advanced system, while Sydney relies more on differential fees and charges. Lack of progress in reducing garden waste, which accounts for 16-18 percent of waste disposed to landfill has slowed efforts to reduce waste disposal. Increasing mechanization of curbside collection has generally incorporated large rubbish bins. This has sent the wrong signals to householders, encouraging increased household disposal even where recycling has been included in the collection system. The capital costs of highly mechanized collection systems are high and there is increasing concern that these systems are hampering efforts to achieve waste reduction targets. Pay for use programs by volume or weight are beginning to arouse greater interest.

There is slow progress in adopting effective regional waste disposal and industry waste reduction agreements. Modest results are being gained from recycling rates, such as diversion rates of about 14 percent of household waste generated in Brisbane and 17 percent in Melbourne.

Much greater emphasis is needed on waste *avoidance*. There are no national or state targets for reduction at source or means of monitoring the effectiveness of waste minimization strategies. As point source pollution from industry has gradually been regulated, attention has turned to prevention through catchment management and cleaner production. The work of the Australia Centre for Cleaner Production, based in Melbourne shows how considerable environmental and economic gains can be made by industry through waste minimization plans.



Cleaner Production programs in some states have achieved limited results through voluntary industry promotion and incentive schemes. Little progress is being made in small to medium enterprises which generally account for more than 80 percent of industrial waste. Mandatory industry agreements and policies such as mandatory content requirements, end use pricing and differential pricing for virgin and reused materials are rarely used. Australia lags behind best international practice on waste reduction at source. It needs a national program based on reduction, recycling and removal.

Reducing waste generation is closely linked to adopting a more sustainable lifestyle, a broader issue that has hardly begun to affect practical issues such as waste management. One success, however, has been a major improvement in the performance requirements of landfill sites.

A major turnaround in the amount of concrete going to landfill also illustrates the potential for improvement. In Victoria, for example, in 1991 only 90,000 tons of concrete were recycled compared to 500,000 tons sent to landfill. In contrast, in 1995, 600,000 tons or 80 percent of the total concrete produced was recycled.

These issues are developed further in the case study **Reducing, Reusing and Recycling Waste**. This case study also examines the Melbourne curbside collection system, the work of the Victorian Recycling and Resource Recovery Council, (RRRC) and several projects sponsored by the RRRC – a waste reduction project by Fletcher Construction, and concrete recycling; Brisbane's recycling and solid waste management system; and new legislation for waste management in New South Wales.

Water resource management

Urban areas have substantially affected the aquatic communities of their waterways and marine environments. The concentration and increase in size of urban settlements, both in

cities and proliferating coastal developments, are placing serious strains on Australia's coastal environments. The Resource Assessment Commission's Coastal Zone Inquiry reported that the main source of coastal problems in Australia was 'the continued sprawl of urban settlement'. The Commission estimated that at least 400,000 dwellings would be constructed in the non-metropolitan coastal zone in the next decade, requiring approximately 35,000 hectares of land.

The condition of bays and estuaries varies. Coastal wetlands continue to be drained and filled for resorts and other developments, leading to incremental impacts on marine life and fish breeding stocks. A major CSIRO study into the condition of Port Phillip Bay adjacent to Melbourne, a city of 3.5 million people, found in 1995 that the bay cleaned itself of large quantities of nutrient through the action of a sea bed ecosystem rich in bacteria, shellfish and invertebrate animals such as crustaceans. Water quality is better now than it was in the 1970s, due to tighter controls on discharges and better waste treatment methods. Nevertheless even this bay, which remains in good condition, is finely balanced. Any additional pressure on natural systems could result in a sudden deterioration in quality. There are large amounts of toxicants in sediments in parts of the bay and introduced organisms threaten significant ecological change.

Impact of erosion and agricultural run-off

Agricultural practices and urban growth along the coast or in the coastal hinterland are adversely affecting both terrestrial and aquatic environments. Clearing of native vegetation to the edges of streams, and unrestricted stock access to wetlands and waterways result in large scale erosion. This was documented in the 1970s in the Victorian *State of the Rivers* report and its extent is being detailed further in *State of the Environment* reports. The continued agricultural

reliance on pesticides, herbicides and fertilizers results in contaminated run-off which is flushed into bays, estuaries and the ocean. These diffuse sources of pollution are largely unregulated and are an increasing problem. For example, more than 85 percent of the biomass of the seagrass beds of Victoria's Westernport Bay has been lost, probably due to the impact of more than 6.5 million cubic meters of eroded material. As Melbourne's outer south-eastern growth is concentrated north of this bay, eroded material from road and house construction will add pressure. This situation is being repeated in many locations around the coast. The Great Barrier Reef, the world's largest network of coral reefs, and Queensland's offshore waters have to withstand the annual impact of almost 15 million tons of sediment, 77,000 tons of nitrogen and 11,000 tons of phosphorus.

Stormwater pollution

Many metropolitan waterways have been altered to concrete channels and others are little more than drains subject to periodic flooding from hard urban surfaces. Stormwater is a continuing major source of pollution to waterways and bays and coastal environments, due to nutrient enrichment, sediment loads, litter, metals and hydrocarbons from road run-off. There has been little use of improved technical methods such as gross pollution traps, settling ponds, absorbing surfaces and swales to reduce stormwater contamination, although some cities have used land use zoning techniques to prevent development on flood plains and to use them as retarding basins. Prevention and reuse of stormwater are rare. The impact of poor stormwater quality can be seen in the measure of beach contamination after heavy rain. In Melbourne's 1992-93 summer season, for instance, at different times over 183 days 28 beaches were not recommended for swimming because of high *E. coli* levels due to contaminated run-off and sewage leaks.

Contamination of beaches or waterways is a continuing problem for all Australian cities.

Inadequate sewerage systems

Water quality is closely related to land use. The quality of major streams is often severely affected by unsatisfactory sewage treatment in catchment townships away from main urban areas. Melbourne's Yarra River, for example, is affected by *E. coli* levels of up to 900,000 maximum organisms per 100 ml from townships situated on tributary streams

Sewerage systems can be a major source of pollution. There are estimates, for example, that up to 40 percent of sewage is lost from the Sydney sewerage system before treatment. Sewer overflows, discharges from treatment plants and breaks in old pipes significantly affect water quality. The aging of infrastructure is a serious problem in some cities which is only slowly being addressed.

The first Commonwealth *State of the Marine Environment* report released in 1995 concluded that coastal cities had significant effects on the environmental quality of adjacent coastal waters. The slow progress of many coastal towns in adopting secondary or tertiary sewage treatment or land disposal is continuing to affect many coastal environments and recreation areas. Heavy metal pollution is an ongoing problem in areas such as the Derwent River in Tasmania and Corio Bay in Victoria.

It is essential to incorporate measures for reducing and reusing run-off in the design of new areas, and to adopt best practice technical methods of reducing the impact of stormwater and sewerage systems downstream. Some new estates, such as Rouse Hill in Sydney, New Haven near Adelaide (discussed in the case study **Urban Environment Restoration**), and the planned new town of Gungahlin in Canberra are showing how these practices can be incorporated into urban design. The same



prevention and treatment techniques need to be progressively incorporated into existing systems.

Water quality improvements

There have been other important successes in improving water quality. Canberra has reduced the impact of storm water on Lake Burley Griffin. Sydney's Clean Waterways program included a special environmental levy to help pay for an estimated \$A6.25 billion¹ 20-year program to improve sewage treatment, effluent disposal and stormwater management with significant improvements already apparent.

Another important pilot project is the MFP Australia project involving restoration of 222 hectares of wetlands in association with urban development of a 2,843 hectare site. The project involves:

- construction of a model town with increased housing density, reduced energy and water use, priority for pedestrians and cyclists and improved urban design;
- stormwater treatment through pollution traps and removal of pollution by wetlands treatment, water quality management and re-use of water, protection of sea grass and fish stocks and prevention of sea bed erosion;
- diversion of 25,000 megaliters of water annually from the Bolivar sewage treatment works to irrigated market gardens at Virginia, substantially reducing use of groundwater for horticulture.

These projects are described in the **Urban Environment Restoration** case study.

Greenhouse gases

More than 25 percent of Australia's greenhouse gas emissions arise from urban non-transport energy use and 10.5 percent from road transport use. When emissions from waste and some other

production of materials for urban infrastructure are included almost one half of Australia's total greenhouse gas emissions and two thirds of emissions from energy are generated in urban areas and through energy conversion for urban use.

All state and territory governments and the Federal Government are parties to the National Greenhouse Response Strategy. This strategy is the key mechanism for fulfilling Australia's international obligations under the Framework Convention on Climate Change, but implementation is slow.

Australia's greenhouse target is to stabilize greenhouse gas emissions other than ozone depleting substances based on 1988 levels by the year 2000 and to reduce these emissions by 20 percent by the year 2005. This is subject to Australian action having no net adverse economic or trade impacts in the absence of similar action by other developed countries. The Interim Planning Target implies a 40 percent reduction by the year 2005 on Australia's 'business as usual' emission levels.

The Framework Convention on Climate Change also imposes commitments for emission reductions on Australia and other developed countries. The Convention's implied target is that developed countries will seek to stabilize their emissions at 1990 levels by 2000. This commitment differs from and is less stringent than the national target in that it seeks stabilization at 1990 levels rather than 1988 levels. It is estimated that the Convention target would imply a 14 percent reduction by the year 2000 on business as usual emission levels.

Australia is falling significantly behind progress required to meet these targets. The Australian Bureau of Agriculture and Resource Economics has estimated that if Australia's absolute consumption trends are extended to the year 2005, Australian carbon dioxide emissions will be 53 percent higher than in 1988, not 20

¹ At start of 1997, \$AUD1.0 equals US\$0.79.

percent less, partly because Australia has one of the world's highest per person levels of energy and resource use and growth rates.

Australia's first national communication under the Framework Convention showed that Australia would not meet the implied target of stabilization. Without any abatement measures, emissions would grow by 14 percent from 1990 levels by the year 2000. The impact of measures contained in the National Greenhouse Response Strategy would cut that growth by half to an estimated seven percent. The Federal Government estimates that additional measures announced in its recent *Greenhouse 21C* package would further cut emissions by four percent, bringing Australia to within three percent of the implied international target. This would represent an estimated 11 percent reduction on the business as usual scenario. There is some uncertainty about these calculations and an increasingly widespread view that the estimated shortfall is significantly larger.

Better Cities

State governments in Australia have the dominant legislative and administrative role in environmental protection.

The Federal Government's environmental role results from its constitutional powers to enter into international treaties which consequently bind state governments, its power to regulate export licenses for products such as woodchips, and its principal role in taxation and funding matters.

Nevertheless, state environment protection authorities still tend to set the pace for regulatory reform and even the recently established Federal Environment Protection Agency has been threatened with downgrading or abolition by the new conservative government in Canberra. This government has portrayed itself as being more pro-development than its predecessor, despite its move in 1996/97 to

establish a \$A1 billion Conservation Trust, derived from the proceeds from the sale of one-third of the public telecommunication company, Telestra.

The Federal Government's Better Cities program has been a major attempt to coordinate and integrate improvements in the quality of Australian cities.

The program was initiated in August 1991 following a special Premiers' Conference on Federal-State Agreements to encourage urban consolidation and improve urban environments. The overall intergovernmental aim was to improve the efficiency, equity and environmental sustainability of cities through better planning and management. This reform was to be achieved through model government, private sector and community partnerships. These models have been demonstrated in strategic planning and capital funds for 26 area strategies throughout Australia.

In the first phase, the Federal Government provided \$A816 million to Better Cities projects over five years. These are scheduled to end in 1996-97. State, territory and local government contributions brought the total public sector investment under the first phase Better Cities agreements to about \$A2.3 billion. This funding also sought to promote private sector investment, and in the third year it was apparent that this involvement was growing.

The major objectives of the program have been to promote:

- economic growth and micro-economic reform;
- improved social justice;
- institutional reform;
- ecologically sustainable development, and
- improved urban environments.



The area strategic approach sought coordination between urban planning and investment. Demonstration projects were intended to permanently change the way cities were planned and developed to integrate economic, social and environmentally sustainable benefits.

Better Cities was based on many of the principles outlined earlier in this section. The program recognized that the nature of employment was changing, that it was increasingly urban-based and that the predominant type of urban development could critically affect Australia's ability to compete internationally. For example, there is little sense in devoting a major effort to micro-economic reforms such as increasing transport efficiencies at ports if traffic congestion increases because of policies which promote rising private vehicle use.

Better Cities reports point to the *Australian Urban and Regional Development Review* studies which demonstrate the environmental costs of continued heavy reliance on road travel which low-density suburban development creates. Better Cities sought improvements in the density, form and sequencing of urban development for better environmental outcomes; better social justice outcomes; and reductions in the rapid pace of development at the fringes of cities and along the coast. The program was also based on the principle that deteriorating environments could have adverse economic and social consequences.

In the 1995–96 budget, the Federal Government funded a second phase of the program with an initial \$A247 million over six years. Projects came under three categories of national priorities: economic gateways; growth management in areas facing major population growth in south-east and far north Queensland, south and west Sydney, south-east Melbourne, and south Perth, especially urban fringe and coastal area; urban renewal; urban and coastal environmental management; and urban design. A

total of \$A200.6 million of capital funding was made available over four years from 1995–96 for the implementation of area strategies. This included an allocation of \$A120.0 million for area strategies in Queensland, of which \$A100 million will be used for investment in key rail-based urban corridors.

An evaluation of the Better Cities program was commissioned by the Federal Department of Housing and Regional Development to assess the program's performance, identify improvements, and contribute the lessons learned to the second phase. This was published in October 1995.

The 1995 evaluation was hampered by the broad program objectives providing limited guidance and making evaluations of performance difficult. It showed that the program:

- in terms of its objectives was likely to generate positive longer term impacts on gross national product and a modest increase in employment;
- had a mixed performance in achieving social justice objectives;
- had hastened the process of institutional reform and included reform objectives in four area strategies;
- was likely to promote the adoption of environmentally sustainable development principles;
- removed significant infrastructure barriers inhibiting urban development in a number of areas, particularly in reorienting urban development towards public transport;
- assisted local government to help solve amenity problems.

A central issue was whether the demonstration nature of Better Cities area strategic projects would lead to wider applications. The evaluation concluded that longer term benefits would depend on success in encouraging a wider

application of lessons learned. It argued that there were examples of wider application but also concluded that a greater marketing of results was necessary and broad adoption would not occur without a change in the culture of key federal and state agencies. It proposed a continuation of funding to assist this process. However, there is doubt that more funding will be available. The fact that most development in Australia continues as urban sprawl on the urban fringe and along the coast poses a serious challenge to the evaluation team's conclusion that the Better Cities program is an appropriate and effective mechanism for the Commonwealth to encourage integrated planning and infrastructure provision by other levels of government.

Conclusion

In the 30 years up to 1990, Melbourne's population increased from 1.9 to 3.1 million people and the size of the metropolitan area from 1800 to 6130 square kilometers; in general terms, a little over a 50 percent increase in population is using a three-fold increase in land area. A similar conclusion can be drawn from urban development elsewhere in Australia. Australia cannot afford to continue this pattern environmentally, economically or socially.

Significant savings in energy use, greenhouse gas emissions and infrastructure costs are possible through changes to urban form. The Victorian *Greenhouse Neighbourhood Study* showed that savings of up to 57 percent of transport energy use, 26 percent in household heating and cooling and \$A11,745 per dwelling in infrastructure costs, could be saved by adopting traditional neighborhood urban forms. The Victorian *Urban Village Study* showed savings of up to 10 percent from the business as usual scenario in fuel consumption and in carbon dioxide emissions from vehicle use and in household heating and cooling, provided

population growth currently planned for the urban fringe was accommodated in mixed activity redevelopments clustered around existing public transport routes.

There have been significant environmental successes in Australian cities over the last twenty years but much more needs to be done.

There have been significant recent improvements in most jurisdictions to environment protection legislation. An intergovernmental agreement on the environment, and other intergovernmental processes are in place for development of new national design standards in the energy, transport, residential and commercial building areas; for environmental standards, in air quality, for example; and for broad policy development and implementation, such as for greenhouse emissions. These show promise, although progress to date has been slow. In general, national environmental intergovernmental processes are not achieving the required results. An ongoing problem is the lack of integrated advice to government from government agencies on environmental sustainability issues. Some departments, for example, may pursue urban consolidation while others promote major expansions to the road network. It is often difficult to gain an integrated approach to transport planning let alone achieve integration between transport and land use.

Lack of effective coordination and action at an intergovernmental level is perhaps the biggest obstacle to achieving substantial change to the environments of Australian cities.

However, there are other constraints. Business and industry interests maintain a strong influence on government and this often prevents the application of the most successful mix of policy measures. Australia's position as the recent Conference of the Parties to the Climate Change Convention, when only Australia and OPEC countries opposed the final declaration,



illustrated this influence, particularly that of the coal industry.

The development industry maintains a strong influence over urban design and the continued use of energy-inefficient housing and large lots on the urban fringe dependent on motor vehicles. Government road agencies and private transport interests have successfully promoted further large scale road construction and helped prevent the introduction of best practice fuel efficiency standards. Australian industry lags behind many international competitor countries in energy efficiency and product design. Agricultural interests continue to successfully oppose an effective national policy to prevent broadscale native vegetation clearance.

A number of recent reports, including the Australian *State of the Environment* 1996 report have shown that land and water degradation, particularly in the Murray Darling Basin, will worsen under the range of currently employed measures. The privatization or corporatization of key government enterprises, particularly the electrical industry, is in general proceeding without adequate environmental safeguards.

The influence of non-government environment organizations on government decision making has continued to wane. Surveys of public attitudes generally continue to rate economic issues above environmental ones in the short term, but to reverse this order for the long term.

There is an increasing emphasis on the use of voluntary measures and to a lesser extent funding powers to address urban and environmental problems in place of a broad policy mix. This is hampering the achievement of environmental outcomes.

Nevertheless, although many environmental trends are worsening, some creative and pioneering initiatives have been undertaken to address environmental problems. Some of the most interesting of these initiatives are described in the following case studies.

SYNOPSIS OF THE FIVE CASE STUDIES

1. Industrial pollution and Melbourne's west

This case study examines complementary initiatives taken by local government, community and resident organizations in the industrial suburb of Altona in Melbourne's west. These initiatives led to major improvements in the levels of pollution being emitted to air and water and the provision quality open space in this industrial heartland. They illustrate very successful examples of consultation and cooperation between the community, industry and government to achieve improvements to the urban environment.

Three projects are examined: the establishment of the Clean Air Project by the City of Altona; establishment of the Altona (Chemical) Complex Neighbourhood Consultative Group and company-level Environment Improvement Plans; and the development of a local environmental committee and network called Habitat.

The study shows how residents, community organizations and local councils can provide new coordinating arrangements between different levels of government, industry and academic institutions, and develop their own local and regional frameworks for sustainable development.

2. Urban environment restoration

MFP Australia is undertaking major environmental improvement projects in Adelaide, the capital of South Australia. This

case study looks at three of these projects: MFP's wetlands' restoration scheme – one of the largest urban wetlands' redevelopments attempted anywhere in the world; the piping of treated wastewater 14 kilometers from Bolivar sewage plant to market gardens at Virginia; and urban development of a derelict site, where a model village showcases new energy, water and waste management technology that ensures maximum savings for residents and minimum impact on the environment.

The projects attempt to create a model for integrated, sustainable, cost-effective protection of the natural environment, resource use and urban redevelopment.

The wetlands' restoration involves reclamation of coastal saltmarsh and mangrove forests in an area which had largely acted as a city dump for more than a century. The wetlands are being used to treat polluted stormwater so that less waste is pumped into the Port Adelaide River estuary. The cleansed stormwater is being reused, leading to better water resource management in Australia's driest state. Once restored, the area will once again provide a thriving habitat for a wide variety of flora and fauna.

The Virginia pipeline, which will transfer treated wastewater from Bolivar sewage plant fourteen kilometers to the Virginia market gardens, will also result in better resource use, especially as bore water supplies are being depleted at an unsustainable rate at Virginia. The pipeline will ensure that less harmful nutrient levels prevail in the estuary, which will in turn assist the process of making the urban redevelopment of adjacent sites more attractive and viable.

New Haven Village near Port Adelaide is a model for future housing developments on the very large MFP site, where building is now viable because of the environmental rehabilitation projects.



3. Cleaner production in Victoria

This case study examines the work of the Australia Centre for Cleaner Production, a national body made up of representatives from industry, government and academia. It outlines the initiatives of the Victorian Environment Protection Authority and Department of Small Business which preceded and complement the work of the Centre, and the move from control to prevention of pollution at source. It also examines some cleaner production innovations undertaken by participating Australian companies and records the benefits derived from them, showing how considerable gains can be made by industry by improving production methods and minimizing waste.

The study demonstrates how very modest government programs with small loans, limited financial assistance and limited time commitment from staff can have a big impact in promoting cleaner production methods by industry. These modest efforts can grow into a national coordinating program and a national center, encouraging strong voluntary participation by industry itself.

The study also shows that demonstration projects alone are unlikely to lead to the mainstream adoption of cleaner production methods by industry, even when cost savings may be available. Environment Improvement Plans, which are examined in the case study on **Industrial pollution and Melbourne's West**, and which involve both the community and the EPA in a formal watchdog role, are proving a more effective framework for encouraging the adoption of cleaner production methods.

4. Reducing, reusing and recycling waste

The Recycling and Resource Recovery Council in Victoria aims to reduce by half the amount of solid waste going to landfill by the year 2000. The case study examines a range of successful local initiatives which have resulted in a world-class level of community participation in recycling programs, including the voluntary curbside collection system, company waste minimization and recycling projects, and community and consumer education programs. It shows that recycling schemes which are largely voluntary and technologically unsophisticated, can achieve results comparable to more expensive or compulsory systems.

The case study examines some of the major policy issues that have arisen with recycling programs. Various financial schemes are examined, including the small landfill levy, grants to community projects and financial incentives to local government to overhaul their waste collection contracting systems.

The largely voluntary approach in Victoria which relies on enabling legislation, voluntary curbside collection and non-mandatory industry waste reduction targets, is compared with the more centralized and technologically advanced system being implemented in Brisbane City, and the greater reliance on differential fees and charges used in Sydney.

The study shows that largely voluntary recycling schemes, with a heavy emphasis on community education and small-scale community grants, can be very successful in increasing the rate of recycling and reducing the level of solid waste going to landfill. The limitations of a non-mandatory approach are also made apparent.

Some major issues highlighted include getting correct price signals for collection and disposal of waste, and encouraging the development of markets for recovered resources. Certain

industries, such as the construction industry, are major contributors to landfill waste, and the study shows how successful waste minimization programs can be implemented at an industry and company level.

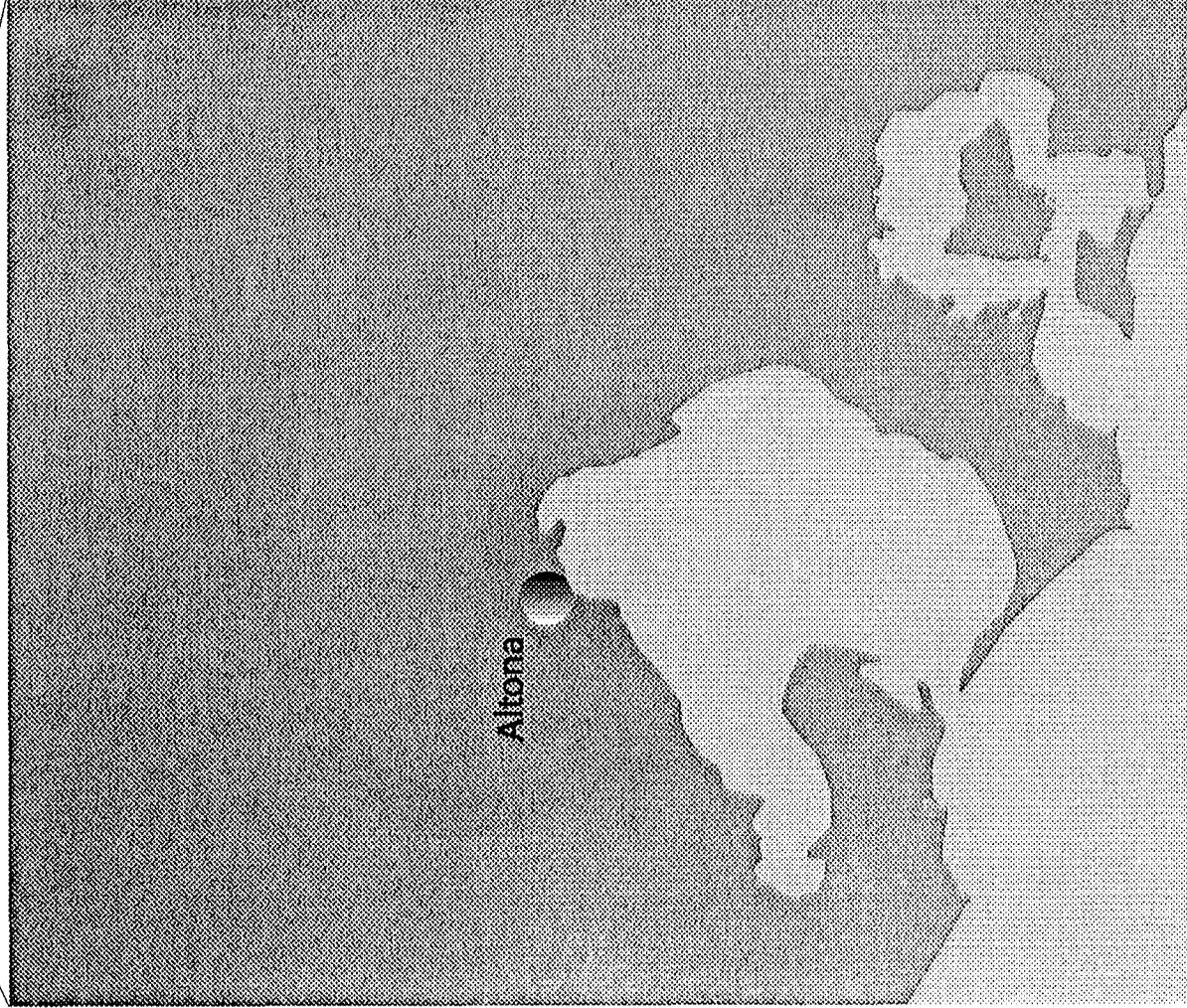
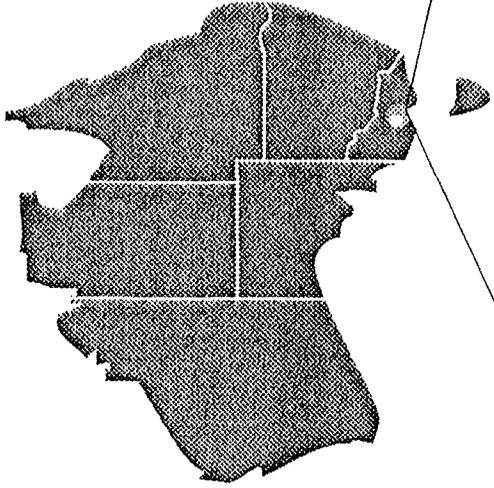
5. Planning for South East Queensland

This is a record of the process and outcome of designing a regional plan for South East Queensland, Australia's fastest growing region, and the specific initiatives of Brisbane City in protection of the urban environment.

Local, city and State governments worked with communities and interest groups in designing a regional plan with a strong open space and environmental protection focus, to address a region where there is strong population growth and migration and where jurisdictional and legislative arrangements have been loose. The process has attempted to be cooperative and inclusive.

The case study also looks at Brisbane City's approach to developing a sophisticated, comprehensive but user friendly Environmental Information Management System to help with land use planning.

INDUSTRIAL POLLUTION AND MELBOURNE'S WEST





INDUSTRIAL POLLUTION AND MELBOURNE'S WEST

Complementary initiatives by local government and residents in the industrial suburb of Altona in Melbourne's West have achieved major environmental improvements.

This case study shows how a local government and community influenced the behavior of multinational chemical and petroleum industries, causing them to lift their environmental performance and dramatically reduce air and water pollution. It shows how residents, community organizations and different levels of government can work with industry and academic institutions to develop their own local and regional plans for sustainable development.

It also looks at the development of an unusual open space project in an industrial heartland, which aims to change the image of Melbourne's western suburbs.

Can industry and community co-exist, not just reluctantly, but with enthusiasm and pride?

This question has been posed many times since 1989 in the City of Altona (now part of the City of Hobsons Bay) in the western suburbs of Melbourne, Australia.

The western suburbs have long been viewed as the 'wrong side of the river', an industrial wasteland and home to factory workers, strugglers and newly arrived migrants.

Altona is situated on Port Phillip Bay in the south-western area of Greater Melbourne, which has a population of about 2.5 million. Altona has 38,000 residents living next to the largest petrochemical complex in the southern hemisphere.

During the 1980s the Altona municipality received 800 resident complaints about the environmental performance of the complex. The number of complaints peaked in 1989, when a substantial section of the community was expressing dissatisfaction with perceived risks to health from air, water and noise pollution, and outrage following several spectacular industrial accidents involving suspected carcinogens.

From 1989, under intense pressure from the local residents, several initiatives were instigated by industry, government and community groups. These form the basis of this case study. They were aimed at improving dramatically the pollution performance of industry in Altona, while changing attitudes and developing commitment and trust through greater openness, better communication and the provision of more information.

The initiatives included the Altona Clean Air Project, formation of the Altona Complex Neighbourhood Consultative Group, and the

Habitat Project. They mark a turning point in the relationship between polluting industries and the local community in Altona, and hold the promise of a far more harmonious approach to economic development and environmental protection in this most unlikely showcase of environmental performance.

Industry, pollution and community unrest

The petrochemical complex was established in Altona 30 years ago, following the building of an oil refinery in 1948 (now the Mobil Altona Refinery). This refinery supplies feedstock for the petrochemical industry, a carbon black factory and about 13 percent of Australia's needs for gasoline, jet fuel and bitumen, using crude oil mostly from the Bass Strait offshore fields.

Major international companies with plants or interests in or near Altona include BASF, Hoechst, Dow, ICI, Mobil, Exxon, Geon Australia (BF Goodrich), Huntsman Chemicals (Chemplex), British Oxygen (CIG), Cabot and others. Some of these companies, namely Kemcor, BASF Australia Ltd., Dow Chemical (Aust.) Ltd., Auseon Ltd., and Hoechst Australia Ltd. are located on one large industrial estate known as the Altona Chemical Complex. These companies and the Altona Chemical Complex are described in detail later in this case study. The complex makes a significant contribution to the Victorian and Australian economies, accounting for 44 percent of the output of the basic chemicals sector in Victoria in the early 1990s. It provides 2000 jobs directly and a further 8000 indirectly in service industries.

The Altona petrochemical industry has been developed over several decades, regulated by planning controls of both state and municipal governments. At the same time considerable residential expansion has taken place around the

complex. With the exception of one area with about 300 residents, there are 1-2 kilometers of open fields providing a buffer zone between industrial plants and houses.

Other industries sited in and around Altona include meat processing, general metalworking and engineering, and many small industries. Toyota recently established a large automotive manufacturing plant in Altona, producing cars for both local and export markets.

Making headlines

By 1989 relations between the local community, the petrochemical industry in Altona and the western suburbs generally were at boiling point. In October 1989, the *Sunday Age* newspaper ran a full page feature article which declared the threat of accidents and made the Altona petrochemical complex the State's 'Number One Environmental Hot Spot.'

Other newspaper articles reported EPA crackdowns at the complex, and chronicled the *Diary of a Polluter*, the violation record of Petroleum Refineries Australia (PRA). The Diary included the following entries:

Penalty imposed for Water Pollution. A separator pit used to separate oil and water overflowed causing oil to flow into Hobsons Bay. 26 January 1984

Penalty imposed for Water Pollution of Williamstown Beach in May 1984. A leaking pipeline resulted in oil getting into the stormwater system and ending up on the beach. 27 March 1985

Penalty for Air Pollution. Offensive odors caused by the processing of Middle East crude which has sulfur content 10 to 30 times greater than local crude. 7 April 1986

Penalty for Water Pollution into Hobsons Bay. 3 June 1986

Penalty for Air Pollution. Offensive odors caused by plant failure. 5 February 1987



In May 1989, the *Melbourne Age* ran the following feature.

MOTHER WORRIES FOR FAMILY IN THE PATH OF POLLUTION

Mrs. Lyn Bjelan, of Altona West, says she is afraid to open her windows because of the air outside. Even on summer nights when her family sleeps, the windows remain shut because odors from nearby petrochemical plants are worse at night.

On still days Mrs. Bjelan said a choking chemical smell hangs under the verandah of her home in Hammond Street. It hangs over the suburb until south-westerly winds blow the smell over Footscray and on to central Melbourne.

When the odors have become unbearable, Mrs. Bjelan has bundled her children into the family car and driven out of the area.

Penalty for Air Pollution. Offensive odors caused by the release of unburnt gasses after flare pilots extinguished at the start up by excessive steam. 18 June 1987

Penalty for unlicensed discharge into bay. 12 October 1989

Penalty for pollution of Port Phillip Bay. Steel pipeline ruptured spraying distillate 12 meters into the air causing a 4.5 km slick. 12 penguins later found dead along Bay Beaches. 14 December 1989

During this period the media reported constantly on the health dangers of environmental pollution in Altona and surrounding suburbs. Stories in the local newspapers quoted the Anti-Cancer Council as claiming Altona to be one of the top 10 cancer areas in the State. There were reports of a mysterious white dust falling on houses and residents. This led to a major asbestos scare and resulted in a serious industrial dispute at the refinery.

Residents up in arms

Resident and environmental organizations started to become more active in their campaigns against the complex and refinery. The

Altona Environmental Action Group was formed and stormy meetings of residents in their hundreds were taking place in the municipality. The groups were also becoming more confrontational, disrupting shareholder and council meetings.

The environmental group Greenpeace chose the petrochemical complex as the site to launch its establishment in Melbourne. In a daring stunt in late 1989, three Greenpeace members broke into the Altona complex, scaled a 70-meter tower, dropped a giant banner reading: 'A Poison Curse', and laid siege to the building. This attracted wide media coverage and also brought attention to the Altona Environmental Action Group's agenda for the west:

- to oppose an impending amendment to the Altona Planning Scheme which would allow PRA to expand its operations;
- to stop the chemical companies and others from polluting the Kororoit Creek;
- to force action on the storage of dangerous chemicals on Coode Island.

The latter issue rose to prominence later in 1991 when a series of spectacular explosions and fires at the storage facilities on Coode Island engulfed

most of the western suburbs and the Central Business District of Melbourne in black toxic fumes. This emergency underlined both the inadequacy of the facilities and their proximity to residents, led to public inquiries and the government decision to transfer the chemical storage facility at the cost of several hundred million dollars.

The Altona Clean Air Project

In 1989 the then City of Altona responded to the growing environmental and health concerns of residents by establishing the Altona Clean Air Project with funds provided by the Victorian Health Promotion Foundation from a new levy on tobacco sales.

The city started by establishing a Project Advisory Committee which was to meet 32 times over a three year period. The Committee had representatives from the city, from the major industries, from the residents' groups and from the environment and health agencies. These meetings were held publicly and community members were encouraged to attend. Health and environment experts were also invited to a series of forums which were promoted widely within the community.

Methods used by the Project Committee to communicate information to the community included regular forums, public release of study reports, establishment of an Envirolink Column in the local newspaper, distribution of magnetic stickers advertising Environmental Complaint Lines, and the establishment of the Altona Residents Computer Access Databank at the Altona Library.

At the same time, an Altona Complex Neighbourhood Consultative Group was established to provide regular liaison between industry and residents. Known as the ACNCG,

this mechanism proved to be the most influential and permanent development of this period, and its work is described later in this case study.

The Altona Clean Air Project was premised on the belief that community consultation and liaison were the most effective way to approach conflict resolution and sound environmental decision making. The objectives of the project were fourfold:

1. Better environmental performance, with fewer incidents and greater progress in reducing emissions and odors.
2. More openness in provision of information about performance and plans.
3. More information to be published in media accessible to the community, including more air monitoring data and more information on emission sources.
4. Better communication between all parties including industrial companies (on technical matters), the community, the council and the various government agencies.

Through public meetings and a major household survey, the Project Committee established the major issues, pollutants and health effects which worried the community. The pollution concerns were about chemical emissions from the complex, dust and black deposits, odors, noise, potential explosions and toxic cloud leaks.

The specific chemicals and pollutants were also identified. These included vinyl chloride monomer, carbon black dust, polychlorinated biphenyls, chlorofluorocarbons, mercaptans, sulfur dioxide and hydrogen sulfide. The major health effects which concerned the residents were asthma, cancer, birth defects and pollutants in breast milk.

Getting the facts

Many of the specific improvements in industry's environmental performance were achieved through the efforts of the Altona Complex



Neighbourhood Consultative Group and are reviewed in the next section. The achievements of the Clean Air Project were in its provision of reliable information to the public, and in providing a forum for public debate on major environmental and health issues. One of the most interesting outcomes from the project was the extent to which many community fears and anxieties proved to be exaggerated and could be allayed through effective communication.

For instance, a comprehensive Respiratory Symptoms Survey relating to asthma was carried out in the project in 1992. It established that asthma was no more a problem among children in Altona than in the rest of Melbourne. A study of epidemiological information, established a similar result for other health concerns, such as birth defects.

A similar pattern emerged in the issue of overall air quality. The EPA's Paisley air monitoring station in Altona provides hourly data for nitrogen oxides, ozone, sulfur dioxide, non-methanic hydrocarbons and airborne particle index. Careful examination of monitoring results since 1983, which were released to the public, disclosed that the Altona airshed was in compliance with the objectives of the State Environment Protection Policy, except for ozone and visibility. As ozone and visibility reducing particles were the two main air pollutants throughout the whole of Melbourne, Altona was not exceptional.

During the project's three-year period, ambient air quality did improve marginally, with a statistically significant downward trend in the frequency of visibility breaches. Trends in ozone were not so definite. However, there were significant improvements in the level of emissions to air from individual companies in Altona, and their record is reviewed in the next section.

The Altona Clean Air Project also commissioned consultants to undertake an air dispersion

modeling study to assess the ground level concentrations of four chemicals (acrylonitrile, benzene, butadiene and styrene): preliminary findings indicated that concentrations were within acceptable levels at all locations.

In 1992, with so much public attention being drawn to the issue of air quality in the western suburbs, and in a milestone for Australian industry, the major companies comprising the Altona Chemical Complex made a public and voluntary commitment to reduce their emissions of volatile organic compounds to the air by 50 percent over a five-year period.

At the end of the three-year Clean Air Project, the project team assessed its success by reviewing the records of the well-established environmental complaints services from the City of Altona (five years of records), the EPA (three years), the Altona Chemical Complex (four years) and the Mobil Refinery (two years).

Environmental complaints had reached a peak in 1988-89 (Table 4). By 1992, the number of resident complaints to various agencies and companies was down by 70 percent (Altona Council), by 40 percent (EPA), by 30 percent (Altona Chemical Complex) and by 50 percent (Mobil).

Industry comes to the party

Towards the end of 1989 the petrochemical industry in Altona was under intense scrutiny. Under pressure from residents and the media, the Altona City Council was delaying Amendment 404 to the Altona Planning Scheme which would allow the oil refinery to expand its operations. At the same time the Victorian Environment Protection Authority was targeting the industry over license arrangements. In this climate, industry representatives from the Altona Chemical Complex seized on the recommendation from a report to the State Government prepared by a local parliamentarian. This suggested that the way through the impasse

was to negotiate a formal consultative arrangement between the chemical companies and the local community, providing a forum for exchanging information and discussing future industry plans.

This proposal coincided with moves by the major chemical companies in Canada and America to develop a Responsible Care Program. This committed the companies to becoming good corporate environmental citizens and preempted some of the harsh regulatory

the auspices of elected council members, and were characterized by suspicion and hostility between residents and the companies.

The ACNCG identified that the number one priority for local residents was to reduce odors from the APC Wastewater Treatment Plant. EPA records show that odor complaints from Altona residents peaked at 76 for the second quarter of 1989. Environmental improvement efforts by the company and the ACNCG over the next 18 months led to a dramatic

turnaround. In the final quarter of 1990, the EPA's pollution watchline registered only four community complaints about odors from the plant.

Gaining community confidence

The ACNCG set out to gain the confidence of local residents. Apart from regular public meetings and elections of resident representatives, the ACNCG set up a 24-hour environmental hotline at the Altona

Chemical Complex to handle resident complaints and requests for information. Open days and tree plantings at the complex became a regular occurrence, as did the publication of simple newsletters publicizing the group's achievements.

Over the next five years the ACNCG developed into arguably the most influential environmental entity in Altona. The chemical companies showed their commitment from the outset by ensuring that their general managers attended

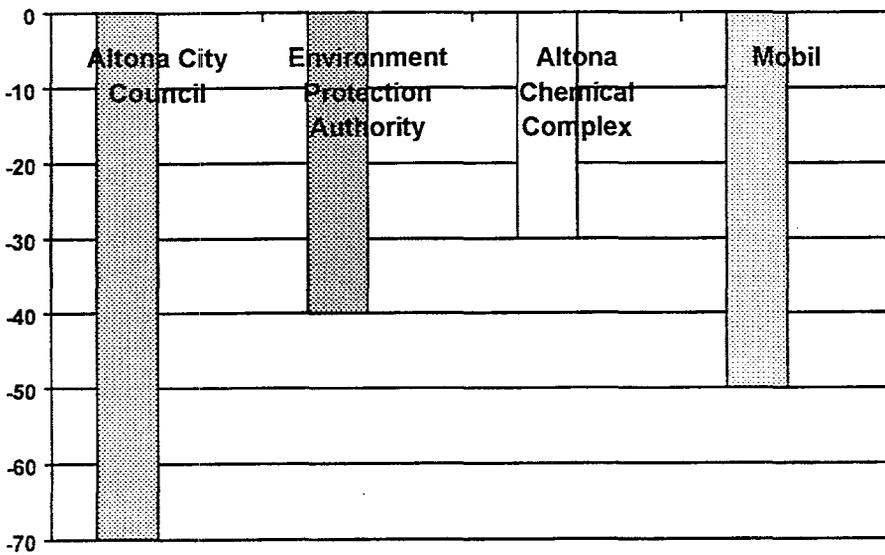


Table 4. Change in environmental complaints 1988/89 to 1991/1992 (percentage)

measures against them being advocated by environmental and consumer groups.

With the assistance of Altona City and the Environment Protection Authority, the chemical companies participated in several community meetings which led to the election of local residents to the Altona Complex Neighbourhood Consultative Group. The ACNCG became a formal mechanism for communication between the companies, the EPA, the Altona City Council and the local community. The first meetings were held at the council offices under



the monthly meetings, that detailed information was made available to the meetings and that community complaints were seriously addressed. The community representatives displayed their dedication by being willing to familiarize themselves with complex and often technical issues, and to stay involved in the Consultative Group over lengthy periods. Both the Environment Protection Authority and the Altona City Council came to use the ACNCG as their primary mechanism for dealing with environmental issues at the chemical complex. In February 1995 the ACNCG received an Achievement Award from the EPA to mark the 25th anniversary of the Victorian Environment Protection Act.

Environment improvement plans

In early 1993, Hoechst, BASF and Kemcor began preparing Environment Improvement Plans in conjunction with members of the ACNCG. These plans outlined each company's forward commitments for the next five years, and became a formal and public contract between the companies, the community and the EPA. An important aspect of the plans was that the industry, community and EPA would reach agreement on expansion of facilities in the context of specific commitments to reduce emissions to air and water. EPA licenses were issued on the basis of commitments made in the Environment Improvement Plans.

In 1994, the companies began making annual reports to the community on progress of the Environment Improvement Plans. These reports illustrate both the public and regulatory accountability, which is a feature of the Environment Improvement Plans. They provide information on improved pollution performance, as well as a record of environmental incidents and accidents. They publish any community complaints over environmental performance,

During the ACNCG's years of operation, the types of industry in the Altona Complex have remained relatively constant, despite mergers, ownership and name changes. There are now five companies:

Auseon Limited is a subsidiary of the Geon Company of the United States, and it employs about 115 people at Altona manufacturing vinyl resin (PVC).

Hoechst Australia employs about 400 people at Altona (and 150,000 people in over 100 countries), and manufactures polyethylene, polypropylene, organic pigments and masterbatch.

BASF employs about 70 people at Altona (and 106,000 people in 170 countries), and produces polymer dispersions and colorants.

Dow Australia (the world's fifth largest chemical company) employs 200 people at Altona, and manufactures polystyrene resins, latex resins, polyols, propylene glycols and epoxy resins.

Kemcor Australia, jointly owned by Exxon and Mobil, operates three sites in the complex. Kemcor Olefins employs about 200 people and uses ethane gas from Bass Strait and gas oil from Mobil Altona Refinery to produce ethylene, propylene and butadiene. Kemcor Elastomers employs 120 people and produces synthetic rubber. Kemcor Plastics employs 213 people and produces polyethylene from feedstock piped from Kemcor Olefins.

and record what action the company has taken in response to the complaints.

BASF

In December 1995, BASF reported that after five years of sustained effort it had reduced the emissions of volatile organic compounds (VOCs) from the plant by 97 percent during a period of 17 percent increase in plant output. VOC emissions were nearly 38 tons in 1989, and less than one ton in 1994 and 1995 (Table 5).

In 1993, BASF and the ACNCG launched the company's Environment Improvement Plan, including future work plans and quarterly reviews of progress. The company's environmental guidelines committed the company 'not to give economic considerations precedence over environmental protection and safety'. BASF received the plaudits of the ACNCG for installing a thermal oxidizer at the cost of \$1.6 million, rather than using less expensive and less effective methods. In addition

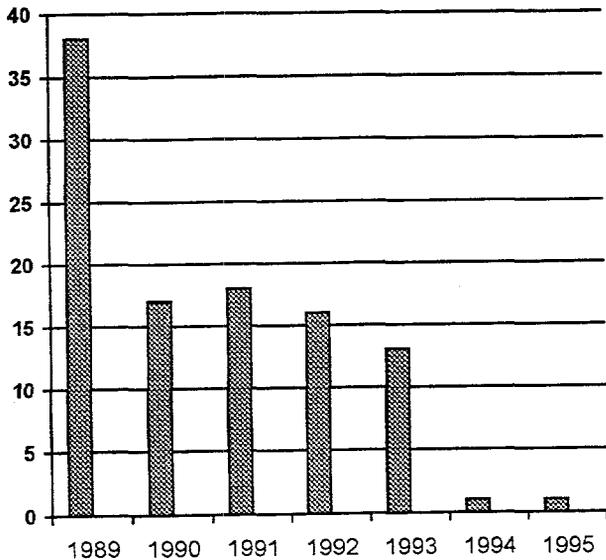


Table 5. Volatile organic compound emissions from BASF (tons)

to the thermal oxidizer, BASF had installed a new chiller and centrifuges which reduced the amount of pentane lost from the polystyrene drying process, changed from pressure transfer to pump transfer of dispersion products out of the reactor, and installed vapor return lines for monomer road tanker unloading. It had also introduced a Cleaner Production Project which saved 60 tons of latex dispersions from going into the sewer, with a benefit of \$120,000 at a cost of \$40,000 in new equipment and pipeline.

BASF recorded one major spill in 1995, involving a ton of acrylic dispersion which was not registered as a hazardous or dangerous material. The company received no community complaints in 1995, with plant odor being substantially reduced as a result of the previous capital works initiatives.

Hoechst Australia

The Hoechst five-year Environment Improvement Plan committed the company to reducing the plant's use of fresh water and its effluent by 75 percent, and reducing the emission of VOCs by 50 percent, following a 60 percent reduction over the previous decade (Table 6).

During the preparation of the Environment Improvement Plan Hoechst's Technical Safety and Environmental Protection Manager, Dr. Ed Jones, told the ACNCG that he had been skeptical of the consultative approach when it was first discussed: 'but the EIP is definitely a step along the route to decreasing our impact on the environment ... the community came up with ideas we had not thought of previously'. Hoechst and the ACNCG received the 1995 PACIA Environment Award for the Altona site Environment Improvement Plan.

Hoechst commissioned a seven million liter lagoon to contain the plant's stormwater. The lagoon was used to filter stormwater which went to Kayes Drain, and to replace fresh water

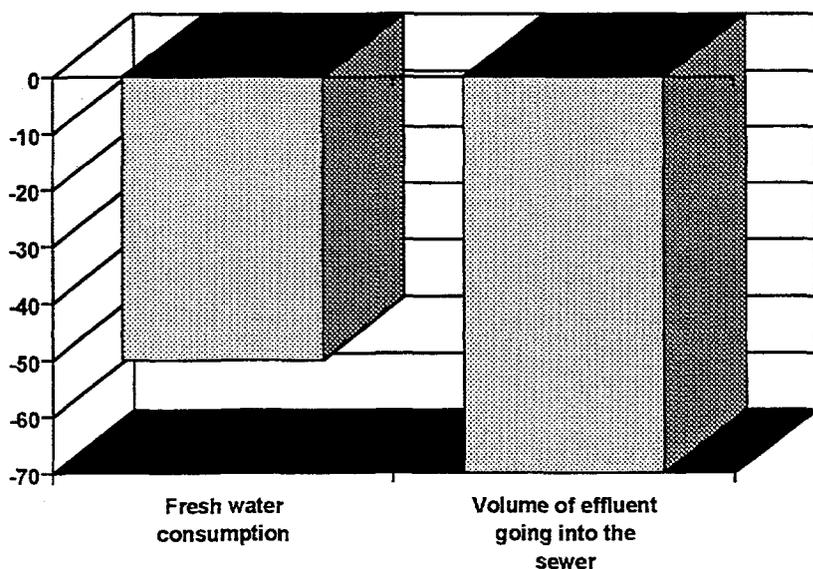


Table 6. Change in environmental impacts at Hoechst, 1993 to 1994 (Percentage)

demand from the plant. Hoechst designed the wastewater scheme in house using conventional treatment methods such as flocculation sedimentation and filtration with state-of-the-art reverse osmosis which eliminated odors and emissions. The lagoon was planted with native grasses and bushes to attract native birds to the area. The projects cost \$A1.8 million.

In 1994 Hoechst won the EPA Clean Water Award for reducing its consumption of fresh water by 50 percent and reducing the volume of effluent going to the sewer by 70 percent.

In 1994 Hoechst began design and construction of new boilers as part of its commitment to cut VOC emissions to 500 tons by 1997 – a 60 percent reduction on 1992 levels (Table 7). The EIP committed the company to two projects. *Phase 1* involved capturing 880 tons of propane and 11 tons of solvent, and burning it in boilers to produce steam. *Phase 2* proposed that a further 220 tons of propane, ethylene, ethane and propylene and 17 tons of solvent be captured, depressurized and used for burning in the boilers.

Hoechst also reduced its solid waste going to landfill by a third between 1991 and 1993.

The Hoechst October 1995 Report to the Community listed a series of environmental problems which had occurred at the plant during the year, including a major effluent level involving the release of 100,000 liters of untreated water containing trace chemicals into Kayes

Drain and downstream to the railway line. A super-sucker was employed to clean up the Hoechst site and Kayes Drain.

There were six community complaints in 1995, all relating to noise problems associated with changes to the waste gas burner.

Problems had also been detected with low level soil contamination from (ensosulfan and diclfpomethyl) used in the manufacture of insecticide and herbicide products. Groundwater analysis indicated a need for cleaning up the contamination which resulted from past practices no longer used by the company.

The soil contamination was being successfully curbed through treatment with hydrated lime. Five groundwater boreholes were drilled and constantly monitored. Only one borehole on the boundary with Auseon indicated unacceptable concentrations of chlorinated organic compounds.

Environmental Innovations in Australian Cities

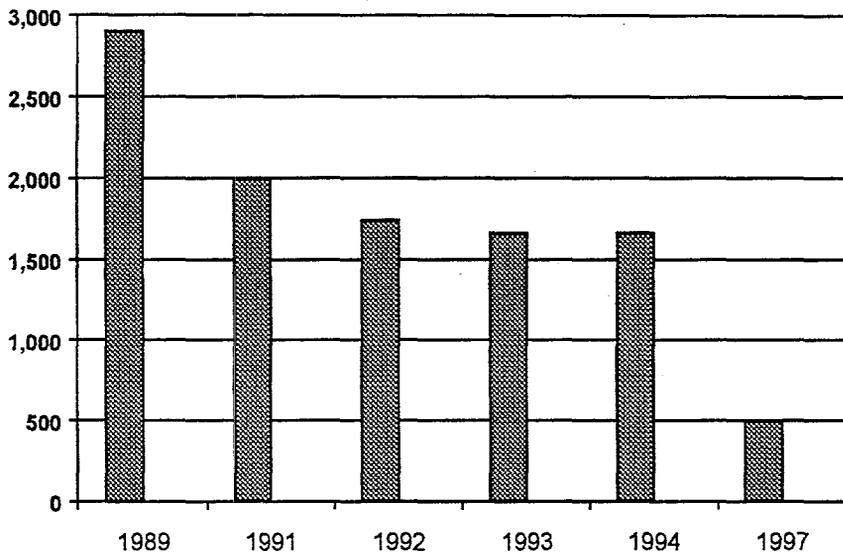


Table 7. Volatile organic compound emissions from Hoechst (tons)

NOx. The VOC reduction itself was from 1,296 tons in 1989 to 584 tons in 1994 (Table 8).

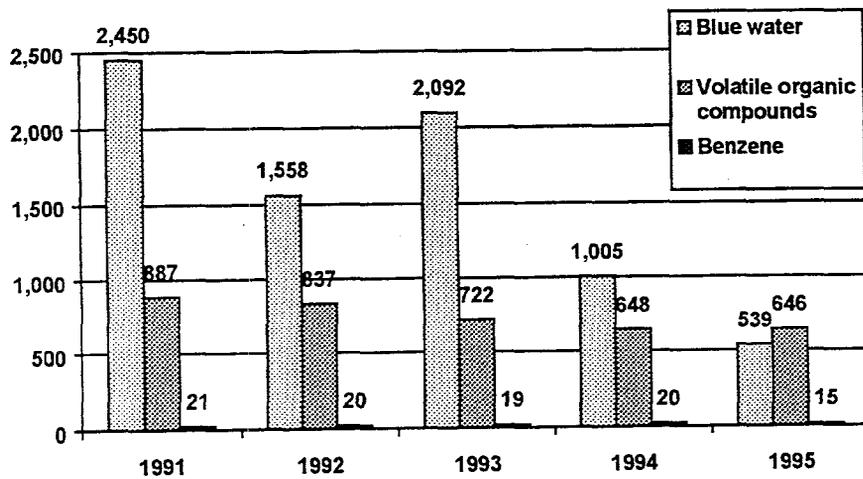
In 1994 the spent caustic plant was awarded the Environmental and Engineering Award by the Institute of Engineers and the development of the low NOx burners on the furnaces won the Victorian EPA Clear Air Award for 1994.

Although the site had achieved major reductions in community complaints about odor, down from 165 in 1990 to 22 in 1993, the complaints rose again in 1994 to 54, because of

Kemcor

Kemcor Olefins reduced all wastes and emissions from its site from 16,000 tons in 1989 to 7,279 tons in 1994. These reductions included VOCs, spent caustic, blue water and

a series of incidents connected with a major maintenance overhaul and persistent problems with the effluent treatment system. Kemcor has a major project near completion that is intended to resolve the effluent treatment odor problem.

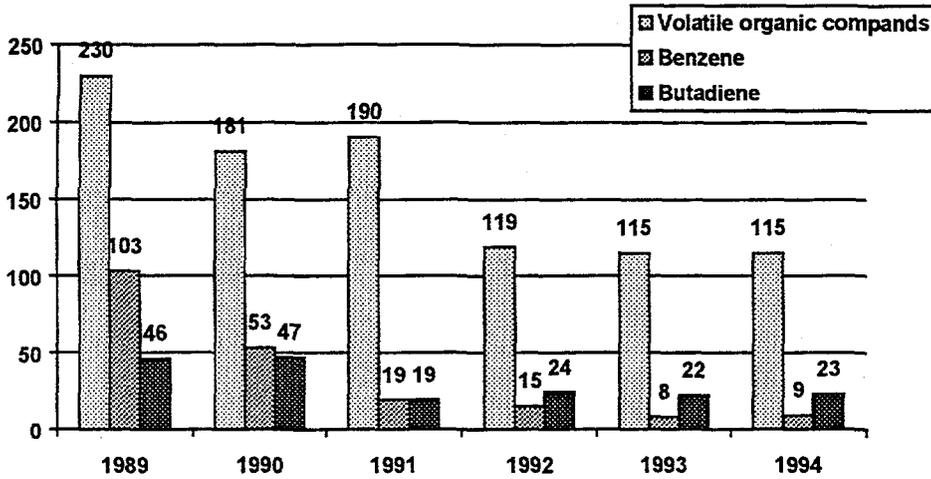


All wastes and emissions totaled 16,000 tons in 1989, down to 7,294 tons in 1994

Table 8. Change in wastes and emissions from Kemcor Olefin (tons)

Kemcor released its Environmental Improvement Plan in 1994 which committed the company to reducing emissions of benzene and butadiene to the atmosphere by 33 percent over three years and further reduce VOCs by 20 percent by the end of 1997.

At Kemcor Elastomers overall wastes and emissions were reduced from 1942 tons in 1989 to 922 in 1994, despite a 20 percent increase in production, mainly from 400 tons of scrapped rubber now being collected and reprocessed or sold. Benzene emissions were reduced from



All wastes and emissions totaled 1,942 tons in 1989, down to 870 tons in 1994

Table 9. Change in wastes and emissions from Kemcor Elastomer (tons)

103 tons in 1989 to 7.5 tons in 1994, and overall VOC emissions reduced from 230 tons to 105 tons (Table 9).

Kemcor Plastics, formerly Commercial Polymers, was not originally owned by Kemcor and not part of the 1990 commitment to reduce wastes and emissions by half. Consequently only after 1993 did significant waste reduction begin. VOC emissions were 190 tons in 1994, down from 400 tons in 1989 (Table 10). This reduction was achieved through a leak detection and repair program (60 tons saved), upgrades of pump and compressor seals (55 tons saved) and connection of various vents to the flare system (38 tons saved).

Serious problems persisted with elevated flares, smoke and odors and the company committed itself to rectifying the flare during a shutdown for maintenance. The company estimated that better hydrocarbon recovery systems and improved reliability would reduce the use of elevated flares and 125 tons of emissions each year.

The Kemcor Report to the Community in March 1996 recorded some mixed results. Kemcor Elastomers had received accredited licensee status from the EPA in December, and the spent caustic carbonation plant had received the chemical industry's Plant of the Year Award. But operations performance, as measured by accidents to personnel, complaints from the community and incidents, had shown a deterioration in 1995 after years of steady improvement.

The Kemcor sites recorded 32 community complaints in 1995, mainly involving concerns with flares and odors. Most complaints related to a three-day flaring incident caused by the boilers being shut down and restarted. Kemcor reported to the ACNCG that its community survey of the community had shown that the purpose and impact of flares was misunderstood, and it committed itself to a major community awareness program in 1996 to allay community fears.

Odor complaints about the effluent treatment plant and ponds were also significant in 1995. Kemcor's most important Environment Improvement Project is to eliminate these odors by 1996. Ironically, seven odor complaints resulted from efforts to reduce the buildup of odorous material in the stormwater ponds. The cleaning procedures combined with the weather to produce unacceptable odors in the neighboring community.

In its March 1996 Report to the Community, Kemcor committed itself to achieving world best practice of no more than five odor complaints a

year by 1999. A \$A1 million environmental project to reduce odors from the Olefins wastewater treatment plant was well advanced. It involved reducing volatile hydrocarbons by recycling six streams within the process.

In February 1995 Kemcor was the first individual company to sign an Industrial Waste Reduction Agreement with the Victorian EPA. The agreement committed Kemcor to achieving plastic milk bottle collection, recycling and recycled resin rates of 50 percent by the end of 1995. The company achieved a 53 percent recycling rate.

Kemcor continued to manage the free environmental action telephone line for the complex, conducted 58 plant tours for the community and schools, and refurbished a facility to operate as a Visitor Education Center.

Auseon and Dow Australia

The Auseon Company and Dow Australia, have also been active on the Altona Complex Neighborhood Consultative Group. Both companies were party to the earlier voluntary

commitment to reduce the emission of volatile organic compounds by 50 percent, and both succeeded (Table 11). Auseon Ltd. was the first company to introduce the practice of Annual Community Reports, and has also been very effective in developing a water recycling program, which has reduced water usage from approximately 10-12 kiloliters per ton of vinyl resin to 3 kiloliters per ton.

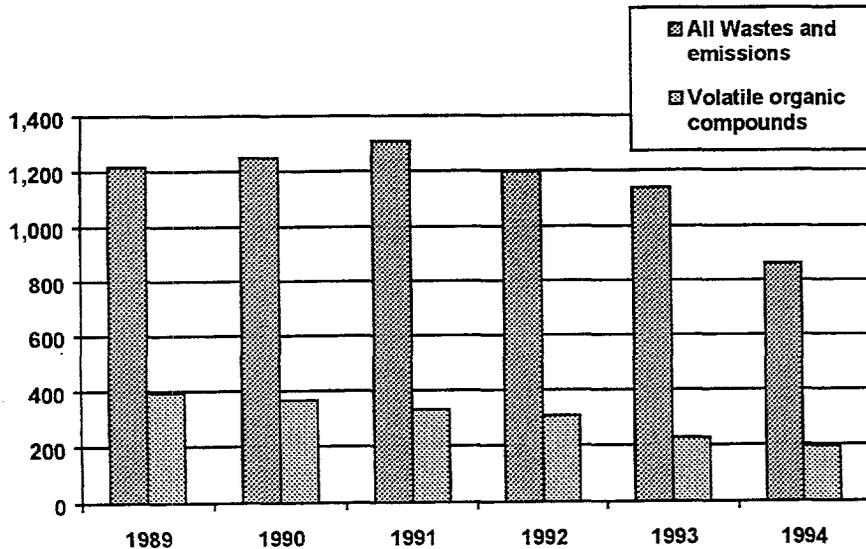


Table 10. Change in wastes and emissions from Kemcor Plastics (tons)

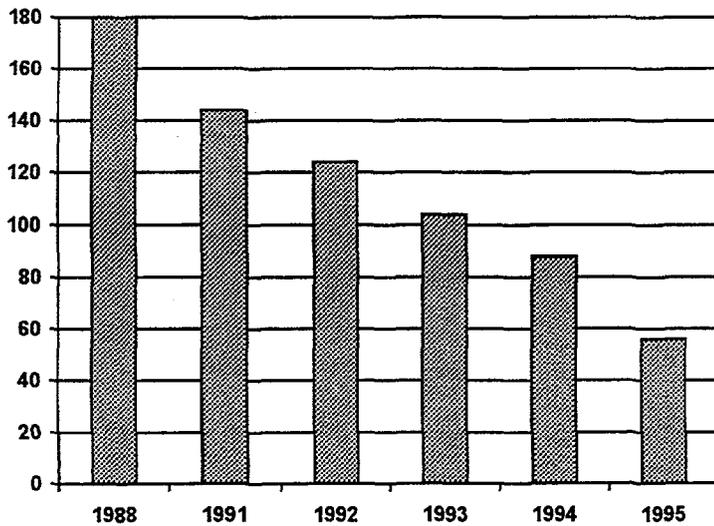


Table 11. Volatile organic compound emissions from Dow Australia (tons)

The Auseon Company and Dow Australia have followed the other companies in the Complex in developing Environment Improvement Plans and qualifying for new measures such as accredited licensee status. Both companies embarked on these initiatives in 1995.

In 1994–95 strong community concern with Auseon and Dow emerged over the issue of groundwater contamination and seepage. Both companies undertook a range of studies and reports in 1995 for the EPA and the ACNCG, which established the existence of groundwater contamination on both sites. Dow closed two surface impoundments in response to the audit.

Further studies indicated that contaminated groundwater was moving off the site, and the company was negotiating with the EPA on measures to contain it on site.

The contaminated groundwater problem was greater for the Auseon Company. The company claimed that the problem resulted from operations on the site between 1960 and 1980. Auseon commissioned consultants' reports into

the problem, which formed the basis of both a public document and draft management plan submitted to the EPA. Auseon argued that expert risk assessments indicated that there were minimal risks to human health from the groundwater contamination.

A critical view

Pollution abatement, environmental improvement and better community relations are cited by many sources as major achievements of the Altona Complex Neighbourhood Consultative Group and the public Environment Improvement Plans. This is generally the view of the citizens' representatives who have been elected to the Group over the past five years, the companies themselves, the Environment Protection Authority and the officers of the City of Hobson Bay.

But this sanguine view is by no means universal.

Some environmental organizations continue to argue that many of the improvements are not substantial, that the companies have only acted when forced to do so by public embarrassment and confrontation, and that fundamentally the chemical companies cannot be trusted. Two groups have continued to campaign vigorously against the chemical companies and to be largely dismissive of the ACNCG. One of these is HAZMAG, a local action group which has been very influential in alerting the community to the existing and potential dangers posed by chemical manufacture and storage in the western suburbs. The group gained widespread credibility in the community when its warnings were realized in the early 1990s in a series of spectacular industrial accidents and fires throughout the western suburbs.

Greenpeace Australia has also continued to be a strong critic of the chemical companies and their environmental performance. The general views

expressed by these groups continue to find muted acceptance and support from broad sections of the community, where the past record of neglect and ongoing environmental incidents causes uneasiness and suspicion.

However, residents who have been closely involved in the processes of the ACNCG, motivated by their own concerns about the activities of the chemical companies, argue that the critics of the consultative process and its results are often grandstanding over ideological differences, focusing exclusively on the negatives, or ignoring the facts.

Environmental officers employed by the companies argue that the change in attitude and behavior by the companies is not always appreciated by environmental activists. They contend that, although the companies may have required pressure to change their old ways and may have resisted initially, good environmental planning and practice has now become routine and institutionalized as a way of doing business, and that the company personnel are as engaged and efficient at accomplishing good environmental performance as they are with any other operational goals.

The Habitat Project

The Habitat Project had modest in 1989 as a proposal by a community agency, the Memorial Park Trust, to set aside a small portion of its own land at the Altona Memorial Park Crematorium as open space. An enterprising consultant for the Trust began to promote the idea that the proposal should be just the start of a larger open space project embracing the entire valley of the Kororoit Creek from the Westgate Freeway to Altona and Williamstown.

After lengthy discussions with government departments and other parties, support was enlisted from the Premier of Victoria, the Honorable Joan Kirner, herself a former

Minister for Conservation and the local member for the seat of Williamstown.

The Premier invited interested parties, including state and local government and industry representatives to discuss the project. The City of Altona subsequently agreed to be the auspices body for the Habitat Open Space Project, a small grant was made from the Victorian Government, and a Steering Committee was established.

Habitat successfully involved other parties. Major industrial companies such as Toyota and Kemcor made small grants and joined the Steering Committee, as did professors from both the School of Environmental Planning and Department of Architecture and Building at the University of Melbourne. Students of design prepared a detailed issues and opportunities paper for the Habitat Project.

The Melbourne University Study was prepared by teaching staff from the School of

The Habitat Project is a good example of the new approaches to economic growth and environmental protection which have emerged in Melbourne's western region, and a new cooperative dynamic which has developed between sections of the community, industry, different levels of government and research and educational institutions.



Environmental Planning. It reviewed a range of earlier open space studies and identified the broad physical, ecological, cultural, social and scenic features of the study area and their implications for planning the proposed open space network. Students made detailed concept drawings for the Kororoit Creek Valley south of Geelong Road and for the Altona coastline. The concepts showed landscape units and other special features, and their relationships to each other and the overall Habitat concept. Detailed designs were prepared for the Toyota site, the quarry site, Cherry Lake and the Altona Coastal Park to illustrate the environmental, recreational and educational potential of these fragmented sites.

The project expands

Habitat began to expand beyond the single focus on open space issues.

When the Premier officially launched the expanded Habitat Project in mid-1992, it was already aspiring to become a regional partnership through which community, industry and government could participate in the development of a city in the west which integrated open space and the environment with industry and urban growth. The regional focus now was on an area approximately 10 kilometers by 22 kilometers, encompassing the municipalities of Williamstown, Altona, Werribee, Sunshine and Footscray.

The City of Altona had provided \$A100,000 to the project, which was employing two committed enthusiasts, the original consultant for the Memorial Park Trust and a former Deputy Town Clerk for Altona. The project was led by a Strategic Development Committee, chaired by the Chief Executive Officer of the City of Altona, and including representatives from Toyota, the University of Melbourne, VicRoads, Melbourne Water, the Western Region Commission, the City of Werribee and

the Department of Planning and Development. Kemcor Australia, one of the major companies located in the Altona Chemical Complex, would later join the Committee.

Habitat already had some major successes under its belt. As well as the academic studies being undertaken by the University of Melbourne and the Victorian University of Technology, Melbourne Water was contributing considerable resources to the development of the Habitat Open Space Strategy, including efforts to purchase and landscape a former quarry as part of the development the Kororoit Creek valley, and constructing a linear trail along the Kororoit Creek which linked with bicycle trails along the coast to Melbourne.

Meanwhile Toyota Australia was spearheading industry support. As part of its new \$420 million car manufacturing plant, Toyota committed \$2 million to landscape a buffer zone next to its plant to form part of the Kororoit Creek Valley Open Space development.

Kemcor Australia, one of the major chemical manufacturers in the Altona Chemical Complex, matched a \$100,000 contribution from the Melbourne Parks and Waterways Program to construct a trail around Cherry Lake.

Local community projects involved schools in developing experimental wetland areas and seed-raising programs. These projects would lead later to the development of Habitat's own educational program, called Community Quality Circles, based on successful learning models used in industry.

Habitat had adopted its own official philosophy and philosophy. Much to his surprise, Geoffrey Kesteven, a retired former scientist with the Commonwealth Scientific and Industry Research Organization and former adviser to the United Nation's Food and Agricultural Organization, found an article he had published in 1968 being reproduced by Habitat as its guiding philosophy. This philosophy begins with a recognition that human development will inevitably change the environment. It maintains that the task is not to oppose development, but to build a relationship of appreciation and stewardship for the environment and natural resources on behalf of future generations.

Champion for the West

Two years after its official launch, Habitat had become a champion for the economic and environmental development of the entire Western Region stretching down to the provincial city of Geelong.

The Habitat members argued that the West's future was either 'Disaster' or 'Showcase', and set a course to realize the latter. Sir Ninian Stephen, former Governor-General of Australia, supported Habitat's attempt to demonstrate how to achieve both sustainable urban development and necessary economic growth, and accepted the role of official patron .

Habitat organized a bus tour of the region by prominent Federal Government Ministers and politicians, promoting the area as *Terra Incognita*, because of the supposed past failure to recognize the region's rich resources and economic importance. When the participation of the Federal Ministers was announced so many state and local officials queued up to join the inspection that one tour bus proved inadequate.

As part of this effort to alter perceptions, the tour party visited the Werribee Sewage Treatment Complex, renamed 'Jewel of the West' by the Habitat members. They were informed that this complex, which treats 70 percent of Melbourne's sewage, was the largest land-based biological sewage treatment system in the world, with some impressive examples of environmental sustainability, leading edge technology and smart biology. It was argued that this complex offered vast wildlife, tourism, aquaculture and agricultural benefits on an international scale. It also contained a major lost resource, since the treated water was finally released into the Bay rather than being diverted into the thirsty inland.

The appropriate reuse of this large volume of water has become a major aspiration of the Habitat Project, which is presently sponsoring some promising experiments in fast-growing



trees which thrive in high nutrient wastewater. If these experiments and subsequent pilots fulfill their promise, Habitat and its industrial members are optimistic that a major new commercial venture for the West will result.

Habitat staff also became involved in transport issues in the West. They argued that the new Western Ring Road, the modernization of the interstate rail line, the presence of the National Freight Centre and developments at the ports of Melbourne and Geelong meant that the West deserved far more attention for its pivotal role in the economic infrastructure of the City of Melbourne.

The new regional and developmental role being played by Habitat was recognized when one of the Habitat officers was appointed as the West's representative to the State Government's Melbourne Metropolitan Strategy Reference Group. This appointment in particular recognized the work being undertaken by Habitat to articulate a Transport Strategy for the Region.

What makes Habitat work?

Involving many groups and specialists

The Habitat Project is an impressive network which has attracted the involvement and commitment of many different mainstream groups and interests. The contributors are highly respected and influential people who represent diverse constituencies. The Project has overcome traditional demarcation lines and institutional barriers which have often proved insurmountable in similar circumstances. The Habitat Project has provided a lateral approach to some old, thorny issues.

The involvement of leading industrialists from companies such as Toyota and Kemcor in a community environment project is critical to Habitat's strategy. To have all three levels of

government working closely together on a locally initiated project is also a major accomplishment. Another strength of Habitat is the involvement of the major universities, their professors and students in carrying out free research into a local region's environmental and economic issues. It is an even greater coup to have the nation's leading scientific and industrial research organization undertaking sophisticated environmental studies and economic modeling for the project. The enthusiasm for Habitat of each of the major groups is enhanced by the substantial involvement of the other sectors. Academics are attracted to Habitat because it gives them access to industry, and *vice versa*.

Taking an integrated approach

Habitat has taken an integrated approach to environmental protection in the West. It has avoided single issue or oppositional environmentalism, and has promoted the economic growth of the region as well as environmental sustainability.

Habitat has emphasized the linkages – open space with transport planning, water conservation and quality, wetland protection and so on.

Building consensus

Habitat has built consensus around a broad philosophy and a long term vision for the region. It will work with whoever wants to come on board. It has been non-threatening and not interested in taking exclusive credit for achievements. As its own members put it, its ambitions seem so unlikely to succeed that no one's security is threatened and no one feels their turf has been invaded.

Habitat has not attempted to reproduce other people's work or generate vast new resources for the task, preferring to reorient agency priorities and rework existing budgets. Research is conducted by universities and scientific

organizations from their existing budgets and funds obtained from industry have often been redirected from existing corporate promotion accounts.

Changing the image

Habitat has had two dedicated project officers with considerable entrepreneurial skills. These workers have become vital cogs in the network of agencies and projects operating in the Western Region, acting as ambassadors for Habitat, for sustainable development, and most importantly, for the industrial suburbs of Melbourne's West. Together with their Board they have concentrated on bringing about a change in the way the community views the western suburbs. The traditional view has been that it is the rump of the city, across the river, an

industrial wasteland where people live because they have no other choice.

Habitat has presented the West as a potential showcase for sustainable urban development, and an area with unrecognized natural assets. Habitat has presented the choice for West as being a disaster waiting to happen or an arena for a new level of cooperation between traditional opponents and the birthplace of a new level of thinking about development.

Habitat has combined concrete results in environmental improvements with a concerted attempt to change the way people think. This is a tricky balancing act, combining a broad view with fine practical details, vision and philosophy with tangible outcomes. This remains one of its greatest challenges.

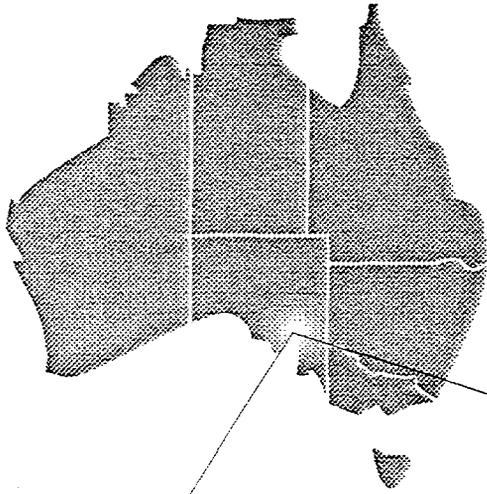
In 1994, Habitat organized the Altona Sustainable Development Congress, which attracted major national contributors from government, industry and academic institutions, as well as many representatives from the local communities. The Congress addressed the issue of how a change towards a sustainable urban industrial city could be managed by the stakeholders who comprised the Habitat Project. It also focused national attention on what would previously have been considered a most unlikely candidate for nomination as a model region for environmentally sustainable urban development.

According to key members of Habitat, it was through the Congress that the vision and mission of Habitat itself began to crystallize. Geoffrey Kesteven who spoke at the Congress, later wrote:

It is not the role of Habitat to design or undertake any substantive developmental project, such as housing, or welfare or pollution abatement. Habitat can promote and refine thinking about development and assist the community in its choice of the direction to be taken by each change.

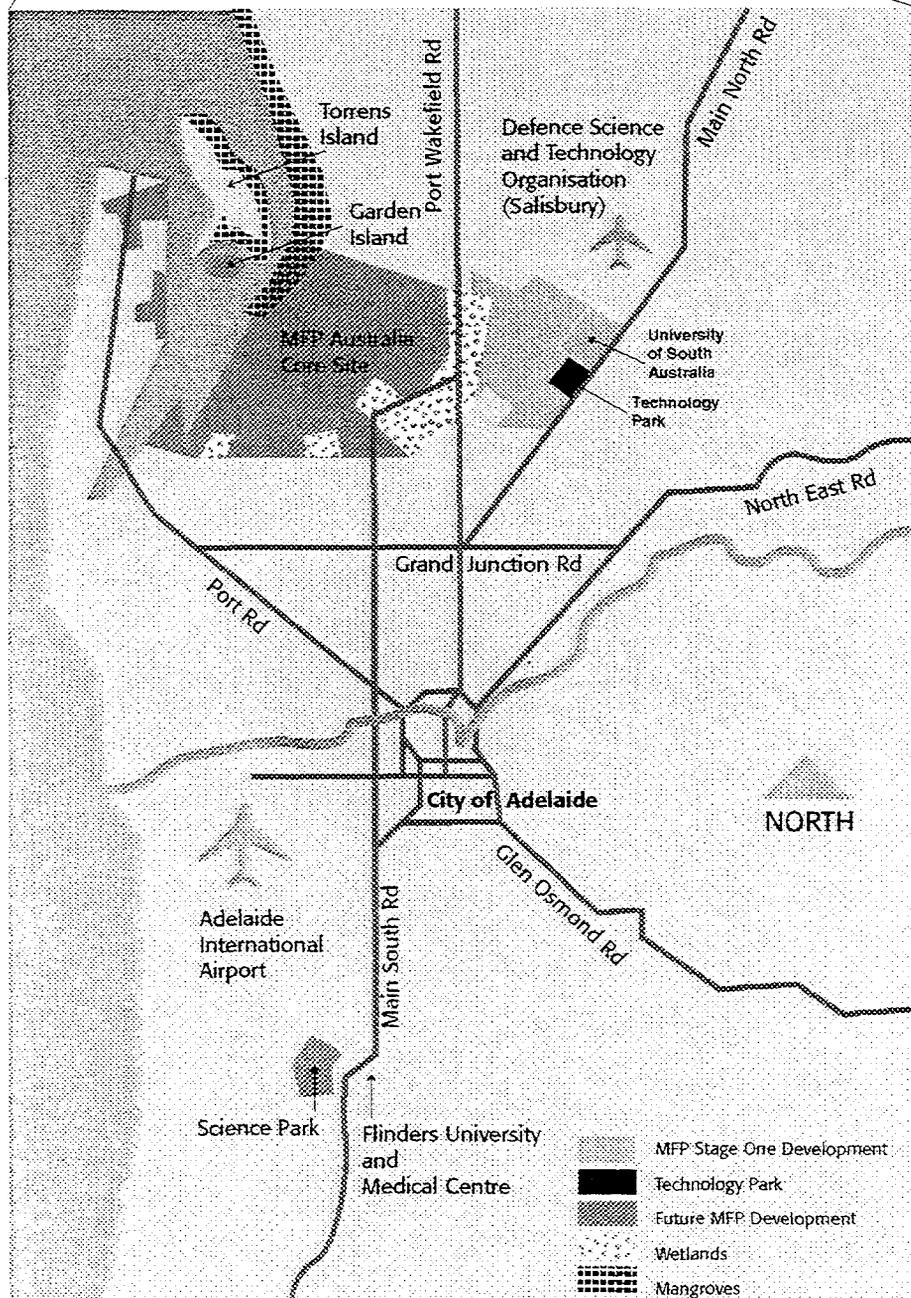


Although the advocates for the Habitat Project argue that its greatest contribution is to change the way people think, its critics find the whole approach too fuzzy. Critics argue that the Habitat Project is not tangible enough, and that it should concentrate on specific outcomes and incremental improvements. Habitat members reply that although not every good idea has come to fruition, they have never stopped producing specific outcomes and incremental improvements. Five years after its inception, Habitat is planting an urban forest along Cherry Creek, in Altona; establishing a Friends Group at Cherry Lake, and establishing a wetland's walk to raise community funds for wetland's rehabilitation works; working with students from the University of Melbourne's Environmental planning Faculty in developing open space designs for Geelong Grammar School; lobbying for Avalon Airport to be built up as a Freight Hub for Clean Food Export; and working with a local youth unemployment program in gaining sponsorship from local service clubs to develop the Altona Miniature Railway.



URBAN ENVIRONMENT RESTORATION

Transforming A Wasteland





MFP Australia, a visionary business consortium established with funds and involvement from State and Federal governments, is undertaking a series of major environmental initiatives in Adelaide, the capital of South Australia. They involve large-scale wetlands restoration, the piping of treated wastewater 14 kilometers from Bolivar sewage plant to market gardens at Virginia, and urban development of a 2,843 hectare site.

These initiatives are noteworthy, first, because of their ambitious scale; second, because of the leading-edge technologies incorporated in the projects, including the computer modeling of long-term tidal fluctuations and the method of filtration and disinfection by ultraviolet radiation used to make sewage safe for use on market gardens; and third, because of the attempt to create a model for an integrated, sustainable, cost-effective approach to protecting the natural environment, resource use and urban development.

URBAN ENVIRONMENT RESTORATION

Transforming a Wasteland

MFP Australia is transforming a large environmentally degraded area to the north of Adelaide with innovative projects involving:

- reclamation of coastal saltmarsh and mangrove forests, which have largely acted as a city dump for more than a century, and the creation of stormwater treatment wetlands to protect the marine environment;
- a waste water re-use project which will sustain an export horticulture industry, recharge depleted aquifers and save further degradation of an important fish nursery;
- construction of a village to serve as a model for its much larger urban development site, in which improved design and some smart technology has increased housing density, integrated services, given preference to pedestrians and cyclists over the car, and reduced energy and water use.

The site of these ambitious projects consists of 2,843 undeveloped hectares next to the coastal environment of Barker Inlet and the Port Adelaide River estuary, on MFP Australia's core site 9-12 kilometers north-west of Adelaide's central business district.

This foreshore was once covered in thick bushland and mangroves; seagrasses matted the estuary floor, which acted as an important fish nursery. But the site fell victim to the carelessness often characteristic of urban development. Mangroves were cut down, the area was made barren and used as a dumping ground for industrial waste, old car bodies, tires and other rubbish. Untreated stormwater and discharges from two sewage treatment works containing nutrients, contaminants and heavy metals poured into the nearby sea. Tidal movements washed excessive nutrients back into

the estuary, causing algae to blanket the water and the seagrass to die.

Now, however, MFP Australia is rehabilitating this blighted environment, and paving the way for sustainable economic development.

The wetlands

The Barker Inlet, Magazine Creek and Range wetlands cover approximately 222 hectares of low-lying salt marsh and reclaimed land (see Map A). They stretch from behind landfill operations at Wingfield to the tip of the Barker Inlet, forming part of a scenic landscape extending more than eight kilometers from the Port River across to the Greenfields wetlands established by the City of Salisbury.

MFP Australia is developing the wetlands to treat stormwater, act as a flood detention basin and a natural environmental filter that will service eight stormwater systems carrying the urban and industrial surface runoff from approximately 60 square kilometers of catchment area. When restored, the area will once again provide a thriving habitat for juvenile fish and a wide variety of flora and fauna.

The pollution legacy

For years stormwater systems discharged the urban and industrial surface runoff from approximately 45 square kilometers of catchment area into the sea at Barker Inlet, an important wildlife haven and fish nursery, with one of the world's southernmost stands of grey mangroves (*Avicennia marina*).

Stormwater contains a wide array of pollutants, including heavy metals, hydrocarbons, pesticides, herbicides, suspended solids, nutrients, pathogens and complex organics. This pollution has been combining with the nitrogen and phosphorous nutrients caused by the discharge of treated sewage from the Bolivar

sewage treatment plant (see Map). The result of these elevated nutrient levels has been the large-scale loss of seagrass off the metropolitan coast of Adelaide; increased frequency of photoplankton blooms or red tides in the Port River estuary; and loss of mangroves in the St. Kilda–Port Gawler region due to the growth and build up of nuisance seaweed.

The treatment of the stormwater pollution will reduce nutrient buildup in the estuary and the subsequent destruction of seagrasses and fish population. Stormwater management will also allow for the conservation and sale of the water resource. The management of polluted surface water and flood protection will also make possible the proposed MFP urban development discussed later in the case study.

The design challenge

In addition to the treatment of stormwater, the design criteria for the Barker Inlet wetlands restoration required the creation of a diverse habitat on which to base an ecotourism center, as well as making the area more attractive through landscaping and construction of walking and cycling trails. Balancing the engineering elements of stormwater management with the achievement of environmental, recreational and beautification targets in a saline environment was a challenging exercise.

To achieve a world class design for the wetlands system, MFP Australia appointed a team of consultants incorporating ecologists, civil engineers, hydrogeologists, environmental scientists, hydraulics and hydrological engineers, and also landscapers and designers. The proposed design was reviewed by an advisory panel which included ornithologists, botanists, marine ecology experts, hydraulic engineers, and other specialists. Community consultation also occurred to ensure regional ownership of the project.



The design provides for a hydrodynamic system of water pollution control by trapping debris and reducing concentrations of pollutants before discharge into the estuary. The stormwater has to pass through trash-collecting traps and is then held for at least 10 days to allow sediments to settle and contaminants and heavy metals to be removed from the water by the wetlands vegetation. The wetlands collect 26 percent of the metropolitan area's runoff and will remove 80 percent of the stormwater contaminants. The natural cleansing processes enable the stormwater to emerge as near-drinkable water which is mixed with seawater in an intertidal zone before discharge into the Barker Inlet.

Conjunctive probability analysis was carried out to ensure that the interaction between stormwater inflows and tidal movements would avoid flooding in even the most extreme years. This analysis by MFP Australia's selected scientists was aided by sophisticated computer and satellite modeling of rainfall and tidal movements over the past 100 years.

Factors to be considered in the design included physical constraints such as landfills, roads, pipelines and other services; surface runoff volumes; groundwater inflow and outflow balance; detention basin volumes; flood mitigation and tidal behavior; tidal gate, culvert and weir design; and the development of a landscape that promoted biological diversity and ecologically sustainable development.

Restoration progress

The City of Salisbury is managing the wetlands project for MFP Australia. The massive earthworks and initial landscaping have already been completed, and a plant nursery of 100,000 indigenous trees and shrubs grown from locally collected seed is being prepared. A management plan will serve to recreate the natural habitat in as little time as possible and ensure that no one species dominates over the others.

The desired stormwater quality is expected to be achieved in two to four years as the ecology establishes. Pelicans, ducks and numerous other bird species are already flocking to the partially filled wetlands.

The costs

According to an Economic Evaluation of the Barker Inlet, Magazine and Range wetlands commissioned by MFP Australia, the capital cost of the wetlands project has been set at \$A10.2 million for Barker Inlet, and \$A7.5 million for Range and Magazine Creek., for a total of \$A17.7 million.

Maintenance costs (clearing trash racks and so on) and administration have been set at \$A80,000 a year. There was some expenditure in this area before establishing the wetlands.

The benefits

MFP Australia believes that the Barker Inlet wetlands design – first stage of the restoration project – is of international standard. The development has won a South Australian Engineering Excellence Award, and the concept and design are proving exportable, with expressions of interest already received from several countries. As a result, the wetlands project will not only result in a significant environmental and amenity improvement for Adelaide, but satisfy a key MFP objective of developing and promoting world best environmental practice and technology.

Total benefits comprise items which can be quantified financially, either directly or indirectly, and additional environmental benefits which are not so easily quantified. The direct financial benefits from the project break down into three areas – the sale of water, cost recovery from future MFP urban development in the area, and sale and application of new models and methodologies for wetlands design pioneered at the MFP site.

There have already been expressions of interest in buying the recycled water (stormwater stripped of nutrients), as there is an over-allocation of drawing rights from the aquifer, and the price for water presently charged by South Australian Water is 88 cents a kiloliter. The mid-range quantity and price estimates for sale of recycled water over a thirty-year period yields a present value of \$A8.96 million.

The other major benefit from the wetlands' restoration is that it enables the MFP urban redevelopment to proceed and results in substantial cost recovery. Both MFP Australia and its independent economic analysts assume that the value of the site without the remediation works is, if anything, negative, and that no residential development would be possible or permissible without the environmental remediation. Similarly, substantial costs would have been incurred to manage the polluting stormwater by more conventional methods, but a cost/benefit comparison between the two approaches has not been conducted. The present value of the cost recovery from this urban development varies from \$A3.37 million to \$A6.75 million, depending on a 10 or 20 year recovery period, and a 20 or 30 year discount period. It is clear, however, that the urban redevelopment is a critical component in justifying the environmental project on financial grounds.

MFP Australia also estimates that financial benefits will accrue to the project from the sale of intellectual property. It argues that the design of the freshwater wetlands is unique and has involved a number of technical challenges, including high salinity soils, very shallow saline groundwater, poor trafficability of soils, and low level of wetlands with respect to mean sea level. The present value of this benefit is estimated to be \$A1.6 million.

Two other benefits can be quantified indirectly: the provision of recreational facilities for walking, cycling and bird watching, and the

creation of an educational facility. The present value of these benefits over 30 years is estimated to be \$A0.23 million and \$A0.05 million respectively.

There are many other important benefits to be derived from MFP's environmental projects that have not been costed or quantified. These include the protection of nurseries, feeding and breeding grounds for commercial fishing in the Barker Inlet area; protection of recreational fishing in the area; stormwater management; beautification of the area; and provision of a buffer zone for residential development of adjacent sites, especially at Garden Island.

All these benefits are clearly important and have great value, although MFP has not attempted to place a dollar value on them. For those costs and benefits where a dollar value has been estimated, the cost/benefit ratio derived from the economic evaluation of the project estimates that present costs will exceed present benefits by \$A1.89 million. MFP has judged that this small deficit becomes a net benefit when weighed against the value of the non-quantified benefits of the project.

The Barker Inlet, Magazine Creek and Range wetlands are part of a planned network of wetlands under development. They meet the second goal of the Northern Adelaide Plan for environmental improvement, and fit into a broader strategy which aims to deal with stormwater management within the whole catchment and at source. In the upper catchment areas, stormwater control is to be addressed by groups representing local councils, State Government, drainage authorities and MFP Australia.

In the past, bipartisan support from the three levels of government has proved fundamental to achieving the wetlands restoration. Funding from the Federal Government through the Better Cities Program acted as a catalyst. Without the State's strategic planning role, combined with



the cooperation and technical support of local government, nothing would have been achieved. Local councils have agreed to maintain the wetlands following the completion of the project.

In mid-1996, the new conservative Federal Government abolished the Better Cities Program, and the Department of Housing and Regional Development which administered the program. As part of a major retreat from both regional and industry assistance, the Federal Government announced that it would no longer provide funds to MFP Australia. At the same time, the conservative South Australian State

Government announced that it would continue its more substantial financial support for the MFP development, and that its environmental and urban development projects would proceed.

In late 1996, the South Australian Government announced that a \$A800 million urban development project was to proceed at the restored MFP Australia urban site. The South Australian Government was investing some \$A20 million in the urban development, and several major commercial property developers and residential builders were providing the private capital for the joint venture with MFP Australia

Better Cities Program objectives for the North West Sector Area, which includes the wetlands and urban redevelopment sites.

- To improve the range and number of employment opportunities locally and within metropolitan Adelaide, by creating an urban environment conducive to private sector development and business investment.
- To improve the utilization of urban land and utilize the spare capacity within existing social and physical infrastructure in the area.
- To improve the environmental health in the area.
- To achieve better coordination across all agencies involved in the development of the North West Sector of Adelaide.
- To remedy the environmental degradation caused by past urban development in the local area and region, as well as ensuring that future development is environmentally sustainable.

Table 12 Summary of financial and benefit areas present values (Discounted rate of 7% used)

Financial and benefit area	Present value over 20 yrs AUDmillion	Present value over 30 yrs AUDmillion
Financial		
Sale of water at 20 cents per kiloliter	6.25	7.56
Recovery from MFP Urban Development		
20-yr recovery period	3.37	4.87
10-yr recovery period	6.75	6.75
Research	1.57	1.60
Benefit		
Recreational values	.18	.23
Education	.04	.05
Total		
No future MFP urban development	8.04	9.44
20-yr recovery period (MFP urban)	11.41	14.31
10-yr recovery period (MFP urban)	14.79	16.19

Table 13 Net present value (Discounted rate of 7% used)

	AUDMillion 20 years (1995 to 2015)	AUDMillion 30 years (1995 to 2025)
No MFP development occurs on site	-9.82	-8.64
MFP development occurs, takes 20 yrs to recover cost	-6.44	-3.76
MFP development occurs, takes 10 yrs to recover cost	-3.07	-1.89

The Virginia pipeline and water re-use

Untreated stormwater is not the only pollutant entering the marine environment near the MFP's Adelaide site. High nutrient effluent from the Bolivar sewage treatment works is also a major hazard. MFP has initiated another innovative environmental and economic project to build a 14-kilometer pipeline to redirect wastewater from the Bolivar sewage treatment works to irrigated market gardens at Virginia.

The pipeline will move wasted water and nutrients from where they cause harm to where they are beneficial – it will reduce or eliminate the discharge of effluent to the marine environment where it damages seagrasses and mangroves, and provide an alternative water resource to the horticultural industry at Virginia, which is using groundwater at an unsustainable rate. This additional source of water offers opportunities for the industry to expand or develop, and enlarge the export market of produce from Virginia.

The project also provides opportunities for research into effluent treatment and aquifer recharge which could be exported to other states and countries.

This complex project involving many layers of government has been suggested many times in the past; it only became feasible when championed and coordinated by an entity such as MFP Australia, and supported by State and Federal governments.

Effects of effluent

Commissioned during the 1960s, the Bolivar sewage treatment works substantially reduces the organic pollution of the municipal waste water flowing into it. Treated water then passes through 350 hectares of stabilization lagoons before flowing along an outfall channel and discharging into St. Vincent Gulf north of St.



Kilda. Of the 50,000 megaliters of effluent produced annually, most is discharged into the sea, unfortunately at a stage when it still contains a significant quantity of nitrogen and phosphorous, and has a high algal content.

Thirty years of discharging nutrient-rich waste water into the marine environment has resulted in the cumulative destruction of more than 1,200 hectares of seagrass meadows. Such an effect is serious enough, as it jeopardizes juvenile fish stocks which use the area as a nursery. Of far greater concern, however, is the susceptibility of the seabed to erosion and sand movement, which in turn is threatening the mangroves along the coastline and has already reduced their area from 250 to 150 hectares.

Other consequences of waste pouring into the Gulf are damage to commercial and recreational fishing grounds and discouragement of tourism and recreation developments that rely on the environment of the St. Kilda area. The damage already done may be irreparable, and unless countermeasures are taken, the harm will continue to mount.

Irrigation overload

South Australia is Australia's driest state. At Virginia, the horticultural industry draws groundwater to irrigate its produce, which comprises mostly vegetables, but includes tree crops and vineyards. The estimated annual value of production is \$A40 million. The current level of water use to support this production is 18,000 megaliters a year. Annually, the natural recharge of the groundwater basin is approximately 6,000 megaliters – a third of what is being currently extracted, clearly an unsustainable situation. The South Australian Government's Water Utility, which presently supplies water to the market gardens from the aquifer, contests these estimates, however. It claims that present withdrawal rates for groundwater could be sustained for at least 10

years without material deterioration in water quality.

Concerns regarding over-exploitation of the aquifer have resulted in several legislative attempts to redress the situation, beginning more than 25 years ago with the enactment of the *Underground Water Preservation Act 1959-1966*. None of the legislative measures have led to adequate management of the situation.

At Virginia, the underground water level has dropped about 50 meters. As a consequence, the groundwater has become increasingly saline. To avoid saline water, the irrigators have deepened their bores, increasing demand on the aquifer to the point where some can no longer pump water at the rate required during the peak irrigation seasons.

This shortage of water is preventing growers from maximizing crop yields, limiting expansion of production even though there are very real opportunities to export fresh and value added produce to south-east Asia.

A second water source

By providing an alternative source of water, the Virginia pipeline project will allow growers to fulfill present demands and enable expansion while avoiding permanent damage to the aquifer. The pipeline will take half the present outflow from the Bolivar sewage treatment plant and will provide 25,000 megaliters of water to growers annually. This, supplemented by 4,000 megaliters of groundwater, is viewed as enabling increased production through more intensive use of water on the land area.

Some irrigators in the Virginia region are already using a limited amount of the existing treated water from the Bolivar outfall channel to irrigate certain crops. In its existing state, however, the water is not of sufficient quality for use on all crop types. A further problem is caused by the high algal content of the water

which can lead to operational difficulties with irrigation systems.

It is proposed to introduce a three-stage process to ensure the treated water can be confidently used on all crops and with all methods of irrigation. The first stage will involve improved sewage treatment; the second, filtration; and the third, disinfection, possibly by ultraviolet irradiation, which is one of the latest developments in waste water disinfection. Unlike chlorination, ultraviolet disinfection does not involve any residual or toxic by-products which may affect plant growth.

The treated water will then be pressurized through a pump station and transported via a pipeline to the Virginia area for distribution to irrigators.

The final product will be clear, high quality irrigation water that can be pumped through any irrigation system without filtration. Compared with irrigation water used for vegetables in other parts of Australia, Bolivar's treated water will offer added nutrients and be microbiologically safer than many surface water irrigation sources.

At present, many irrigators pump bore water to the surface at a slow rate and store it in an earth tank to balance the irrigation demand of their crops. Irrigation water is applied by a pump which takes water from the earth tank and directs it through the irrigation system. It is proposed that these facilities remain in place. The Virginia pipeline will provide each irrigator with a metered water supply which will be discharged into on-farm storage.

As Bolivar's supply of treated water is relatively constant, the pipeline can be designed to carry water at a steady rate with this becoming the base load for the irrigators.

During peak demands in summer, the irrigators will be able to use groundwater in conjunction with pipeline water to optimize their water use.

Rate of use

Occurring mainly during the summer months, the use following the opening of the pipeline is projected at:

- 25,000 megaliters a year for Virginia vegetable triangle growers, and
- 2,000 megaliters a year for industry.

A total of 6,000 megaliters a year will continue to be drawn from the aquifer, 4,000 megaliters a year by the Virginia vegetable triangle growers and 2,000 megaliters a year by other horticultural users. This will allow the aquifer to regain its balance with the natural recharge rate of 6,000 megaliters per year.

Additional use

Although the scheme more than halves the amount of effluent discharged to the marine environment from the Bolivar sewage treatment plant, there will still be the challenge of using the remaining 23,000 megaliters of annual discharge in a more environmentally responsible manner. The ultimate aim is total diversion of the discharge year round. Four options under consideration include:

- storage of this water in the aquifer during winter for reuse during summer
- the increased planting of winter crops which will require some irrigation
- the planting of wood lots
- the use of additional wetlands.

Financing arrangements

Like the Barker Inlet wetlands, this project has been made possible only with the cooperation of the three levels of government. The Federal Government's Better Cities Program once again acted as the catalyst by providing seed funds. The financing arrangements for the Virginia pipeline are still being finalized and it is



proposed to establish a management company operated by the farmers' cooperative to undertake the project. Capital grants of \$A10 million have been provided under the Better Cities Program, and it is proposed to raise \$A30 million privately. These financing arrangements are treated as mere transfers between the farmers, the water utility and the government agencies in the Economic Assessment of the project, but how the costs and benefits are distributed clearly has a major impact on the political feasibility and desirability of the project. The financial forecasts assume that the competitive charge for the piped water will be set at approximately eight cents a megaliter to encourage farmers to use it.

Costs and benefits

The South Australian Centre for Economic Studies at the University of Adelaide has undertaken an Economic Assessment of the Virginia Pipeline Scheme for MFP Australia. This assessment uses data from a Kinhill commercial feasibility study and a technical response prepared by the South Australian Government's Water Utility.

The economic assessment examines direct and indirect, tangible and intangible costs and benefits. These are summarized in Table 14.

The major capital costs for undertaking the project have been alternatively estimated as \$A38.4 million and \$A39.65 million. Estimates of major operating costs range from \$A1.073 million to \$A1.95 million. These are summarized in Table 15.

Table 14 Summary of tangible and intangible costs and benefits

Direct		Indirect	
Tangible	Intangible	Tangible	Intangible
Benefits			
Water supply for growers	Reduce environ. damage	Increased commercial fishing	Use of environ. resources
Sales to local salt producer		Tourism/recreation development	Increased recreational fishing
		Downstream vegetable processing	
Costs			
Capital	Increased salinity and ground water quality		
Operating			

Table 15 Alternative estimates of costs (\$A millions)

	CAPITAL COSTS	
	From commercial feasibility study	From E&WS response
Pipeline	31.0	26.5
Pumping station	2.9	3.4
Treatment works	3.75	8.0
Project management	0.75	0.85
UV disinfection	0.0	1.0
Total	38.4	39.65
	OPERATING COSTS	
	From commercial feasibility study	From E&WS response
Pipeline	0.325	0.475
Pumping station	0.2	0.35
Treatment works	0.55	1.05
UV disinfection	0.0	0.075
Total	1.075	1.95

Some sources have argued that the Virginia pipeline will expose the sewer system to additional and substantial repair costs as a result of salinity problems associated with the intrusion of groundwater. MFP Australia strongly contests that any additional repair costs will be incurred as a result of the project.

The University of Adelaide's Economic Assessment concludes that, in general terms, the benefits of the project will substantially exceed the costs, in its base case by \$A20 million.

It conservatively estimates the economic benefit that can be expected as a result of reducing the discharge of effluent to the marine environment to be \$A4 million. It argues that the project cannot be justified on these limited environmental grounds, and that its economic attractiveness relies on it being the best alternative supply of water to the horticulture industry at Virginia. However, it could be considered that this is a narrow definition of environmental benefit by the Centre for Economic Studies. The benefits which accrue from the sustainable use and reuse of a scarce natural resource – water – which can be measured by the maintenance and expansion of horticultural production at Virginia, could also be described more generally as environmental benefits.

It should also be noted that a range of other alternative projects have been suggested to achieve the 90 percent reduction target in nutrient output at St. Vincent Gulf required by the EPA and state government policy. The most likely alternative would seem to be to continue water disposal from the Bolivar sewage plant, but invest in a treatment plant which can remove up to 80 percent of the nutrients before disposal. This compares with the impact of the pipeline project which will divert 50 percent of the water and therefore 50 percent of the nutrients directly. However, these alternative projects do not capture the horticultural benefits, which are expected to be considerable.

Major economic benefits are derived from the maintenance of water supply to the horticultural industry at Virginia and a major extension project which has been negotiated with a local producer. The existing growers of the Virginia area gain \$A28 million and the flow-on effects to the broader community amount to an additional \$A14 million. Even if it is assumed that the market gardens without the new water supply could successfully convert to alternative uses, such as sheep and what farming,, it is still estimated that the economic benefit from maintaining the higher use is more than \$A4 million.

The availability of reliable and low-cost water is the key to the expected commercial salt production extension project proceeding at Virginia, and the University of Adelaide Study assumes that this is only viable with water available from the Virginia pipeline. It estimates that the expansion project will achieve \$A13 million of value-added gain, with the value-added flow-on to the broader community being \$A7 million.

The Economic Assessment undertaken by the University of Adelaide concludes that the Virginia Pipeline Project is sound and viable and that its net present value is \$A19.5 million.

However, it also notes that the project is very sensitive to a number of estimates and forecasts made by MFP Australia and Kinhill. The scientific analysis of the long-term sustainable use of groundwater and the market research into the potential export market for increased horticultural production are contested by other authorities, and the value of the project is very sensitive to these two assumptions. The Economic Assessment notes that if the analysis and assumptions do not hold, the net present value of the project becomes a negative \$A2.2 million.

The results of the Economic Assessment suggest that innovative environmental projects, such as



the Virginia pipeline, carry considerable risks and are unlikely to proceed without strong support from government.

New Haven Village

At New Haven Village near Port Adelaide new energy and water management technology ensures maximum savings for residents and minimum impact on the environment. This innovative development of 65 medium-density affordable dwellings on two hectares of land is a showcase for future 'green' housing developments on the very large MFP urban site where building is now viable because of the environmental remediation which MFP has carried out.

New Haven is five kilometers from Port Adelaide and 20 kilometers from Adelaide's central business district (see Map). The village is part of an MFP Australia project in which previously degraded and unusable land is being rehabilitated for gradual residential development over the next decade. It incorporates urban design and engineering innovations developed largely in South Australia through the cooperative efforts of public and private sector organizations and individuals, including the South Australian Housing Trust, BHP, the City of Port Adelaide, and state service authorities. The first of the homes are selling and more are being built by selected private builders.

A winning design

The Village is the product of an Australia-wide competition. In 1992, MFP Australia joined with BHP to organize and sponsor a National Housing and Urban Design Competition. The competition's purpose was to test, demonstrate and evaluate new ideas for environmentally sustainable housing and urban design which eventually might be applied in a larger scale MFP urban development.

The architectural firm Woods Bagot won from a field of 85 competitors. Their stylish, medium-density housing incorporates a wide range of innovative and energy-conscious urban design techniques aimed at making the most efficient use of the two hectare site; enhancing the living environment for residents; and promoting interaction within a village-style residential development.

Pedestrians first

For the first time in a residential area in South Australia, a shared brick pavement gives priority to pedestrians and cyclists. Strategic placement of bollards, landscaping and street furniture, combined with narrow streets, ensure traffic is slowed down. Cars are restricted to a speed of 10 kilometers per hour.

The number of cars per dwelling is expected to be 20 percent down on the Le Fevre Peninsula average, with the number of daily trips on foot or by bicycle increasing to 25 percent against the current 10 percent average for Adelaide.

Energy conservation

Each home within the Village is constructed to high energy-efficient standards, incorporating the latest in passive energy conservation features.

Dwellings are oriented to ensure living rooms and adjacent outdoor areas face north to make most use of the sun and reduce energy demand for domestic heating and cooling.

Alternative energy systems – geothermal, solar and reverse cycle – have been included for demonstration purposes in the first homes built. Traditional air conditioners and heaters will be replaced by a geothermal system using the constant temperature of the earth's crust (about 17°C). A tiny electric motor circulates liquid coolant through thin, deep pipes penetrating to a

depth of 66 meters under the homes, then transfers heat to or from the building via another pump.

Household savings

Annual household energy for water heating, domestic heating and cooling is expected to be reduced by 30 percent resulting in a potential annual cost saving of up to \$A400 per household for the same comfort levels.

‘Green mortgage’ options – a first in Australia – allow homebuyers to marginally increase their borrowing limits to finance the installation of energy and water saving features in their home.

Some homes within the Village are built with ‘sludge’ bricks, comprising five percent treated sewage sludge mixed with clay. If all the 100 million bricks produced in Adelaide each year were made from five percent sewage sludge, it is estimated that it would eliminate approximately half the city’s solid sewage waste output.

Design for a community

The mix of two and three bedroom, single and double story dwellings has been designed to provide individuality, while at the same time ensuring a homogeneous character is maintained within the Village.

Each household’s mail box is located within the village tower overlooking the ‘town square’. Reintroduction of the village square concept and a reason to visit it are aimed at encouraging greater communal interaction.

An adjacent oval provides an opportunity for active recreation while two reserves within the Village are designed for passive recreation and positioned to maximize views from homes.

Innovative street lighting is not only more energy efficient, but also less obtrusive, designed to provide public safety and resist vandalism.

New Haven has been located to link up with existing infrastructure such as public transport, a shopping center, schools, community services and recreational facilities (Map).

Breaking with convention

The higher density housing at New Haven was made possible through engineering concepts never seen before in South Australia or, in some cases, the world.

One of the most significant engineering breakthroughs is the creation of a much narrower public utility street services corridor for the installation of underground service mains. This will have major implications for the density and street layout of future housing developments in Australia.

Project participants from gas, water, electricity and phone service authorities have worked cooperatively with local government to rethink the way they provide basic services to homes. As a result, they have been able to reduce the required street services corridor from an obligatory 12.4 meters to just 6.8 meters in width.

New Haven Village also features engineering innovations which radically change the way water and waste water are managed. A waste water treatment plant under the main reserve adjacent to the Village tackles sewage and storm water runoff at source, ensuring it can be re-used in toilet cisterns and for irrigating gardens, road verges and reserves. It is expected this will result in a significant 30 percent reduction of average household water consumption, and offer far-reaching benefits for improving the quality of Adelaide’s waterways and marine environment by reducing waste water discharge.

New Haven is testing an automatic remote metering system for electricity and water usage, developed by the Electricity Trust of South Australia (ETSA) in conjunction with Nilsen



Industries. Since direct access is no longer required by a meter reader, the electricity meter box can be installed within the household's garage, and a new underground cast-iron water meter box is planned to replace the conventional above-ground meters.

Collaboration between the service authorities in remote meter reading also means household electricity and water usage is transferred electronically into their billing systems, resulting in less handling and a significant reduction in monitoring costs.

ETSA's distribution system throughout the Village is completely underground. In another innovation, ETSA has developed a service pit which can supply four houses instead of two. The use of an enclosed, in-line fuse holder has allowed the installation of service fuses in this pit, rather than in an above-ground pillar.

A sealed telephone system requiring fewer pits and no future maintenance will provide two lines to each household for telephones, computer links, facsimiles and other communication technology.

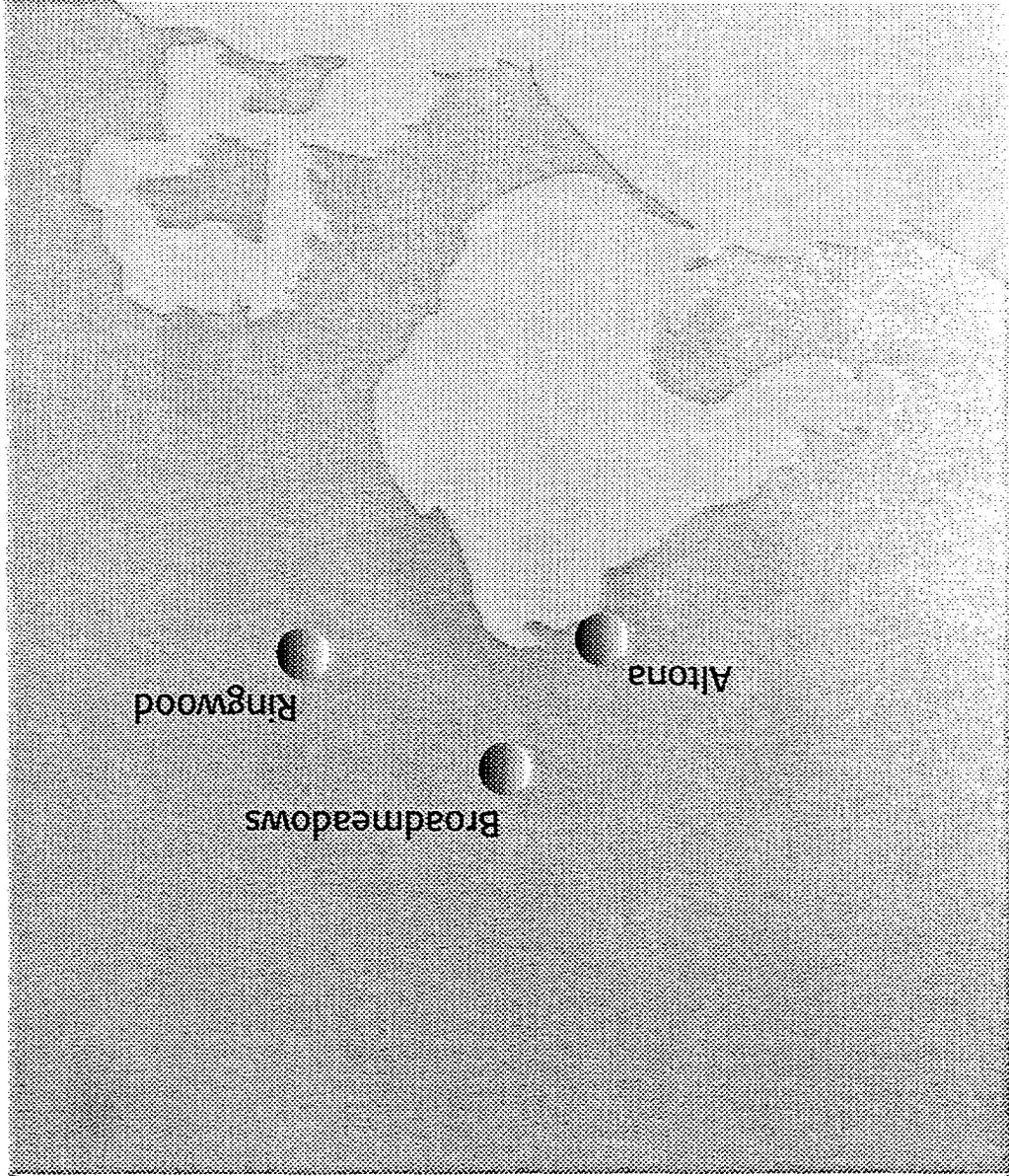
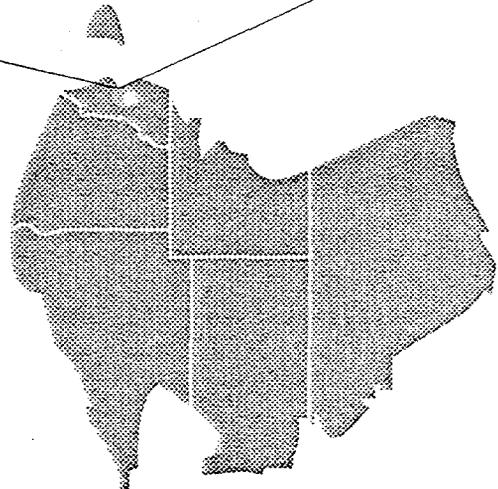
A sub-surface drip irrigation system will water the Village reserves and household gardens. Residents will be able to control their household irrigation systems from a small control unit located in their garage. This drip irrigation is far more efficient than conventional above-ground sprinkler watering of lawns and gardens, which forms the major proportion of the average urban Australian household's water consumption and results in wasteful evaporation and runoff.

Characterized as products of 'smart thinking,' projects such as the three outlined in this case study provide both innovative and practical models of how people might live in the cities of the future. They are an attempt to foster economic and urban development in an environmentally responsible and sustainable manner.

The MFP Projects have also experienced some serious setbacks and attracted strong criticism from time to time. These setbacks and much of the criticism have resulted from the grandiose, futuristic conception of the original initiative (when it was known as the multi-functional polis), and from the lengthy delays which did occur between formulation and development.

Despite these controversial beginnings, the environmental remediation and urban development projects described in this case study, contain tangible lessons for the future management of the urban environment.

CLEANER PRODUCTION IN VICTORIA





The cleaner production case study examines the work of the Australia Centre for Cleaner Production and the programs and initiatives of the Victorian Environment Protection Authority and Department of Business and Employment (DBE) which preceded it. It shows how a national promotion and organization evolved from a series of modest innovations and grants and the increasing cooperation of regulators and industry.

Cleaner production programs aim to prevent pollution at its source and minimize waste in industrial procedures by applying environmental criteria to every stage of production, from raw material extraction to disposal. They involve conserving energy and resources, eliminating toxic raw materials and reducing the quantity and toxicity of all emissions and waste before they leave a process.

The case study demonstrates how these programs benefit both the environment and the companies adopting them.

The Australia Centre for Cleaner Production is a national body made up of representatives from industry, government and academia. In Victoria, it collaborates with the EPA, the Victoria Office of State Development and Industry to introduce and promote cleaner production projects. It also acts as a conduit for industry into Asia Pacific markets.

CLEANER PRODUCTION IN VICTORIA

From control to prevention

Cleaner production programs in Victoria show how pollution can be prevented, waste reduced and profits increased in the industries adopting them. Their success is the result of new technology and procedures, changing attitudes and, most importantly, co-operation between environmental regulators and industry.

Until the 1980s, most efforts to control pollution in Victoria were concentrated on measures such as air filters, noise buffers and chemical treatment of end waste products. Instead of attempting to modify poor practices inside industrial plants regulators concentrated on 'end of pipe' engineering solutions, waiting before acting until industrial pollution had fouled air, land or sea. Operators were basically concerned with gaining permits and meeting minimum standards, rather than taking responsibility for their impact on the environment.

From the 1980s onwards, however, the Victorian Environment Protection Authority (EPA) began thinking differently, developing a more innovative approach to pollution management, based on prevention rather than control, and working with industry to achieve cleaner methods of production.

In 1992, to promote the new thinking both locally and internationally, the EPA hosted an international conference on Cleaner Production, in conjunction with the United Nations' Environment Program (UNEP). In 1993, in collaboration with the Department of Business and Employment and several large industries it coordinated a series of demonstration projects showing how cleaner production methods benefited both the environment and the industries concerned. In 1994 it helped to

establish the independent national Australia Centre for Cleaner Production.

From small beginnings

The progress towards cleaner production in Victoria began with modest government programs, and limited financial assistance and time commitment from EPA staff.

In 1988 the EPA introduced a scheme providing small grants and technical assistance to companies that voluntarily implemented cleaner production projects. The aim was to give industry a greater degree of responsibility for its environmental performance while allowing more efficient allocation of public sector resources. EPA's Cleaner Production Grants Program made approximately \$500,000 a year available in interest-free loans to participating industries. Thirty-two industries benefited from these loans.

Chairman of the Victorian EPA, Dr. Brian Robinson, believes waste minimization and cleaner production will dominate the thinking of environmental agencies in the 1990s. He states that:

a sustainable future can only be achieved with commitment from the whole community. No individual sector can bring it about alone. Indeed, it will only happen through collaboration and cooperation – through a genuine partnership between industry, government and the community at large.

—Gib Wettenhall, 'The Toxic Avenger,' 21 C magazine, Spring 1992, pp. 78–79.

The following examples show how.

Heat treatment process

The use of fluidized bed furnaces to replace cyanide and barium salt baths has eliminated some major environmental problems at Quality Heat Treatment Pty. Ltd., while at the same time providing technical improvements and operational cost savings. It has also created a new market for this innovative equipment.

Tanning industry

By using the CSIRO Sirolime process, Victorian Hide and Skin Producers Pty. Ltd. has introduced a faster dehairing process which both leaves the hair intact and reduces chemical usage and wastes. The cost savings generated mean locally tanned hides have become competitive on the international market.

Electroplating

Gainsborough Hardware Industries Ltd. has replaced the conventional electroplating processes with an electrophoretic lacquer system. These lacquers are applied directly on to the metal surfaces via a high voltage and low cathodic current. The process halves water usage and waste water discharge, eliminates cyanide, and reduces the quantity of heavy metal sludges to landfill.

Dye works

By changing to a 'cold-pad' dyeing process, Seymour Dyeworks Pty. Ltd. has eliminated the need for 10 tons of salt and 13,000 liters of water for each 100 tons of product. Together with 80 percent, savings in water this new, cold process has also led to a substantial reduction in energy costs.



Economic benefits

Demonstration models have shown that cleaner production not only benefits the environment, but also improves economic competitiveness by providing industry with a means to increase profitability, and reducing the need for and costs of policing.

Advantages for industries adopting cleaner production processes include:

- reduced capital and operating costs,
- improved yields,
- reduced storage and transport needs,
- reduced liability/insurance,
- enhanced product quality,
- improved occupational health and safety,
- improved employee morale, and
- community support.

Conscious of the dual benefits of cleaner production programs, the Victorian Department of Business and Employment (DBE) also provided incentives for industry to adopt them. Adapting some of its enterprise improvement programs for use in environmental projects, it provided subsidies for industries to commission private sector consultants to carry out:

- a waste/environmental diagnostic evaluating current practices and identifying

Waste management and clean production are among the world's fastest growing environment industries. The OECD estimates global spending on waste management at \$US200 billion in 1990, increasing to \$US300 billion by the year 2000.

—Industry Commission, *Environmental Waste Management Equipment, Systems and Services*, Report No. 33, 1993, p.27

In Australia, the value of the environment management industry in 1990 was estimated by the OECD at \$US2 billion. Annual growth in the market for environmental equipment and services is projected by the Australian Bureau of Statistics at 4.4 percent for Australia to the year 2000.

—ACF/ACTU Green Jobs in Industry Research Project, *Green Jobs in Industry*, Australian Conservation Foundation, 1994, pp. 30-31

opportunities for waste minimization (eligible enterprises receive a subsidy of 80 percent of the total cost, up to a maximum of \$4,000);

- a detailed study examining site-specific cleaner production issues (eligible enterprises receive a subsidy of 50 percent of the total cost up to a maximum of \$6,000); and
- a waste/environmental management plan following or replacing a detailed study (eligible enterprises receive a subsidy of 50 percent of the total cost up to a maximum of \$7,500).

Cutting out waste

Following the success of its early programs, in 1990 the EPA adopted a broader Industrial Waste Management Policy (Waste Minimization) which encourages industry to work with the EPA to prevent problem odors, emissions, effluents, and mismanagement of waste by adopting comprehensive waste minimization plans. In some cases, as with the chemical companies in Altona (examined at length in another case study), these become

formal three-year agreements called Environmental Improvement Plans, which commit the companies to adopt specific new production methods and technologies, and set waste reduction targets. New licenses and permits for expansion are made contingent on these plans. While the policy contains some statutory requirements, it also provides incentives through economic measures, information and education.

In 1992 the Environment Protection Authority Act was further amended to include the Resource Recovery and Recycling amendments, which introduced statutory requirements mainly

At much the same time as the EPA's adoption of the Waste Minimization policy, UNEP established a Cleaner Production Program. As an aid to the spread of cleaner production initiatives, UNEP is supporting industry demonstration projects and the development of local information centers.

In conjunction with the United Nations Industrial Development Organization, UNEP has launched a program to establish approximately 20 national centers for cleaner production in developing countries over the next five years, including several in the Asia region.

- Dr. Fritz Balkau, UNEP Cleaner Production Programme, Conference Proceedings, Asia-Pacific Cleaner Production Conference, Melbourne, Australia, 1992, p.15.

concerning post-consumer and domestic waste, but also providing a framework for industry-wide plans to reduce waste. This has achieved results in the building and construction industry, which is a major source of solid waste going to municipal disposal sites (this is examined in more detail in the case study on **Reducing, Reusing, and Recycling Waste**).

A demonstration program

In 1992-93 in partnership with local industry and universities the Victorian EPA established the first small Australia Cleaner Production Centre, staffed by an EPA officer. With the Centre's support the EPA, the Department of Business and Employment and several large industries undertook a joint venture to promote the Waste Minimization policy through a demonstration program.

The program was designed to demonstrate the value of cleaner production processes and technologies to each company involved and others within its industry sector, as well as the general community. Participating companies agreed that the best way to create enthusiastic proponents of cleaner production was through learning by experience, then demonstrating the value of what they had learnt to their peers and competitors.

Throughout the demonstration program experienced professionals provided regular assistance with project planning and procedures for waste assessments. Each company prepared its own waste management plan. When implemented, the successful waste management plans were published and promoted as examples for other companies to follow. Documenting successes and building up a library of local case histories is an important part of any waste minimization project. It does not require disclosure of confidential data, but provides models for others to follow.



The EPA and DBE were responsible for training, facilitation and promotion in conjunction with the companies. The EPA developed the information technology and monitoring facilities, and the publications required for promotion. The companies were responsible for committing the resources necessary to undertake the work and initiate the necessary changes. Companies taking part in the demonstration projects are listed below.

Company Name	Industry Type
ACI, Spotswood	Glass manufacturer
BASF Australia Ltd., Altona	Styrene resins
Cadbury Schweppes Australia Ltd., Ringwood	Food manufacturer
Con Agra Wool Pty. Ltd., Laverton	Wool processing
Ford Motor Co. of Australia Ltd., Broadmeadows	Motor vehicle manufacturer
W R Grace Australia Ltd., Campbellfield	Printing and adhesives

Each project was the responsibility of the company involved. Consequently, progress was directly related to :

- prior knowledge of waste minimization,
- production pressures,
- structure of team,
- technical strengths of team members,
- financial climate within the industry, and
- continuing management commitment.

Each team had different requirements and levels of experience at the commencement of the program, and support from the Centre and DBE was tailored as far as possible to their needs.

Information and training

Training sessions to introduce the concept and put the program in context were held for staff of the companies involved in March and April 1993.

A meeting of team leaders from each of the participating companies was held in July 1993 to review progress and discuss future steps, giving them each an opportunity to present their approach and appreciate the commonality of issues across different industries.

Monitoring progress

To assist the teams work through the process, project management software using Microsoft Project was developed and made available to the participating companies. The EPA maintains a master copy to help in monitoring progress.

Supporting publications

The EPA produced publications with a consistent design so they could be easily identified with the cleaner production demonstration program. These included:

- booklet developed in conjunction with DBE to provide an overview of both the concepts of cleaner production and the program generally for the participating companies and industries within these sectors;
- poster featuring the cover of the booklet for use within the participating companies to raise awareness of cleaner production and for use in general production;
- 15-minute video featuring the demonstration projects;
- fact sheets to communicate outcomes of the program and promote results within the companies, designed to provide general information rather than technical details, and

- case studies which included technical information.

The outcome

A key outcome of the program has been the commitment to cleaner production by the participating companies, all of whom now have comprehensive and continuing cleaner production programs. The completed case study examples are detailed in Appendix 1.

By late 1996, 25 case studies were being circulated on successful cleaner production programs in Victorian industry. It is noteworthy that many of the original participants in the 1992 demonstration project had now developed comprehensive cleaner production programs. For instance, at Cadbury Sweppes Pty Ltd, over the last two years period, trade waste generated had been reduced from 600 kiloliters per day to 150 kiloliters per day and solid waste disposed to landfill had been reduced by 50 percent. Cadbury Sweppes was citing examples such as the installation of dedicated bins for recyclables at a cost of \$A20,000, and a benefit of \$A60,000, and the sale of solid food wastes to stockfeed agents for a net benefit of \$A63,000.

Importantly, companies such as Cadbury Sweppes acknowledged the critical role that the 1992 demonstration project had played. In public review of its record in 1996, it described its early cleaner production initiatives as fairly unstructured, and credited the Victorian EPA's demonstration program with providing a big impetus in setting a clear direction for cleaner production within the company.

A national approach

While these demonstration projects were under way, cleaner production methods were attracting support nationally from both industry and the new Federal Environment Protection Authority. In 1994 these groups joined forces

with the Victorian EPA to reconstitute the Australia Centre for Cleaner Production as an independent national body closely involving industry in management and staffing. Its stated goal was :

To achieve the widespread adoption of internationally-competitive cleaner production philosophies and practices in industry, government and academic institutions in accordance with the principles of sustainable development.

The Australia Centre for Cleaner Production has become the major focus for coordinating cleaner production efforts nationally, although individual state and federal agencies continue to play their statutory roles and continue with their own cleaner production programs.

The Centre is part of a technology transfer network, providing a conduit for industry into Asia Pacific markets.

It has an independent board consisting of representatives from industry, government and academia. Board members come from ICI Australia, the Shell Company of Australia, Royal Melbourne Institute of Technology, Amcor, University of NSW, CSIRO, EPA Victoria, EPA New South Wales, and EPA Australia.

To help industry achieve the dual goals of international competitiveness and environmental excellence through cleaner production, the Centre concentrates on providing commercial services in support of the 'public good.' Services to Australian and international public and private organizations include:

1. Consultation

- assisting with waste minimization assessment and audits;
- establishing and managing industry assistance schemes;
- establishing and participating in research and development projects;



- assisting industry to solve specific waste problems;
2. Education
- lecturing in college courses - Secondary College to Masters Degree (Victoria's RMIT University has begun a Masters Degree in Cleaner Production);
 - preparing, managing, and presenting seminars;
 - making presentations to conferences, workshops, associations and government;
 - preparing and presenting short or longer term training programs;
 - preparing articles for publication.
3. Technology Transfer
- as a broker, introducing new technology into and from Australia;
 - establishing linkages to assist the spread of technology;
 - managing technology transfer networks, and
 - providing support and technology assistance to regulatory authorities.

Conclusion

Large funding programs by governments are not necessary for the progressive introduction of cleaner production throughout industry. Conversely, government funding of demonstration projects, although valuable, is unlikely to succeed in the widespread adoption of waste minimization principles.

The Victorian Environmental Protection Authority has employed a wide range of measures to promote cleaner production. These include the introduction of legislation and statutory policy, the use of Environment Improvement Plans, statutory assessment of industry, and demonstration projects.

Legislation and policy provide the framework. Cleaner production principles have been

successfully introduced into the statutory works approvals and licensing of industry operations. This integration into an existing regulatory process has achieved important improvements in the major industries which are subject to EPA approval, at a relatively low cost. Similarly requirements for Environment Improvement Plans are being introduced into the same statutory approvals processes. These approvals are suited especially to the larger companies which value a strong environmental record.

The same gradual state of success is not evident through the promotion of voluntary programs. Industry has been slow to take up the Victorian EPA's accredited license system under which a company can receive a performance-based license providing operational freedom specifying whole-of-plant performance. Few voluntary waste management plans covering all aspects of the reduction, management and disposal of wastes have been prepared in Victoria over the past four years.

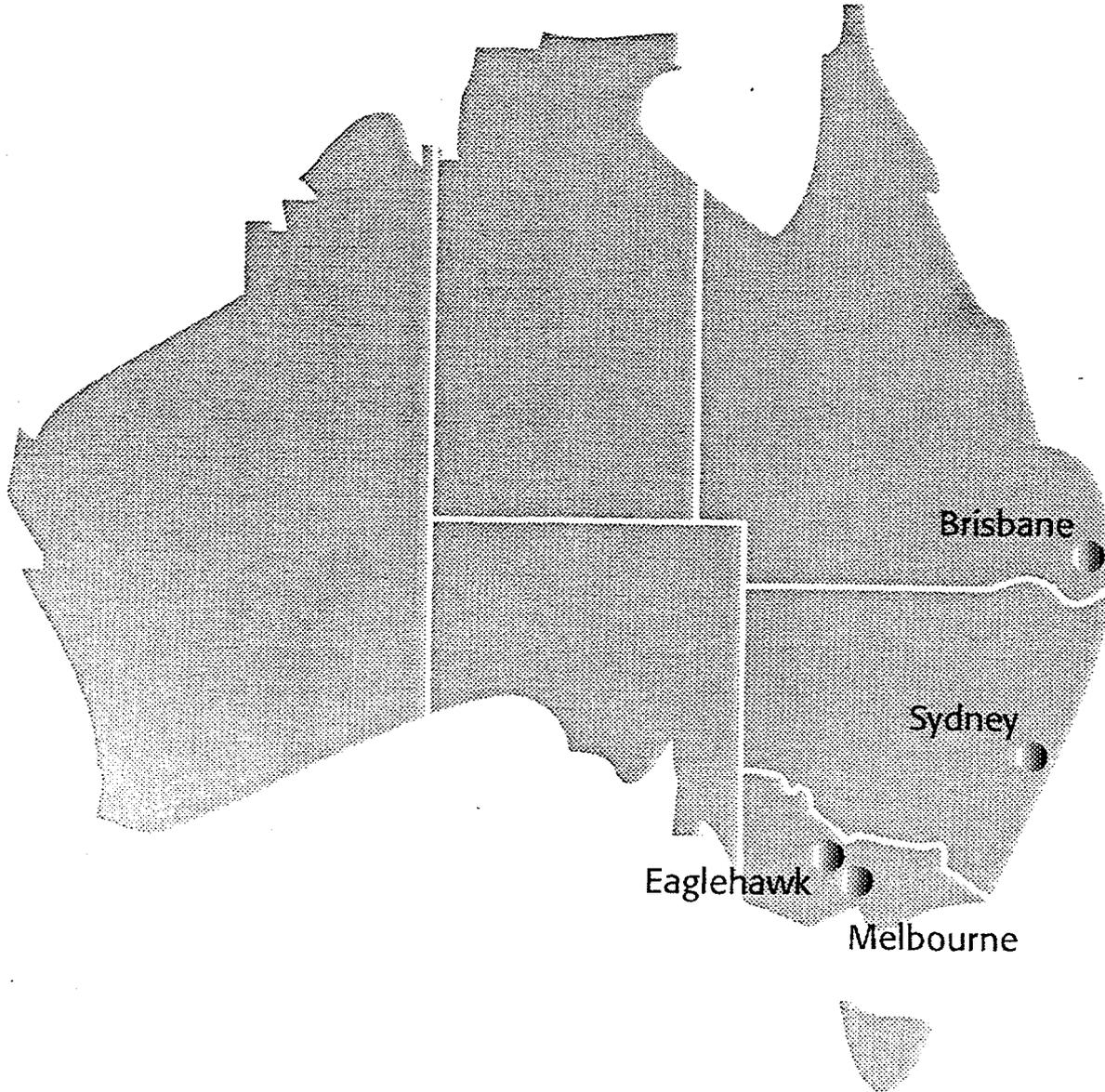
The actions of larger companies are improving. But small to medium enterprises produce most industry waste in Australia and must also be targeted if cleaner production techniques are to achieve lasting improvements in industry's environmental performance. These programs should also address the psychology of industry owners and managers who are often preoccupied with immediate and short term concerns and not long term economic savings and the benefits of improved environmental performance.

The experience with the promotion of cleaner production in Victoria has shown that a range of policy measures targeted at different sizes and types of industries will be most successful in promoting the adoption of cleaner production, and that these measures may incur relatively little cost to government.

Lessons learned from completed demonstration projects

- Support from the top gives weight to a demonstration project and helps carry it through any skepticism in early stages.
- Involvement of all levels of staff in the project team is essential if the strategies evolved are to gain wide acceptance and understanding.
- Widespread training in basic environmental principles provides the knowledge leading to a wider identification of problems, a necessary prerequisite before generating any solutions.
- Opportunities for cost savings and increased profits need to be emphasized at the outset. In many businesses, the word 'environment' conjures up visions of regulatory control, high costs and radical greenies.
- It is best to start with the easy problems, moving to the harder ones once the project has won acceptance.
- Measuring results provides hard evidence of whether or not the changes made are proving successful. Where there are quantifiable cost savings, they act as an incentive for investigating further initiatives.
- In business, provision of ongoing monitoring is the equivalent of implementing a continuous improvement or TQM process. A process of review provides the only real means of ensuring whether or not the changes put in place are working.

REDUCING, REUSING AND RECYCLING WASTE





National and state governments in Australia have set targets to halve the amount of solid waste now going to landfill by the year 2000. This case study examines some of the country's waste problems – the need for reduction at source, particularly in the building and construction industries, the need to encourage recycling and to find markets for recycled materials and products, and the need to change attitudes. It highlights the work of the Recycling and Resource Recovery Council in Victoria, and it shows how community education, a voluntary system of curbside collection and company waste minimization and recycling projects can help to achieve results, while noting the limitations of a non-mandatory approach.

It includes examples of financial schemes, including landfill levies, grants for community projects and incentives to local government.

Victoria's largely voluntary approach relying on enabling legislation, curbside collection and non-mandatory industrial waste reduction targets is compared with the more centralized and technologically advanced system being implemented in Queensland's capital city, and the greater reliance on differential fees and charges in New South Wales.

REDUCING, REUSING AND RECYCLING WASTE

Australians are big wastemakers. Australian Industry Commission estimates showed that municipal councils disposed of 776 kilograms of waste for each Australian in 1989. With the addition of waste going to private landfills the total was close to one ton per person for the year.

This level of waste disposal is similar to the US and Canada but very high by other international standards. Even when garden waste is excluded from these figures, Australians produce twice as much waste as Europeans.

Factors contributing to these high rates include the low cost of waste disposal in Australia, few efforts to minimize waste at source, particularly in the building and construction industry, and lack of profitable markets for recycled product.

The siting and characteristics of landfill sites and post-consumer litter clogging rivers and bays, destroying ecosystems and reducing urban amenity are problems causing increasing concern to governments and communities alike.

National and state governments have adopted a target of halving the amount of waste going to landfill by the year 2000. The National Waste Minimization and Recycling Strategy adopted in 1992 sets this target in per capita terms, while some states have adopted it in absolute terms.

In Victoria, for instance, the Environment Protection Act was amended in 1992 to include specific Recycling and Resource Recovery clauses. These amendments established a statutory body, the Recycling and Resource Recovery Council (RRRC), which is funded from a small levy on landfill disposal, and which works with industry, the community and local government to coordinate efforts to reduce waste.

These efforts have been successful. While only 3 percent of waste disposed by councils in Australia in 1989 was handled via recycling, in 1994 Victoria was diverting 17 percent of household waste for recycling, and Brisbane's new curbside recycling program was achieving rates of about 14 percent.

In 1994 the RRRC estimated that one third of Victoria's potential waste stream (including domestic, industrial, commercial, institutional, building and construction) was being diverted to reuse or recycling. This is high in international terms, with the most successful US states achieving only about 40 percent. Victoria's voluntary curbside collection system is one of the best in the world, reaching between 90 percent and 95 percent of the state, with 68 percent of households participating in 1994.

The record is similarly impressive for the recycling of post-consumer domestic waste,

which includes paper (newsprint, corrugated cardboard, liquid-paperboard, printing and writing paper etc.) and various beverage and other containers (glass, aluminum, plastics such as PET, HDPE and PVC). These materials are all candidates for curbside or drop off collection systems. The recovery rate of these materials from curbside programs is about 48 percent in Victoria at present, with the items concerned accounting for about 36 percent of the household waste stream.

Brisbane, with its 240 liter mobile garbage bin (MGB) systems for recycling, can expect a higher capture rate once this system is well established.

In Sydney, waste levels per person fell 23 percent in four years, from just over a ton in 1990 to 780 kilograms in 1994.

The Recycling and Resource Recovery Council (RRRC) makes funds available under its Waste Minimization Grants Program to industry and community organizations. The program's objective is to assist the establishment and expansion of recycling and other waste minimization initiatives in Victoria. Projects can be justifiable in their own right or serve as best practice models. About 30 organizations ranging from transnational companies to community groups receive \$1.5 million a year under the program. Non-metropolitan groups receive a fixed share of funds under the RRRC's strategic plan targeting different types of waste.

A program slowdown

However, these waste reduction levels are not as high as they could be, and the last two years have seen a slowdown in progress. Three key factors are involved in this decline:

- the need for market development for recovered materials,
- the slowness with which attention has focused on source reduction of waste, and
- conflicts about who should pay for waste reduction programs and by what means.

Market development remains the central challenge for maintaining and increasing recycling of materials that are part of the post-consumer waste stream. There are some key restraints inhibiting market development.

- *Low prices for virgin materials and high initial capital costs for secondary production.* When commodity prices are low, it becomes difficult for secondary materials to compete and remain profitable. Old newsprint prices are a classic example of



these swings. However, in Australia there have been some major new investments in recycling facilities, including the expansion of the Australian Newsprint Mills facility near Albury, Australian Paper's expansion in Melbourne, and Tasman's new de-inking mill in New Zealand using Australian feedstock, which indicate an underlying price competitiveness for secondary newsprint.

- *Lack of legislation mandating secondary content requirements.* Targets set by industry and governments for the recycling and reuse of secondary materials is voluntary in Australia, and those targets which have been set at a national level are often lower than what is already being achieved in some states.
- *Lack of quality in supply.* Contamination of materials has been a major problem during the developmental stages of the curbside and drop-off systems.
- *Lack of information and consumer resistance.*

Need to minimize waste at source

Too little attention to the reduction of waste at source is also providing a constraint to achieving overall targets. Ironically, the success of the curbside collection systems and voluntary recycling efforts may be proving a distraction from the desired hierarchy of reducing, reusing and recycling. Even the method of measuring the success of waste reduction initiatives in all the government strategies is for levels of disposal rather than generation. None of the national and state waste minimization plans set targets for source reduction.

The more widespread adoption of quality management programs and cleaner production programs by industry is beginning to focus attention on reduction of waste at source.

Australian examples of the way firms can benefit from initiating cleaner production programs are being used to promote the more widespread adoption of this approach. Another case study, **Cleaner Production in Victoria**, examines these initiatives in detail.

Other types of source reduction programs, which are in their infancy in Australia, include reducing material intensity of production (such as product light-weighting), increasing product durability, and substituting reusable products for disposable ones (such as shopping baskets for plastic bags).

Inadequate costing and pricing of waste disposal to landfill adds to the lack of incentives for source reduction and other waste minimizing behavior. Studies by Stanley and Maunsell Pty. Ltd. (1992a, b) for example, indicate that Victorian waste disposal is generally underpriced by up to about \$10-12 per ton. This shortcoming is probably less significant than the failure of most councils to introduce a user pays system for domestic waste services. Both pricing reforms are needed to remove disincentives to reducing waste.

Recycling economics

Beyond these pricing reforms is the even more complex issue of who should pay if recycling initiatives do not. In the post-consumer curbside recycling area – the most comprehensive for waste reduction – the council's costs of collecting and sorting products are often not even covered by sale of the recyclable materials. At the same time the financial cost to councils responsible for such programs has tended to increase.

In November 1994, the National Institute of Economic and Industry Research prepared a report for the Recycling and Resource Recovery Council, examining the economics of recycling in Victoria.

The report found that in the absence of any mandatory requirements on industry to recycle products, the costs associated with recycling were largely borne by local government and rate payers. It also found that with low waste-disposal costs, and at current product prices, broad range recycling collections were unlikely to be economic, whatever the yield – the only collections likely to be economic were those limited to glass and aluminum cans. Paper was economic to collect and recycle, but this was often done by separate contractors.

The Institute reported that repurchase prices of glass and aluminum more or less justified curbside collection, and repurchase prices of PET, PVC and LPB were likely to justify their inclusion in mixed collections in the typical municipality. But the repurchase prices of other recyclables, such as HDPE and steel cans, were likely to justify inclusion only where landfill costs were high.

Two main charging mechanisms are available to meet the residual costs of domestic recycling: council waste charges and product-specific charges (voluntary or otherwise). Market research conducted for the RRRC has indicated that people are willing to pay more for recycling, seeing it as an important service. Some local governments, such as Brisbane City and Knox City in Melbourne have recognized these resident preferences and are providing 240-liter MGB based curbside collection systems for recyclables.

The growing costs of curbside programs and the absence of an agreed framework within which to sort out who should pay and how this should be done has been a significant factor in slowing progress in waste reduction. The reliance on a voluntary approach has worked well until the past two years, when these unresolved conflicts about relative responsibilities have become more of a concern.

There is increasing evidence that larger garbage bins lead to greater volumes of garbage for disposal and lower volumes of material placed out for recycling. Linking reduced bin sizes with volume-based waste charging systems will reinforce waste reduction efforts.

More attention also needs to be given to the efficient implementation and operation of waste reduction programs. Local government attitudes are proving to be central on this point. Where councils are prepared to enter long term contracts for collection of recyclables, with rewards based on performance (tons or cubic meters of material collected rather than simply number of houses served), recovery rates can be high if the recycling services are reliable and of good quality and are supported by a user pays system.

Maintaining the pace

Several conclusions about maintaining the pace of waste reduction can be drawn from Australia's experience over the past decade.

Governments have an important coordinating role to play. They can undertake strategic analysis, bring various stakeholder groups together, support local community initiatives, support key demonstration projects and remove impediments to efficient waste reduction initiatives.

Charging for waste by volume or weight is relatively new in Australia. Several councils are conducting trials of volume charging (Maroochy in Queensland, Darebin in Victoria and Manly in Sydney) and the practice is expected to spread over the rest of the decade. This has the potential to encourage reductions not just in



post-consumer waste but also green and food waste which can be home composted.

Industry and Company Waste Minimization Plans can be very successful in reducing waste. Victorian Industry Waste Reduction Agreements show how this cooperative approach can work. But the agreements also show that specific performance targets need to be included, and the slow progress in delivering agreements indicates the need for some legislative back-up.

In some countries, such as France and Germany, high rates of return have been required for producers and levies invoked if these rates are not achieved. If Australia's easier voluntary approach does not deliver on industry waste reduction targets already agreed at a national level, Australia will need to consider a tougher approach. The community is likely to expect manufacturers of products which end in the waste stream to accept a greater degree of responsibility for those products throughout the product lifecycle.

Success stories

Despite the slowdown in progress towards waste reduction targets, successful projects in Victoria, Queensland and New South Wales show what can be achieved through different means.

VICTORIA

Melbourne's curbside collection system

The Recycling and Resource Recovery Council claims that Melbourne's curbside collection system is one of best in the world.

This success has been achieved even though the system is almost totally voluntary (there have been few pricing incentives or restrictions placed on the use of large volume waste bins), has

involved little capital expenditure or reliance on new technology (such as mobile recycling bins and mechanized separation facilities), and has been coordinated by a large number of small local governments.

The curbside collection system reaches all Melbourne households, and between 90 percent and 95 percent of all households across the State. This can be compared with the famous Canadian Blue Box system, which covers about 80 percent of households in the originating province, Ontario.

Participation rates in Melbourne are also excellent. In 1989 they were 36 percent of households. In 1994 it was 68 percent, and it is expected to rise to 80 percent by 1997 as durable containers become the norm and other initiatives are introduced to strengthen collection infrastructure (Table 16).

In 1994, 56 percent of all recyclable material was recovered. The highest recovery rates were 82 percent for glass beverage containers, followed by 70 percent for newsprint, and 60 percent for PET soft drink bottles (Table 17).

A report prepared for the RRRC by Ian Manning of the National Institute of Economic and Industry Research revealed that widespread use by local government of flat rate contracts with recycling contractors was discouraging higher participation rates. Coupled with low prices paid by reprocessors for some secondary materials, flat rate contracts did not compensate for the higher handling costs of increased volumes.

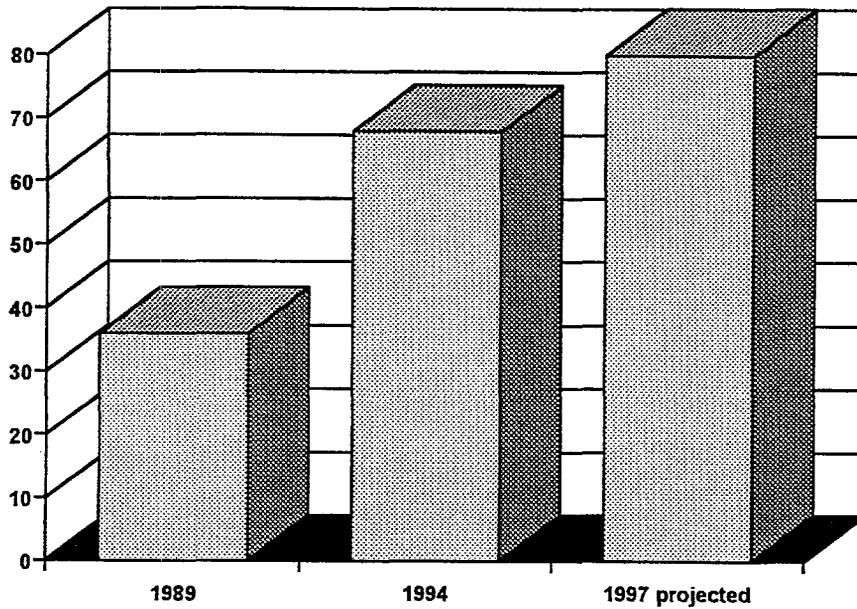


Table 16. Melbourne households participating in curbside recycling programs, 1989, 1994 and 1997
(Percentage)

Because of these threats to the viability and expansion of the curbside recycling system, the RRRC launched a \$A3.2 million Curbside Development Program in 1995. The program helps councils to adopt best practice in waste management, by reducing expenditure while increasing yields and collection costs of recyclables.

Funding under the program depends on the introduction of performance based contracts of three to five years duration. Contracts need to include a mechanism for managing price fluctuations of recyclables and the introduction of a durable recycling container. Councils eligible for financial assistance are encouraged to adopt user pays waste pricing, a curbside garden waste collection service, recycling at public venues and events within the municipality, regular community promotion and education programs, and a purchasing policy to buy recycled products themselves.

Other methods of improving the economics of the curbside collection system are also being encouraged. These include increasing the density of materials collected through households

crushing cardboard and plastic bottles; public education to reduce the levels of contaminant material; and integrating recycling and garbage contracts so that increased recycling yields lead to waste disposal cost savings for the council.

Late in 1995, the RRRC produced its own Model Performance Based Curbside Recycling Contract, which forms the basis for negotiations between

the RRRC and local governments.

Waste minimization and recycling project

Recent audits have established that waste from the construction and demolition industry accounts for 44 percent (by weight) of the demand for landfill disposal. The Recycling and Resource Recovery Council in Victoria has demonstrated how this can be changed in pilot project it sponsored with a \$A40,000 grant to Fletcher Construction Australia.

Fletcher Construction had decided that current industry practices were no longer adequate and had made it company policy to reduce waste on its sites by 25 percent.

The waste reduction project, known as RECON, was conducted over 16 months during the construction of the Dandenong Police and Court Complex, a \$A14.5 million project with a floor area of 10,600 square meters. The project results were benchmarked against the very

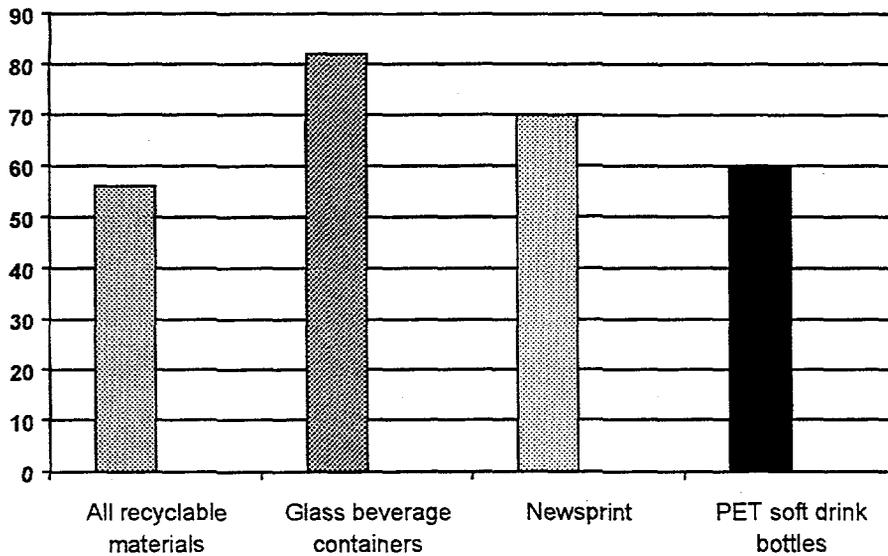


Table 17. Recovery rates for recyclable materials in Melbourne, 1994 (percentage)

similar Frankston Police and Court Complex being built at the same time.

The results from the pilot project are impressive. The landfill needs of the Dandenong project were 43 percent lower than Frankston's. The total level of waste produced by the RECON site was 15 percent less and 35 percent of the waste (by volume) was recycled. Waste removal costs at Dandenong were halved.

When Fletcher Construction Australia made its project report to the RRRC, it concluded:

RECON sets in place mechanisms for change in waste management practices in the Australian construction industry which have remained virtually unchanged for centuries. It also encourages new environmentally conscious attitudes among construction personnel which will heighten their general appreciation of the need for care of the environment.

The company stated that in the past, 'practices and attitudes have been disposal driven – fill the skip, empty the skip, fill the skip and so on.'

Results of the trial revealed substantial savings to the project, the environment and the whole community.

How RECON got results

The site superintendent was responsible for the development of the program, and one leading hand was responsible for implementing the program on the site.

The project began with analysis of the problem and examination of alternatives. An inventory of all wastes was carried

out on site, and a review made of the potential for reduction at source by establishing an ideal level of material consumption for each trade package. A study was made of which items were recyclable, the services available and costs and savings involved. Waste disposal costs were also examined.

The core of the waste reduction implementation was extremely simple. Receptacle bins were provided in appropriate numbers, and of practical size and type to ensure that trade contractors could comply with the program. This incurred no new capital costs to Fletcher or the sub-contractors, because funds raised from the sale of recyclable materials were used to offset waste costs, with enough over for social functions and contributions to charity.

Fletcher Construction developed a positive approach by workers and sub-contractors to waste minimization from the outset. Tenderers were contracted to participate in the program, and during their induction on site workers were briefed on the project and what was expected

from them. Records were kept of all waste types, volumes, costs and savings, and as results were produced they were posted on the site notice boards.

Tenderers for waste removal from the site were asked to submit prices based on the waste minimization program objectives. Scheduled prices for recycled waste and waste destined for landfill were requested. Because many recycling depots were closer than the landfill and did not charge fees, the removal costs for recycling material were 20 percent lower, and credit received from recycling merchants was returned to Fletcher Construction.

Separating recyclable material was not a problem. No additional labor was used to separate materials. Trades which caused the waste were responsible for placing it in bins, and very little became mixed.

Recycling enterprises for some wastes are still underdeveloped. Plasterboard, for instance, is one of the largest contributors to the waste stream, but there are no developed recycling plants for the board in Victoria. However, the RECON team worked with two small operators who crush or decompose the board, and sell it as a soil conditioner to farmers.

Other initiatives in the waste reduction program included the demolition and excavation contractors' reuse and recycling of materials from the old police complex which was demolished. The use of recycled material was encouraged on site, and crushed concrete and bricks were used for temporary roads. Some useful cost savings were made and disbursed to the social fund from these initiatives, but their main achievement was to reinforce a mindset to strive for waste minimization.

Processing recyclables

The Recycling and Resource Recovery Council works closely with industry and government

regulators to encourage more processing of recyclable material.

Concrete recycling is one of its success stories. In 1991, only 90,000 tons of concrete were recycled in Victoria, and the major processor was struggling to find markets.

Outdated quality specifications in government road building contracts meant that private contractors were wary of using recycled concrete. The Victorian EPA successfully lobbied to have the regulations altered to reflect the higher standard and consistency being achieved by the recyclers. As a result, private contractors were no longer reluctant to specify its use for road base material.

By 1995, Victoria was recycling 650,000 tons of concrete, and it had become the State's second most recycled material (Table 18). The major concrete recycler had won the RRRC's award for Recycler of the Year, and another major company had entered the industry and invested in a purpose-built mobile concrete crushing facility.

This was a great achievement in helping to reduce waste in the building and construction industry, which has been responsible for 44 percent of the demand on landfill space.

A similar success was achieved with the reuse of rubber tires. Victorians replace around four million vehicle tires every year. In the past, this potentially valuable resource was going straight into the waste stream, or at the margins, finding low value reuse in gardens and on farms.

Pacific Dunlop, a major manufacturer of rubber tires, has established a number of subsidiaries to collect and reprocess tires. At Somerton, north of Melbourne, it invested \$A15 million in a facility to shred, crumb and reprocess the discarded rubber tires. A subsidiary, Encore Rubber Technologies, has engineered a range of high quality products from the recycled material.

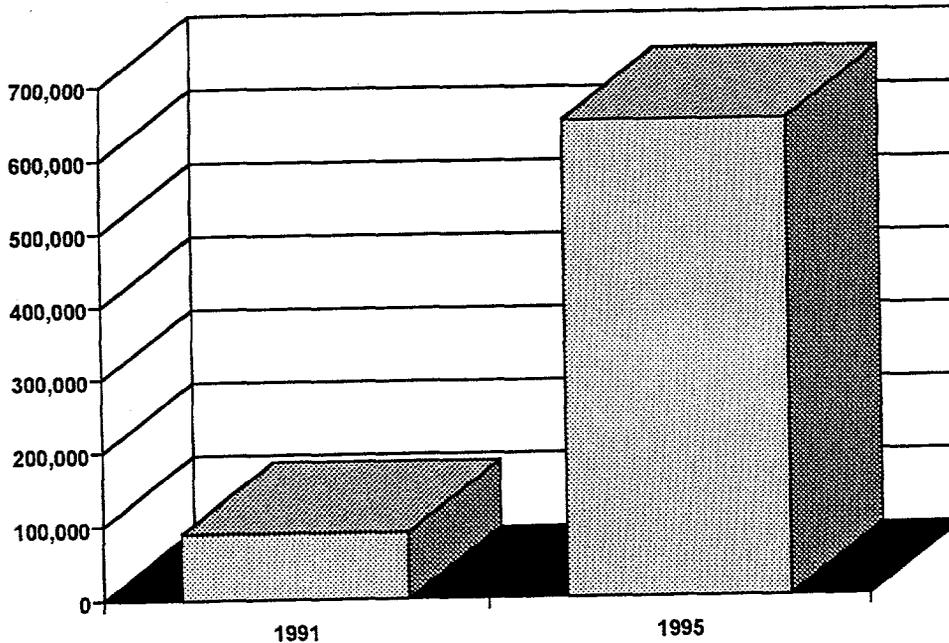


Table 18. Quantity of concrete recycled in Victoria (tons)

In 1992, the problem facing the business was not one of finding a market for discarded rubber tires, but rather, finding a steady volume of tires to feed the recycling processors. The Victorian EPA responded to the demand for disused tires by banning the disposal of all rubber tires to landfill.

Another Pacific Dunlop subsidiary, Tyre Cycle, could now collect 2.5 million of these discarded tires. The crumbed rubber goes back into new tire manufacture, road surfacing and adhesives manufacturing. A significant amount is also used to make paving surfaces in playgrounds, around pools and in shopping plazas.

The use of recycled rubber to produce water weeping hose is another excellent innovation. This hose uses 70 percent less water than conventional ones because there is no loss through evaporation.

A further 1.5 million tires are used as fuel at the Blue Circle cement kiln outside Geelong. This saves a considerable amount of natural gas in a very energy intensive industry, and was given

EPA approval because it does not result in any environmentally hazardous emissions.

Eaglehawk Recovery and Sales Yard

The Eaglehawk Recovery and Sales Yard is an example of a new focus on reuse of waste. Hundreds of companies are developing new recycled products in Australia. However, reducing waste at source and reuse of waste have been relatively ignored. Waste reduction,

recycling and utilizing recycled material provides opportunities for manufacturers who wish to take advantage of previously wasted resources.

This project was established in April 1994 when the Eaglehawk community realized that the local landfill facility would be filled in less than 10 years if waste was not reduced and reused. The yard is operated by Future Employment Opportunities, a non-profit community based organization, on the Eaglehawk landfill site.

The general aims of the operation are to provide a conservation-based alternative to traditional landfill methods of waste disposal and to create jobs for unemployed people. Specifically, the project aims to:

- provide an alternative to dumping unwanted goods to landfill
- recover resources that would otherwise be lost to the community
- give the community a practical way to recycle goods
- create new jobs at a time when there are insufficient jobs for local people

- develop the yard to be self-supporting so that it covers all operating costs including wages, vehicles costs and other overheads.

The yard is self-supporting and employs five full time workers. The break even point of \$1,400 a week was exceeded very early in its operation by \$800, and cash sales soared to a total of \$15,397 in May 1996. Over 270,000 kg of scrap metal is being recycled every six months.

The project includes an extensive training program to help meet the needs of job seekers in central Victoria, and seeks to create opportunities in waste recovery projects in other locations. The Recovery and Sales Yard course is conducted over 12 weeks with trainees attending for 30 hours a week.

The project is also involved in an extensive community education program about the need to reduce waste disposed to landfill.

QUEENSLAND

Brisbane's recycling and solid waste management

Every day of the year Brisbane Council accepts more than 2000 tons of solid waste into the refuse transfer stations and landfill facilities.

After extensive research, investigation and consultation, the council decided to build Australia's first and only fully engineered landfill for putrescible and other solid waste at Rochedale. The landfill is managed by Pacific Waste Management, a subsidiary of the multinational WMX Technologies.

The Rochedale landfill and four transfer stations replace nine old traditional tip sites. The landfill covers more than 200 acres and has a capacity of more than 10 million cubic meters for waste alone. The site and stations that feed it have cost the city more than \$A65 million to develop – more than \$22 million was spent on acquisition

and development of the landfill alone. The annual operating costs exceed \$A19 million.

The city's waste management program is the largest local government run system in the southern hemisphere and features in the world's top ten. The total service costs more than \$A50 million a year.

A state-of-the-art landfill

Brisbane Landfill is an engineered system which catches all the polluted water that seeps out of the solid waste as well as the landfill gas. It protects the ground, waterways, atmosphere and the people.

Mudstone is excavated on site, then layer by layer, pulverized, moistened, kneaded, rolled and compacted into a 900 mm thick clay liner for the base and sides of each cell of the landfill. Above the clay, a virtually impregnable HDPE layer is placed. When the cell is full of solid waste, the top is covered with 900 mm of clay, topsoil and grass to stop rain getting in and gas getting out.

A 1 percent slope on the base liner drains the leachate to a sump. From here it is pumped to a treatment plant, then discharged to sewer.

Methane from the landfill gas is used to heat kilns at the brickworks.

The system is highly mechanized and controlled. For instance, only a small area is needed to bury the solid waste arriving in transfer trailers from the four transfer stations. The driver reverses his trailer, opens the back door, then pulls a hydraulic lever. This starts the walking floor on the bottom of the trailer and load moves out. Throughout the day soil is progressively pushed over the solid waste.

An Environmental Education Centre near the landfill site teaches environmentally responsible solid waste management.

Brisbane people do not take their waste to the tip. They take it to one of the four modern, fully



enclosed transfer station buildings. These modern facilities are staffed by Pacific Waste Management, set in landscaped gardens, accessed via a computerized weighbridge and monitored to ensure that hazardous waste is not jumped illegally.

In the enclosed building, general waste is disposed into a central pit, and recyclables are placed in a special containers. There is a separate section for small quantities of household wastes for special treatment, such as appliance batteries and containers of old paint and pesticides.

An open area is set aside for woody material to be shredded and old car bodies to be recycled.

Each weekday 50 trailer loads of rubbish are hauled from the transfer stations to the Brisbane Landfill. All trucks leaving the landfill site are washed down so that roadways do not get littered or contaminated.

Collecting the waste

The city contracts to just two companies to collect refuse in the north and south of Brisbane and operate a recycling service. Over 230,000 households are provided with an additional 240 liter wheelie bin with distinctive yellow top, and this is collected fortnightly. The collection system is highly mechanized – a robotic arm on the side of the truck picks up the wheelie bin and tips its contents into the truck.

Five products are accepted for recycling; newspaper, plastic (PET, HDPE, PP), glass, cans (aluminum, steel and aerosol), and liquid paperboard.

Before including any of these products in the collection scheme, the council entered into agreements with the respective industries to accept all products collected through the curbside recycling program for the full term of the contract.

About 48 percent is domestic waste and 52 percent industrial and commercial. Curbside recycling has reduced domestic volume by about 20 percent and the next target is green waste, followed by putrescible waste.

Because of its unique position, Brisbane City was able to make a detailed analysis of the composition of its total waste stream.

Initially, it undertook this survey to support its case in getting Pratt Industries to establish a paper recycling facility in Brisbane. Pratt required access to 140,000 tons of material a year.

The survey also highlighted that packaging across the waste stream was about 30 percent – far more than the 10 percent claimed by the Packaging Industry.

In the early 1980s rates for collection were more than \$A10 a cubic meter. Until 1990 there was a downward trend in charges, averaging less than \$A7 a cubic meter, even though disposal of waste averaged \$A13 a ton. The current collection rate is \$A10 a cubic meter.

Ralph predicted that because collection charges had been uncharacteristically low for such a long period, and realistic disposal costs had increased dramatically, rate payers could expect to be paying two to three times the current collection costs shortly.

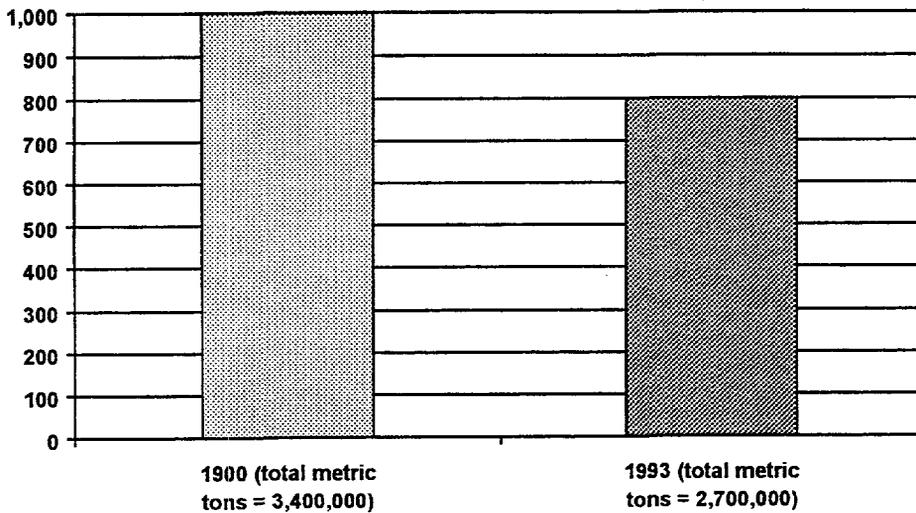


Table 19. Waste per person going to landfill in New South Wales, 1990 and 1993
(kilograms per person)

NEW SOUTH WALES

Legislating for waste management

At the end of 1995, the New South Wales Government reformed the State's waste management legislation and tackled the gaps and weaknesses of the Council Recycling Rebate Scheme which had operated for the previous five years. The Government set the ambitious target of reducing by 60 percent per person the amount of waste going to landfill.

These graphs show a steady decline from 1990 to 1993, from approximately 3.4 million tons to 2.7 million tons, or from approximately 1,000+ kilograms of waste per person per year to less than 800 kilograms (Table 19).

The total waste figure combined council and commercial/industrial waste. An increase in commercial and industrial waste began pushing the figures up again, and the amount of building and demolition waste going to landfill in 1994 had grown by 21 percent.

This reversal threatened the success of the national target of 50 percent reduction in waste going to landfill, and the NSW target of a 60 percent reduction per head. It was considered to show the inadequacies of the national waste minimization and recycling scheme negotiated in 1992. The scope of this scheme was limited and its structures loose. It applied mainly to packaging, ignoring worse waste-generating

industries. It placed too much emphasis on domestic waste even though this comprised less than 35 percent of the solid waste stream. It had unambitious reduction targets, and even these were voluntary. The targets largely related to curbside recycling collection targets, rather than waste avoidance measures. The scheme monitored performance against targets poorly.

During the five years between 1990 and 1995, the State Government had provided Sydney councils with \$14.4 million, partly sourced from a levy at landfill, as a rebate for volume of material recycled. The landfill levy was established under an amendment to the *Waste Disposal Act, 1970*. Councils received a rebate of \$A20 for each ton of recycled material collected. By mid 1995, 45 councils were participating in the scheme, compared with 21 at its inception. In the second and third quarters of the year, 98,800 tons of material were recycled, including paper, cardboard, glass, PET and other plastics, aluminum cans and steel cans. This tonnage represented more than a 100 percent increase in collections since the same period in 1991.



The CRR Scheme was discontinued at the start of 1996, and replaced by a new scheme. In 1991, 21 of the then 41 councils in Sydney operated regular weekly or fortnightly curbside services on the same night or morning as their garbage collections, and only four provided their residents with containers for storage of recyclables. At July 1995, all 42 councils provided these services, and only four did not provide containers. During this four-year period recycling increased from 27 kilos to 62 kilos per head per year (Table 20). Domestic waste comprised 35 percent of the entire waste stream, and 15 percent of this was being recycled, making Sydney one of the world's best recyclers. But commercial and industrial waste was on the increase, and the domestic recycling gains proved to be the easy yards. The Government concluded that encouraging more recycling by itself was no longer the easy answer to reducing waste and meeting the overall waste reduction target.

In December 1995, the *Waste Minimization and Management Act* became law. Like similar

legislation in Victoria, this Act established a State Waste Advisory Council comprising local government, industry, the waste industry and consumer and environment groups. It also organized local government into regional waste management groups. The law superseded the old council Recycling Rebate Scheme, and replaced it with a new Waste Planning and Management Fund financed from consolidated revenue. The State Government continued to collect a levy at the landfill sites, and committed \$35.8 million to the fund in the first three years.

The major difference in the NSW legislation is that the EPA is given greater powers, such as the opportunity in set circumstances for the Minister to require individual companies or industries to meet nominated waste reduction targets, product reuse levels and financial support for community recycling efforts. This power forms part of a Producer Responsibility Scheme involving the development of binding commitments on industry sectors in comprehensive Industry Waste Reduction Plans. Although, the new law envisages that these

plans will be developed voluntarily between industry, the EPA and the Advisory Committee, in line with nationally agreed industry reduction targets (ANZECC 1995), there is the opportunity for mandating such plans where cooperation breaks down.

The new fund was established to overcome perceived problems with the existing waste disposal levy. It was

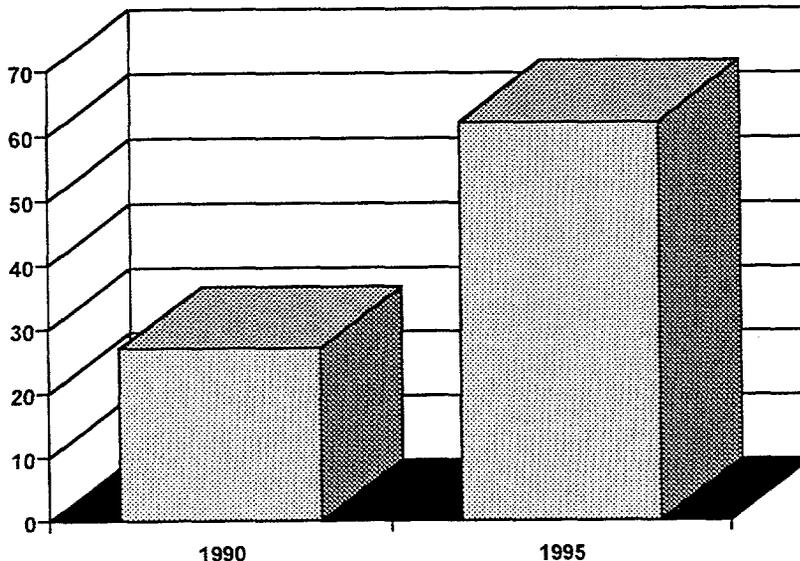
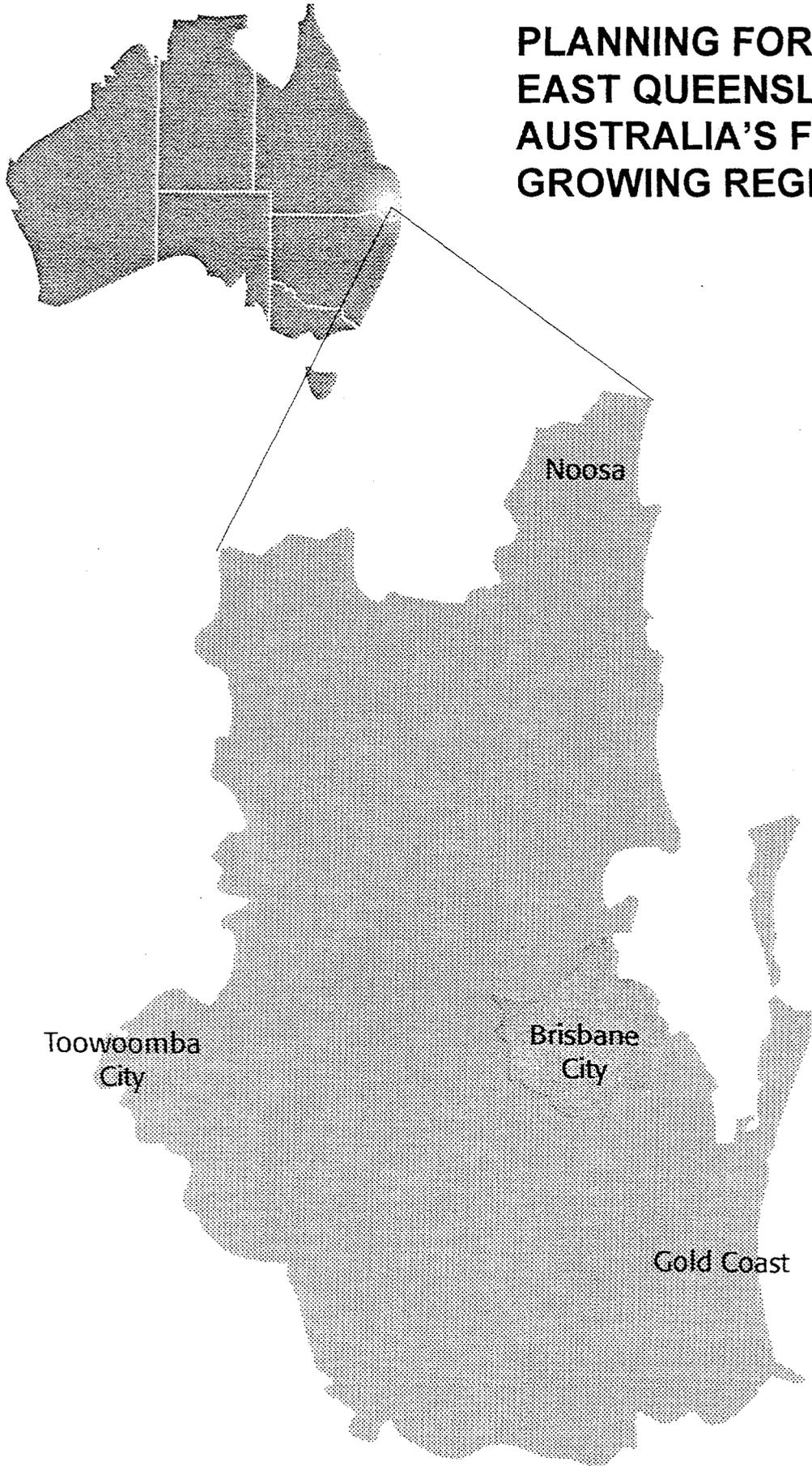


Table 20. Per capita material recycled by municipal councils participating in New South Wales Government recycling rebate scheme (kilograms)

considered that the old levy provided a financial disincentive to waste disposal and reflected the fact that landfill prices did not incorporate all of the environmental and social costs of waste disposal. It levied all metropolitan landfills the same, irrespective of whether they were conducting disposal or recycling activities. There was no power for the EPA to provide rebates for beneficial uses of waste. Disposal sites on the fringe of Sydney and in the rest of NSW were not covered by the same levy.

The fines and penalty structure is the same as for air and water pollution offenses – a maximum penalty for breaches of license conditions of \$A125,000 for a corporation (with a daily maximum of \$A60,000), and a maximum penalty of \$A60,000 for an individual (with daily maximum of \$A30,000). In the case of poor performance, the new law also allows for product bans, ‘take-back and utilize’ requirements, and the imposition of a waste reduction bond as a financial guarantee for promised waste reduction commitments.

PLANNING FOR SOUTH EAST QUEENSLAND: AUSTRALIA'S FASTEST GROWING REGION





This case study examines the process and outcome of designing a regional plan for South East Queensland, an area where strong population growth and migration has placed great pressure on urban infrastructure and the natural environment. It is estimated that growth in this region between 1991 and 2011 will account for almost one third of Australia's total growth.

Local, city and state governments worked cooperatively with communities and interest groups to design a comprehensive regional plan – the 1995 *SEQ Regional Framework for Growth Management* – for an area where jurisdictional and legislative arrangements had been ill-defined. The plan has a strong emphasis on open space and environmental protection.

The study also examines planning initiatives of Brisbane City Council, which has developed its own sectoral strategy – *Brisbane 2011* – and embarked on a major corporate development process for achieving its ambitious goals for the city. It also looks at some of the new information systems, including a user-friendly Environment Management Information System that alerts decision makers to environmental issues affecting any property in the City of Brisbane.

PLANNING FOR SOUTH EAST QUEENSLAND: AUSTRALIA'S FASTEST GROWING REGION

An integrated land use planning process was introduced in South East Queensland (SEQ) as a response to serious environmental problems arising from unplanned incremental growth.

Population growth

SEQ has attracted growth suggestive of the 'sunbelt phenomenon' observed in the USA and other advanced western economies.

This is the fastest growing region in Australia. It is estimated that its population increase between 1991 and 2011 will account for almost one third of the nation's total growth, more than the total growth in Sydney or the total population of Adelaide.

Over the past five years the population of SEQ has grown by over a quarter of a million, primarily as a result of migration from interstate. By 2011 another one million people will have been added to the region since 1991 increasing the total population to between 2.9 and 3.2 million (Table 21).

The pattern of urban development

Most of the region's population growth has been absorbed through outward urban expansion. This is characterized by incremental, low density land subdivision scattered over numerous fronts on the fringes of established urban areas.

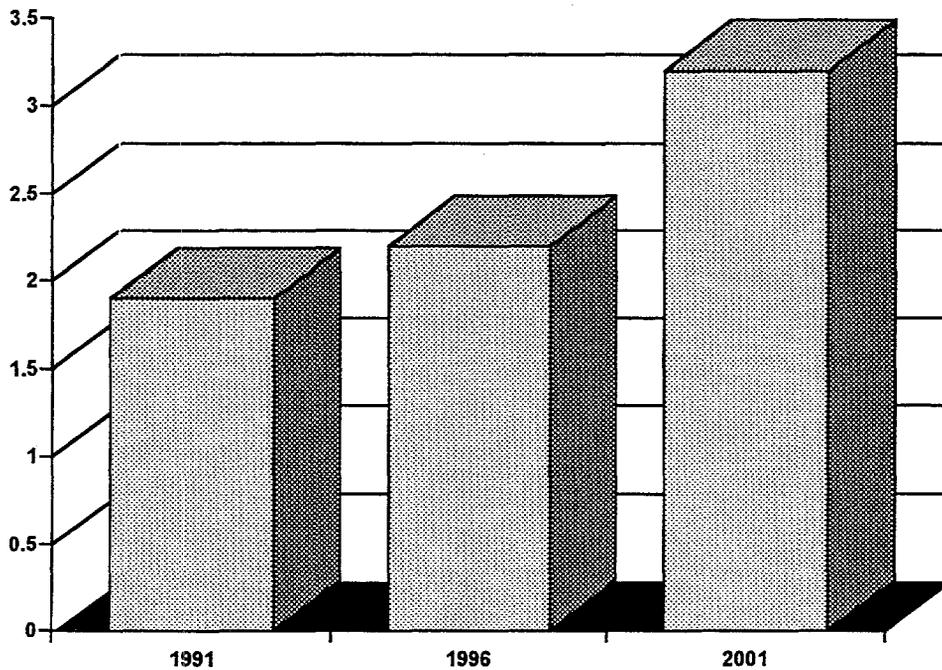


Table 21. Population of South East Queensland (millions)

The SEQ Region

The Pacific Ocean forms the eastern boundary of the South East Queensland (SEQ) Region, which stretches 260 kilometers from Noosa in the north to the Tweed Shire just north of the New South Wales border, extending 130 kilometers inland to Toowoomba

South East

Queensland enjoys a favorable sub-tropical climate within a rich and varied natural setting that includes fine beaches, broad rivers, extensive remnant rainforests and highly productive and attractive agricultural lands.

The current population of the region is approximately 1.9 million with 1.45 million residents in the Brisbane Statistical Division (Greater Brisbane). These populations support a wide range of advanced personal and business services as well as diverse cultural activities.

About 85 percent of new housing in these growth areas is constructed in 'urban residential' subdivisions. These developments are primarily for detached, single household dwellings. More than 50 percent of newly created dwelling allotments are more than 600 square meters in area. The land subdivision typically occurs as a separate development from housing construction; subdividers offer fully serviced lots (i.e. water, sewerage, drainage, on-site roads, power, telecommunications) to speculator builders or end users.

The remaining 15 percent of new housing construction on the urban fringe occurs in 'rural residential' subdivisions – acreage development without sewerage. Again, these subdivisions are usually undertaken in advance of, and separate from, housing construction.

Population growth has been concentrated in those parts of the region which are either on the coast or have rapid access to it

Environmental challenges in SEQ

Land resources

At the beginning of the present decade, urban development in South East Queensland occupied 179,000 hectares with approximately 143,000 hectares in standard urban use and



36,000 in rural residential use. Growth in accordance with recent trends would see a need for a further 155,000 hectares (110,000 urban and 45,000 rural residential). In many parts of the region, these demands would exceed stocks of land deemed appropriate for urban development in local planning schemes.

The result of such pressures would include the displacement of agricultural activities both directly through conversion of farm lands and indirectly through increases in local land values, subdivision of farms into uneconomic units and the introduction of incompatible land uses. Pressure on the natural environment would also increase.

In the mid seventies, 44 percent of the coastal part of the region (i.e. the areas east of a line from Nambour to Beaudesert) was covered in remnant, pre-European vegetation. By 1990, this proportion had dropped to 36 percent, indicating an annual clearing rate of 3,000 hectares.

If current trends were to continue, a range of forested areas would be placed at risk. Some rainforest areas on the Sunshine Coast would be threatened, but the major impacts would be felt in *Eucalyptus* and *Melaleuca* open forests and woodlands. These are known to provide habitat for many rare and endangered species.

Air quality

Current urban development trends in the region also imply a continuing mismatch in outer urban areas between local jobs and resident workers. In the outer suburban areas of Greater Brisbane only 43 percent of the resident workforce is employed locally.

These mismatches mean greater demands for travel, particularly by private car. This, in turn, generates the potential for serious air quality problems in the region. The Air Pollution Potential (APP) index developed by the Bureau of Meteorology indicates that there are more

days with high pollution potential in Brisbane than in Melbourne, Adelaide, Perth or Newcastle. This is due to the higher temperatures, clearer days and lighter winds that prevail in SEQ.

Water quality

The region's wastewater treatment infrastructure is substantially at or near capacity. Major new investment will be required over the next 20 years.

Most existing wastewater plants provide for secondary treatment only (i.e. there is no provision for removal of nutrients) and use river or near-shore sea outfalls. Little is known about the assimilative capacity of these aquatic ecosystems because detailed and systematic data collection on water quality is a relatively recent practice.

However, the indications are that the ecological values of the Brisbane River at least have been substantially degraded through a combination of sewage discharges, untreated urban stormwater run off, continued dredging (for shipping and gravel mining) and flood mitigation measures upstream, which have reduced the natural flushing characteristics of the river's lower reaches. Continuation of existing growth trends and servicing strategies would exacerbate these problems.

The SEQ2001 Project

Origins

Rapid growth is not a recent phenomenon in SEQ. The region has sustained rates of growth well above national averages for more than three decades.

By the late 1980s there was a widespread view in South East Queensland that growth pressures had increased beyond the community's 'comfort

margin'. Through media commentary and other forums, concerns were being expressed that relentless urban sprawl could bring about a 'Los Angeles' scenario, threatening the environmental quality and relaxed lifestyle of the region.

During this time Brisbane City Council played a key part in generating a more coordinated, region-wide response to the growth pressures confronting South East Queensland.

Notwithstanding the size of Brisbane City, it had become clear that planning actions confined to the council's boundaries could not guarantee protection of Brisbane's high standard of livability. Extensive modeling work commissioned by the council had demonstrated that the central part of the region was under considerable pressure from commuter flows. This would impact on residential amenity, the viability of traditional commercial centers on major roads and, as noted, air quality.

In December 1990, the State Government called a conference to discuss the implications of rapid growth for the livability, ecological sustainability and economic development potential of the region. The conference, attended by more than 300 people from a wide cross-section of the community, called for the establishment of a broad-based group to develop recommendations for growth management.

SEQ process

Regional planning has had a checkered history in South East Queensland. A Federal Government sponsored planning exercise covering much of SEQ had been carried out in the early 1970s (the *Moreton Regional Plan*). This had a limited impact. The plan was a technically oriented undertaking with minimal resources being deployed to build the coalitions of interest necessary to support its implementation. The relative autonomy of the local government

sector in Queensland was an important factor in this regard.

The SEQ2001 Project was established to plan for the region's projected population increase, following the December 1990 conference. A Regional Planning Advisory Group representing all levels of government and community sectors was established in July 1991.

The brief for this group was to establish principles to guide the management of growth to achieve social, economic and environmental objectives; identify gaps in current policies; and to identify priority tasks to protect environmental values, integrate urban growth and transport and achieve urban consolidation.

This strategy came very close to failing. At a mid-term review of SEQ2001 in late 1992, a number of councils, together with elements of the business sector, argued strongly that the project should not proceed to the production of a Regional Outline Plan. They proposed that a regional plan should evolve on a 'bottom up' basis, by allowing individual councils to review their strategic plans in the light of sectoral policies and principles developed by the SEQ2001 Project.

Again the influence of Brisbane City as a leading council in the region (and Chair of the South East Queensland Regional Organisation of Councils) was important in averting this shift in direction.

Brisbane City subsequently played a strategic role in shaping the Regional Framework and Regional Outline Plan. The council often led the debate by proposing relatively radical positions on crucial aspects of the plan, such as commitments to public transport and, initially at least, the need for higher densities across the region.

The Regional Planning Advisory Group's draft recommendations (contained in the report *Creating Our Future*) were released for public comment in July 1993. The final



recommendations were published in April 1994 in the *Regional Framework for Growth Management (RFGM)*. They received broad endorsement by local, state and federal governments.

In addition, policy papers were prepared on 15 topics, as well as a two-volume report – *The Preferred Patterns for Urban Development for South East Queensland and Institutional Arrangements for Growth Management*

Following release of the RFGM recommendations, the SEQ2001 Project moved into the implementation phase. The Regional Planning Advisory Group was replaced by a high level Regional Coordination Committee, comprising representatives from the three spheres of government and chaired by a Queensland Government Minister. This committee oversaw the preparation of sub-regional structure plans by sub-regional organizations of councils covering, respectively, Brisbane City and the northern, western and southern segments of the region. The sub-regional structure plans tested and fleshed out a number of the recommendations contained in the RFGM. A number of key sectoral strategies on integrated transport planning, regional open space, water resources and infrastructure coordination were also prepared.

Taking into account the outcomes of the sub-regional planning process, the Regional Coordination Committee endorsed a revised and expanded version of the Regional Framework in September 1995 – the *South East Queensland Regional Framework for Growth Management*. The following summary is based on this document, which is referred to simply as the Regional Framework.

‘The Plan’

The SEQ Regional Framework identified 100 planning principles grouped into 15 sections

such as economic resources, air and water quality, urban growth and transport. Priority actions are identified in each section and lead agencies nominated for each task.

Key policies are:

Urban growth. Urban expansion will continue but will be located in four nominated areas – Brisbane, the Sunshine Coast, the Gold Coast, and Toowoomba. Detached housing on single lots will continue to dominate. There will be some infill development. The objective is to reduce urban expansion to 60 percent less than current trends to the year 2011 using about 42,000 hectares.

Integrated land use and transport planning.

Integration will aim to increase public transport use by the year 2011. High density residential development will be concentrated around major regional centers linked to public transport. Developments will be concentrated around Coomera on the Brisbane to Robina Rail line and on the Sunshine Coast.

Protection of environmental assets.

The four development areas will be separated by open space and non urban areas. Specific environmental assets will be protected. A regional open space system will be based on nature conservation and recreation areas linked by corridors of public land.

Major centers

Seven key centers have been identified as major retail commercial and cultural locations. These will be supported by a network of major district centers, linked to public transport, and will bring employment closer to residential areas. Together with integrated land use-transport planning measures, the centers policy aims to reduce total vehicle travel by 10 percent and total vehicle emissions by 20 percent over existing trends.

Implementation

The Committee established to implement the SEQ Regional Framework is responsible for its review in response to trends and needs; for monitoring progress and advising the Planning and Infrastructure Coordination Committee of Cabinet each year on both implementation and the results of monitoring; and for facilitating sub-regional and sectoral plans. It also has the crucial role of ensuring these plans are consistent with the Regional Framework and promoting the Framework's integration into local government planning schemes.

The Queensland Government made it clear that the SEQ2001 project was to be a cooperative process involving all levels of government, business and community sectors. A new tier of government or a planning authority to manage the region was not intended. Instead, principles and policies to guide the future pattern of development were to be developed through consensus and implemented through existing state and local structures.

While the Regional Framework is not legislative or prescriptive, there are some stipulations, and local councils are to have regard to its provisions in carrying out their land use planning responsibilities. Local government is particularly important to the implementation process. It has a powerful role in land use planning in Queensland through its development and administration of planning schemes. If the SEQ2001 process and the Regional Framework are to have any impact on managing development and growth in South East Queensland they must be implemented through state and local government land use planning decisions. It is intended that all spheres of government will endorse the plan and sign a Memorandum of Agreement to commit all parties to its implementation and monitoring.

The apparent tension between the cooperative nature of the Regional Framework and the

objective of ensuring that development is properly planned according to its principles is recognized in the wording of the priority actions for key areas. The urban growth section recognizes that urban expansion must be located in suitable areas and that urban design and form are critical elements of this planning. It identifies a development pattern by mapping the four future growth areas, separates them by non-urban areas, and stipulates that growth should be excluded from areas of nature conservation and open space significance. It also requires that this development pattern be implemented through local government planning schemes and that planning schemes and government decisions be consistent with the Regional Framework.

In keeping with the consensus and voluntary nature of the regional planning model pursued in Queensland, councils are not under immediate statutory obligation to amend their planning schemes. Many priority actions are qualified, as in the requirement that the indicative growth pattern be implemented subject to ongoing refinement. Many actions are made the sole responsibility of local government, such as the specification of maximum and minimum residential densities. Ultimately the effect of the Regional Framework's implementation will depend on the strength and clarity of its policies, how well these are implemented through the priority actions, and whether the Queensland Government is ultimately prepared to intervene if monitoring reveals that the plan is being ignored.

Successful implementation of SEQ2001 project also depends on complementary reforms concerning infrastructure funding and coordination, the regulation of activities impacting on the environment and the institutional machinery for planning in Queensland. These actions are outlined in **Appendix 2.**



Critique of SEQ2001

A number of aspects of the SEQ2001 process have been questioned. These include:

Implementation and institutional arrangements. Regional planning policies relying on voluntary implementation and matrix management models and institutional systems including budget coordination have generally not provided lasting plans for development and protection of environmental assets elsewhere in Australia. Even statutory regional planning controls have generally either not been fully implemented or have been substantially altered.

Regional centers. Designating a small number of hierarchical regional centers may be incompatible with changes in economic and employment patterns, particularly the increase in part-time work, establishment of home-based small businesses, the dynamic nature of economic restructuring, loss of traditional jobs and growth in new services. These emerging patterns may be more suited to greater dispersal and self-containment in a larger number of smaller mixed use activity areas based on public transport.

Transport. Assuming an increase of 50 percent in public transport usage may be unrealistic unless accompanied by major changes in urban form away from separated residential, retail, office and service uses and detached housing on large lots, to mixed use activity centers and a housing density of 25 lots per hectare based around public transport. Although improved integration of public transport and land use is proposed, a continuation of conventional urban development characteristic of car-dependent Australian suburbs will continue to be the norm. As a result, the required increase in public transport trips as a percentage of total trips is unlikely to increase by the required 11 percent from 7 percent in the SEQ region.

Residential development. The Regional Framework assumes a uniform regional increase

in average dwelling density of 15 lots per hectare (a 50 percent increase on densities achieved in current conventional development) along with an increased residential density in existing areas through infill development. Even this moderate increase is unlikely to be achieved unless made mandatory, given consumer reaction and the domination of market preferences by the developer industry. The general trend in other Australian cities and similar cities in other countries is of substantial population growth to the urban fringe despite increased dwelling density.

Policy framework. The Regional Framework's policies and priority actions are often general and conditional and many identify future processes rather than outcomes. This makes it difficult to monitor and evaluate the plan regardless of the effectiveness of implementation procedures.

Queensland's planning system. In Australia, urban planning is the constitutional responsibility of state governments: local governments are the creatures of the state and do not have separate constitutional recognition.

Under Queensland's current laws, local governments are empowered to make local planning schemes. In SEQ at least, such schemes generally have two elements. A *strategic plan* describes the preferred pattern of settlement in outline terms and provides the policy framework for development control. This is supported by more detailed *town plan* provisions featuring cadastrally based zonings and land use regulations.

Because local councils operate their planning schemes under the authority of the state, rezonings and new or modified planning schemes must be approved by the State Minister for Planning.

In Queensland, unlike some other states, local government has primarily responsibility for the provision of water supply, sewerage, local roads and other basic infrastructure. The State Government, on the other hand, has responsibility for supplying most social infrastructure, including primary and secondary schools, hospitals, community health centers, subsidized public transport and a range of family and community facilities. These differing roles and responsibilities can lead to different perspectives on the preferred pattern of development in particular areas.

The current legislation makes no explicit provision for regional planning, which in SEQ has been undertaken on a consensus basis led by the State Government.

The core of Queensland's planning legislation dates back to the 1930s and draws heavily on British town planning models. In May 1995, however, the Queensland Government released the draft of a new Planning Act. This is discussed later in this chapter.

Sub-regional planning – Brisbane 2011

About Brisbane City

Queensland's capital and largest city, Brisbane, is situated on the Brisbane River in the South East Region of the State (Figure 1).

Brisbane City Council is different from other

SEQ2001 implications for Asia's cities

Many major Asian cities face growth challenges far greater than those of most rapidly expanding Australian cities. Such scale differences may limit the transferability of the voluntary and consensus driven models of regional planning which have been developed in Queensland. Nevertheless, the SEQ2001 experience may offer some useful lessons for other cities in the Asia Pacific Region.

The harmonization of infrastructure pricing and planning controls in pursuit of improved environmental outcomes is a lesson worth learning. Shaping settlement patterns through price signals assumes particular importance in the context of a state where there is long standing commitment to an essentially market-driven land release system. Another possible lesson concerns effective linking of planning processes and state budget processes without resort to major, centralized coordination bureaucracies.

A key contribution of the SEQ2001 process was the clear demonstration that medium term environmental outcomes are quite sensitive to changes in urban structure. In particular, it demonstrates the advantages of concentrated decentralization of employment in metropolitan areas.

SEQ2001 has also been important in developing advanced analytical tools for planning. The outstanding example of this is the regional GIS, which has been a valuable source of information for the Brisbane City Council's Environment Management Information System (EMIS).



city governments in Australia, in that it has responsibility for many functions carried out by state governments in other parts of the nation. The *City of Brisbane Act 1924–1987* gives the council an extremely wide charter, largely transferring ‘home rule’ to Brisbane – the only city in Queensland to have its own separate statutory charter. This was an unprecedented delegation of powers to a local government authority in Australia.

These powers were delegated in 1925 because Brisbane was then considered the most backward capital city in Australia. A new city government was established by merging 20 councils and various boards administering hospitals, utilities, bridges and roads. As a result of these mergers, Brisbane City now covers a large area (1,220 square kilometers). In 1993 there were nearly 300,000 ratable properties and an estimated resident population of 776,000 within the city boundaries.

The Brisbane City Council is responsible for a wide range of undertakings and services, including town planning, distribution of water supply, sewerage, municipal buses, ferries, cemeteries, libraries and traffic improvement works. It has an annual budget of more than \$A1 billion to maintain the large range of services and infrastructure, which includes over 5,000 kilometers of roads and bridges, and 7,000 hectares of parks. Almost every home in Brisbane is seweraged, involving 6,000 kilometers of sewer pipes and 11 treatment plants. The city also operates a fleet of 550 buses and 11 cross-river ferries.

The council uses six dams, four water treatment plants, 42 reservoirs and 70 pumping stations to supply water to the city. The Brisbane River makes a 19-kilometer journey through the city to Moreton Bay.

Because of its size and complexity, Brisbane City has been a major player in planning the

future of both the city and the region of South East Queensland.

The Environment Management Branch of Brisbane City is an example of its institutional capacity. It has approximately 50 staff, and its sole function is to engage in environmental research, policy and planning for the city. Policy implementation is carried out by other operational branches of the council. The Environment Management Information System described later in the case study is just one of the many initiatives of the council’s Environment Branch.

Brisbane City planning

With a population of 763,000, Brisbane City is one of the largest local governments in the world.

Along with the three other sub-regional planning processes undertaken elsewhere in the region during 1994–95, *Brisbane 2011* was intended to flesh out and test the recommendations put forward in the draft Regional Framework for Growth Management (April 1994). In particular, this planning process reviewed the achievability of the population and employment distribution targets then proposed for Brisbane by the Regional Planning Advisory Group.

Brisbane 2011 also forms the basis for a comprehensive review of the Brisbane Town Plan.

Some major features of the draft *Brisbane 2011* plan are listed below as an example of the sub-regional planning process.

Population and housing

- A population target of 900,000 in 2011 is proposed. This compares to medium series forecasts of 855,000.
- Sixty percent of new dwelling requirements are to be met through outward urban expansion. About 4,500 hectares of raw land are to be converted to urban development at slightly higher densities than those evident in recent trends for Brisbane (11.5 dwellings per hectare compared with 10.5). Most of the growth is projected to occur in the suburbs on the southern fringe of the city.
- Of the new dwellings to be provided in the established parts of the city, the lion's share

will be located in the 'city core' district (which includes several major infill development opportunities in the Roma Street railway yard, South Bank and Highgate Hill) and in the inner north-eastern suburbs which feature a large stock of obsolete factories and warehouses suitable for redevelopment or conversion to residential uses.

An Environmental Vision

All Brisbane's planning documents are prefaced by reference to the framework in which they have been prepared – the *SEQ Regional Framework for Growth Management* and the aims of the council's 1991 Environmental Vision.

1. Flora and fauna protection through the establishment of a well-designed open space network.
 2. No net loss of wetlands and protection of forested foothills and waterways vegetation.
 3. Water quality standards to ensure safe recreational use of the Brisbane River and its waterways.
 4. No increase in 1991 levels of air pollutants by the year 2000.
 5. Soil and tree retention and maximum efficiency in water use.
 6. Minimization of solid and liquid waste creation and encouragement of recycling and reuse of materials.
 7. Effective controls over road, aircraft and industrial noise levels.
 8. A 20 percent targeted reduction in greenhouse gas emission levels.
 9. The highest standard for the transport, storage and disposal of hazardous goods and the management of contaminated land.
 10. The highest levels of environmental responsibility for business, the community and the Brisbane City Council.
-



Employment and economic development

- A key policy of *Brisbane 2011* is to reduce the extent of commuter flows through central city areas. According to the draft plan, Brisbane is to accommodate 650,000 jobs by 2011 – approximately 66 percent of the total job stock in the Brisbane Statistical Division compared with 78 percent in 1991.
- More than 40 percent of the job additions in Brisbane are expected to be in the CBD and Gateway Ports Area (Brisbane's domestic airport, international airport and seaport are co-located in areas around the mouth of the Brisbane River. This is a key resource for export-oriented industries and support services).
- Two suburban commercial and retail centers designated as major district centers in the 1995 Regional Framework – Chermside and Upper Mount Gravatt – would be strengthened as employment hubs. New outer urban employment areas would be developed at Heathwood–Parkinson (industrial) and Brookside–Mitchelton (retail), Toombul–Nundah (retail) and Sunnybank–Calamvale (retail) to further reduce commuter pressures on central Brisbane.

Transport

- The focus is on travel demand management involving indirect pricing, direct pricing (pending cooperation and leadership from the State Government) and reorienting job-to-residence patterns as indicated above. Investment in new roads would be the option of last resort.
- New public transport investment is to strengthen the roles of the Chermside and Upper Mount Gravatt centers and better

integrate key employment locations in the central sector of the city, i.e. the airports, Fortitude Valley, CBD, South Bank and the University of Queensland.

Green space

- *Brisbane 2011* proposes a Green Space System to reflect and extend the Regional Open Space System. The Green Space System will comprise major reserves, parks and sporting fields, public or private lands with ecological and/or environmental or scenic value (with or without public access) and land with rural amenity value (usually in private ownership and currently in low density residential use).
- The Metropolitan Green Space System would cover 55,000 hectares or 48 percent of Brisbane. The draft plan proposes that all of this land be protected from intensive urban development.

Another of Brisbane Council's environmental initiatives is a computer system that highlights environmental issues in planning matters.

An Environment Management Information System

Introduction of an on-line Environment Management Information System (EMIS) to staff computer terminals has boosted the Brisbane City Council's environment management capacity and helped decision makers become better informed and more accountable for actions affecting natural features and systems. EMIS alerts council officers to the existence, type and significance of every environmental issue associated with any property within the City of Brisbane before they make decisions about it. This helps to avoid any unforeseen detrimental effects these decisions could have where, for instance, rare bushland or species are involved. It also provides a means of mapping environmental change.

EMIS was introduced as part of Brisbane City Council's policy of integrating environmental management with mainstream decision making. It began as an in-house project to provide accurate and up-to-date information for environment management practitioners and to make all decision-makers more aware of environmental issues.

Rather than introducing new, more sophisticated GIS technology, the council decided to use existing systems, which were well understood by the 3,500 council staff with access to computer terminals.

Brisbane Council's Bimap Section, Information Service Branch and Environment Management Branch worked together to develop a system which made the best use of existing information and technology and presented data in a form that was comprehensible and easily accessible to most council staff.

Flag alerts

Brisbane's Integrated Map of Assets and Properties (Bimap) project already provided a 'flag' system of spatial information to these terminals and to those of licensed external users, alerting them to particular features. To this EMIS added a set of flags noting the existence of environmental issues related to any property under consideration. Information is displayed on a property by property basis, rather than relating to the nature of an activity, such as inflows to creeks. It includes the location of natural areas of Brisbane, such as bushland and wetlands, and specific legislation or regulations that might apply, such as Vegetation Protection Ordinances.

Information is displayed graphically by way of an Environmental Status Theme showing environmentally sensitive sites, and an Environmental Status Map which displays environmentally significant locations. Supporting text is provided through an

Environmental Status Report, which identifies the categories of environmental issue present, then describes each issue and its implications.

Spatial flags on Bimap draw attention to:

- bushland (information provided by aerial photos and on-ground knowledge about specific communities),
- forested foothills,
- wetlands,
- waterway corridors (based on Department of Lands orthophotos),
- vegetation Protection Orders (VPOs) covering individual historic trees or significant landscapes and requirements for permits for clearing native grassland or bush (VPOs are digitized to individual property boundaries),
- prescribed purpose sites,
- zones with natural landscape and ecological values of city-wide and regional importance which require special treatment,
- contaminated sites, and
- bushfire hazard rating.

EMIS is a huge advance on past practices, where there were few requirements for staff to take environmental issues into account when making decisions such as bringing in a bulldozer for laying pipelines. Where there was concern over environmental issues, follow through was slow and labor-intensive. An environment officer would have to go out with a plan and physically inspect and check the situation.

Until environmental flagging through Bimaps began, no mapping of waterways in Brisbane had ever taken place. Information about the rate of bushland clearing within the city of Brisbane was anecdotal. There was no agreed definition and no base map.

The process of mapping the information in a precise and uniform manner allows the rate of change to be charted for each defined



environmental issue. EMIS provides for benchmarking and setting performance indicators for future rates of bushland or wetland clearance.

Spreading the message

Brisbane Council has made Bimaps available for some time to licensed external users and plans to provide public access to EMIS in the near future. A customer survey showed that 92 percent of developers wanted direct access to EMIS through modems and customer service centers. Access will also be given to community groups and interested individuals through terminals in libraries.

More specialized systems have been devised to help council officers where a higher level of analysis is required. The Flora and Fauna Information System, for instance, charts the distribution and characteristics of flora and fauna throughout Brisbane on a more

sophisticated basis than devised under the spatial flags in Bimaps.

EMIS has also developed a Geographic Information System (GIS) capable of storing, retrieving and analyzing map-based data. The system is developed from an Environmental Resource Mapping System package, E-RMS, developed by the NSW National Parks and Wildlife Service which integrates a diverse range of map layers from a variety of sources.

EMIS takes mapping data from other sources, such as SEQ2001, and reduces it to smaller grid sizes, allowing more detailed calculations to take place. For instance, E-RMS will allow overlays of zonings on vegetation types or comparisons between the proportions of, say, heathland to banksias and their rates of loss.

The introduction of similarly accessible and comprehensive on-line environmental management information systems on a state, national and international scale would not only benefit information flows, but also provide the base dataset for quantifying, and therefore measuring, the effect of human activities on the natural environment.



APPENDICES

Appendix 1.

Case Studies from Victoria Waste Minimization demonstration program, as discussed in the chapter, **Cleaner Production in Victoria**

BASF Australia Ltd.

Background

The Victorian-based firm BASF Australia Ltd. has a well established environmental program. Working with local residents, council and the EPA, BASF has, since 1993, undertaken an Environment Improvement Plan (EIP).

The first Cleaner Production Demonstration project meeting was held in April 1993 involving a team of BASF employees (operators and management) and representatives from Business Victoria (DBE) and EPA.

BASF manufacture a range of acrylic latex products which are pumped through drum filling lines into different sized containers for transportation and sale. The aim of the Cleaner Production Demonstration Project was to reduce product losses to effluent caused by line washings between different latex emulsion products.

In seeking to find a solution to this problem, the cleaner production team looked at several approaches which had been suggested by BASF employees.

BASF expect to save more than \$100,000 per year by introducing a few clever innovations to their operating processes.

Problem identified

Between the product changes, the equipment involved in the filling operations had to be thoroughly cleaned. This was done by pumping

large volumes of fresh water through the drum filling lines and discharging the waste washings produced to the sewer.

While this effectively cleaned the system, it resulted in a significant loss of the valuable material still retained in the pipe work and entailed the use of high volumes of costly water. In effect, money was being washed down the drain.

This was an opportunity identified for priority action by the BASF's Cleaner Production Program staff team.

The solution

The solution to the problem involved two simple changes.

The first was to the filling schedule. A survey found that many of the acrylic latex products manufactured at BASF were compatible. By scheduling the production of compatible products in serial sequence, the number of line wash outs was reduced dramatically.

The second change involved installing a reversible pump in the filling process.

Although reversible pumps were in use in other areas of the plant, using them for waste recovery was a completely new idea.

The installation of a reversible self priming pump in the drum filling line has enabled the recovery of 85 percent of the residual product in the filling liners. The recovered material is now sold rather than lost as a waste.

Commercial benefits

The value of lost product was about \$140,000 per year. The capital cost of the pump and associated pipework was \$40,000. The expected payback period on the investment was about four months.

Actual savings to BASF go beyond this simple calculation of initial cost savings when



productivity increases are factored in as well. Removing the need for line flushing between compatible products and the introduction of air purging between incompatible products has substantially reduced down time between filling the containers, as well as increasing the yield from each product batch.

Other significant commercial benefits to BASF include a reduction in the water costs and trade waste license fees.

Environmental benefits

Sixty tons of latex that used to go down the sewer are now recovered, thus reducing the load at the Werribee Treatment Plant. There has also been a significant reduction in the quantity of fresh water used in the process.

Future commitment

In conjunction with all other companies in the Altona Chemical Complex, BASF made a voluntary commitment to reduce VOC (Volatile Organic Compounds) emission by 50 percent over a five-year period commencing in 1989. This target has already been exceeded by BASF, but efforts will continue to reduce VOC further. Most of the improvements have been achieved through waste minimization techniques.

Fugitive (non-paint source) emissions are controlled by an ongoing leak detection and repair program.

The Environment Improvement Program is annually updated and projects are scheduled beyond 1995.

Cadbury Schweppes Australia Ltd.

Background

Before participating in the Cleaner Production Demonstration Project, the company already had an Environmental Policy and an Operational Strategy. Cadbury Schweppes took part in the Asia Pacific Cleaner Production Conference in Melbourne (February 1992). Incorporation of the Europe Health Foods range complemented the company's environmental push.

Cadbury Schweppes manufactures a huge range of food and confectionery products for the Australian and overseas markets. They include brand names such as Cherry Ripe, Crunchy Bar and Red Tulip Easter eggs. The company participated in the Cleaner Production demonstration project both to improve its own performance and profits and to show other companies what could be achieved in environmental and cost benefits.

Reflecting the strong commitment by management, a waste minimization team was established comprising the technical manager, environment coordinator, waste management officer and EPA consultant. The team carried out the identification and quantification of waste streams with various production sectors of the company.

The company made the Cleaner Production project a priority. Participation of shop floor staff in the investigation was a key element in its approach. Staff were informed and invited to make suggestions for improvements in their specific work place areas.

Problems identified

More than 12 areas were identified for immediate action.

Much of the project work concentrated in areas related to packaging where reasonably quick results could be obtained. Waste reduction in product manufacturing revealed some potential, but generally required equipment or technique changes.

Implementation of these initiatives was scheduled around the demands of the production program.

The solutions

Many of the projects achieved savings without any capital expenditure. In one example, a simple product substitution change is saving \$14,500 per year by avoiding the wastage of 120 kilograms of gelatine each day. A further evaluation of the use of gelatine has found that the quantities can also be reduced, producing more savings without capital expenditure.

Another \$10,000 has been saved with a simple change to a metal detection and aligning process, eliminating 150 kilograms of waste product per shift.

It can be expected that the new technology introduced by Cadbury Schweppes will soon have a much broader application in the packaged food industry.

Packaging

The largest gains are being achieved by replacing wooden cases with re-usable steel containers in the import of cocoa butter from overseas.

Polyethylene fill used for wrapping cocoa blocks is being mixed with other materials to make builder's vapor barrier film (30 tons per year).

Waste food wrappers (over 30 percent of the solid waste at Cadbury) are converted into durable plastic pallets by Australian Challenge and are used in-house for product storage (30 tons per year).

Two recycling projects with little capital expenditure include the segregation of food wastes for sale as stockfeed, (savings of \$63,000 per year), and an increase in cardboard recycling to approximately 300 tons, saving \$9,000 per year.

Waste water

Another simple project involved fitting electrically-operated valves to ensure that water sprays only operated when there was product on the conveyor. Eleven kilometers of hot water is saved each day for a cost of \$400, with the ongoing benefit of \$5,000 a year.

Recycling of vacuum pump sealing water for a full shift instead of continuous feeding of fresh water conserves water in the bar cooking section.

The installation of two new high-pressure cleaners has greatly reduced cleaning water volumes.

Other

Auto lights sensors from intelligent Lighting Systems, which sense the intensity of natural light available, enable dimming via controls down to 40 percent of designed capacity.

A Rotary Swirl Cyclone developed with CSIRO will extract and reclaim dust from the Kibbling room. The dust, which made working conditions very uncomfortable, used to be captured in a bag-filter and washed down the drain.

Commercial benefits

In the first year of its waste minimization program, and with a proposed capital outlay of



\$1.25 million, the projected cost benefit to Cadbury Schweppes approximated \$780,000 a year.

The program is now entering the third year and a further \$500,000 in total savings has been identified.

Environmental benefits

Before the changes were implemented, about 50 tons a week of solid waste was going to landfill. This has now been greatly reduced, and includes the saving of valuable product.

Waste use is down to about half of what it was two years ago, and liquid trade wastes going to the sewer have similarly been reduced.

Temperature is being lowered, pH levels are better controlled, BOD is being cut, solids and suspended solids as well as fats and nitrogen levels are lower.

The energy management program included the installation of lighting controllers and the insulation of 1.5 kilometers of chocolate processing lines. The result is a significant reduction in the overall heat load with air conditioning costs down by 15 percent.

Future commitment

The Cadbury Schweppes experience is outstanding. It is a good example of the gains which can be achieved through the adoption of a whole company philosophy in tackling waste minimization and the introduction of cleaner production processes.

Many of the ideas have come from the shop floor and the company is committed to keeping workers up to date with progress. Recognition of staff contribution and participation is highlighted in internal newsletters.

As part of its environmental commitment, Cadbury Schweppes staff now undergo specific training in the concepts of cleaner production.

Ford Motor Company Australia Ltd.

Background

Ford has developed a comprehensive Waste Management Plan, and each of its plants and facilities is required to have a waste minimization program. Ford has undertaken many projects in the areas of solid waste reduction, water re-use/recycling, energy conservation and cleaner production.

When approached by the EPA and Business Victoria, Ford decided to use the opportunity in one of their designated project areas – the caustic cleaning of paint off skids and booth grates.

This led to the replacement of an inefficient and environmentally hazardous hot caustic stripping process with high pressure water blasting at the Ford Broadmeadows Car Assembly Plant 1.

Financial incentives for improvement in this area were very high with heating costs of \$750,000 a year and paint sludge disposal costs of approximately \$1 million per year for the previous five years.

Problems identified

The Caustic Cleaning Facility was installed in 1960 to remove paint and sealer buildup from car body skids and also paint accumulation from spray booth floor grates and screens.

The Facility was an inefficient user of steam heating and the working environment was extremely corrosive. The process used hazardous, hot caustic soda solution to strip and remove paint and sealer build up from car body skids and also from floor grates and screens.

Special protective equipment was required to meet the requirements of Occupational Health and Safety legislation. Large quantities of hazardous liquid were stored and hazardous wastes had to be disposed of to landfill.

The solutions

Six alternative technologies were investigated, including shot blasting, sand blasting, fluidized bed stripping and chemical stripping.

One alternative, high pressure water blasting, was found to be very successful. Technically quite simple, it involves blasting the paint off with a high pressure jet of water which undercuts and lifts the paint off the skid.

There are over 1,600 skids in the system and the paint can build up on them to about four micron a cycle. With approximately 400 cars a day, and allowing for some randomness in selection and some repaints, each skid had to be stripped and cleaned about once every six days.

Ford claims it is now able to clean six times as many skids in one day using the new system.

The old caustic cleaning facility was decommissioned in October 1993.

Commercial benefits

This innovation is saving Ford approximately \$300,000 a year in reduced heating costs and disposal of caustic residues.

The capital outlay for the water blast equipment was approximately \$120,000, giving a direct payback in less than five months.

Because the skids and other equipment are kept much cleaner on average than before, the amount of dirt particles in the paint plant is lower by approximately 3–5 percent. This equates to a 2–3 percent reduction in reprocessing of rejects via sanding, cleaning and respraying. Conservatively, this would amount

to a further saving of more than \$100,000 a year.

Environmental benefits

Chemicals, especially caustic soda, have been eliminated from the processes and this also eliminates acid neutralization of the prescribed wastes. 'Because there are no chemicals involved, it is much safer for operators and the waste generated is not hazardous to the environment,' claims Grant Hoatson, the Supervisor of Ford's Environmental Group.

Energy reduction lowers the amount of greenhouse gases produced from electricity generation.

The reduction in the number of paint job rejects also saves on chemicals and paint and has a corresponding positive effect on the environment.

Future commitment

Ford has committed funds for a new, totally enclosed, sound-proof, purpose-built plant which will be modified to reduce water consumption, improve drainage and automate the disassembly of skids for cleaning.

Ford hopes to apply the principles proven at Broadmeadows to its other manufacturing operations.

Other opportunities to reduce paint waste in the assembly area are being investigated.



for catchment, riverine and coastal water resources'. This sets a long term and evolving agenda spanning all spheres of government and has both a sectoral and spatial dimension. The Regional Framework is not a simple 'master plan' for the region.

Appendix 2

The SEQ Regional Framework for Growth Management

The SEQ Regional Framework identifies 100 planning principles grouped under the following goal areas:

- conservation of the natural environment,
- economic resources,
- water quality,
- air quality,
- regional open space,
- urban growth,
- residential development,
- major centers,
- employment location,
- social justice and human services,
- livability,
- cultural development,
- transport,
- water supply, and
- waste management.

These goal areas are accompanied by a list of priority actions, nominating lead agencies for each task.

The priority actions deal with matters of process and the institutional framework for planning as well as measures for development outcomes. An example of the former is . . . *'Develop a Memorandum of Understanding between State agencies and with Local Government to specify administrative and management responsibilities*

Form and distribution of urban growth

The regional policy envisages the development of four distinctive and self-contained urban areas:

- **the Brisbane metropolitan area**, which extends to Caboolture in the north, Beenleigh in the south, Ipswich in the west and Redland Shire in the east, and includes the area of North Beaudesert,
- **the Sunshine Coast,**
- **the Gold Coast, and**
- **Toowoomba.**

It is intended that each of these areas will offer residents diverse employment opportunities and a vibrant social and cultural lifestyle. An important objective is the reduction in environmental pressures caused by long-distance commuting.

Urban expansion will continue in the four nominated areas, limited urban consolidation will occur through infill development, and low density detached housing on single allotments will continue as the dominant urban form.

Other requirements:

- greater housing diversity and choice in growth areas,
- the minimization of land takeup in the urban growth process,
- higher average densities,

- an increase in densities around the key centers and other areas with access to high quality public transport services, and
- protection of areas suitable for urban growth beyond 2011.

Within the Brisbane metropolitan area, major new growth areas are expected to emerge in Fitzgibbon, Mango Hill, Caboolture, Ripley Valley, Springfield, Rosewood, Forest Lake, Calamvale and Algester. The character of the existing suburbs will generally remain unchanged.

Considerable infill development is expected to occur within the inner north-eastern suburbs of Brisbane and in and around the Ipswich city core. The objective is to expand population numbers in the Brisbane CBD and frame areas.

Urban growth in the Sunshine Coast will be concentrated in the coastal area between Noosa and Caloundra.

In the Gold Coast sub-region growth will be mainly in consolidation areas. The Brisbane–Robina railway line may generate pressures for a new growth front at Coomera.

Toowoomba is expected to grow steadily through incremental and consolidated urban expansion.

Overall, urban development is intended to be more compact and supportive of public transport. Total land requirements for urban expansion, including rural residential, will be 60 percent less compared with current trends. Excluding the rural residential component, land requirements will be approximately 42,500 hectares to the year 2011 compared with the 110,000 hectares under current trends.

Population planning targets for the various local government areas making up the region reflect higher order infrastructure capacities and the desired changes in the pattern of employment locations.

Integrated land use and transport planning

The integration of land use and transport planning will aim at increasing public transport use by 50 percent by the year 2011, concentrating development around improved public transport on the Sunshine Coast and at Coomera on the Brisbane–Robina rail line, through improved bus links, and by achieving higher density residential development around major regional centers linked to public transport.

Environmental constraints to development

Areas of open space and conservation value will be protected and the four development areas physically separated by non-urban areas.

The Regional Framework calls for protection of SEQ's environmental assets, including nature conservation areas (national parks and reserves, other areas of broad and critical conservation value, scenic and habitat areas, marine parks and catchment areas) and economic resource areas (including good quality agricultural land, extractive and coal resources, state forests, and areas of potential private forestry).

The following environmental assets are specifically cited.

For the Brisbane metropolitan area:

- Pumicestone Passage,
- Moreton Bay and its islands,
- the koala habitat areas,
- the Spring Mountain area,
- the upper reaches of the Brisbane River.

For the Sunshine Coast:

- forestry resources in the catchment of the Pumicestone Passage,
- the D'Aguilar Ranges,



- the Conondales,
- significant tracts of good quality agricultural land for sugar cane and horticulture.

For the Gold Coast:

- Tamborine Mountain
- East Coomera
- Southern Moreton Bay.

The Regional Framework embodies the first comprehensive review of development constraints in South East Queensland. This has been undertaken with the assistance of an advanced purpose-designed Geographic Information System (GIS). The GIS will be a valuable resource as local governments progressively review their planning schemes to take environmental limits into account.

Regional open space system

The Regional Open Space System will link areas of:

- high nature conservation significance,
- designated water catchments,
- high scenic amenity,
- cultural heritage and social value, and
- high recreational significance.

‘Core’ areas based primarily on major elements of the existing public estate, such as national parks, state forests and marine parks will be connected by ‘corridors’ along rivers and steep ridges.

The system will permanently frame and help provide a distinctive character to the four major urban sub-areas in the region.

A considerable proportion of the land identified in the Regional Open Space System is in private ownership. A major challenge in implementation will be the balancing of open space values (wildlife

corridors, visual amenity, public access) with the rights of private owners.

Distribution of employment and services

Sub-regional self-containment is to be reinforced through a major centers policy.

The Brisbane Central Business District (CBD) and its frame area are to continue as the dominant center in the region for the seat of government, national and regional headquarters of large private firms, and cultural, recreational and sporting facilities of state importance. Employment growth in the CBD and frame which is not consistent with this role is to be discouraged.

Seven key centers have been identified within the urban areas as the preferred location for higher order retailing, commercial, entertainment, cultural and social activity. These will be second only to the Brisbane CBD in terms of future role and function. They will, in turn, be supported by a network of major district centers.

The designated key centers for the various urban sub-regions are:

- | | |
|-------------------------------------|---|
| • Brisbane metropolitan area | Caboolture/Morayfield
Ipswich
Beenleigh |
| • Sunshine Coast | Maroochydore |
| • Toowoomba | Toowoomba |
| • Gold Coast | Robina
Southport |

Key centers will be supported by the Government’s infrastructure coordination system. Host local governments will also receive special assistance for detailed structure planning in these centers.

The redistribution of jobs brought about mainly through the major centers policy will, together

with measures to improve the competitiveness of public transport, significantly reduce potential environmental pressures in the region. Modeling carried out suggests that under the preferred pattern of settlement for South East Queensland, total vehicle travel in the region would be 9.3 million kilometers (or 10 percent) less compared with projected outcomes based on existing trends. Total vehicle emissions (carbon monoxide, hydrocarbon and nitrogen oxides) were estimated to be 20 percent less under the preferred pattern versus the trend pattern. (The estimates quoted here relate to an early version of the preferred pattern of settlement prepared prior to the sub-regional planning process. Direct modeling has not been carried out for the settlement pattern included in 1995 Regional Framework, but this scenario is likely to generate impacts of a similar order to those cited.)

Supporting SEQ2001

The SEQ2001 project is part of the extensive planning and planning-related reforms undertaken in Queensland over the past five years. Complementary initiatives include the following plans and projects.

Integrated Transport Plan

In April 1994 the Queensland Government began preparing an Integrated Regional Transport Plan (IRTP) for South East Queensland, as recommended in the draft Regional Framework for Growth Management (March 1994).

A discussion paper issued early in 1995 highlighted the Government's intention to *'reverse the trends towards car dependency which have held sway for so many years'*.

The production of the discussion paper was also prompted by adverse public reaction to the Government's decision to proceed with a new

arterial road link between Brisbane and the Gold Coast, duplicating the function of the existing Pacific Highway. (The apparent need for this link had arisen because of decades of ad hoc planning and development decisions in this corridor. No reservations for an additional link had been put in place despite the obvious strategic significance of such a road. The consequential need to disrupt residential, farming and valuable koala habitat areas proved to be highly controversial. The Government's decision to proceed with the new South Coast Motorway despite public opposition in the corridor cost it several seats in the July 1995 state elections. The commitment to the road has since been abandoned).

The IRTP discussion paper indicated that:

- an extra 0.5 million vehicles would be registered in South East Queensland by 2011 (excluding commercial vehicles),
- total daily vehicular trips would increase from 5.7 million in 1995 to around 10.5 million in 2011, based on current trends, and
- public transport's share of all trips in metropolitan Brisbane could fall to 7.6 percent by 2011 compared with 40 percent in 1960.

The IRTP was proposed to build on earlier major initiatives in the transport area, including:

- introduction of a more accountable service contract system for the operation of subsidized public transport services;
- construction of a new high speed rail link between Brisbane and Robina in the Gold Coast hinterland (this has been part funded by the Commonwealth's Better Cities Program and involves planning measures to encourage transit-supportive development), and
- the ill-fated decision to proceed with the South Coast Motorway.



The discussion paper canvasses views on a range of strategies to help bring about a more efficient, socially just and ecologically sustainable transport system. The key elements of these strategies are:

Making public transport more competitive

- introduction of a seamless, single ticket system,
- greater use of busways,
- investigation of new rail investments (e.g. Sunshine Coast, Beaudesert, Redcliffe, Springfield and the Gold Coast/Tweed region and a rail extension to the domestic and international Brisbane Airports),
- provision of better pedestrian links to high quality public transport corridors, and
- better co-ordination of transport modes. (The Government has since committed itself to establishing a separate statutory authority to integrate and manage the provision of public transport services in the region.)

Car travel demand management

- use of transit lane restrictions, car park management, traffic calming in residential areas and restrictions on freeway on ramps to discourage car usage;
- encouraging change in work patterns (e.g., flexible hours, work from home and provision of public transport incentives as part of enterprise bargaining agreements); and
- direct and indirect road pricing (but only after an extensive phase-in period and when adequate public transport alternatives are available).

Better fit between transport and urban policy

- rectifying regional employment imbalances through the major centers policy in SEQ2001;
- linking major centers with high quality public transport services;
- promotion of transit-oriented development (e.g., more compact suburbs designed around public transport and discouragement of excess parking provision);
- protection of key transport corridors from urban encroachment, and
- location of major employers along public transport routes.

Intergovernmental protocol on planning roles and responsibilities

In July 1993 the State Government and the Local Government Association of Queensland formally adopted a protocol setting out their respective interests and roles in the planning system. The protocol is important in that it affirms the efficacy of consensus-based regional planning processes.

Through the protocol the State Government has effectively traded off the option of establishing regional authorities as an additional tier of planning decision making (an approach which has been commonplace in other states). In doing so it has secured a commitment to 'meaningful cooperation' in regional planning exercises from what has traditionally been a fiercely independent local government sector in Queensland. This commitment is clearly vital to the success of SEQ2001.

Reform of local government

A new Local Government Act was passed by the Queensland Parliament late in 1993. The Act

establishes a framework for more accountable and forward-looking local councils.

Considerable emphasis is placed on the preparation and regular revision of corporate plans and their attendant resource allocation. This institutionalized commitment to planning will facilitate constructive participation in the voluntary regional planning exercises noted above.

Local government reform has extended further to the amalgamation of councils in key growth areas of the State. In the south east, the Shire of Moreton and the City of Ipswich have been joined to form a municipality of 120,000 covering virtually all of the western growth sector of the region. The southern corridor has been treated similarly with the amalgamation of the Albert Shire and Gold Coast City. This local government area has a population of almost 200,000. In part these moves have been prompted by the need for more integrated planning particularly with respect to trunk infrastructure and major retail, commercial, administrative and cultural centers.

New planning legislation

The Government's Planning, Environment and Development Assessment (PEDA) Bill is scheduled for debate in Parliament early in 1996.

The Bill has four main themes:

- promotion of ecological sustainability,
- whole-of-government integration of policies and regulations impacting on land use and development,
- accountability in decision making, and
- micro-economic reform of development approval processes.

A stated objective of PEDA is to 'safeguard the life supporting capacities of air, water, soil and ecosystems for present and future generations'. The Bill also requires all state and local government agencies to 'have regard for the

goal, objectives and guiding principles of the National Strategy for Ecologically Sustainable Development'.

These draft provisions give local communities the power to 'keep their Councils and the State Government honest' on environmental issues. People participating in the planning system, whether making submissions on proposed planning schemes, commenting on state planning policies, objecting to particular developments or engaging in a court appeal, can invoke these principles in the legislation and require decision makers to justify their actions accordingly.

PEDA establishes the local planning scheme as the pre-eminent instrument for coordinating all the policies and requirements of both state and local governments which might impact on the living, working or natural environment.

Planning schemes will be the product of a range of inputs, including state policies, the recommendations of Regional Planning Advisory Forums such as SEQ2001, local policies and a thorough-going process of local consultation.

Making the local planning scheme the centerpiece of an integrated planning system will have important implications for the way state agencies go about their policy development work. In effect, they will be forced to look at their ideas from a local community perspective. Broad concepts and propositions which ignore the local detail will struggle to survive.

PEDA strengthens public access and accountability in the planning system.

As well as being obliged to exhibit draft planning schemes as at present, local governments will be required to consult on the terms of reference for new and revised schemes, including identified major issues, at the very start of the planning process. State planning policies will have to go through a similarly exhaustive public notification and consultation procedure.



The draft Bill seeks to strike a reasonable balance between state and local interests in line with the planning protocol signed between the Local Government Association of Queensland and the State Government in 1993. Ministerial call ins must be agreed by full Cabinet. Such call ins will be required to follow the normal notification and referral procedures, though appeals will not be possible.

The Bill introduces a range of important micro-economic reforms including an integrated development approval system. This would enable most development proponents to lodge a single application with a development manager in the relevant local government rather than dealing with a multitude of different approval agencies, each with their own information requirements and time frames.

Other reforms include streamlined impact assessment provisions, the concept of preliminary approvals for large scale projects or projects undertaken over a long time frame, consolidation of appeal jurisdictions and private certification of compliance with building, plumbing and subdivision codes.

The Bill also provides a clearer legislative context for new development contribution practices which have been initiated under the present *Local Government (Planning and Environment) Act*.

Reform of infrastructure charging through the development approvals process

As is common with most planning systems across Australia, development proponents are often called on to contribute towards infrastructure.

Over the past three years, the Queensland Government has developed a framework for more accountable, efficient and equitable

operation of development contributions and with several main features:

- recognition that development contributions are a form of end user charge for infrastructure, rather than a tax on developer profits or the betterment margin in land development;
- confinement of such charges to *basic* infrastructure (i.e. water supply, sewerage, local roads, and local community land) where consumer choice would have been limited anyway for reasons of health and safety, or because of the prospect of major savings in the long term cost of supplying infrastructure;
- a requirement that agencies seeking to charge for infrastructure through the development contribution system justify the use of this mechanism in preference to alternative user charging options (e.g. tolls, local government rates, volumetric charging etc.),
- a requirement that up-front infrastructure charges are based on a publicly accountable forward plan for infrastructure provision and that such a plan should embody minimum life cycle cost strategies for achieving the desired infrastructure service standards; and
- enforcement of the marginal cost pricing principle (i.e. requiring that individual developers are not called upon to pay more than their fair share of the cost of extending infrastructure, based on share of anticipated future use).

These are important reforms in the context of the SEQ2001 project. Under the new development contribution arrangements, local governments will have a clear financial incentive to undertake detailed structure planning for growth areas. In the past most growth has been managed in a reactive fashion with the application of opportunistic development contribution practices.

Moreover, the reforms will mean that developers receive stronger price signals to focus on urban consolidation and infill opportunities, where infrastructure extension costs are generally lower. In this way infrastructure pricing policy is harmonized with broader strategic planning objectives.

Infrastructure coordination

Certain classes of infrastructure investment, most notably major highways, rail freight links, fixed rail public transport, airports, seaports, modal interchanges, universities and major cultural and sporting facilities, have the potential to reconfigure accessibility in urban and regional settings. Changes in accessibility, in turn, influence the locational and investment choices of businesses and residents alike. Thus major infrastructure decisions help shape the pattern of settlement in ways which are, arguably, much more powerful than zonings, policy statements and other statutory planning mechanisms.

Maximizing the overall economic return from public investment in major infrastructure is therefore not just a matter of best value for money in the delivery of specific government services, like transport, health and education. It is also about capturing the *added* community benefits from more efficient and ecologically sustainable patterns of settlement.

The Queensland Government's Strategic Asset Management Program, and the Public Finance Standard (PFS) for asset management in particular, recognize this dual source of benefits from major items of urban infrastructure.

The PFS requires all state agencies (including off-budget enterprises) to prepare forward infrastructure investment plans on an annual basis, linked to the preparation of corporate plans. These investment plans, known as Physical Asset Strategic Plans, (PASPs) cover both near term (0–3 years) and longer term horizons (beyond 10 years, depending on the

type of infrastructure involved). They must be endorsed by Cabinet and form the basis for the annual capital budget bid.

The PFS further requires agencies to consider the adopted regional plans of Government when preparing their PASPs. Agencies must prepare a self-assessment regarding the match between proposed infrastructure projects and regional policies like SEQ2001.

The congruence between PASPs and regional planning policies is independently reviewed before these plans are submitted to the Government for endorsement. This review role is performed by the Infrastructure Coordination Group (ICG) which comprises senior officials from the Queensland Treasury, Office of the Cabinet, the Department of Housing, Local Government and Planning and one other agency on a rotational basis.

The ICG provides an advisory and quality assurance role in respect of the self-assessments compiled by agencies. Agencies will determine the extent to which the advice of the ICG is incorporated into their PASPs. But any divergences from the position advised by the ICG must be reported to Government at the time PASPs are presented for endorsement.

Unlike metropolitan planning strategies elsewhere in Australia, SEQ2001 is effectively linked into the State's budget process through the PASP and ICG mechanisms.

The infrastructure coordination model adopted in Queensland also involves innovative mechanisms to optimize the use of existing and proposed new capacity in social infrastructure.

Studies commissioned in Queensland over the past three years have confirmed that the cost of supplying social (i.e. taxpayer-funded) infrastructure can vary significantly with the pattern and sequencing of development. Fragmented development can trigger the need for new infrastructure investment before capacity in existing facilities and services is



efficiently utilized. It also means some services have to bear the costs of 'dead running'. Furthermore, opportunities for more efficient provision of services through co-location strategies may be lost.

If the overall pool of funds available for social infrastructure is limited, the extra costs implied by fragmented development will necessarily mean longer waiting times for the delivery of these facilities in new communities. On the other hand, if the Government commits to certain delivery standards, these extra costs must translate to a heavier burden on the general taxpayer.

The approach adopted in Queensland involves the designation of a 'benchmark' sequence of development in planning schemes. Developers are free to take on out-of-sequence projects provided they are prepared to make up any extra costs in social infrastructure provision. That is, out-of-sequence development is required to meet the cost of having to provide schools, health care facilities, bus services and other social infrastructure in an area at a time sooner than would have occurred had development complied with the efficient pathway for growth.

It is important to note that in an out-of-sequence situation, responsibility for the substantive cost of providing social infrastructure remains with the taxpayer. The developer merely meets the financial costs of bringing service provision forward in time.

Benchmark sequences of development identified in regional plans and local planning schemes will form the basis for the forward planning of social infrastructure, thereby facilitating coordinated and timely provision of local services. Importantly, the sequencing mechanism will also provide clear financial signals in support of the consolidated development called for by *SEQ2001* and other regional policies.

Environmental legislation

Since 1989, the Government has also pursued an energetic program to revamp the State's laws dealing with the identification and conservation of environmental assets. Without this regulatory framework, many of the principles enunciated in the Regional Framework could not be put into practice.

There are several relevant legislative reforms in the environment area:

- The *Contaminated Land Act*. This provides an integrated system for site identification, assessment, clean up, cost allocation and general management of contaminated land in Queensland.
- A *Heritage Act* to protect places which have aesthetic, historic, scientific, social or other special significance.
- The *Nature Conservation Act*. This is arguably the most comprehensive and innovative legislation of its type in Australia. The Act recognizes that national parks alone cannot ensure the survival of all species. It creates a number of classes of protected areas including national parks, conservation parks, resources reserve, nature refuge, coordinated conservation area, wilderness area and international agreement area.
- Amendments to the *Water Resources Act* to protect the integrity of non-tidal water courses. New provisions strengthen controls on the destruction of native vegetation along water courses and the excavation or placement of fill in these areas.
- The *Environment Protection Act* which provides Queensland's first comprehensive pollution control laws. The Act establishes an integrated licensing system which links fees and penalties directly to the scale of emissions.

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