Local Government and the Greenhouse Effect

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TOWN&COUNTRY SGIO Deloitte Ross Tohmatsu

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Local government and the Greenhouse Effect

Managing the 'Greenhouse Effect' will involve all Australians and all levels of Government:

Federal and State governments provide co-ordination and legislation; and

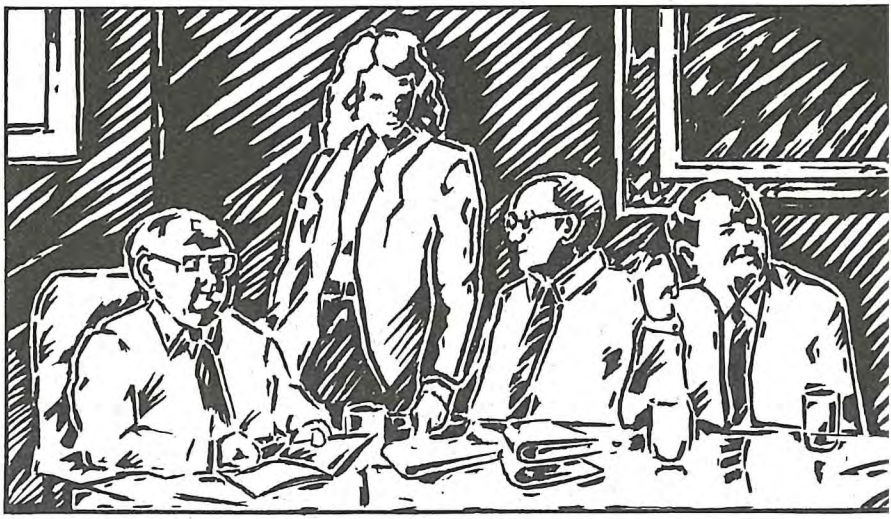
Local government provide direct environmental management at the community level.

Local government decisions need to be made with an understanding about possible future changes, so as to protect public and private investment and reduce personal risk. Good decisions now will also avoid possible financial liability being placed on future councils.

Local government also needs factual information about the causes and possible impacts of the Greenhouse Effect in order to represent local interests to other levels of government and to provide guidance to the local community.

This booklet provides an introduction to the science upon which Greenhouse theories are based, and gives practical guidance for local government in managing this complex issue.

The City of Stirling, Western Australia, in recognising potential Greenhouse Effect impacts has developed a Greenhouse Strategy Action Plan which includes limiting greenhouse gas emissions.



Greenhouse Action Plan for local councils:

- **Appoint** an officer (eg planning/ environmental officer) to be responsible for climate change.
- **Identify** specific issues relevant to the council area.
- **Prioritise** these issues.
- **Compile** a strategy to address each issue.
- **Assign** issues to particular officers or groups.
- **Oversee** the issues to make sure they are being adequately addressed.
- **Review** the progress and re-assess priorities on the Greenhouse Action Plan.

What is the Greenhouse Effect?

The Greenhouse Effect is:

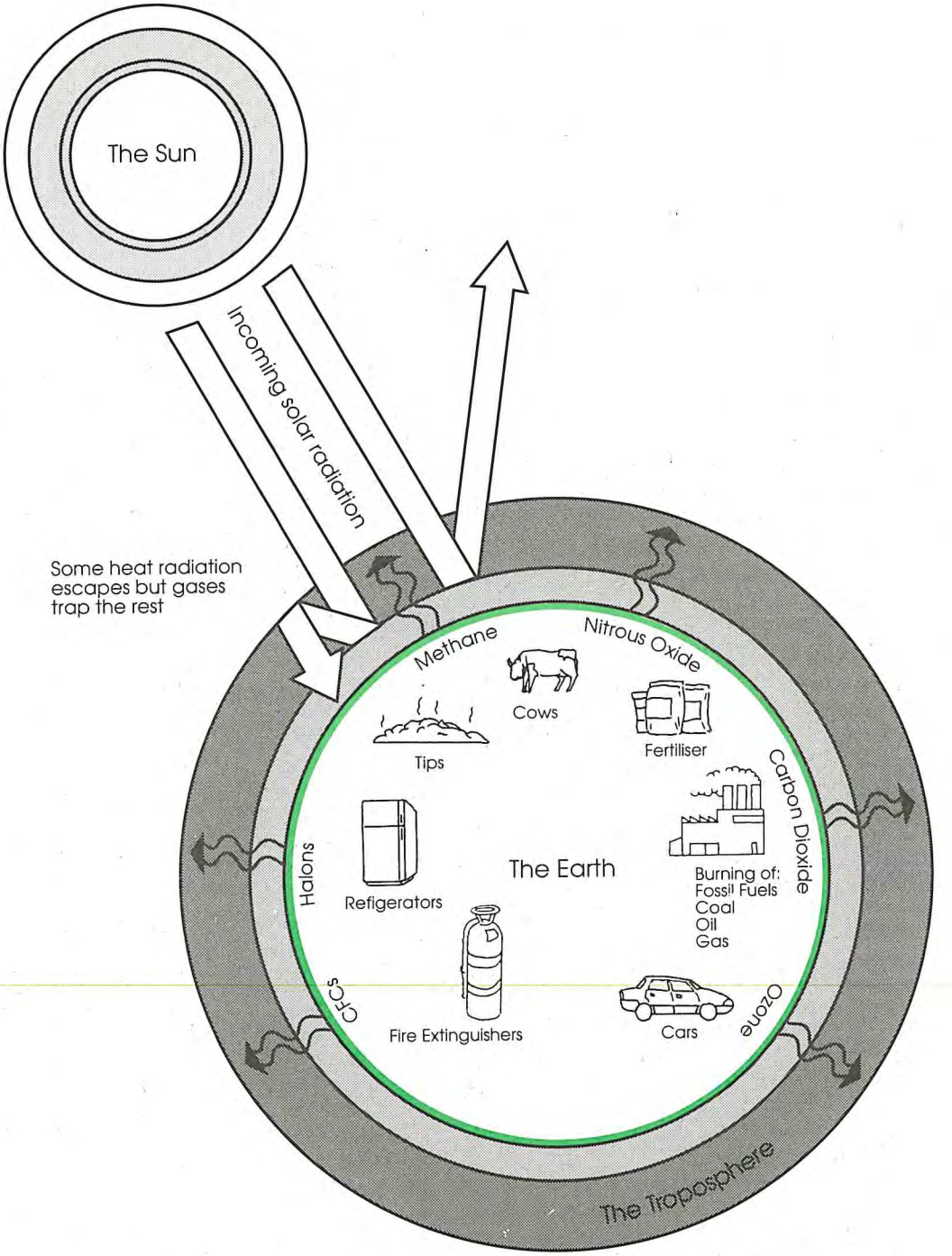
- the retention of some of the heat of the sun's rays by the presence of certain gases in the atmosphere;
- the increased accumulation of these greenhouse gases in the atmosphere, trapping more heat causing a greater warming effect;
- higher air and ocean temperatures, rises in sea level and changes in climate; and
- possible changes in agriculture, forests and fisheries and threats to water supplies, natural habitats, coastal areas and health.

A form of Greenhouse Effect has been operating for billions of years - without it, the earth's atmosphere would be too cold for human habitation and most other life as we know it today.

However, since the Industrial Revolution (1750 AD) the concentration of Greenhouse gases in the atmosphere has significantly increased.

The burning of fossil fuels such as coal, oil and gas to produce energy, other emissions from our factories, cars and houses, and the use of CFCs has promoted these changes to our atmosphere. Deforestation and changes in land use practices have also contributed Greenhouse gases.

Because many greenhouse gases have a long lifespan (up to 150 years), any action we take now will not stop the Greenhouse Effect immediately but rather can only slow the rate of increases of the gases. Thus it is important for society to take steps as soon as possible to reduce unnecessary emissions of Greenhouse gases to the atmosphere.


The Sun
Incoming solar radiation
Some heat radiation escapes but gases trap the rest
Methane
Nitrous Oxide
Cows
Tips
Fertiliser
Carbon Dioxide
Halons
Refigerators
The Earth
Burning of:
Fossil Fuels
Coal
Oil
Gas
CFC's
Fire Extinguishers
Cars
Ozone
The Troposphere

Sources of Greenhouse gases

The main 'Greenhouse' gases are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), chlorofluorocarbons (CFCs), ozone (O_3), water vapour (H_2O) and halons.

The contribution to global warming from each gas depends upon several factors:

- the capacity of the gas to absorb heat;
- the amount of the gas in the atmosphere; and
- the length of time the gas remains in the atmosphere before it decomposes.

Carbon Dioxide (CO_2)

Carbon dioxide is the major contributor to greenhouse warming. The concentration of CO_2 is increasing by 0.4 % per year.

Current emissions arise from the burning of fossil fuels such as coal, oil and gas for energy, deforestation, the burning of forests, rotting vegetation and agricultural land. Only half of CO_2 emissions are taken up by oceans and other sinks, with the remainder staying in the atmosphere.

Nitrous Oxide (N_2O)

Nitrous oxide concentrations appear to be increasing by about 0.3 % per year due to the burning of fossil fuels and plant materials, fertiliser use and soil cultivation.

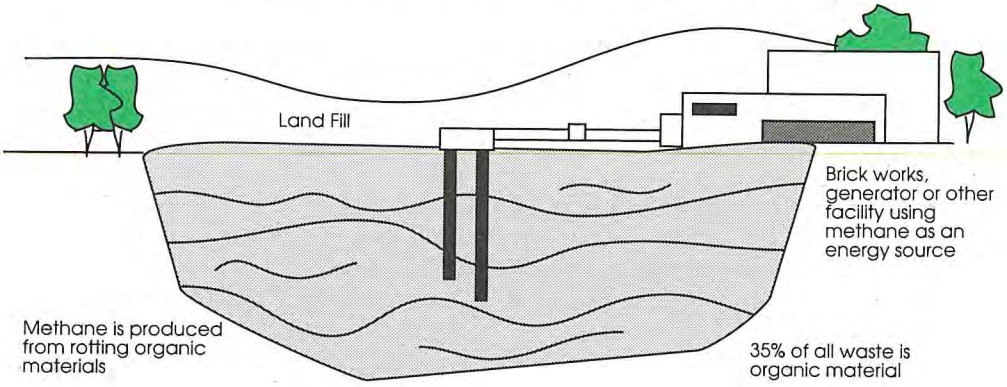
Methane (CH_4)

Methane concentration in the atmosphere has more than doubled in the past 200 years and is currently increasing by 0.8 % per year. At this rate, it will double again in less than a century.

The increase in methane is closely linked to the world's growing population and its need for food and disposable goods. The main sources in Australia are from vegetation burning, the large numbers of ruminant animals (cows and sheep) and landfills. Methane is also released from coal mines and natural gas leakage. In other parts of the world rice paddies are a major source of methane.

Local Government can contribute to the reduction of methane levels through appropriate landfill management and promoting the recycling of organic materials.

Methane can be extracted from land fills



Halons

Halons are human-made chemicals which have increased in concentration from nil to 50 parts per trillion in 50 years and are increasing in concentration at a rate of more than 10 % per year. Fire extinguishers are the main source in Australia.

Chlorofluorocarbons (CFCs)

These human-made chemicals were first introduced to the atmosphere in the 1920s. They are best known for the destruction of the ozone layer in the upper atmosphere but also contribute to greenhouse warming in the lower atmosphere. On a molecule-to-molecule basis CFCs contribute more to the greenhouse effect than any other gas. (see Table opposite).

The main sources of CFCs are the manufacture and service of industrial and consumer goods (such as refrigerators), aerosols, plastic foams, electronic components (such as video recorders, TVs and computer parts), dry cleaning and air conditioning.

The Montreal Protocol is an international agreement which requires a 50% reduction in the emission of CFCs by the year 2000, with halon use to be kept at 1986 levels. In Australia CFC - based aerosols have been banned from sale since June, 1990, and the total phasing out of the use of CFCs and halons that can deplete upper atmosphere ozone should occur by 1998.

GAS
CO_2
CH_4
N_2O
O_3
CFCs
Halons

Ozone (O_3)

This gas has increased due to urban and industrial pollution principally from motor vehicles.

Water Vapour (H_2O)

As the atmosphere warms as a result of increases in these other gases, higher levels of water vapour will also occur, which will further enhance global warming.

ONCENTRATION IN ATMOSPHERE (ppm)			RELATIVE CAPACITY TO ABSORB HEAT (per molecule)	ATMOSPHERE LIFETIME (years)	RELATIVE WARMING CONTRIBUTION (Time Horizon, 100 years)†
DATE		RECENT ANNUAL GLOBAL TRENDS β			
750	1988				
?75	350	+0.4%	1	120	1
).75	1.7	+0.8%	21	10	21
?.85	0.310	+0.3%	206	150	290
).015	0.025	+0.5%	403	0.2	1
ıil	0.0008	+4.0%	15,000*	100*	5,800*
ıil	0.00005	>10.0%	8,000 to 120,000	40-100	1,200*

(*) Average of the several chemicals in the group.

(†) Relative to CO_2 with CO_2 as 1

(β) Annual increment of increase over the previous year's atmospheric concentration.

Climate changes

A doubling of CO_2 by the year 2030 is expected to result in an increase of mean global temperature in the range 1.5°C to 4.5°C. An associated rise of sea level of about 30cm to 50cm together with a rise in temperature of the surface ocean layer of between 0.2 °C and 2.5 °C is also expected.

The City of Brisbane, Queensland, has adopted an approach to climate change which recognises the present uncertainty about Greenhouse impacts, and so assesses the range and probability of environmental changes, their impacts on specific areas of council activity and the costs and benefits of making adjustments now or later.

Future climate scenarios for Australia

Our best current information suggests the following Greenhouse climate changes by the year 2030:

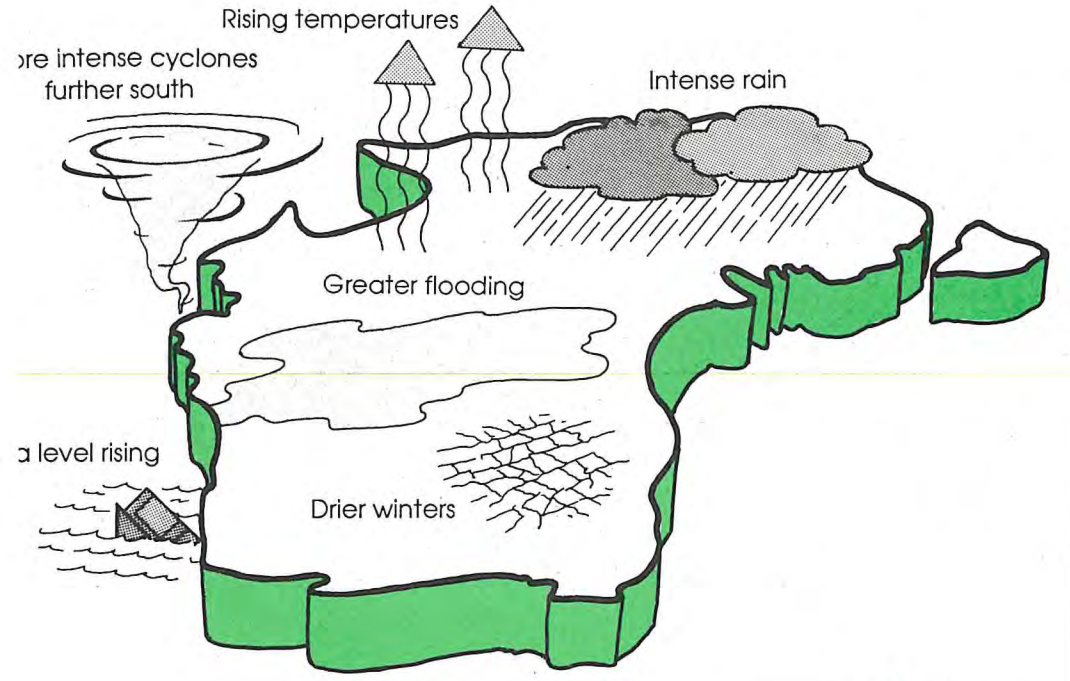
- **Temperature**: Rises of between 2°C - 4°C in annual mean temperature with greater warming in the south in winter and less warming in the north of the state.
- **Sea-level**: Sea level rises of between 10 and 40 cm by 2030 AD.
- **Tropical Cyclones**: Cyclones may become more common in the Geraldton to Perth region. They may also become more intense and frequent throughout their current range.

- **Rainfall:** Up to a 50% increase in spring, summer and autumn rainfall is expected in tropical and sub-tropical areas with increased humidity during wet periods in the tropics. In the south, generally drier winters with more intense rainfall events could result in greater flooding. Daily maximum rainfall could increase by 20 to 30%.

- **Wind speeds**: Prevailing wind speeds could decrease by 20% north of 36° latitude but increase elsewhere.

- **Weather extremes**: Extremely high or low temperatures, droughts and floods, higher winds and storm activity and other weather extremes may be experienced more often.

The regional impacts of the Greenhouse Effect are still speculative. The Western Australian government is currently funding C.S.I.R.O. research programs to obtain better information on regional climate changes. Annual interim reports on this research are available from the EPA.



Implications of the climate changes:

- **Agriculture** could be affected in several ways:
  - new climate and weather patterns may require changes to agricultural production in affected areas;
  - insect and crop disease distribution could change.

  These could result in a loss of agricultural production, or a shift in crop or in location, affecting the economies of local communities, the State and the Nation.

  Plant growth could be enhanced by higher carbon dioxide levels yielding higher agricultural production in some regions where nutrient supply, rainfall and ambient temperature do not limit crop yields.

- **Forests** could be stressed by drier and hotter conditions and changes to rainfall patterns. However, increased carbon dioxide and other factors could favour forest growth in some regions. Forest fires may become more frequent and intense.

- **Natural habitats and rare species** could be threatened as new climates, patterns of rainfall and ocean conditions change the habitats to which plant and animal species have adapted over thousands of years.

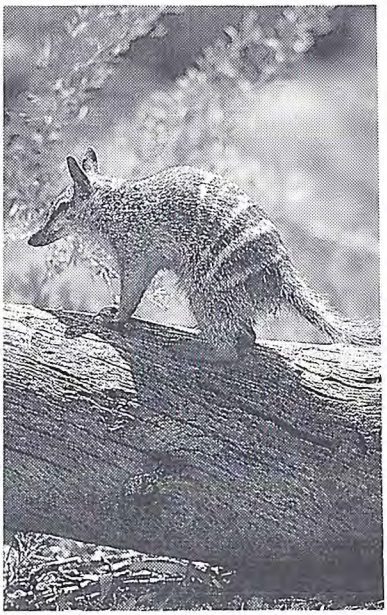


Photo courtesy Perth Zoo.

The Numbat is one of many rare species which may be affected by climate change.

Sea side houses may be threatened by rises in sea level.

- **Water supplies** could be affected by changing patterns of rainfall, temperature and evaporation. The effects could vary from prolonged drought and water shortages to increased runoff, floods and rising groundwater tables.
- **Fisheries** may be affected through changes to the distribution of fish species resulting from altered ocean temperatures, ocean current patterns, breeding ground locations and abundance of phytoplankton.
- **Coastal areas** may be affected by a rise in sea level. Structures at risk include houses, particularly those in canal estates, ports, sea walls, groynes, roads and other transport and communication facilities. Storm water drains may not be able to cope with a rise in the water table, and natural systems such as mangroves could be lost.
- **Health** problems such as heat-related deaths, the wider geographic distribution of disease-transmitting mosquitoes and respiratory diseases may increase.

Slowing down Greenhouse warming

By stopping carbon dioxide and other greenhouse gas emissions we could avoid many of the projected climate changes. This would require major global action to reduce energy consumption, change food and agriculture habits and so on.

International and national meetings of scientists, economists and administrators are presently seeking ways to reduce Greenhouse gas emissions. Because global and national agreements must be implemented through local action, local government will have a vital role in community efforts to reduce the emission of Greenhouse gases.

Some initiatives, such as more efficient energy management, will reduce energy costs and the level of Greenhouse gas emissions with little or no loss of services.

Energy conservation is a winner for everyone

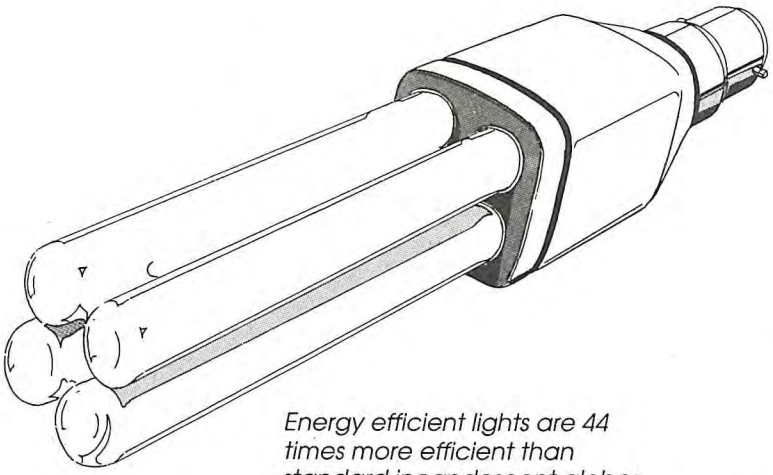
We often use energy inefficiently. This places unnecessary demands on electrical generating systems and fossil fuels.

The best way to conserve energy is to avoid its use entirely wherever possible:

- walking or cycling short distances;
- turning off lights, heating or other appliances when they are not needed;
- using solar lighting or heating wherever possible;
- insulating homes and other buildings.

Using energy directly is almost always more efficient than indirect use. Using gas rather than electricity for space and water heating not only reduces greenhouse gas emissions but also costs less.

There can be a great difference in the efficiency of appliances such as electric lights and refrigerators. Efficient appliances often cost a little more to purchase initially, but repay their owners with lower power bills.

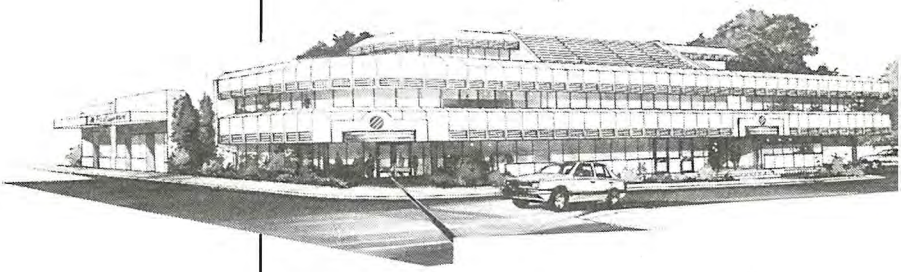


Energy efficient lights are 44 times more efficient than standard incandescent globes.

Local governments can reduce their own energy consumption and costs by:

- making existing buildings more efficient through insulation, window treatments, and using natural light and ventilation whenever possible.
- constructing new buildings to be as energy efficient as possible.
- installing energy efficient appliances such as high efficiency lighting.
- using all night street lighting only where necessary.
- using gas rather than electric space and water heating.
- using air conditioners, heaters, lights and photocopiers only when necessary.
- providing suitable lockers, bicycle racks, showers, change rooms etc. to encourage staff to use bicycles and public transport. Providing lockers will also encourage staff to wear suitable clothing rather than using air conditioners or heaters.
- purchasing energy efficient vehicles.
- regularly evaluating the economic benefits of converting vehicles and plant to LPG or natural gas.
- maintaining plant and vehicles to maximise fuel efficiency.
- minimising water pumping at parks and reserves through control systems and by using native plants.

By conducting regular (eg annual) energy audits, areas of energy saving can be identified and the success of energy management initiatives can be evaluated.



The Solar Energy Information Centre, South Perth, holds an Australian Design Award for incorporating the principles of energy efficiency. This is achieved through orientation, solar heating (air and water), heat and light control slats, wind generation and insulation. The energy costs of the Centre are one fifth that of an equivalent standard showroom premises in Perth.

The Centre brings together solar information, manufacture, product display, public education and industry development assistance under one roof.

Local government can make existing buildings more energy efficient, cheaper to run and more comfortable places to work.

This requires examination of;

- the overall structure of the buildings;
- heating, ventilation and air-conditioning;
- lighting;
- water heating; and
- the particular usage of the premises and energy requirements.

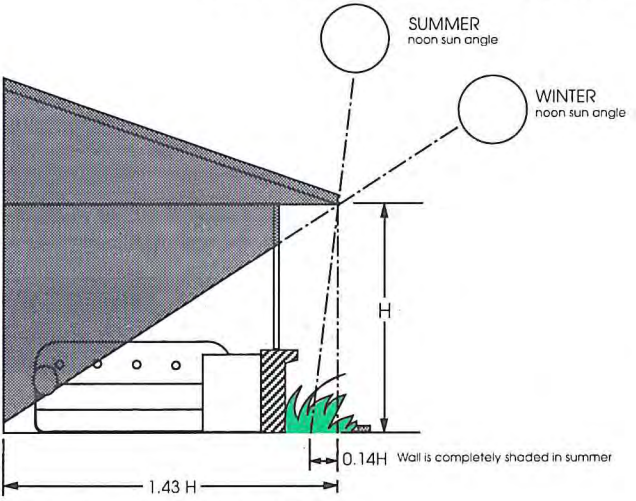
From this, corrective measures, recommended suppliers and contractors can be determined.

Local government can promote energy efficiency in the wider community.

Local government is well situated to provide information to the community on energy savings options (such as passive solar design) via the municipal offices and libraries.

Energy conservation can be encouraged through council's planning and building approval processes by:

- encouraging the use of passive solar design and other energy conservation principles.
- training planning and building department staff on energy conservation potential.
- providing bonuses for energy efficient commercial and industrial developments.



Buildings can be designed or altered to gain direct sunlight and heat in winter while staying cool in summer.

Cycling is good for your health and for the environment.

Energy use in transport can be reduced by:

- promoting the use of public transport and providing facilities such as bicycle racks and bus shelters.
- providing and maintaining footpaths and cycleways.
- locating major community facilities on public transport routes, with interrelated activities in close proximity.
- encouraging high density housing near public transport terminals.
- supporting Green Street Joint Venture principles in new developments.

Green Street Joint Venture (GSJV) principles are:

- smaller detached blocks;
- modified lot widths and building lines for blocks;
- walls built on boundaries;
- innovations in street design, kerbing, guttering and drainage;
- common trenching of services to save costs and possible erosion;
- creative lot design and siting of houses for maximum solar design;
- sensible use of open space and landscaping.

Local government can reduce other Greenhouse gas emissions.

Methane emissions can be reduced by:

- managing waste disposal sites to use the methane gas as an alternative fuel, or at least by flaring it to transform it to CO_2.

The Eastern Metropolitan Regional Council, Western Australia, has been testing methane gas quantities in its tip. Hopefully the methane will be used to drive generators with electricity being sold to the State Energy Commission.

The landfill site presently used by the City of Stirling, Western Australia, is owned by a brick manufacturer. The owner recovers methane gas for firing brick kilns and burning limestone for lime production. Surplus gas is available for electricity generation.

- promoting composting and recycling in homes and businesses.

Subiaco City Council, Western Australia, is encouraging residents to do home composting by selling the 240 L compost bins for only $39. They also provide a comprehensive door to door recycling scheme including collection of all qualities of paper, aluminium, glass and PET plastics.

- encouraging separation of rubbish at source. This can be achieved by providing specially marked bins at shopping centres and public areas for glass, aluminium, paper and plastic bottles, and maintaining house to house pick ups.

CFC emissions can be reduced by:

- encouraging the recycling of CFCs from refrigerators.

> *South Melbourne Council, Victoria, coordinates a CFC recycling programme. The council retrieves CFC gas from old refrigerators and recycles the scrap metal.*

- ensuring maintenance of car air conditioners.

Carbon dioxide uptake can be enhanced by:

- adopting vegetation clearance controls.
- working with local groups such as Men of the Trees and Greening Australia to revegetate public land and road verges.
- holding an annual local tree-planting day as well as participating in national Tree Day programs.
- providing free tree seedlings or propagation facilities for residents or local organisations.

Rockdale Municipal Council, Sydney, has adopted a recycling incentive scheme to encourage householders to recycle their rubbish. Every three months the garbage collectors randomly choose one bin to inspect. If it contains no recyclable items the residents win $500. The council saves $33 in landfill costs for every tonne recycled, making the scheme a winner for all residents of Rockdale.

Local government can prepare for possible climate changes

Local governments are decision-making authorities and management agencies. Their actions need to be responsive to local concerns and conditions and supported by the best information possible, particularly when faced with an issue as complex and uncertain as the Greenhouse Effect.

Local knowledge

Some impacts of the Greenhouse Effects could be similar to climatic extremes such as droughts, floods and storms which have already been experienced in recent decades. Existing information about these events could enhance present management programmes, and better information could help future local government decision makers and managers to respond to climate change. This could be particularly useful in:

- regulating development in areas prone to erosion and flooding.
- classifying areas according to their importance, need for protective works and costs.
- developing sensitivity analyses and risk assessment procedures.
- developing computer-based management procedures (GIS) within the local government authority which will allow individuals and local groups to "model" responses to various climatic scenarios in areas of possible risk (eg coastline, flood prone areas and fire management).

The City of Salisbury, South Australia, has introduced a development assessment standard that includes a provision for sea level rise. The City's standard states that the development "must be protected from, or be able to be protected from" sea level rise and shifts the onus to the proponent to establish that the development is able to be protected.

Building and planning regulations.

- Town Planning schemes should discourage development in areas that may become prone to flooding or inundation by rising sea levels or erosion.
- Building foundation standards need to account for possible changes in soil moisture and stability.
- Building construction standards should take account of high winds, tropical cyclones and increased rainfall.

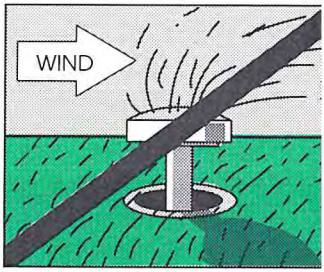
Infrastructure planning and management.

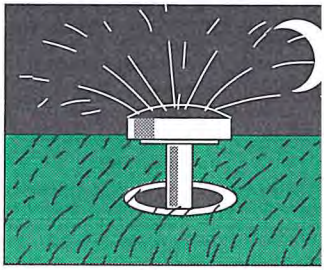
- Water storage and supply facilities may require expansion or modification.
- Design standards for long lasting infrastructure (e.g. roads and stormwater drains) should be reviewed to ensure they can cope with future conditions, without requiring expensive replacement or alteration.

Water supply and water conservation.

Present water supply systems or groundwater sources may be inadequate if the Greenhouse Effect results in reduced rainfall.

- Domestic water use can be reduced through water-efficient appliances such as dual- flush cisterns, non-flush compost toilet systems or special shower heads and taps.
- Treated waste water could be used to reticulate town ovals.
- Reticulation systems are most efficient if operated early in the morning.
- Local governments can install computerised reticulation - monitoring systems for reserves and gardens.
- Wasting water wastes energy through pumping.
- Stormwater run-off systems can be designed to water town parks and gardens.
- New houses could be designed so that stormwater is taken to garden areas instead of into the main drainage system.
- Replacing some lawns with mulch, native shrubs and trees will save water.
- Storm runoff retention trenches will collect water from roof guttering, reducing street drainage runoff and pollution downstream. Runoff from one house is enough to support two full grown native trees.





Native plants and animals.

Many native plants and animals could become extinct as climatic changes reduce the areas of sustainable habitat available to them.

Water in the cool of the night.

- "Corridors" for wildlife movement between patches of remnant native vegetation can be planned and protected as part of an integrated revegetation or conservation strategy.

Watering in the heat of the day or when the wind is high. Results in high evaporative losses and poor distribution.

- Revegetated road reserves could form part of a wildlife habitat system as well as promoting tourism, reducing soil erosion and providing other benefits.

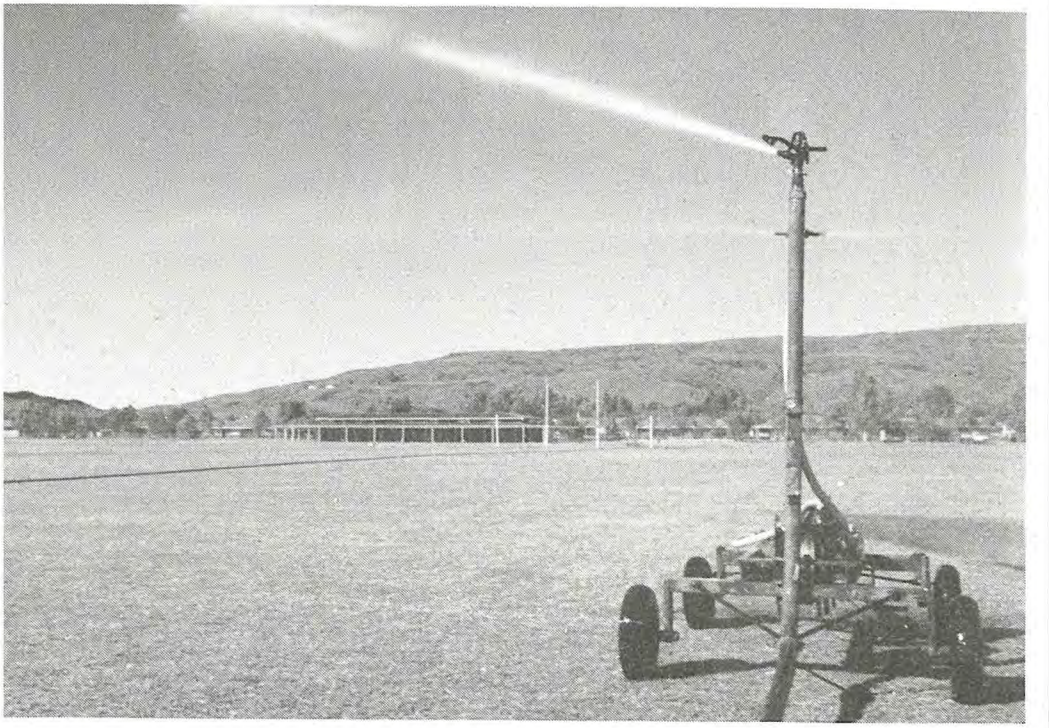


Photo courtesy Western Australian Water Authority.

Treated wastewater can provide irrigation for community ovals.

Coastal management

Photo courtesty West Australian Newspaper.

Coastal buildings are at risk with a rising sea level.

Local governments in coastal areas may confront rising sea levels, higher winds, increased frequency and intensity of cyclones, changes in prevailing winds and sea currents, and the accretion or erosion of coastlines.

- Protecting and restorating of beaches and foreshores gives them more resilience to changes.
- Building and maintenance standards for bridges, seawalls, stormwater drains and roadways must be adequate to cope with more frequent and intensive storms, runoff and flooding from drainage of inland areas.
- Outlets for stormwater and sewerage may need to be raised
- Structures in low-lying areas need appropriate standards to account for sea-level rises or flooding. This may require legislative changes at other levels of government.
- Low-lying land could be reserved for non-intensive purposes such as recreation, agriculture or conservation.
- By recording sea levels, flood events, salinity incursions and patterns of shoreline change, local governments could ensure that new understanding gained from global, National, State and regional research and data gathering programs can be applied to their locality.

Warringah Shire Council, New South Wales, has included allowances of sea level rise in the management plan for Collaroy/ Narrabeen Beach. For new development it has also put an allowance for climate change in guidelines and design policies such as floor level and setbacks.

Emergency Services

- Emergency services should be reviewed to ensure that they could cope with increased demands resulting from cyclones, bushfire, heat waves, flooding and other events.
- Bushfire control programs should be reviewed to ensure they are adequate for new conditions, such as hotter, drier summers.

Funding

- Some Commonwealth funding has been available for local research, planning, education and projects related to the Greenhouse Effect.
- Local governments could provide small grants to local groups for community information about the Greenhouse Effect.
- Local governments or local service clubs could sponsor programs, such as tree propagation, planting and care, or waterway restoration, through schools or other community organisations.
- Local governments could establish and administer a Trust Fund for donations from residents and the business community for environmental enhancement projects.

Local government as information brokers

Local government could expand its existing roles of transferring information between local government staff, the community and other levels of government.

Staff Education.

Providing staff training about climate change would help them take this issue into account when carrying out their duties.

Community Education

- Local governments could distribute pamphlets and other forms of written information through libraries, with rate notices or over-the-counter and by providing information through existing mass media.

The City of Chelsea, Victoria, produced a Greenhouse Action Kit for community education and to promote its own conservation orientated activities. The kit outlined what the Greenhouse Effect is and the local action needed to accommodate climate change in this low lying bayside municipality.

- Local governments can promote regional workshops and seminars to allow the local community to explore Greenhouse issues.
- Council staff and infrastructure are well suited to assist in education programs by providing regular reports about the state of the local and regional environment, and progress in regional conservation programs.

Further information

General:

Western Australian Greenhouse Coordination Council
C/- Environmental Protection Authority
1 Mount Street
Perth 6000
Telephone: 222 7000
Facsimile: 322 1598

Local government:

Western Australian Municipal Association
134 Adelaide Terrace
East Perth 6004
Telephone 221 2911
Facsimile: 221 2912

Agriculture:

Department of Agriculture
Baron-Hay Court
South Perth 6151
Telephone: 368 3333
Facsimile: 368 1205

Forests and conservation:

Department of Conservation and Land Management
50 Hayman Road
South Como
Telephone: 367 0333
Facsimile: 367 0466

Health:

Health Department of Western Australia
East Perth Government Offices
100 Plain Street
East Perth 6004
Telephone: 222 4999
Facsimile: 221 3755

Coastal planning and residential development (Green Street Joint Venture):

Department of Planning and Urban Development
Albert Facey House
Forest Place
469-489 Wellington Street
Perth 6000
Telephone 264 7777
Facsimile: 321 1617

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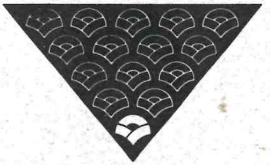
Greenhouse Co-ordination Council



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