# City of Greenhouse Gas Joondalup Emission Reduction Action Plan







Milestone 3 Cities for Climate Protection Programme

## FOREWORD

Sustainable development is defined as;

"development which meets the needs of the present without compromising the ability of future generations to meet their own needs"

(World Commission on Environment and Development, 1987).

The City of Joondalup's Strategic Plan 2003 - 2008 is based on creating a sustainable City and community that are recognised as innovative, unique and diverse.

A sustainable community is one that is:

- Environmentally responsible;
- Socially sound;
- Economically viable; and
- Based on effective governance.

Through the Strategic Plan, the City is committed to sustainable development that has economic, community and environmental benefits. The Cities for Climate Protection (CCP<sup>TM</sup>) Program enables the City to pursue sustainable development by reducing Greenhouse Gases, achieving financial savings and improving human health.

The City is one of 171 Australian Councils currently participating in the CCP<sup>TM</sup> Program. The City has achieved Milestones 1 & 2 of this program and this Greenhouse action plan seeks to fulfill the requirements of Milestone 3. Milestone 3 will be achieved once the City has developed and adopted a local action plan that identifies specific actions to reduce Greenhouse Gas emissions in the community and corporate sectors.

By participating in the CCP<sup>TM</sup> Program, the City is demonstrating leadership towards establishing and maintaining a sustainable future by addressing the serious risk Greenhouse Gases pose to the world.

#### ACKNOWLEDGEMENTS

This report was prepared by Scott Favacho, Senior Environmental Health Officer, under the guidance of John Goldsmith, Sustainable Development Officer. The following City of Joondalup staff have contributed with the preparation of this report:

Armstrong, K. Technical Officer - Conservation.

- Bishop, C. Coordinator Contracts and Purchasing.
- Broome, A. Murdoch University
- Callaghan, K, Assets Officer.
- Edmunds, A. Coordinator Health and Environmental Services.
- Etherington, V. Principal Building Surveyor.
- Fennessy, P. Human Resources Consultant.
- Hoar, P. Coordinator Waste Management and Environmental Services.
- Juricev, M. Human Resources Project Consultant.
- Lenton, B. Coordinator Traffic Project Engineer.
- Low, K. Community Education Co-ordinator.
- Mehta, P. Policy and Planning Officer.
- Prideaux, L. Coordinator Parks and Landscaping.
- Pyke, T. Coordinator Infrastructure Management.
- Stewert-Dawkins, S. Acting Manager Operations Services.
- Veljanoska, S. Coordinator Urban Design and Policy.
- Whelan, P. Coordinator Building Services.

## **EXECUTIVE SUMMARY**

The City of Joondalup is one of the largest local governments in Western Australia and therefore plays a major part in influencing Greenhouse Gas emissions in the state. The population of the City of Joondalup represents approximately 11% of Perth's population and 8% of the entire population of Western Australia.

In 1999, the City of Joondalup resolved to participate in the CCP<sup>TM</sup> Program. The CCP<sup>TM</sup> Program was developed by the International Council for Local Environmental Initiatives (ICLEI) and is delivered in Australia in collaboration with the Australian Greenhouse Office (AGO) to reduce Greenhouse Gas emissions at the local government level.

Local Governments participating in the CCP<sup>TM</sup> Program pledge to reduce Greenhouse Gas emissions from their local government operations and from throughout their communities. Each local government sets its own emissions reduction target and develops a Local Action Plan outlining actions that will be pursued to meet the target. To participate in the program, local governments passed a resolution to undertake the following milestones:

- Milestone 1. Conduct an inventory and forecast of corporate (Council) and community Greenhouse gas emissions.
- Milestone 2. Establish a Greenhouse Gas emissions reduction target for corporate and community sectors.
- Milestone 3. Develop a Local Action Plan.
- Milestone 4. Implement the Local Action Plan.
- Milestone 5. Monitoring and reporting.

## Milestone 1

An emissions inventory titled "An Inventory and Forecast of Energy Use and Greenhouse Gas Emissions within the City of Joondalup" was prepared in 2000 in order to meet the requirements of Milestone 1.

The corporate sector was broken down into the areas of buildings, vehicle fleet, streetlights, water/sewage and waste.

The community sector was broken down into the areas of residential, commercial, industrial, transportation and waste.

This inventory identified the main source of Greenhouse Gas emissions in the corporate and community sectors for the City of Joondalup as electricity used to operate streetlights and buildings (corporate sector) and electricity used in the residential sector (community). A forecast of future emissions indicated that Greenhouse Gas emissions are expected to rise in all sectors unless action is taken to control this.

In order to evaluate current and future Greenhouse Gas emissions, the CCP<sup>TM</sup> Program requires the selection of a base year and a forecast year to formulate data for.

1996 was adopted as the base year for community data mainly due to the availability of statistics obtained from census data in that year.

The 1999-2000 financial year was adopted as the base year for corporate data mainly due to changes in the administrative structure following the division of the former City of Wanneroo in 1998.

## Milestone 2

In early 2002, following community consultation, the Council endorsed corporate and community Greenhouse Gas reduction targets in order to fulfill the requirements of Milestone 2 of the CCP<sup>TM</sup> program.

Council agreed to the following reduction targets:

- A 20% Community Greenhouse Gas emissions reduction target on 1996 levels by 2010, with a stretch target of 35%; and
- A 20% Council Greenhouse Gas emissions reduction target on 2000 levels by 2010, with a stretch target of 35%.

#### Milestone 3

This Greenhouse Action Plan seeks to satisfy Milestone 3 of the CCP<sup>TM</sup> Program. This plan identifies strategies to reduce Greenhouse Gas emissions to target levels endorsed under Milestone 2 and has been developed with input from all Directorates within the City.

#### Benefits

The Greenhouse Action Plan identifies actions that have the potential to provide significant cost savings through energy efficiency and other benefits including better air quality and reduced Greenhouse Gas emissions. Corporate greenhouse gas emissions are forecasted to increase from 19,152 equivalent tonnes of  $CO_2$  in 2000 to 22,762 equivalent tones of  $CO_2$  in 2010. This equates to a rise in energy costs from \$2,905,370 to \$3,481,211 for the City of Joondalup alone (an increase of \$575,841).

The main benefit of reducing Greenhouse Gas emissions for the City will be the opportunity to lead the way in achieving real improvements in air quality at the local level, leading to a better quality of life for residents and visitors to the City. Other benefits for the City include a reduction in traffic congestion, the promotion and support of local services and job creation from new technologies. Additionally, Council has the opportunity to significantly reduce energy costs across all areas.

Unless governments, businesses and individuals take action immediately, Greenhouse Gas emissions will continue to increase resulting in enhanced global warming and climate changes that have the potential to cause coastal flooding and erosion, severe storms and ecosystem damage as well as increasing vectors of disease and changes to the demand and delivery of essential services and construction activity.

#### **Summary**

The City has already undertaken a number of activities that reduce Greenhouse Gas emissions. An energy audit conducted of the Main Administration, Civic and Library building in 2002 identified a potential total energy cost saving of 16% (\$64,000 per annum).

This plan identifies additional actions to these current activities that will further reduce Greenhouse Gas emissions. In implementing these actions, the Council will need to work cooperatively with other levels of government as well as the broader community.

The Greenhouse Action Plan will have major implications in the way the City conducts its business. The Action Plan needs to be monitored and reviewed regularly and will encompass new and innovative ideas that will assist the City and its community to meets its desired Greenhouse Gas emissions reduction goal.



Councillors John Hollywood and Mike O'Brien at the 2<sup>nd</sup> National Cities for Climate Protection Conference in 2001.

FORE	EWORD	2
ACKN	NOWLEDGEMENTS	3
EXEC	CUTIVE SUMMARY	4
1.0	THE GREENHOUSE EFFECT	8
2.0	RESPONSES TO GREENHOUSE GAS EMISSIONS	9
2.1	Australian Response	9
22	Wostern Australia's Resnanse	Q
2.2	" csicin musiculu s response	
3.0	THE CITIES FOR CLIMATE PROTECTION (CCP <sup>TM</sup> ) PROGRAM	9
3.1	City of Joondalup Actions	9
4.0	EMISSIONS PROFILE – MILESTONE 1: Energy and Emissions Inventory	10
4.1	Corporate	10
4	1.1 Street lighting	
4	.1.2 Buildings	
4	.1.3 Water and Sewage	14
4	.1.4 Vehicle Fleet	14
4	.1.5 Waste	14
4.2	Community	15
4	2.1 Residential	16
4	2.2 Commercial & Industrial	
4	2.3 Transportation	
4	2.4 Waste	
5.0	EMISSION FORECAST	18
51	Cornorate	18
5.1		
5.2	Community	
6.0	EMISSIONS TARGET - MILESTONE 2: REDUCTIONS GOAL	20
7.0	ACTION PLANS	21
8.0	REFERENCES	
Attacl	hment 1 – Guide for business units	
Attacl	hment 2 – Abbreviations	50
Attacl	hment 3 – The Greenhouse Effect	51

#### 1.0 THE GREENHOUSE EFFECT

Greenhouse Gases are a natural part of the atmosphere. They trap the sun's warmth, and maintain the Earth's surface temperature at a level necessary to support life. The problem we now face is that human activities—particularly burning fossil fuels (coal, oil and natural gas) and land clearing-are dramatically increasing the concentrations of these gases this in turn traps more heat and changes the climate. This is the enhanced greenhouse effect.

Water vapour is the most abundant Greenhouse Gas. Its concentration is highly variable and human activities have little direct impact on its amount in the atmosphere. Humans have most impact on carbon dioxide, methane and nitrous oxide emissions. Various artificial chemicals such as halocarbons also make a small contribution to climate change.



**GREENHOUSE EFFECT** 

The Earth is covered by a blanket of gases which allows light energy from the sun to reach the Earth's surface, where it is converted to heat energy. Most of the heat is greenhouse gases. Scientists are convinced re-radiated towards space, but some is trapped by greenhouse gases in the atmosphere. This is a natural effect which keeps the Earth's temperature at a level necessary to support life

#### ENHANCED GREENHOUSE EFFECT



Human activity—particularly burning fossil fuels (coal, oil and natural gas) and land clearing—is generating more that this will trap more heat and raise the Earth's surface temperature.

#### Figure 1: The Enhanced Greenhouse Effect.

## 2.0 **RESPONSES TO GREENHOUSE GAS EMISSIONS**

## 2.1 Australian Response

Australia contributes just over 1% of global Greenhouse Gas emissions. However it's per capita emissions, at approximately 20 tonnes of greenhouse gases per person, are one of the highest in the world second only to the United States and Canada.

If no further specific actions were taken to reduce Greenhouse Gas emissions, Australia's emissions are expected to grow approximately 28% from 1990 to 2010. Urgent action needs to be started now if Australia is to meets its Kyoto Protocol target of limiting emissions to 8% above 1990 levels.

## 2.2 Western Australia's Response

In 2002, the State Government established a Greenhouse Task Force to consult with industry, the community and local governments to assist with the development of a State Greenhouse Strategy.

Local Government is recognised for its critical role in helping to reduce Greenhouse gas emissions through the CCP<sup>TM</sup> Program.

## 3.0 THE CITIES FOR CLIMATE PROTECTION (CCP<sup>TM</sup>) PROGRAM

Local governments around the world are responding to the threat of climate change and joining the CCP<sup>TM</sup> Program. CCP<sup>TM</sup> is an innovative program that helps local government and their communities to reduce Greenhouse Gas emissions and their impact on the environment. The CCP<sup>TM</sup> Program is delivered by ICLEI in collaboration with the AGO.

The City of Joondalup joined the CCP<sup>TM</sup> program in 1999. The program is based on five Milestones.

- Milestone 1. Conduct an inventory & Forecast Greenhouse Gas Emissions.
- Milestone 2. Establish a Greenhouse Gas Emission Reduction Target.
- Milestone 3. Develop a Local Action Plan.
- Milestone 4. Implement the Local Action Plan.
- Milestone 5. Monitoring and reporting.

## 3.1 City of Joondalup Actions

In October 1999, the Joint Commissioners authorized the City of Joondalup to participate in the CCP<sup>TM</sup> Program. The City has achieved Milestones 1 & 2 in this program.

As part of Milestone 2 requirements, a Report was submitted to the Council on 12 February 2002 regarding the CCP<sup>TM</sup> Program. At this meeting, the following resolutions were passed:

THAT:

- Council ENDORSES the program for developing the Greenhouse Gas Emission Reduction Action Plan for Council and the Community (Milestone 3 of the Cities for Climate Protection Program);
- The implementation of any of the proposed action plans DOES NOT lead to any changes of planning guidelines that may adversely impact on the ratepayers and the future development of the City of Joondalup; and
- Any reduction action plan development under the aegis of Milestone 3 be returned to Council for approval.

Some actions taken by the City already contribute to Greenhouse Gas emissions reduction. These actions include:

- Enviro-Care Over 40,000 plants were planted in 2002 in coastal and bushland reserves.
- Lighting retrofit of the Administration building A recent energy audit conducted of the Main Administration, Civic and Library building in Joondalup identified a potential 16% energy efficiency improvement that equates to an approximate \$64,000 saving for the City every year.
- Building modifications All City buildings have been fitted with dual flush systems.
- 3 dedicated LPG utilities are currently being trialled by the City.
- Recycling programs Waste paper and used printer toner cartridges from the City's operations are currently collected for recycling.

## 4.0 EMISSIONS PROFILE – MILESTONE 1: Energy and Emissions Inventory

The inventory is to establish the amount of Greenhouse Gas emitted from Council's operations and the community. A baseline year of 1996 has been used for Community emissions while 2000 is the baseline year for Corporate (Council) emissions with forecasts and targets working towards 2010.

## 4.1 Corporate

Research conducted for the Inventory found that Council's activities contributed Greenhouse Gas emissions into the atmosphere totaling 19,152 equivalent tonnes of carbon dioxide in 2000.

The main source of Greenhouse Gas emissions in 1999/2000 was from street lighting (48.2%) and from Council owned and operated buildings (33.8%) as shown in Figure 2.



Figure 3 shows the cost to the City in terms of energy expenditure for 1999/2000.

Corporate Greenhouse gas emissions for the City of Joondalup in 1999/2000 were higher than the average per capita emissions for other Australian local governments.



A complete summary of all the results for the corporate sector including Greenhouse Gas emissions, energy consumption and total annual cost is shown in Table 1.

## Table 1: Joondalup Corporate Greenhouse Gas Emissions in 1999/2000Summary Report .

Source: CCPTM software

	Equiv. CO <sub>2</sub> (tonnes)	Equiv. CO <sub>2</sub> (%)	Energy (GJ)	Cost (\$)
Streetlights	9,240	48.2	33,169	1,434,798
Buildings	6,478	33.8	30,524	806,080
Water/Sewage	1,965	10.3	7,054	270,034
Vehicle Fleet	940	4.9	13,643	322,937
Waste	529	2.8	0	71,521
TOTAL	19,152	100.0	84,390	2,905,370

When the source of the emissions for each sub-sector is examined, it can be seen that electricity was, by far, the highest source of Greenhouse Gas emissions across all the sub-sectors followed by petrol, natural gas and diesel. Table 2 indicates the five leading sources of corporate emissions including Greenhouse Gas emissions, energy consumption and total annual cost.

## Table 2: The Top Five Sources of Corporate Greenhouse Gas Emissions, Consumption and Cost by Energy Source. Source: CCPIM Software

	Equiv. CO2 (tonnes)	Equiv. CO2 (%)	Energy (GJ)	Cost (\$)
Electricity	17,225	89.9	61,837	2,380,110
Petrol	537	2.8	7,855	195,493
Natural Gas	457	2.4	8,910	130,802
Diesel	403	2.1	5,787	127,444
Food Waste	285	1.5		19,168
TOTAL	18,907	98.7	84,389	2,853,017

## 4.1.1 Street lighting

Street lighting and the lighting in public areas contributed to almost half of the total emissions and total energy expenditure for the City of Joondalup. This is mostly due to the large land area within the City that requires lighting and the length of time streetlights are left operating. This includes outdoor lights in parks, at recreation centers, cycle ways and decorative street lighting. The City of Joondalup paid a monthly charge of \$101,023.25 to Western Power for general street lighting in 1999/2000 and the total annual cost of all streetlights, inclusive of Western Power lights, was \$1,434,798.



City of Joondalup Street lighting

## 4.1.2 Buildings

The buildings component makes up the second highest consuming sector and this is understandable considering the size of the City of Joondalup and the number of buildings the City owns. Opportunities to source "renewable" sources of energy exist e.g. using natural power or landfill generated power from Tamala Park to heat pools at the Craigie Leisure Centre.

The top five highest energy-consuming buildings are shown in Table 3. Together, these buildings make up almost 30% of the total building energy cost.

Table	3:	The	Тор	Five	Energy	Consuming	Buildings	Owned	by	the	City	of
Joonda	alup	o for	the F	inanc	ial Year	1999-2000 (i	n descendir	ng order	).			

Building	Energy Consumed (GJ)	Equiv. CO2 (tonnes)	Equiv CO2 (%)	Total Annual cost (\$)
C.O.J. Admin. Building	13,264	3,391	17.7	\$361,549
Craigie Leisure Centre	11,634	1,566	8.2	\$227,143
Percy Doyle Community Facility	1,902	504	2.6	\$61,094
Ocean Ridge Community Centre	407	113	0.6	\$18,145
Fleur Freame Pavilion	341	88	0.5	\$14,335
TOTAL	27,548	5,662	29.6	\$682,266

## 4.1.3 Water and Sewage

Water and sewage Greenhouse Gas emissions come from the use of pumps on the City's reserves as well as from the energy used to power the sewage system. The water and sewage sector is the 3<sup>rd</sup> highest emitter of Greenhouse Gases.

## 4.1.4 Vehicle Fleet

Table 4 shows Greenhouse Gas emissions and cost per vehicle type and also includes the total litres of fuel consumed by each particular vehicle during 1999-2000 based on an average of 85 cents per litre.

## Table 4: Details of Vehicle Fleet for the City of Joondalup for the 1999-2000 Financial Year According to Vehicle Type.

Source: CCP<sup>™</sup> Software

Туре	Equiv. CO <sub>2</sub> (tonnes)	Equiv. $CO_2$ (%)	Energy (GJ)	Cost (\$)
Heavy Truck	105	0.6	1,514	33,345
Light Van or Truck	472	2.5	6,871	164,853
Passenger Vehicle	168	0.9	2453	60,969
Specialised Heavy Equipment	62	0.3	888	19,575
Other	133	0.7	1,917	44,194
TOTALS	940	4.9	13643	322,937

## 4.1.5 Waste

An inventory of corporate and community waste was conducted with the assistance of the City's Environmental Waste Management Services unit. Included in the corporate inventory for waste is green waste collected from parks and waste collected from council owned buildings.

There were 75,712 corporate bins emptied in 1999-2000. Multiplying this by the average weight of refuse from mobile garbage bins (15.1Kg) gives a total corporate waste of 1,143.25 tonnes. At a cost of 68.8 cents per bin for collection, the collection fee comes to \$52,089.86. Tipping fees were \$17 per tonne in 1999-2000 so the annual tipping cost was \$19,431.

The total haulage and tipping costs are therefore:
19431 + 52,089.86 = 71,520.86

There was no data specific to the City of Joondalup's breakdown of waste so default breakdown figures for the state were used and is shown in Table 5.

 Table 5: Breakdown of waste into various types for the state of Western

 Australia.

Source: Ho, 1992

<u>Waste Type</u>	Waste Share
Paper products	24.5%
Food waste	26.8%
Plant debris	21.7%
Wood/textiles	3.0%
Other	24.0%
Total	100%

## 4.2 Community

Community Greenhouse Gas emissions produced 1,379,421equivalent tonnes of carbon dioxide in the base year 1996. The community sector deals with all activities occurring within the City of Joondalup that are not directly owned and operated by the City itself. Data was sourced from default data supplied by ICLEI and was broken into five sub-sectors, as shown below in Figure 4.



The inventory indicates that electricity use in the residential sector is the main source of Greenhouse Gas emissions in the Joondalup community. Major contributions also come from electricity use in the commercial and industrial sector and from transportation sources (mainly passenger vehicles).

The largest source of emissions in the community sector was from electricity use. Table 6 lists the top five sources of community emissions for 1996.

	Equiv. CO2 (tonnes)	Equiv. CO2 (%)	Energy (GJ)
Electricity	871,428	63.2	3,128,333
Petrol	257,612	18.7	3,769,412
Diesel	123,506	9.0	1,773,267
Natural Gas	45,065	3.3	877,922
LPG	31,256	2.3	522,714
TOTAL	1,328,867	96.5	10,071,648

 Table 6: Top five community Greenhouse gas emission sources and consumption for 1996.

## 4.2.1 Residential

To calculate residential emissions, gas and electricity usage rates were obtained from Western Power and Alinta Gas.

Natural gas figures were obtained from Alinta Gas on a postcode basis. Electricity figures for the Joondalup community were based on Western Power data for 1997-1998 that was then extrapolated to account for the decrease in population for the base year 1996.

Default data provided from ICLEI had to be used to calculate LPG emissions as Kleenheat could not provide a figure for confidentiality reasons.

41.1% of community Greenhouse Gas emissions are estimated to come from the residential sub-sector making this area the main target of Greenhouse reduction initiatives.

#### 4.2.2 Commercial & Industrial

In order to determine natural gas emission levels from the commercial and industrial subsectors, default data from ICLEI had to be used as Alinta Gas were only able to provide a total figure and not a breakdown for each area.

Using this default breakdown percentage, a commercial gas use figure of 37,317 GJ was obtained while 74,848.37 GJ was used by the industrial sector in the base year.

Table 7: Alinta Gas commercial and industrial gas consumption forestablishments within the City of Joondalup for base year 1999-2000.Source: Ralph Bailey, Alinta Gas

Postcode	% Of Postcode in C.O.J.	Consumption (kWh)	Total Annual Sales (\$)	Number of customers
6020	30	1,066,222	\$65,608.18	18
6023	100	1,472,110	\$87,326.84	36
6024	100	4,362,628	\$179,225.60	37
6025	100	13,048,210	\$502,795.87	60
6026	85	2,676,211	\$153,754.70	34
6027	100	7,697,188	\$478,226.47	103
6028	100	226,662	\$14,058.05	12
6065	10	610,857	\$43,205.68	9
TOTALS		31,160,088	\$1,524,201.39	309

Commercial electricity use for the base year was determined by extrapolating 1997-1998 back to 1996 levels. Commercial sector use of electricity was 809,149 GJ while 448,784 GJ was used by the industrial sector.

## 4.2.3 Transportation

The total Annual Vehicle Kilometres Travelled (VKT) in the Joondalup community was broken down into different fuel types and the percentages are indicated in Figure 5.



## 4.2.4 Waste

Community waste incorporates domestic rubbish collections, commercial waste and industrial (non-hazardous) waste and in 1996, total waste for the City of Joondalup community was estimated to be 31,237 tonnes or almost a third a tonne per person per year.

## 5.0 EMISSION FORECAST

A forecast of the City of Joondalup's Greenhouse Gas emissions in 2010 was calculated based on population and development trends predicted by the Australian Bureau of Statistics (ABS). The forecast is a "business as usual" estimate of expected Greenhouse Gas emissions if actions are not taken to reduce energy consumption within the City.

The 2010 population was estimated to be 148,910 based on the Ministry for Planning's Population Projections from the 1996 census data. The 1996 population was 141,036. Using these two figures gives a population growth figure of 1.056. This population growth figure was applied to each sector to give the 2010 forecast.

## 5.1 Corporate

In order to complete the corporate forecast, expected changes to the City's infrastructure and services needs to be taken into account. Some of the changes include the construction of the new Performing Arts Facility, construction of the new depot, changes to the Craigie Leisure Centre, the installation of reticulation in at least 20 parks and on median strips, the extension of roads and street lighting and additional car parking facilities.



Figure 7 indicates the expected increase in all corporate sub-sectors except in the vehicle fleet sub-sector. This sub-sector should remain fairly constant in size and emissions. In 2000, 19,152 tonnes of  $eCO_2$  was emitted from the corporate sector for the City of Joondalup. A forecast of 2010 emissions was prepared based on estimated growth provided by ICLEI. Based on the estimated forecast, emissions are expected to increase by 19% to reach 22,763 tonnes of  $eCO_2$  in 2010.

In addition, Figure 7 also indicates that the greatest increase in emissions is from the Water/Sewage sector. This is mainly due to the planned reticulation of dry parks.

## 5.2 Community

Projections for the community forecast were predominantly estimated using population growth statistics and the default data that was provided by ICLEI. Expected community emissions for 2010 can be seen in Figure 8.



Table 9: Community Greenhouse Gas Emissions for Base Year 1996.					
Summary Report Source: CCI	PTM Software				
	Equiv. CO2 (tonnes)	Equiv. CO2 (%)	Energy (GJ)		
Residential Sector	566,608	41.1	2,741,218		
Commercial Sector	229,879	16.7	889,393		
Industrial Sector	188,758	13.7	1,325,092		
Transportation Sector	362,939	26.3	5,332,078		
Waste Sector	31,237	2.3	0		
TOTAL	1,379,421	100	10,287,781		

Table 10: Community Greenhouse Gas Emissions for Forecast Year 2010.					
Summary Report Source: CCP™ Software					
[]	Equiv. CO2 (tonnes)	Equiv. CO2 (%)	Energy (GJ)		
Residential Sector	600,969	36.8	2,938,740		
Commercial Sector	244,352	14.9	965,962		
Industrial Sector	209,047	12.8	1,539,684		
Transportation Sector	549,165	33.6	8,073,062		
Waste Sector	32,987	2.0	0		
Total	1,636,521	100	13,517,448		

This report has been generated for Joondalup, Western Australia with software created by Torrie Smith Associates for the CCP<sup>TM</sup> Campaign of ICLEI. Default emissions coefficients were used.

It can be seen from Figure 8 and Tables 9 and 10 that community emissions are expected to rise in all community sectors if no action is taken control Greenhouse Gas emissions.

Actual usage rates of electrical and gas usage in 1996 were extrapolated for the expected increase in population resulting in an expected rise in emissions for the residential, commercial and industrial sectors.

The waste to landfill figure was also increased to accommodate the increase in population and the increase in transport emissions is due to the additional road length added by Infrastructure Management (estimated to be 12 Km per year).

## 6.0 EMISSIONS TARGET - MILESTONE 2: REDUCTIONS GOAL

Council resolved on 12 February 2002 the following Greenhouse reduction targets:

- A 20% <u>Community</u> Greenhouse Gas emissions reduction target on 1996 levels by 2010, and a stretch target of 35%; and
- A 20% <u>Council</u> Greenhouse Gas emissions reduction target on 2000 levels by 2010, and a stretch target of 35%.

These targets were adopted by Council following a three month community consultation program in which 96% of 168 survey respondents indicated that they believed that Council should adopt a strategy in relation to the Greenhouse Effect.

## 7.0 ACTION PLANS

This section deals with the specific actions to reduce Greenhouse Gas emissions in the City and assist in achieving the emissions target.

Actions for the corporate sector are shown according to the following sub-sectors:

- Buildings;
- Street lighting;
- Water/Sewage;
- Vehicle Fleet; and
- Waste.

Actions for the community sector are shown according to the following sub-sectors:

- Residential;
- Commercial;
- Industrial;
- Transportation; and
- Waste

The actions will be phased over a period until 2010 and each action has been prioritized as either:

- High to be implemented within the next 3 years; or
- Medium to be implemented within the next 5 years.

The Local Action Plan will be reviewed regularly to determine the level of emission reductions, progress towards the emission reduction target and available funding. The review will also update actions to include new information and technology.

A review of this plan and audit of the implementation status of proposed actions, is scheduled to occur periodically every two years throughout the life of the plan.

The summary table following indicates potential Greenhouse Gas savings, return on investment, priority of actions and areas of responsibility for each individual action.

For this Local Action Plan to be successful, a whole of Council approach to implementing the actions must be taken.

Summary Table Legend:

#### Business Unit

A&C – Assets & Commissioning APES – Approvals, Planning & Environmental Services CDS – Community Development Services FS – Financial Services HRS – Human Resource Services IMRS – Infrastructure Management & Ranger Services IM - Information Management OS – Operations Services SSD – Strategic & Sustainable Development

## **CORPORATE ACTIONS**

Sub-sector		Action	Priority	<b>Business Unit</b>
	1. Un energ Admi	dertake energy auditing of the top 5 emitting Council buildings and implement viable y reduction actions identified in these audits. (Craigie Leisure Centre and the Main nistration, Library and Civic Chambers already completed).	Medium	IMRS
	2. Develop a selection criterion for energy efficiency to be incorporated in the assessment of tenders for new Council buildings, plant, equipment and the supply of goods.		High	A&C, SSD, IMRS, APES
	3. De <sup>.</sup>	velop a sustainable purchasing policy.	High	SSD, A&C
Buildings	4. Est	ablish a reserve fund for energy reduction initiatives.	High	SSD, FS
	5. Pur	chase NaturalPower or Green Power for Council facilities	High	SSD, A&C
	6. Est	ablish an Energy Management Team.	High	HRS, SSD
	7. Enable/activate energy saving devices on all suitable corporate devices and electrical equipment.		High	IMRS, IM

Sub-se	ctor	Action	Priority	<b>Business Unit</b>
	8. De	velop an energy efficiency policy for decorative lighting.	High	IMRS
ghting	9. Develop a general lighting policy for streets, reserves, parks and cycle ways under the City's control.		High	IMRS, APES
Street L	10. Pa	10. Participate in the WALGA Greenhouse advisory group.		SSD
	11. Li	aise with Main Roads Department on the implementation of LED traffic lights.	High	IMRS, SSD
age	12. Ut energ	ndertake and review water auditing of all Council's reserves and implement viable y reduction actions identified in these audits.	Medium	OS, APES
er & Sew	13. D	evelop a water efficiency policy for reserves where irrigation is installed.	High	OS
Wat	14. C efficie	ontinue and further develop the system of water pump maintenance to ensure energy ency.	High	OS

Sub-se	ctor	Action	Priority	<b>Business Unit</b>
	15. R	eview rainwater sensor options for all irrigation systems and implement viable options.	Medium	OS
	16. Investigate energy efficiencies of water pumps, including an investigation into alternative energies.		Medium	OS
hicle Fleet	17. In prima of lar	vestigate the possibility of using vehicles with less Greenhouse gas emissions, irily LPG and hybrid petrol-electric for passenger fleet and CNG dual fuel conversion ger vehicles.	High	A&C, SSD
	18. C	ontinue to improve the City's car pooling system.	High	A&C
Ň	19. C	ontinue to improve the City's vehicle fleet maintenance system.	High	A&C
Waste	20. Implement a recycling service for office paper and co-mingled (mixed) recyclables.		High	SSD, IMRS

## **COMMUNITY ACTIONS**

Sub-se	b-sector Action		Business Unit
	21. Investigate the construction of an environmentally sustainable building project.	Medium	SSD, APES
ential	22. Develop and promote energy efficiency initiatives for new and renovation projects.	High	APES
Resid	23. Secure funding to assist in Community actions that reduce Greenhouse gas emissions.	High	SSD, FS
	24. Review the District Planning Scheme to investigate the inclusion of policies that promote energy saving design, devices and environmentally friendly transport.	High	APES

Sub-see	tor Action	Priority	Business Unit
	25. Facilitate energy reduction initiatives and promote these to the wider community	High	SSD, CDS, APES
dustrial	26. Promote the use of renewable energy to the wider community.	High	SSD, CDS, APES
ccial & In	27. Develop educational activities and campaigns that promote Greenhouse gas reduction measures.	High	CDS, SSD, APES
Comme	28. Assist and promote cleaner production and Energy Smart principles in businesses operating in the City.	g High	SSD, APES
	29. Participate and encourage participation in the Commonwealth Government's Challenge Program and the Greenhouse Allies Program.	High	SSD
ortation	30. Develop a transport survey and plan for the City of Joondalup that encourages the use of transportation other than cars.	Medium	IMRS, SSD, APES
Transpo	31. Complete and implement the City of Joondalup Bike Plan.	Medium	IMRS, APES

Sub-see	tor Action	Priority	<b>Business Unit</b>
	32. Investigate participation in the TravelSmart Program.		IMRS, SSD, APES
ste	33. Develop a comprehensive Waste Management Strategy to reduce waste to landfill.	High	IMRS, APES
Wa	34. Liaise with the Mindarie Regional Council regarding the recovery of methane from the Tamala Park landfill facility.	High	IMRS, APES
her	35. Develop a tree planting and bush care policy to off set emissions.	High	APES, IMRS
Oth	36. Investigate opportunities for tree planting programmes in regional areas.	Medium	SSD

#### 8.0 **REFERENCES**

Australian Automobile Association, - Motoring Directions Autumn 1999, Issue 1 Volume 5. RACV, 1999.

Australian Bureau of Statistics, Internet Web Page: www.abs.gov.au, 2003.

Australian Cooperative Research Centre for Renewable Energy, Internet Web Page: <u>www.acre.murdoch.edu.au</u>, 2003.

Australian Greenhouse Office, Internet Site Web Page: <u>www.greenhouse.gov.au</u>, 2003.

Australian Greenhouse Office, Your Home, Design for Lifestyle and the Future Technical Manual, Commonwealth of Australia, January 2003.

Brisbane City Council, *The Sustainable Energy and Greenhouse Action Plan*, Brisbane City Council, November 2001.

Carbon Rights Taskforce, - *Carbon Rights in Western Australia*. Department of Environmental Protection, WA, 2001.

Christie, J. An Inventory and Forecast of Energy Use and Greenhouse Gas Emissions within the City of Joondalup, City of Joondalup, October 2000.

City of Joondalup, Council News Targeting Greenhouse Gases, City of Joondalup, 2001.

City of Joondalup, 2002-2003 Five Year Capital Works Program, City of Joondalup, 2002.

City of Joondalup, Strategic Plan 2003 – 2008, City of Joondalup, March 2003.

City of Joondalup, Internet Site Web Page: www.joondalup.wa.gov.au, 2003.

City of Mandurah, Internet Web Page: www.mandurah.wa.gov.au, 2003.

City of Melville, Sustainability and Greenhouse Action Plan, City of Melville, 2000.

City of Melville, Transport Strategy, City of Melville, July 2000.

City of Melbourne, Internet Web Page: www.melbourne.vic.gov.au, 2003.

City of Rockingham, *Corporate Greenhouse Strategic Plan 2000/2001*, City of Rockingham, 2000.

Commonwealth Scientific and Industrial Research Organisation, Internet Web Page: www.csiro.gov.au, 2003.

Connell Wagner - City of Joondalup Coastal Shared Path Lighting Report 21 June 2002.

Conservation and Land Management, Internet Web Page: <u>www.calm.wa.gov.au</u>, 2003.

CSIRO, Atmospheric Research Internet Web Page: <u>www.dar.csiro.au</u>, Commonwealth, Scientific and Industrial Research Organisation, 2003.

David Suzuki Foundation, Internet Web Page: www.davidsuzuki.org, 2003.

**CCP** Action Plan

Department of Environmental Protection, Waste Wise WA Internet web page: <u>www.wastewise.wa.gov.au</u>, 2003.

Department of Planning and Infrastructure, Internet Web Page: www.dpi.wa.gov.au, 2003.

Eco-Recycle Victoria, Internet Web Page: www.ecorecycle.vic.gov.au, 2003.

Goldsmith, J, *Targeting Greenhouse Gases Public Consultation and Survey Results*. City of Joondalup, January 2002.

Government of Western Australia, *Western Australia and Greenhouse Issues Paper*. Government of Western Australia, December 2002.

Housing Industry Association GreenSmart, Internet Web Page: <u>www.greensmart.com.au</u>, 2003.

International Council for Local Environment Initiatives, - *Cities for Climate Protection Australia 2002 Program Report*, Australian Greenhouse Office, April 2002.

Intergovernmental Panel on Climate Change, Internet Web Page: www.ipcc.ch, 2003.

International Council for Local Environment Initiatives, - *Financing Energy Projects – Revolving Energy Funds*, Australian Greenhouse Office, April 2002.

International Council for Local Environment Initiatives, Internet Site Web Page: <u>www.iclei.org</u>, 2003.

International Council for Local Environment Initiatives, - *Greenhouse reductions via hi-tech and Foreshore Park Lighting*, Australian Greenhouse Office, November 2001.

Leigh, C. Local Government and Sustainability: How the Western Australian Local Government Association is assisting local councils to adapt to the new agenda of sustainability, Murdoch University, April 2002.

Main Roads Western Australia, Internet Web Page: www.mainroads.wa.gov.au, 2003.

Mindarie Regional Council - Strategic Plan 2003 - 2007. Mindarie Regional Council, 2002.

Mindarie Regional Council, Internet Web Site: www.mrc.wa.gov.au, 2003.

Sage Consulting Engineers - City of Joondalup Urban Lighting Handbook Adopted 1998.

Sustainable Energy Development Office, Internet Web Page: <u>http://www1.sedo.energy.wa.gov.au/</u>, 2003.

Transport, (Department), TravelSmart 2010 A 10 Year Plan, WA September 1999.

Victorian Business Information and Research Unit, Internet Web Page: www.business.vic.gov.au, 2003.

WasteNet, Internet Web Page: <u>www.wastenet.com.au</u>, Western Australian Municipal Association, 2003.

Western Australian Local Government Association, Internet Web Page: <u>www.wama.wa.gov.au</u>, 2003.

Western Australian Office of Energy, Internet Web Page: www.energy.wa.gov.au, 2003.

Western Australian Planning Commission, Internet Web Page: <u>www.planning.wa.gov.au</u>, 2003.

Western Australian Planning Commission, *Liveable Neighbourhoods – A Western Australian Government Sustainable Cities Initiative Edition 2*, WAPC June 2000.

Western Australian Planning Commission, Western Australia Tomorrow, - Population Projections for the Statistical Divisions, Planning Regions and Local Government Areas of Western Australia - Population Report No.4 - October 2000, Western Australia Planning Commission, October 2000.

Western Australian Planning Commission, Internet Web Page: <u>www.planning.wa.gov.au</u>, 2003.

Western Power, Internet Web page: www.westernpower.com.au, 2003.

#### Attachment 1 – Guide for business units.

<u>Action 1</u>: Undertake energy auditing of the top 5 emitting Council buildings and implement viable energy reduction actions identified in these audits. (Craigie Leisure Centre and the Main Administration, Library and Civic Chambers already completed).

#### Overview:

The major energy consumed for each council building is electricity for lighting, mechanical services and power supply. Audits have already been carried out for two of the City's largest users of energy, the Craigie Leisure Centre and the Administration, Civic and Joondalup Library buildings. Continuing review will be necessary to further identify actions that will further reduce energy consumption e.g. the refining of light sensor placement.

#### ADMINISTRATION, CIVIC AND LIBRARY BUILDING ENERGY AUDIT:

Improvements in mechanical services to the Main Administration, Civic and Library buildings include:

- Variable Air Volume Box Controls Upgrade
- Fine Tuning of the Building Management System
- Replacement of the building roof and ceiling of the eaves. This has resulted in a decrease of infiltration of outside air and heat transmission with more efficient roof insulation.

An energy audit by Lincolne Scott in 2002 on the Administration, Civic and Library buildings has identified a potential total energy cost saving of 16% valued at \$64,019 per annum or 653 tonnes of Greenhouse Gas emissions. \$43,588 of these savings can be achieved for a relatively low capital expenditure of \$35,500 giving a simple return on investment in 0.8 years.

Identified savings with the mechanical services can primarily be achieved by the installation of variable speed motor drives (VSD) to the Administration chilled water pumps and cooling tower fans and additional modifications to the controls system. Installation of VSD for the main Library air handling unit reducing fan speed to 80% during periods of low loads will result in further savings.

Lighting is also a significant electricity consumer with savings being achieved by the installation of motion sensor detection in various areas of the buildings and lighting upgrade in the Administration building resulting in a total saving of \$38,041 per annum.

The audit found that Main Administration, Library and Civic mechanical services consumption (26%), can be reduced by replacing the existing chillers, installation of pump and fan VSD control and implementing control strategy changes.

Light and power for the buildings (43%) can be reduced by implementing motion sensor controls for lighting and by adopting better switching off practices.

Lighting and power can be reduced significantly in the Administration building by switching to triphosphor bulbs and by refurbishing the existing light fittings.

Lincolne Scott recommend that the City of Joondalup allow a budget in the order of \$190,000 ex GST to undertake all the Energy Saving Actions highlighted in their Energy Audit Report as well as the retrofitting of existing light fittings within the Administration building.

#### CRAIGIE LEISURE CENTRE ENERGY AUDIT:

An energy audit of the Craigie Leisure Centre has recently been completed by Lincolne Scott to identify potential energy savings with the intent of reducing Greenhouse Gas emissions.

The major energy source used at the centre was gas which is used in the boiler to heat the pool water and pool hall air.

Lincolne Scott's audit identified a number of energy saving actions which have a potential energy cost saving of 42.7%, valued at \$104,764 or 271 tonnes of Greenhouse Gas emissions. These savings could be achieved with a capital expenditure of \$273,740 giving a simple return on investment of 2.6 years.

Identified savings with the mechanical services will primarily be achieved by the installation of a heat pump unit to heat the indoor pool water. The use of a heat pump would be a lot more efficient than the gas boiler resulting in a large reduction in gas use with only a minor increase in electrical energy consumption.

Lighting control is another area where savings can be achieved with the installation of motion sensor detection and time scheduling in various areas of the building.

Additional annual energy savings of \$1,325 could be achieved by upgrading to more efficient lights and fittings and this should be done during the refurbishment of the centre.

Lincolne Scott recommend that the City of Joondalup allow a budget in the order of \$310,000 ex GST to undertake all the Energy Saving Actions highlighted in their Energy Audit Report as well as the retrofitting of existing light fittings within the building.

Action 2: Review the existing Purchasing Goods and Services Policy to include a selection criterion for energy efficiency to be incorporated in the assessment of tenders for new Council buildings, plant, equipment and the supply of goods.

#### Overview:

The City has developed a draft evaluation form entitled "How sustainable is your project?" which seeks to enable proponents to assess the economic, environmental and social sustainability implication for any project. This guideline will be used to assist assessment of the design and construction of the City's new works depot.

By including or requiring that energy efficient designs be implemented, the City can ensure future energy savings.

Building design factors that can be looked at include passive solar orientation, ventilation and heating systems, lighting systems, window ratings, use of recycled materials, waste minimisation and insulation.

The City should require that environmental and economic factors be considered when seeking tenders for new Council buildings. The City currently has access to expert staff in the areas of sustainability, building design and building management and allowing these key staff to have a coordinated approach to the design of new buildings will promote energy efficient building design and realise savings for the City. A clause could be incorporated into the existing Purchasing Goods and Services Policy. Existing Policy requires that consideration CCP Action Plan 32

be given to "Buying Local" and this Policy could be expanded to include a preference for energy efficient goods. Similarly, a clause could be added to the City's Purchasing of Goods and Services procedure (Procedure 1.27) to include energy efficient considerations.

Environmental sustainability needs to be a major consideration with the design of the Joondalup Performing Arts Centre as theatre lighting can be very energy intensive. The potential remains for energy efficient design to be incorporated into the design and construction of the proposed Joondalup Performing Arts Centre. This would start at building design stage and will assist in reducing heating and ventilation costs by proper solar passive design and by the use of energy efficient lighting and plant and equipment. As a major Council building, the Performing Arts Centre could also serve to demonstrate the City's commitment to best practice energy efficient building design.

Increasing staff awareness of how purchasing can impact on the City's Greenhouse Gas emissions will be instrumental if changes in policy and procedures are to be adopted when purchasing equipment.

<u>Action 3</u>: Develop a sustainable purchasing policy.

#### Overview:

The following areas should be considered: Waste, energy, habitat destruction and pollution.

A review of existing purchasing policy should be conducted to examine the use of recycled products where available.

The use of recycled products creates a market demand for such products and demonstrates the City's commitment to reducing Greenhouse Gas emissions.

Training of purchasing staff may be necessary to increase staff awareness of this issue and cooperative purchasing services with other local governments or businesses could be established. An example of this is the Eco-buy network that has been set up amongst Victorian local governments. The Eco-buy network allows Victorian councils to share information about stationery and equipment supply and has created a demand for recycled products.

The City has trialled the use of recycled letterhead and paper in the past but this has since been discontinued. Using recycled paper will demonstrate the City's commitment to recycling, reduce Greenhouse Gas emissions, support biodiversity by reducing the number of trees cut down and create a demand for locally produced, recycled paper. This could be trialled again to determine if improvements in the paper recycling industry have addressed previously identified quality issues.

EcoRecycle Victoria is a state government agency that provides information and advice to business, government and the community about waste reduction and improving materials efficiency. EcoRecycle have developed a model Purchasing Policy that can be adopted by the City of Joondalup.

Consideration should be given to preparing a purchasing policy that includes consideration for low environmental impact and energy efficiency when purchasing equipment and machinery. Whilst this equipment may be more expensive initially, lower running costs and the benefit of less Greenhouse Gas emissions are important factors to consider.

An example of this would be only purchasing equipment that has a 4 or 5 star energy rating when this information is available. The City may decide that preference is given to energy efficient equipment when whole of life costings indicate that the use of this type of equipment is less than 10% more expensive than the use of similar, more energy demanding equipment.

The availability of energy saving devices on equipment should also be a factor to be taken into account when purchasing equipment like photocopiers and computer equipment.

Staff should be aware of energy efficiency considerations and ensure that any new energy using equipment be looked at from a triple bottom line view. The current practice in the City for equipment under \$40,000 is only that 3 quotes be obtained. No consideration is given towards efficiency of the equipment.

The "Green Office Guide" is a booklet produced by the National Appliance and Equipment Energy Efficiency Committee. The booklet offers advice on the purchase and use of environmentally friendly office equipment.

The City should develop and apply minimum energy performance standards for new and refurbished Council buildings, appliances and equipment.

Action 4: Establish a reserve fund for energy reduction initiatives.

#### Overview:

A reserve fund can be established to support energy saving initiatives.

Energy reduction actions that have a high return on investment will be given priority and benefits include no initial capital set up costs. The effectiveness of the fund will depend on the regular review of the financial balance of the fund and the number of initiatives developed.

There are a number of methods that can be used to set up the reserve fund. Seed funding could be provided and this "topped up" with savings made from energy saving initiatives. Alternatively, operational savings from energy can be identified and this money used as it is gradually grown. Business units can apply for funding from this fund for proposed initiatives. Financial Services, Sustainable Development or an Energy Management Team could oversee management of the fund.

This fund can be established after submission of a report to the Council. The Report should be worded to allow both savings and allocated funds from the Council to be invested. Physical invoices from Western Power, the Water Corporation and Alinta Gas will provide information of units saved.

This will be assisted by developing the Oracle data management systems to report on energy usage and savings. The recommendations from the Milestone 1 CCP<sup>TM</sup> report as prepared by Jacinta Christie will assist future monitoring and reporting and these recommendations should be actioned as a priority.

A similar scheme set up by the City of Newcastle in 1997 received an initial allocation of \$300,000 from the Council's reserve funds. There was no reduction in annual budget allocation that Council departments received for their energy costs and any savings were not retained by the departments but transferred into the REF. CCP Action Plan

Since 1995, the City of Newcastle reduced its energy bill from \$1 million to \$597,000 (40% saving). Cumulative savings since 1995 have been \$993,000 and approximately 75% of these have come from energy saving initiatives with the remaining coming from energy market deregulation.

Newcastle Council's finance department manages the REF while other teams in Council deliver the energy saving projects. Staff energy awards ensure that recognition is given to staff for achieving savings.

Newcastle's REF was established for a period of 3 years and was not reinstated as all managers in the Council are now fully aware of the benefits of energy saving initiatives. The City of Melville also has an REF whereby 80% of energy savings are reserved for energy saving projects and the remaining 20% are returned to the individual departments making the saving an incentive.

Savings from energy saving initiatives are reinvested back into the fund and yearly budgets are not reduced when savings are realised. There was no initial outlay for the City of Melville and the fund continues to grow from savings that are reinvested in to the fund. The property/energy co-ordinator manages this fund and authorises expenditure.

Action 5: Purchase NaturalPower or Green Power for Council facilities.

Overview:

Green Power or NaturalPower is the use of renewable sources for the production of electricity. Western Power and other energy providers are using technologies such as hydro, wind, biomass and solar generation to produce electricity with minimal Greenhouse Gas emissions.

NaturalPower is sold by Western Power and is available to customers in Western Australia connected to the South West Interconnected System at a premium per kiloWattHour (kWh).

NaturalPower Option	5%	10%	25%	50%	75%	100%
Average unit price rise (cents)	0.15	0.3	0.75	1.5	2.25	3.0

Depending upon how much NaturalPower is used, the average increase could be as little as 0.3 cents per unit. The following table demonstrates this relationship:

New opportunities exist with the contestability for renewable energy for sites of over 300 MWh now a reality in Western Australia and the City should investigate tendering for the supply of renewable energy.

The City of Mandurah has recently tendered its power supply for its major facilities and an agreement has been reached with Landfill Gas and Power to utilise landfill gas obtained from Canning Vale. Eight of Mandurah's buildings are now powered by renewable energy.

Landfill Gas and Power currently sell Green Power to the Councils of Mandurah, Melville, Belmont, Cambridge and Bayswater and have tendered for the supply to Armadale Council.

Landfill Gas and Power work with Perth Energy and are available to assist with the tender process. Perth Energy will also conduct a free audit to determine if the City can use Green Power by examining consumption rates and existing tariffs.

#### Action 6: Establish an Energy Management Team

#### Overview:

The City should call for nominations for an energy management team with representatives either from each Directorate or work area to meet regularly, develop training for City staff and implement an awareness campaign.

This will have the benefit of reducing Greenhouse Gas emissions through the saving of energy. There is also the opportunity for the measurable results of this awareness to be included in regular audits of work practices which could then be used to gauge different business unit's participation and level of awareness or used as a business unit indicator of performance.

A competition could also be run for staff to come up with Greenhouse Gas reduction initiatives that have the potential to save the City money as well as reduce its Greenhouse emissions. A reward for the best idea could be offered similar to the Customer Service Awards currently offered by the City.

Awareness training for new staff could be included in Induction training performed by Strategic and Sustainable Development and facilitated by Human Resources. A training package can be developed with the assistance of ICLEI for in house training of existing staff and a presentation at the annual staff conference could be used to disseminate information about the project.

<u>Action 7:</u> Enable/activate energy saving devices on all suitable corporate devices and electrical equipment.

#### Overview:

Energy saving devices exist on many of the City's equipment. By ensuring that energy saving devices are enabled, the City will be able to realise Greenhouse Gas reductions and reduce electricity costs.

This action would ideally benefit from increased staff awareness about Greenhouse issues.

Action 8: Develop an energy efficiency policy for decorative lighting.

#### Overview:

The City should develop an energy efficiency policy for decorative lighting and entry statements to ensure that the most efficient lighting option is investigated along with economic and social factors.

Solar lighting should always be considered as the use of solar energy results in no Greenhouse Gas emissions. The use of solar energy will demonstrate the City's commitment to Greenhouse Gas reduction and assist in the education of the community and visitors to the City.

This Action may be incorporated as part of Action 9 (Development of a general lighting policy). The Urban Lighting Handbook has a section on decorative lighting that could be amended to include energy efficiency considerations.

<u>Action 9:</u> Develop a general lighting policy for streets, reserves, parks and cycle ways under the City's control.

#### Overview:

The City has control of street lighting in the Joondalup CBD and in the provision of lighting in parks, at recreation centers, along cycleways and for decorative street lighting. The City also provides street lighting for Harbour Rise and in the suburb of Iluka. There is increasing pressure on the City to provide more security lighting.

The City engaged Connell Wagner to undertake a review of lighting options for the coastal path running from Marmion Beach to Burns Beach in 2002. The design criteria of the report were based on the lighting standards of AS 1158.3.1, which is the Australian Standard for pedestrian lighting. Environmentally aware solutions were investigated including LED Dio lights and renewable sources of solar and wind power.

The study recommended that Metal Halide lamps be used for this coastal pathway because it is characterised by high efficiency, high illumination, medium-high lamp life, excellent colour rendition, suitability for distinguishing path users and is conducive to user comfort and feelings of safety and security. The use of wind power was considered but not recommended because total cost (whole of life operating cost and whole of life maintenance cost) was 34% more than conventional lighting costs. The presence of 10m masts with rotor blades was also seen to have an adverse visual and ecological impact although it could also be argued that the masts would serve to demonstrate the City's commitment to reducing Greenhouse Gas emissions.

An audit of existing lighting in the Joondalup CBD is planned and \$230,000 has been budgeted for replacement of the inefficient lighting (mercury vapour lamps) with more efficient lighting (high pressure sodium and metal halide). Consideration of new lighting technology (Dio, solar and Induction) may also be viable although the previous review suggested that initial infrastructure costs would be high and in the case of Dio lights, only provide a low lumen output. Continuing advances in new technology may soon make solar, induction and Dio a viable option for the City to consider. A consideration of environmental and social factors should be made rather than making a determination solely on financial cost.

The audit requires an electrical engineering consultant's report and money would also need to be budgeted for the installation and retrofitting of more efficient lighting as well as for the consultant's study. There is room to further improve the efficiency of the lighting that the City provides to recover some of these costs.

The use of innovative lighting is also being trialled currently in the Moore Drive underpass. Latitude and longitude has been input into the lighting controller and the lights for the underpass come on and off according to sunset and sunrise. This avoids the need to manually adjust starting and stopping times.

Lighting requirements for recreational reserves needs to be considered as insufficient lighting in areas where sports are played has the potential to result in injuries to users. Some of the City's recreation reserves currently receive less lighting than Australian Standard 2560 requirements and new lighting will need to satisfy these requirements as well as have energy efficient qualities.

Most of the City's parks have lighting controls that enable lighting to be switched off. Lighting is currently left on in many parks, however, as the cost of providing this lighting is less than the cost of repairing damage done by vandals when the lighting is switched off.

The City has an Urban Lighting Handbook that covers various aspects of urban lighting and the City's role in this area. This handbook should be amended to include provisions that encourage and promote the use of efficient and effective lighting and to include new, energy efficient technologies.

Action 10: Participate in the WALGA Greenhouse Advisory Group.

#### Overview:

Western Power is currently the main provider of street lighting and the City currently has a service agreement with Western Power to operate street lights throughout the whole night.

The City should work with WALGA and Western Power to reduce energy consumption by improving street lighting efficiency and by investigating the length of time streetlights are operated for. 49% of corporate Greenhouse Gas emissions come from electricity used to provide street lighting.

The City has previously written to Western Power to request consideration of the use of more efficient lighting options and Western Power have started installing metal halide globes to replace existing mercury vapour lamps.

WALGA have a working party looking in detail at this issue currently and the City should seek to have input into this group to investigate actions to reduce emissions from street lighting.

<u>Action 11:</u> Encourage the Main Roads Department to investigate the provision of energy efficient (LED) traffic lights.

#### Overview:

The City has no jurisdiction over the provision of traffic lights and Main Roads WA are responsible for the provision of these signals. Main Roads WA are trialing traffic signal lanterns with Light-Emitting Diodes (LED) as an alternative to incandescent signal lamps.

LEDs are likely to be more reliable, cheaper to run and should have a longer life expectancy than traditional incandescent traffic signals lamps. Manufacturers tests show that energy and maintenance savings can be significant.

The City should encourage Main Roads to trial more energy efficient traffic light signals. This could be as part of a co-ordinated approach from local governments through the WALGA Greenhouse Advisory Group.

<u>Action 12</u>: Undertake and review water auditing of all Council's reserves and implement viable energy reduction actions identified in these audits.

#### Overview:

The Water Corporation currently provides a budget to the City for the watering of parks and reserves and flow meters have been installed to most of the City's reserves to monitor water usage.

Operation Services are currently reviewing all sprinkler systems to examine water efficiency and any pumps that require replacement are upgraded to more energy efficient models.

Water audits should be done on all of the City's reserves to determine further potential savings. This will involve auditing approximately 200 irrigated parks in the next 5 years. 20 parks have been audited in 2003.

If audits identify savings with a return on investment of less than 5 years, then the recommendations of the energy audit should be implemented.

Action 13: Develop a water efficiency policy for reserves where irrigation will be installed.

#### Overview:

The City has identified at least 20 dry parks that will be provided with bores and reticulation from 2002 - 2007 although further funds have been budgeted for the provision of reticulation to other parks as determined by the Dry Park Development Committee. Sixteen (16) of these parks are yet to have irrigation installed.

This will increase pumping costs quite considerably by 2010 and a water efficiency policy needs to be developed to deal with this expected increase. This policy will be determined by the findings of Action 12 where operational efficiencies may be identified.

#### CCP Action Plan

Sub surface irrigation has been trialled by the Cities of Perth and Melville. Sub surface irrigation systems must be well designed and monitored as the potential for damage from blockages and leaks is the main concern and is harder to trace than conventional irrigation systems. A successful trial is likely to result in sub surface irrigation being used in other parks and reserves. The City has looked at this option and whilst no suitable systems have been identified to date, improvements in this area may make this a viable option in the future.

Other areas that a policy could address include the provision of larger areas of native vegetation that are less water dependent in parks and the reduction of grassed areas that require regular watering. Regular mulching of parks could also reduce watering requirements.

<u>Action 14</u>: Continue and further develop the system of water pump maintenance to ensure energy efficiency.

#### Overview:

The City's Operation Services currently conducts regular pump maintenance on an annual basis.

By regularly servicing water pumps, the City is able to maintain pump efficiency and reduce emissions associated with the use of electricity to operate these pumps.

<u>Action 15</u>: Review rainwater sensor options for all irrigation systems and implement viable options.

#### Overview:

A central overriding Irrigation Monitoring System is currently in place for the City's main and largest parks and reserves. This system currently requires manual overriding and the provision of automated rain sensors should be examined.

As rain monitors cost \$7,000 - \$8,000 per monitor, the provision of these sensors to small parks will require some capital outlay by the City.

Many of the City's older stand alone reticulation systems cannot be overridden and the conversion of these systems have been investigated.

The City is currently investigating an option that utilizes one main rain gauge sensor to control park irrigation.

<u>Action 16</u>: Investigate energy efficiencies of water pumps, including an investigation into alternative energies.

#### Overview:

Variable Speed Drives (VSD) are currently used to water parks in the Joondalup CBD.

CCP Action Plan

The City needs to develop a policy that promotes continual improvement in water pump efficiencies and should ensure that pumps that require replacement are upgraded to the most efficient pumps available at the time.

The availability of solar pumps is currently not a financially viable option given the high cost associated with this new technology. Further investigations into solar pump technology should be conducted especially in Council reserves close to the water table where large head heights are not a factor.

Continuing investment and improvements in the area of solar power is likely to reduce the cost of these systems in the future.

Action 17: Investigate the possibility of using vehicles with less Greenhouse Gas emissions, primarily LPG and hybrid electric-petrol for passenger fleet and dual fuel conversion of larger.

#### Overview:

The City of Joondalup has a vehicle fleet that is currently run mainly on unleaded petrol and diesel and vehicle purchasing is currently solely dependant on "Whole of life" cost. The City has 2 dedicated LPG utilities.

Reducing the number of vehicles in the vehicle fleet with large engines to small engines can result in a significant reduction in Greenhouse Gas emissions as a result of decreased fuel consumption

Similarly, the conversion of the existing fleet from diesel and petrol to Liquefied Petroleum Gas (LPG) will result in a reduction of Greenhouse Gas emissions by up to 16% and will also contribute to the reduction of smog.

LPG is a cleaner fuel than petrol and emits less Greenhouse gas, results in longer service life and reduces long term maintenance cost. A cost analysis of vehicle operating costs by the RACV indicated that lower fuel costs outweigh the increased capital cost of converting to LPG. A City of Joondalup Report in relation to fleet management-passenger vehicles also found that the use of dedicated LPG 6 cylinder vehicles would result in savings to the City (Refer Council Report CJ133-05/01).

Funding from the Commonwealth Government is available through the Alternative Fuels Conversion Program (AFCP) for the purchasing, conversion or upgrading to LPG or CNG (Compressed Natural Gas) on commercial vehicles or busses over 3.5 tonnes gross vehicle mass.

Several local authorities have trialed the use of CGN in their heavy vehicle fleet and results from these trials indicate savings in costs and emissions in the order of 20-30%. Initial investigations by other local governments in Western Australia indicate that initial capital costs involved in conversion of heavy diesel vehicles may be covered by the gas suppliers in line with contracts for fuel supply at a slightly higher rate. The availability of CNG in Perth is very limited at this time although availability should improve as demand for the fuel increases in the years to come.

Consideration should also be given to the use of hybrid passenger vehicles (powered by a petrol-electric engine). Many local governments and State governments have purchased these vehicles as this demonstrates a firm commitment to reducing vehicle emissions. Hybrid CCP Action Plan 41

vehicles use half the fuel of conventional petrol engines and emit significantly less quantities of Greenhouse Gas.

The City currently has some passenger vehicles with an engine capacity of less than 2.0 litres. Vehicles with smaller engines use less fuel than their larger counterparts.

Action 18: Continue to improve the City's car pooling system.

#### Overview:

By encouraging car pooling, the City has been able to reduce its fleet size. Some staff have also traded their commuting rights for other incentives and this has allowed extra vehicles to become available for the City's staff to use and share.

Action 19: Continue to improve the City's vehicle fleet maintenance system.

#### Overview:

The City has developed a system to ensure that all Council vehicles are serviced regularly in accordance with the manufacturer's specifications. By ensuring that regular maintenance occurs, the City is able to reduce Greenhouse Gas emissions.

Action 20: Implement a recycling service for office paper & commingled (mixed) recyclables.

#### Overview:

The City of Joondalup currently provides a recycling service for recyclable materials like newspapers, certain plastics, glass, aluminium, certain cardboards, motor oil, car batteries and steel cans.

Opportunities to increase the level of recycling exist in the corporate sector. Currently, the recycling of waste paper and cardboard occurs on an ad hoc basis and the City should investigate increasing the recycling participation rate of business units as well as investigate new recycling opportunities e.g. Expanding services to include the recycling of waste paper, cardboard, glass and plastics in all of the City's buildings.

Increasing staff awareness through training will be necessary for an improvement in corporate recycling. Waste minimisation is aimed at reducing waste through education and improved production process rather than relying on technology to improve the treatment of waste.

Waste minimisation is a method of managing existing resources and technology in order to maximise the efficiency of available resource use. Minimising waste generation has the potential to reduce costs or increase profits by maximising the use of resources and by reducing the amount of waste to be disposed of the cost of waste management is also decreased.

<u>Action 21:</u> Investigate the construction of an environmentally friendly sustainable building project.

#### Overview:

The City could build an Environmentally sustainable "showcase" building. This could be an Environment Centre as identified in the Proposed Final Yellagonga Management Plan that has been endorsed by the City of Joondalup. Another option would be to look at buildings currently included in the future capital works program. Ensuring new public buildings like the Performing Arts Centre are rated for energy efficiency will not only reduce operation costs in the future but could also serve as a showcase in environmentally friendly building design.

Action 22: Develop and promote energy efficiency initiatives for new and renovation projects.

#### Overview:

There are a range of initiatives the City could consider in this area. Recent amendments to the Building Code of Australia will require that new developments be rated for energy efficiency at the building application stage. Energy rating software FirstRate and National House Energy Rating software (NatHERS) will be used to assess applications and a rating of 4 or above must be achieved for approval to be issued. A checklist to assist Building Surveyors monitor compliance with energy efficient principles has already been developed and will be ready to use on 1 July 2003 when these mandatory changes come into effect.

Achieving a rating of 4 or above will mean that consideration has been given to energy reducing factors like the provision of insulation, solar hot water systems and lagging for hot water pipes.

Prospective applicants could visit the City and use the FirstRate software to look at ways they can increase the energy efficiency of their home. The City could also provide this software at its libraries although this will need to be discussed with the program supplier. The City may also be able to provide this on its web site if this type of use does not breach license agreements.

The provision of information about the Housing Industry Association's GreenSmart building principles and solar passive design is readily available and the City could develop guidelines to assist people at building application stage. Alternatively, the City could promote the comprehensive work done in this area by the Australian Greenhouse Office by providing information from the "*Your Home Design for Lifestyle and the Future Technical Manual*" and by links on the City's web site to www.yourhome.gov.au.

The City should also seek to join GreenSmart and actively support and sponsor GreenSmart principles and members. Competing in GreenSmart competitions will also demonstrate the City's commitment to reducing energy use and give recognition to the City for the work it is doing in this area.

Action 23: Secure funding to assist in community actions that reduce Greenhouse Gas emissions.

#### Overview:

The Sustainable Energy Development Office provides funding and grants to support renewable energy and energy efficiency projects in Western Australia.

Grants are available to households, community groups, businesses, governments and research and development organisations.

Action 24: Review the District Planning Scheme to investigate the inclusion of policies that promote energy saving design, devices and environmentally friendly transport.

#### Overview:

Planning can consider energy consumption and Greenhouse Gas emissions of all urban development policy matters that come before Council by the way of Structure Plans.

For example, the City's Town Planners currently look at retaining significant vegetation species in subdivisions although the lack of a Policy addressing environmental concerns does not leave Town Planners with the legal backing they often require to demand environmentally friendly developments.

The City has a policy for Pedestrian Access Ways (PAWs) that provides guidance on the inclusion and design of PAWs in new subdivisions. This promotes the use of walking and cycling in the local neighbourhood and reduces the need for the use of cars that contribute to the Greenhouse effect. In this policy, the closure of PAWs is generally not supported particularly if it provides an important access route to a community facility. Examples of facilities include schools, shops, public open space, bus stops, libraries, churches and rail stations.

The Department of Planning and Infrastructure released a Planning Bulletin in May 2003 which requires that the closure of PAWs be assessed and consideration given to the impact on the community.

State Government involvement for subdivision application will need to be considered as the Department of Planning and Infrastructure is the determining body in this regard. The Department of Planning and Infrastructure has developed the *Liveable Neighbourhoods* policy. This policy has been introduced to provide an alternative approach to the design of towns and neighbourhoods and aims to achieve compact, well connected, safer and more vibrant urban communities. The policy is a key element of the Commission's *State Planning Strategy*, which is focused on achieving economic, social and environmental sustainability. The City has not yet adopted this policy and should seek to do so to ensure that future subdivisions consider triple bottom line factors.

The City of Mandurah has developed a City Centre Skyline Policy to guide Mandurah City centre development into the 21st century. Guided by community concerns about uncontrolled

development, the policy promotes solar design across the city centre, as well as increased residential density in an area zoned for mixed use, and equality for all landholders and developers in terms of views and solar access.

Action 25: Facilitate energy reduction initiatives and promote these to the wider community.

#### Overview:

There are many government partners in the area of energy and sustainability and the City should promote the work done by these departments. This could be achieved by providing links to these organisations on the City's web page or by displaying their pamphlets in Council buildings.

The Australian Greenhouse Office, the Department of Environment Protection, Environment Australia and the Sustainable Energy Development Office have all developed pamphlets and guides that contain information on a range of energy saving initiatives.

Areas that can be addressed include tips for the efficient use of lighting, air conditioning and water, encouraging the purchase and use of energy efficient equipment and encouraging the use of grants available for solar hot water systems and photo-voltaic cells for power supply.

Promotion of existing schemes such as the Australian Greenhouse Office's rebate for grid connected solar panels for residential/household usage should also be considered.

Action 26: Promote the use of renewable energy to the wider community.

#### Overview:

With contestability for renewable energy for sites of over 300MWh, the City is able to tender the supply of renewable energy at certain sites.

The City should promote the use of renewable energy that it uses and encourage large users of energy in the community to do the same.

The promotion of Western Power's GreenPower will also increase the level of renewable sources of energy in the Community.

<u>Action 27</u>: Develop educational activities and campaigns that promote Greenhouse Gas reduction measures.

#### Overview:

The City currently has a school education program which address learning outcomes identified by the Education Department. Examples of existing programs that touch on environmental issues include the Adopt a coastline/bushland program, Ribbons of Blue/WaterWatch WA and World Environment Day.

The opportunity to increase awareness of and activities associated with Greenhouse Gas reduction should be investigated within the context of this program.

Other educational opportunities exist through the City's Sustainability web site and from displays during Local Government Week and in libraries.

<u>Action 28:</u> Assist and promote cleaner production and Energy Smart principles in businesses operating in the City.

#### Overview:

The promotion of cleaner production principles in businesses operating in the City should be considered and there is existing staff in the City (Environmental Health Officers) that can assist in this regard. As well as reducing costs for businesses, cleaner production and Energy Smart initiatives will result in less waste and the more efficient use of energy with a resulting decrease in Greenhouse Gas emissions.

<u>Action 29:</u> Participate and encourage participation in the Commonwealth Government's Challenge Program and the Greenhouse Allies Program.

#### Overview:

The Greenhouse Challenge - launched in 1995 - is a joint voluntary initiative between the Commonwealth Government and industry to abate Greenhouse Gas emissions. Participating organisations sign agreements with the Government that provide a framework for undertaking and reporting on actions to abate emissions.

The City could also seek to actively pursue partnership projects with businesses addressing Greenhouse concerns. Incentives for the business could include promotion and recognition on the City's web sites, cost savings from energy savings and in return the City will be promoted as a supporter of local businesses that address Greenhouse concerns.

<u>Action 30</u>: Develop a transport survey and plan for the City of Joondalup that encourages the use of transportation other than by car.

#### Overview:

Some local governments like the City of Melville have developed a transport strategy and a similar strategy should be developed by the City of Joondalup. The success of Melville's whole of Council approach to transport issues demonstrates that strategies of this nature are successful in improving safety, convenience and efficiency with social and environmental responsibility.

Melville's strategy provides a vision, objectives and benchmarks for transport over the following key areas:

- Traffic Congestion;
- Enhanced Public Transport;
- Road Crashes;
- Parking Demand;
- Pedestrian and Cyclist Environment;
- Through Traffic;
- Impact on Residences and Other Users;
- Accessibility for People Without Access to Private Cars;
- Accessibility for People with Disabilities; and
- Integration of Transport and Land Use.

#### Action 31: Complete and implement the City of Joondalup Bike Plan.

#### Overview:

In 2002, the City conducted a Bike Survey to gauge residents' attitudes and participation towards using bicycles. Input from this survey will be used to review the Bike Plan for the City of Joondalup and to investigate ways to increase and improve the use of bicycles in the city. Encouraging the use of bicycles and reducing the use of transport requiring energy will reduce Greenhouse Gas emissions and has the added benefit of improving health through exercise.

#### Action 32: Investigate participation in the TravelSmart Program.

#### Overview:

TravelSmart is another partnership opportunity that the City could consider as a means of reducing emissions from transport in the Community. TravelSmart is a successful Western Australian community-based program that encourages people to use alternatives to traveling in their private car. As well as the reduction in Greenhouse Gas emissions, the TravelSmart program reduces traffic congestion, develops a sense of "community belonging" and increases activity (and associated health outcomes) amongst participants.

TravelSmart provides information and support to help people choose other ways of traveling other than by car. Partnerships are developed with schools, government organisations and businesses as well as with health, environmental and cycling groups.

The 1997 South Perth pilot TravelSmart program resulted in 14% less car travel and increased walking by 16%, cycling by 91% and the use of public transport by 21%. By changing attitudes, changes in travel behaviour were shown to have been sustained when they were measured one or two years later. Since this time, successful TravelSmart programs have also been run in Subiaco and Victoria Park.

A TravelSmart program is also being undertaken in the City of Melville and the initiatives being adopted include: Individualised Marketing to encourage people to use public transport; school and workplace intervention to encourage the use of public transport; encouraging residents to car pool to work by establishing a car pooling register; and examining the establishment of a Central Area Transit (CAT) bus within the City of Melville.

Action 33: Develop a comprehensive Waste Management Strategy to reduce waste to landfill.

Overview:

The City of Joondalup currently provides a 240 litre bin for refuse and a recycling service for recyclable materials like newspapers, certain plastics, glass, aluminium, certain cardboards, motor oil, car batteries and steel cans.

The Mindarie Regional Council (MRC) is currently considering the development of a Secondary Waste Treatment Plant and a Materials Recovery Facility that will significantly reduce the amount of waste that goes to landfill.

It is proposed that by 2005/06, 65 – 70% of residential waste will be diverted to the Secondary Waste Plant and Materials Recovery facility. Currently, only 16-17% of waste is recycled and reused.

The proposal can be shown as follows.



#### Action 34:

Liaise with thee Mindarie Regional Council regarding the recovery of methane from the Tamala Park landfill facility

#### Overview:

The Tamala Park landfill site is the largest landfill site in Western Australia. The site is operated by the Mindarie Regional Council (MRC) which is comprised of representatives from the Cities of Perth, Joondalup, Stirling and Wanneroo, and the Towns of Cambridge, Victoria Park and Vincent. About 500,000 people live in these localities.

The MRC have recently approved a plan to trap and store methane gasses produced by the site which will be converted into electricity and fed into the Western Power grid. The capping of the old landfill cell has begun with leachate lining of the new landfill cell due to start soon.

An initial cost of approximately \$1.2 million has been allocated for this project and the electricity produced from collected gasses is expected to generate 1500kW of electricity per hour.

The capture and conversion of methane will reduce significant amounts of Greenhouse Gas emissions from the community sector.

Action 35: Develop a tree planting and bush care policy to off set emissions.

#### Overview:

The City of Joondalup has a draft tree policy and plants hundreds of trees in medians, bush land and parks. The City should seek to develop a policy that initially aims to keep the status quo for the number of trees with the view to planting more trees than are removed in the future. Such a policy could ensure that any trees that are removed are replaced and should also seek to increase tree planting targets on a yearly basis.

This policy could deal with street tree planting issues and consideration could be given to promoting and targeting areas or suburbs for a mass tree planting. Targeting specific areas will assist maintenance of the trees during their early growth stages and will also be more noticeable than one off plantings in sporadic areas throughout the City. The Policy could form part of the City's verge and tree planting program which is currently in operation.

Whilst trees do not eliminate Greenhouse Gases, they have the ability to absorb carbon dioxide and convert this to oxygen through photosynthesis. The amount of carbon absorbed by trees is difficult to quantify, especially with native plants.

The City has many bush care programs like "Adopt a Coast Line" and Operation services will plant at least 40,000 plants in 2002/2003 in bush reserves and along the coastal dunes. The City currently provides free native plants to ratepayers upon request. Another benefit of this in addition to the absorption of Greenhouse Gases is that native plant species often do not require watering and indirectly reduce emissions further. An updated brochure that informs residents of this service is currently being produced.

The City should investigate the provision of exotic trees as some residents do not wish to plant native species. This will need to be monitored as invasive species or species that require large amounts of water should not be encouraged.

The Town Planning Scheme requires the provision of trees for car parking areas and the City should ensure that all of its car parks contain trees in line with the scheme. Consideration could also be given towards conditioning new developments to include the provision or retention of trees.

The provision of underground power to older suburbs will also assist with carbon absorption as trees planted on verges are currently situated underneath power lines. These trees are over pruned to a height of 2 metres and must also be kept clear of power lines. Resources are therefore required to provide for the regular pruning and the tree's capacity to absorb carbon dioxide from the air is diminished.

Action 36: Investigate opportunities for tree planting programmes in regional areas.

#### Overview:

The provision of funding for community groups wishing to participate in tree planting should be considered. As an example of this, the City could fund school groups travel costs to Wheatbelt councils where tree planting programs will also have the added benefit of reducing salinity. Tree planting activities could also be planned for National Tree Day.

## Attachment 2 – Abbreviations

AGO	Australian Greenhouse Office
ССР	Cities for Climate Protection
$CO^2$	Carbon dioxide
СОР	Conference of Parties
GJ	Gigajoule
GWh	Gigawatt-hours
ICLEI	International Council for Local Environmental Initiatives
IPCC	International Panel on Climate Change
Kg	Kilogram
LPG	Liquid Petroleum Gas
MRET	Mandatory Renewable Energy Target
NGS	National Greenhouse Strategy
NGRS	National Greenhouse Response Strategy
OECD	Organisation for Economic Co-operation and Development
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
VKT	Annual Vehicle Kilometres Traveled
WMO	World Meteorological Organization

#### Attachment 3 – The Greenhouse Effect

The Intergovernmental Panel on Climate Change (IPCC) is an international panel of scientists and researchers that provides advice on climate change to the international community. It is acknowledged by Governments around the world, including the Australian Government, as the authoritative source of advice on climate change science.

The IPCC's Climate Change 2001 Report catalogues the increasing concentrations of atmospheric Greenhouse Gases and assesses the effects of these gases and atmospheric aerosols in altering the radiation balance of the Earth-atmosphere system. A detailed study is made of human influence on climate concluding that there is new and stronger evidence that most of the observed warming observed over the last 50 years is attributable to human activities.



Figure 1: Globally averaged surface temperatures from the instrumental record. (Source: Climatic Research Unit and the UK Met. Office Hadley Centre)

Both temperature and sea level are projected to continue to rise throughout the 21st century. Rainfall patterns may change resulting in changes to flood intensities and water availability for agriculture. This could then result in changes to food production and the spread of diseases such as Malaria and Ross River Virus as insects breeding grounds shift.

The primary gases that cause the Greenhouse effect are water vapour, carbon dioxide, methane, nitrous oxide and chlorofluorocarbons. Since the industrial revolution, the concentration of these gases, particularly carbon dioxide, has been increasing rapidly. The concentration of carbon dioxide is approximately 30% greater than in the 18<sup>th</sup> century.

Each gas traps a different amount of heat. One kilogram of methane traps as much heat as 21 kilograms of  $CO_2$ . This is expressed as 21 equivalent  $CO_2$  or  $21CO_{2-e}$ .

Greenhouse gas	Source	Greenhouse Warming Factor (in equivalent
Carbon dioxide	Burning of fossil fuels Cement manufacture	1.0
Methane	Waste decomposition without air (eg landfill) Coalbed methane from coal mining Leakage of natural gas Grass digestion by grazing animals Burning of biomass fuels	21
Nitrous oxide	Soil, nitrogen fertilizer decomposition Burning of petroleum products	310
Chlorofluorocarbons and substitutes	Leakage from refrigeration and air conditioning systems Aluminium smelting	CFC-12 - 8,500 HCFC-113 - 93 HFC-134a - 1,300

Table 1: Greenhouse warming potential per kilogram of gas in terms of equivalent CO<sub>2</sub>

It is vital that something is done to control increasing Greenhouse Gas emissions and to develop renewable sources of energy not dependant on fossil fuels. Renewable energy is any source of energy that can be used without depleting its reserves. Western Australia is generously endowed with renewable energy resources - sunshine and wind are plentiful and there are a number of locations throughout the State where hydro, tidal and biomass energy resources are potentially available.

The use of renewable energy in Western Australia is increasing as people become more aware of the Greenhouse effect and because of incentives and strategies being implemented.

The Commonwealth Government's mandatory renewable energy target (MRET) places a legal liability on wholesale purchasers of electricity to proportionately contribute towards the generation of an additional 9,500 GWh of renewable energy per year by 2010.

National concern over Greenhouse Gas emissions has also resulted in increased State and Commonwealth Government funding for smaller scale renewable energy projects. This funding will help to increase the number of niche applications for renewable energy technologies, particularly where the costs of using fossil fuels or extending Western Power's electricity grid are high.

#### Australia's Response

For Australia to reduce Greenhouse Gas emission, a few changes will need to be made. Currently, fossil fuels, in particular coal, supply most of our energy needs and Australia is a major exporter of energy extensive products. Australian industries can be quite energy intensive (steel and aluminium industries) and our population growth rate is relatively high. Add to this the vast distances between our cities and the reliance on cars for transport and it becomes easier to understand why Australia is a large Greenhouse Gas emitter.

The Commonwealth, State and Territory governments recognised the need for a nationally coordinated approach to the climate change issue and endorsed a National Greenhouse Response Strategy (NGRS) in 1992.

The NGRSs goal was to contribute to effective global action to limit Greenhouse Gas emissions, to improve knowledge and understanding of the enhanced Greenhouse effect and

to prepare for potential impacts of climate change. Much of this initial work has since been superseded by negotiations with the UNFCCC and the Kyoto Protocol.

In late 1996, work on the National Greenhouse Strategy (NGS) begun with input from all State, Territory and Commonwealth Governments and with contributions from the Australian Local Government Association, industry and community groups.

Kyoto Protocol negotiations were successfully concluded at the third Conference of Parties in December 1997, where agreement was reached on the text of the Kyoto Protocol. Australia signed the Protocol on 29 April 1998, indicating acceptance of the text and intent to become Parties to it. Australia has not yet ratified the protocol.

The NGS was officially released in November 1998 after being endorsed by the Commonwealth and all state and territory governments.

The three goals of the NGS are:

- 1. To limit net Greenhouse Gas emissions, in particular to meet our international commitments;
- 2. To foster knowledge and understanding of Greenhouse issues; and
- 3. To lay the foundations for adaptation to climate change.

The Commonwealth Government, through the NGS, which incorporated the Prime Minister's 1997 *Safeguarding the Future* package, and through the 1999 *Measures for a Better Environment*, has committed almost \$1 billion to the Greenhouse response. This level of Commonwealth expenditure on a broad range of programs places Australia among the leading nations addressing climate change.

Another action was the establishment of the Australian Greenhouse Office (AGO) which is the world's first government agency dedicated to cutting Greenhouse Gas emissions. It was established in 1998 as a separate agency within the environment portfolio to provide a whole of government approach to Greenhouse matters. The AGO is responsible for many new initiatives and programs including the National Carbon Accounting System, the Cool Communities program, the Greenhouse Challenge program and the Greenhouse Gas Abatement program which offers investment incentives for Greenhouse Gas reductions.

#### **International Response**

In 1988, the Intergovernmental Panel on Climate Change (IPCC) was formed by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP).

The role of the IPCC, which brings together over 2,500 leading scientists and technical experts, is to assess on a comprehensive, objective, open and transparent basis the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation.

The IPCC has released a number of assessment reports in relation to Greenhouse gas and the initial report in 1990 played an important role in establishing the Intergovernmental Negotiating Committee for a United Nations Framework Convention on Climate Change (UNFCCC). The UNFCC was developed in 1992 and entered into force in 1994. It provides

the overall policy framework for addressing the climate change issue and 170 countries including Australia are currently signatories to the Convention.

The primary aim of the Convention is to achieve:

Stabilisation of Greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable world economic development to proceed in a sustainable manner.

The convention places particular onus on Annex 1 parties (includes Organisation for Economic Co-operation and Development (OECD) countries, East European countries and Australia) to adopt policies and measures to reduce Greenhouse gas emissions and to report regularly to the Conference of Parties (COP) on these policies and measures.

The Kyoto Protocol was agreed to at the 3<sup>rd</sup> COP in 1997. This protocol commits Annex 1 countries to individual, legally binding targets that collectively reduce or limit Greenhouse Gas emissions by at least five percent below 1990 levels by the period 2008 - 2012.

Within this target, individual countries have agreed to different targets ranging from an eight percent reduction to a ten percent increase depending on their economic situation and differing abilities to make emission reductions. Australia's target is to reduce its Greenhouse Gas emissions in the target period to not more than eight percent above 1990 levels.

Meeting these reduction commitments can be done through a host of mechanisms including emissions trading, joint implementation of measures with other countries, emissions banking, and emission reduction credits for assistance to developing countries.

The Kyoto Protocol was open for signature between 16 March 1998 and 15 March 1999. 84 countries signed the Protocol during that period, including all but two Annex I Parties, indicating their acceptance of the text and intent to become Parties to it (states that did not sign may also become Parties).

In order for the Kyoto Protocol to come into force, 55 countries that produce 55 per cent of the developed world's 1990 carbon dioxide emissions must ratify it. The European Union ratified in May 2002 and Japan followed suit a month later. In December 2002, Canada ratified the Kyoto Protocol. Russia is expected to finalise ratification in 2003. When Russia ratifies, the Protocol will come into force.

The Kyoto Protocol is the only broadly supported international agreement that addresses the Greenhouse problem.