LISMORE CITY COUNCIL

Ten Years of Greenhouse Gas Emissions

Monitoring and Reporting 2002 to 2012

Cities for Climate Protection Framework ICLEI

lismore city council



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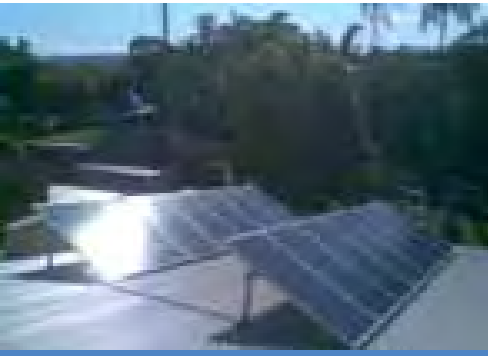
Executive Summary



Lismore City Council made significant GHG emissions reductions

In 2004 Lismore City Council responded to the increasing knowledge of climate change and resolved to join the *Cities for Climate Protection Australia Program.* Council committed to reduce greenhouse gas emissions at the local level to show leadership to the community and to take responsibility for its own organisational carbon emissions.

This document presents 10 years of Lismore City Council's greenhouse gas emissions monitoring and reporting under the *Cities for Climate Protection* framework. The program's Milestones are explained which include undertaking emissions inventories, forecasting emissions if no action is taken, setting a 20% emissions reduction goal, and a comprehensive Action Plan to reduce emissions.

Through the Cities for Climate Protection program Lismore Council made the extraordinary achievement of curbing a six year strong emissions growth trend and continued on to set a downward trend. Emissions were reduced by 4% in just one year by the end of 2011 financial year. This was achieved primarily through a reduction in electricity consumption and fuel usage.

This was of great value to Council due the impending electricity price surge. In 2011 the Independent Pricing and Regulatory Tribunal (IPART) predicted an increase in electricity costs of around 18%. Council experienced an increase in electricity costs of only around 2% (excluding street lighting costs). Council's significant reduction in electricity consumption protected it from the full impact of the price rise.

While the ten year 20% emissions reduction goal was not met, the whole of Council approach and practical actions of the Cities for Climate Protection program lowered levels of greenhouse gas emissions and provided significant financial savings to Council. The program enabled Council to develop a comprehensive and effective greenhouse gas emissions monitoring and reporting program.

Key future actions include maintaining a framework for emissions reduction monitoring and reporting by updating the current methodology in line with the National Greenhouse and Energy Reporting (NGER) Scheme. The goals of the program in future will align with the inspiring 2013 'GM's Challenge' of becoming 100% self-sufficient on electricity from renewable resources by 2023.

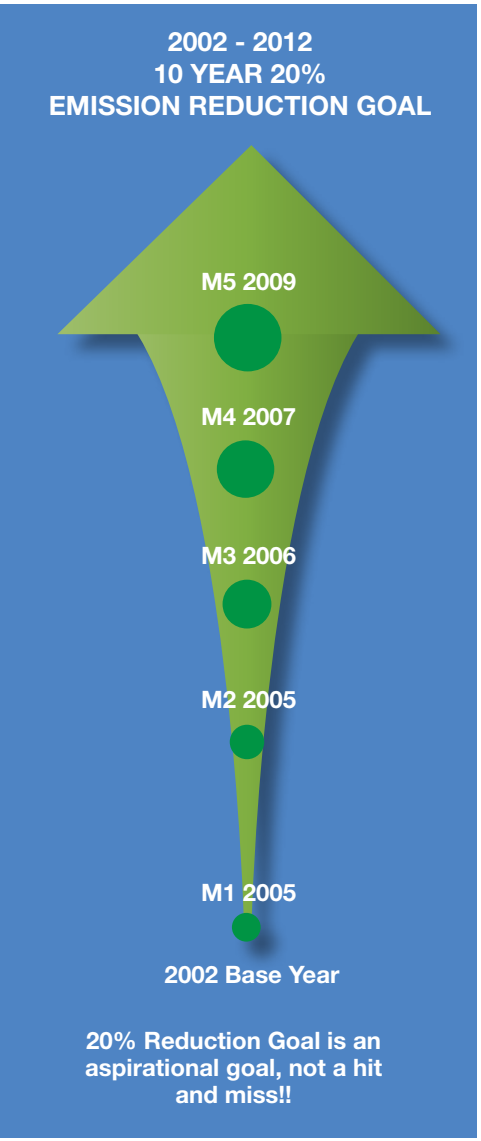
The conclusion highlights that Lismore City Council's Greenhouse Gas emissions monitoring program has proven to make good business sense. The findings have led to better resource management and given a better perspective of Council's current and future Climate Action.

To achieve Councils goals and allow the organisation to grow so that the quality of life and needs of residents are met, corporate carbon management must be a routine part of our business. Looking into the future this program gives a positive commitment to key initiatives and challenges in Council's 2013 Community Strategic Plan, and ultimately to the community's *Imagine Lismore* visions.

PART 1

Background
and 2002 to 2008
report summaries

1 Background



In July 2004 Lismore City Council (LCC) resolved to participate in the *Cities for Climate Protection* (CCP) Program and endorsed the Program's **5 Milestones.** The CCP program was developed by the International Council for Local Environmental Initiatives (ICLEI) and was delivered in Australia in collaboration with the Australian Greenhouse Office (AGO). The objective of the CCP program was to reduce Greenhouse Gas emissions at the local government level.

To participate in the program, Local Governments made a commitment to reduce greenhouse gas emissions from their local government operations and throughout their communities by achieving the program's five (5) strategic Milestones:

- **Milestone 1:** Establish an Inventory and Forecast for key sources of greenhouse emissions for Council operations and the Community.
- **Milestone 2:** Set an Emissions Reduction Goal.
- **Milestone 3:** Develop and adopt a Local Greenhouse Action Plan to achieve those reductions.
- **Milestone 4:** Implement the Local Greenhouse Action Plan.
- **Milestone 5:** Monitor and report on greenhouse gas emissions and the implementation of actions and measures.

Each local government set its own emissions reduction target and developed a Local Action Plan (LAP), which outlined actions to be pursued to meet the target. On a worldwide basis there were over 700 councils participating in the CCP Campaign. In Australia there were over 200 councils participating in the program.

The CCP program framework required work on both Council and community emissions. Inventories for both sectors were conducted for the 2001-02 (base Year), and 2007-2008 (re-inventory year).

The CCP program funding concluded in 2009 and there was no longer support through ICLEI for local government in provision of community emissions data, therefore inventories from 2009 onwards are for Council emissions only. As this summary document is focused on Council emissions, past community emissions data is not included. The most current community emissions data is in the 2009 Milestone 5 Report, which can be viewed upon request or by Council Staff in the internal TRIM records system.

When Council commenced the innovative CCP program in 2004 it was the first time Council had considered its greenhouse gas emissions. It was a foreign method of data collection and required an enormous amount of tedious manual work. Over the years the framework of the CCP program has enabled Council to streamline data collection and to develop processes to efficiently record, monitor, and report on emissions. This has led to successful implementation of emission reduction action.

In 2005 Council commenced outsourcing data management of electricity and water accounts to an external company which, over time, has greatly increased the efficiency of conducting emissions inventories.

Lismore City Council completed all 5 CCP Milestones by 2009. 2012 is the anniversary year of Council's commitment to a 20% emissions reduction goal. 2012 also marks the end of Council's participation in the CCP branded program.

1.1 The CCP Methodology

The CCP methodology involves grouping council operations into five (5) sectors:

1. Buildings
2. Vehicle Fleet
3. Streetlights
4. Water/sewage
5. Waste

All inventories over the ten (10) year period have been conducted with the same methodology for consistency and meaningful comparison. This inventory process is documented in - *'Methodology for completing an annual greenhouse gas emissions inventory at LCC'.* This is a process orientated internal document which can be viewed by LCC staff from the internal file system.

1.1.1 Data Sources

Council emissions data was initially manually sourced solely from internal data management systems. From 2005 Council engaged an external data monitoring company, Planet Footprint, to assist in gathering electricity consumption data. Planet Footprint collect data for *Buildings, Water & Sewer,* and *Streetlights* (*Streetlight* data is gathered from two sources; the energy providers' annual inventory and the metered sites billing data).

The *Fleet* and *Waste* data continues to be collected internally by Council staff, this data is then sent to Planet Footprint to incorporate into the LCC organisational database.

1.1.2 Units of measure

Greenhouse gases vary in their capacity to induce global warming. To account for this when assessing the effect of emissions of different gases, the Global Warming Potential (GWP) of each gas is factored in. The GWP compares the greenhouse effectiveness of each gas over a particular time span, typically 100 years, using Carbon Dioxide (CO_2) as a reference. Using the GWP to account for the contribution from all greenhouse gases, overall emissions can be reported as equivalent CO_2 emissions (CO_2e), i.e. total emissions of all gases expressed as an equivalent amount of CO_2.

For example the global warming potential for methane (CH_4) is 21 times more potent than Carbon dioxide (CO_2), which means that one tonne of methane has the same warming effect as 21 tonnes of carbon dioxide, therefore one tonne of methane would be expressed as 21 CO_2e tonnes (NSW DEC 2005).

In all reports emissions are expressed as either tonnes of CO_2e emissions or GJ of energy consumption. For the 2002 and 2008 inventories the CCP online database was used to convert the consumption data to tonnes of greenhouse gas emissions (CO_2e tonnes) and gigajoules (GJ) of energy consumed. From 2009 onwards standard emissions factors consistent with those used by CCP were used by Council staff to calculate emissions.

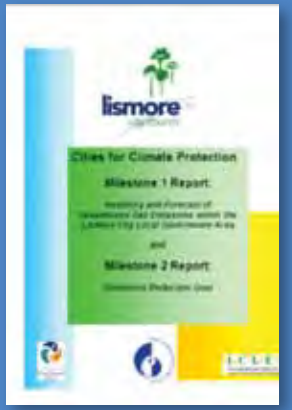
1.1.3 Data Inaccuracies and Corrections

The inventory processes over the years have revealed data and process inconsistencies and inaccuracies. This was expected due to the innovative and progressive nature of the program, and has been acknowledged along the way.

The original data was extremely useful as a starting point and has enabled comparisons over time. Data corrections required in future inventories are explained in section 13. This process has enabled substantial system and process improvements. The inaccuracies and corrections have not been of a scale that would have significantly impacted the outcome of the program. The purpose of the explanatory notes is to provide clarity if needed when reviewing the ten year historical data.

2 Milestone 1: 2002 Base Year Inventory and Forecast

Council achieved Milestone 1 in 2005



Milestone 1: An inventory of GHG emissions and forecast to 2012.

To achieve Milestone 1 Council was required to undertake a base year inventory and forecast of greenhouse gas emissions from the Local Government Area. This included the Council sector (Council's operations) and the Community sector. The base year data was then used to forecast emissions to a chosen year under a 'business as usual scenario'.

Council emissions consists of the sectors *Buildings, Vehicle fleet, Streetlights, Water/sewage* and *Waste.* The base year selected was the financial year 2001-2002. The forecast year was 2012, which is the year recommended by ICLEI mainly because experience has shown that a 10-year period gives a practical time frame to implement actions and achieve significant reductions. The base year is referred to as '2002' rather than 2001-2002 for simplicity.

Data collection for Milestone 1 was extremely labour intensive and involved manually gathering data from electricity account files, Fleet Services spreadsheets, Lismore Water staff, assets registries, Waste services Audit report, and from Council's internal database.

The forecast calculations are based on a 'business as usual' scenario for Council's operations i.e. if no action is taken. This included any new developments expected between the base year and the forecast year, for example the numbers of new streetlights, pump stations, large developments, roads and parks in suburban expansion.

2.1 Milestone 1: Summary of Base Year Inventory 2002

The 2002 base year inventory identified that Council's activities produced 10,669 equivalent tonnes of carbon dioxide (CO_2e) greenhouse gas emissions (GHG) into the atmosphere in 2002 (Table 1).

By sector, *Waste, Water/Sewage* and *Buildings* were the main contributors to greenhouse gas emissions at 23%, 22% and 20% respectively (Figure 1, Table 1).

Council Sector	Base Year 2002 CO_2e (tonnes)	%
Waste	2435	23%
Water/Sewage	2352	22%
Building	2122	20%
Streetlights	1964	18%
Vehicle Fleet	1796	17%
TOTAL	**10,669**	**100**

Table 1: Council Emissions by sector, 2002 Base Year. Source: LCC Milestone 1 report

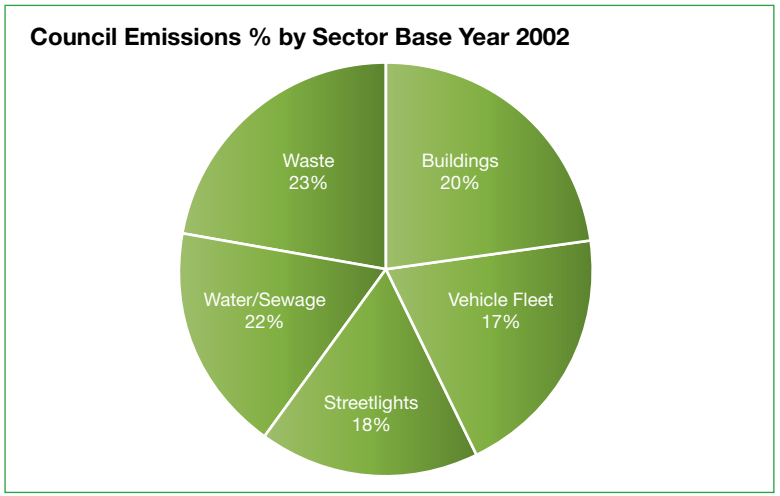


Figure 1: Council emissions in percentage by sector 2002. Source: Milestone 1 report

2.2 Primary Source of Council Emissions in 2002

In 2002 electricity consumption was the primary source of emissions across Council's operations at 6,439 CO_2e tonnes (Table 2). This equates to 60% of the total Council emissions (Figure 2). The next highest source of emissions is 'Waste activities' comprising of paper products, food waste, plant debris and textiles at 2,435 CO_2e tonnes (24%), and Diesel at 1,512 CO_2e tonnes (14%).

Emission Source	CO_2e (tonnes)	CO_2e (%)	Energy (GJ)	Cost ($)
Electricity	6439	60.3	21992	597,362
Petrol	284	2.7	4160	97,566
Green Electricity	0	0	197	4043
Diesel	1512	14.2	21705	542,186
Paper products	1257	11.8	-	-
Food Waste	723	6.8	-	-
Plant debris	392	3.7	-	-
Wood/textiles	63	0.6	-	-
TOTAL	**10,670**	**100**	**48,054**	**1,241,158**

Table 2: Council emissions by source CO_2e, GJ $, 2002 Base Year.
Source: Milestone 1 report

Source of Council GHC Emissions - 2002
Overall Sectors: Buildings, Fleet, Streetlights, Water/Sewer and Waste

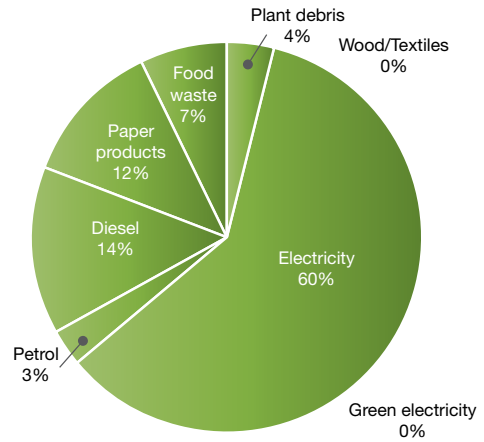


Figure 2: Council CO_2e emissions by source in percentage, 2002 base year
Source: Milestone 1 report

2.3 Forecast of Emissions to 2012 with no Emissions Reduction Action

A forecast of emissions for ten years from the base year 2002 to 2012 was generated for all sectors. The forecast incorporated projected percentage of population growth, and associated future planned infrastructure within Council. The forecast was based on a business as usual scenario*, and demonstrated what our potential emissions could be if no action was taken.

Council emissions were predicted to increase from 10,669 tonnes of CO_2e in 2002 to 11,768 tonnes in 2012. Overall the emissions growth for Council operations was projected to be 10.25% higher than the 2002 base year.

The greatest growth in emissions was expected to occur in the Water/ Sewage sector (15%). A consistent growth of around 9% was projected across all other sectors (Table 3).

Council Sector	Base Year 2002 CO_2e (tonnes)	Forecast Year 2012 CO_2e (tonnes)	Increase in CO_2e (tonnes)	% Increase
Building	2122	2306	184	9%
Vehicle Fleet	1796	1962	166	9%
Streetlights	1964	2137	173	9%
Water/sewage	2352	2697	345	15%
Waste	2435	2666	231	9%
TOTAL	**10,669**	**11768**	**1099**	**10.25%**

Table 3: Council emissions forecast 2002 to 2012 at a 'business as usual'* scenario.

**'Business as usual' refers to a projection that incorporates changes in activity levels and greenhouse gas emission factors, but with the exclusion of any effects that are directly attributable to greenhouse policy measures. Source: Milestone 1 report*

3 Milestone 2 – Emissions Reduction Goal

Council achieved Milestone 2 in 2005

Council adopted an emissions reduction goal of 20% of the 2002 emissions by 2012

The reduction goal is a quantitative objective for developing the Local Action Plan. In 2005 Council adopted an emissions reduction goal of a 20% reduction in emissions from the 2002 base year by 2012.

Figure 3 graphically illustrates that a 20% reduction goal based on the 2002 emissions would result in a decline of CO_2e emissions by 2133 tonnes over the ten year period to 2012.

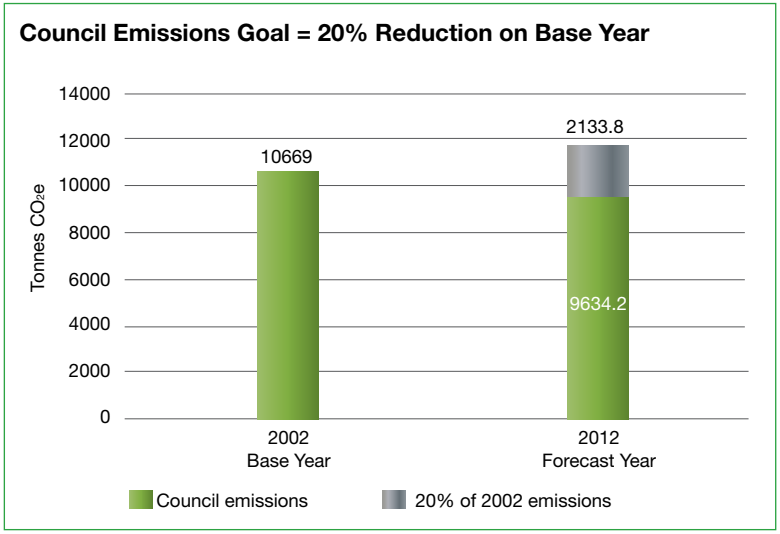


Figure 3: Council emissions reduction goal - 20% reduction on 2002 emissions, and projected decline by 2012. Source: Milestone 1 report

4 Milestone 3 – Summary of Local Action Plan 2007

Council developed, adopted, and implemented the LAP in 2006/2007 . . .

Lismore City Council developed, adopted, and implemented the CCP Local Action Plan (LAP) in 2006-2007 (attachment A). The implementation of the LAP completed Milestone 3 of the CCP program. The objective of the LAP is to provide a detailed list of steps that the community and Council can undertake to achieve the 20% reduction goal by 2012. The actions that are described in LAP were specifically designed for the Lismore local government area and have been tailored to address all sectors of both the Council's operations and community's activities.

The document remained a dynamic guide used to trigger continual consideration, prioritisation and implementation of greenhouse gas emission reduction actions. The plan will be updated in 2013 to allow for continuous improvement and to ensure the Plan remains consistent with and responsive to Council's management programs, State Of the Environment reporting, and other relevant plans and programs.

When developed in 2007 Council's progress through the CCP program was incorporated into the State of the Environment Report. Therefore, indicators from the SOE which correspond with actions in the LAP were identified through a coded table.

In 2008 Council resolved to establish a one million dollar fund to implement the Council LAP actions that had a demonstrated payback period under 10 years. Until 2010 this fund was difficult to access as it was not available for the investigative work to report on and demonstrate the required payback period. This has since changed and the fund has been accessed on a number of occasions for major projects.

The Council section of the LAP is presented in the five CCP sectors. The following colour coding has been added as a visual way to follow the progress:

Green = Proposed Action implemented & complete

Blue = Action implemented and remains ongoing – an annual action or activity, ongoing research etc

Yellow = Proposed Action initiated but not finalised/completed

Red = Proposed Action not started

The current LAP is available from Council upon request. The 2013 updated version will be available on Council's website in the near future.

5 Milestone 4 – Summary of Monitoring and Reporting 2008

Council demonstrated an ability to monitor and calculate emissions.

The CCP Measures Report was submitted to ICLEI in 2008. Council was required to demonstrate an ability to monitor and calculate emissions reduction through the CCP Measure Reporting Program.

The report listed the LAP actions that Council has undertaken. Key actions during this time included education and procedural change projects which have had high *"change"* value but are very difficult to quantify emissions and cost savings. Other actions such as lighting retrofits are able to be quantified in terms of energy reductions and emissions savings.
Actions included:

- Downsizing and partial offsetting of passenger fleet vehicles
- Office Lighting retrofit
- Audit of Council owned Street lights
- Introduction of curb side organics recycling
- Quarterly monitoring of electricity and water consumption
- Air- conditioning retrofit
- A variety of staff and community education campaigns (e.g. "Switch Off" campaign)

For the period 2006/07 the LAP actions resulted in a greenhouse gas emission saving of 5 tonnes in the Council sector.

6 Milestone 5 – Summary of 2008 Re-inventory Report

Emissions increased 20% ... action from 2005 to 2007 was focused on education programs

This section provides a summary of the Milestone 5 (M5) Inventory report released in 2009. This is an internal document and the full version of the report can be viewed by LCC staff from the LCC TRIM file system.

The M5 Inventory report outlined the comprehensive re-inventory of greenhouse gas emissions for the 2007/2008 financial year for both the Community and Council Sectors. The M5 Inventory report brought together results of quantitative and qualitative assessments of actions implemented. This provided a measure of Council's emissions trends.

6.1 Milestone 5 Results Summary

The M5 Inventory revealed that GHG emissions increased 20% above the 2002 levels in just six years. By 2008 emissions had risen from 11,256 tonnes in 2002 to 14,024 tonnes (Figure 4), a 2,768 tonne increase. This is more than double the forecasted rise of a 10.25% increase with no abatement action over ten years.

By sector *Fleet* was the highest contributor to Council emissions during the 2007/2008 financial year (Figure 5, Table 4).

There had been significant organisational growth during this period and Council had yet to make substantial investment in emission reduction action. Action from 2004 to 2007 focused predominately on education programs to raise awareness of the climate change issue. A number of key reduction actions commenced in mid-2007, however the emissions reduction from these actions would not begin to be evident until the end of the 2009 financial year.

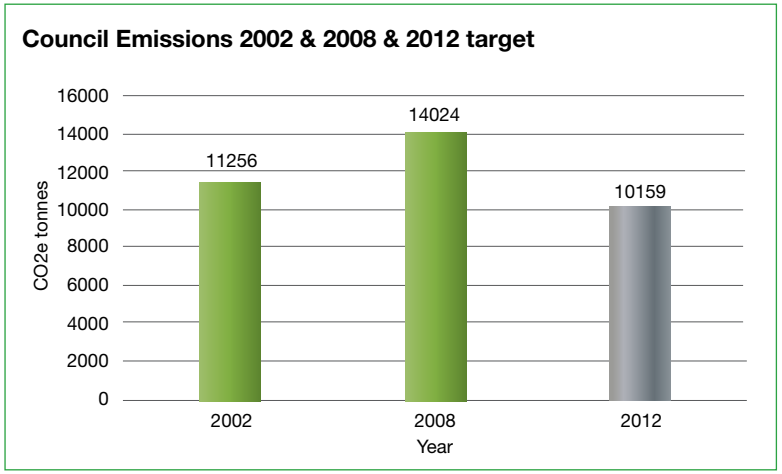


Figure 4: Council emissions 2002 & 2008, & 2012 target. Source: 2007-2008 M5 GHG re-inventory *Totals adjusted, see explanatory notes within Section 9

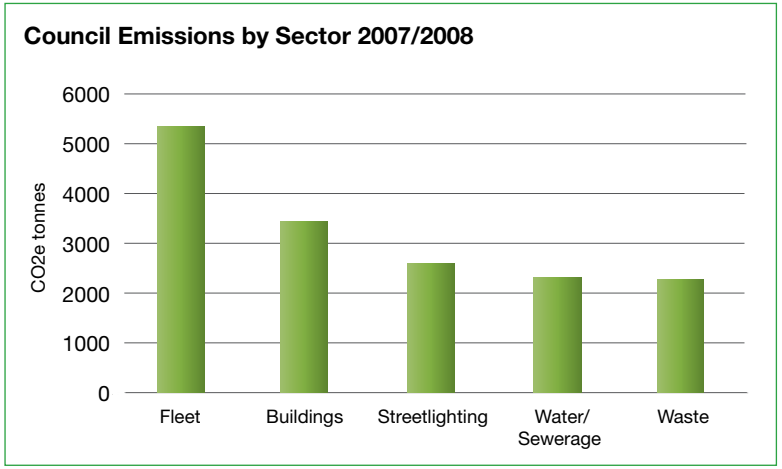


Figure 5: Council emissions by sector 2007/2008
Data Sourced from Milestone 5 report. *Waste adjusted to reflect M1 original data, Fleet CO_2e adjusted with additional anomaly amount of 586 tonne. See section 9 for further explanation.

A key contributor to rising emissions was the 2005 Memorial Baths upgrade.

Council Sector's Emissions Inventory

Sub - Sector		2001-2002	2007-2008	2012 Target
Building	CO_2e	2 122t	3 405t	1882t*
	Cost	$164 428	$454 341	-
Streetlights	CO_2e	1 964t	2 561t	1744t*
	Cost	$222 562	$263 533	-
Fleet	CO_2e	2382*	5 343t	2126t*
	Cost	-	-	-
Water and Sewerage	CO_2e	2 352t	2 582t	2227t*
	Cost	$214 415	$309 600	-
Waste	CO_2e	2 435t*	110t	2179t*
	Cost	$14 976	$21 060	-

Table 4: Council emissions by sector 2002 - 2008, Milestone 5 Report
Data sourced from Milestone 5 report. *Waste adjusted to reflect M1 original data. Fleet CO_2e adjusted with additional anomaly amount of 586 tonne, $ value unlikely to be correct so removed. See section 9 for further explanation.

A key contributor to rising emissions was the 2005 Memorial Baths upgrade. New heat pumps were installed which required a larger amount of energy than the previous system. Winter pool operations commenced in 2005 and both pools were operational for winter in 2005 & 2006. This added an additional 156 tonnes per year for the 2 months of winter.

Other key growth areas included *Water & Sewer,* and *Streetlighting* increases due to new subdivisions, as well as the implementation of multiple extra garbage runs for curb side recycling and their expansion to commercial and rural areas. While this led to increased fuel use, the extra waste services significantly reduced waste to land fill and emissions generated for the *Waste* sector.

In addition to the increase in emissions, increases in costs were accentuated by including service charges in the 2007-2008 data. Electricity and fuel consumption has been accompanied by an increase in per unit cost which has exaggerated the increase in cost further.

PART 2

Ten Year Council GHG Emissions Inventory 2002 to 2012

7 2002 - 2008 Inventory Review

The 2008 Inventory revealed a 20% growth in emissions over 6 years.

The 2008 inventory revealed a steady increase in emissions for the six years from the Baseline Year 2002 to the Re-inventory year 2008 (Figure 6). Council's emissions rose 20% above the 2002 levels which is double the projected emissions rise of 10% without any abatement action over the ten years at a business as usual approach. The trend line in Figure 6 shows where emissions were likely to go if the same rate of increase continued.

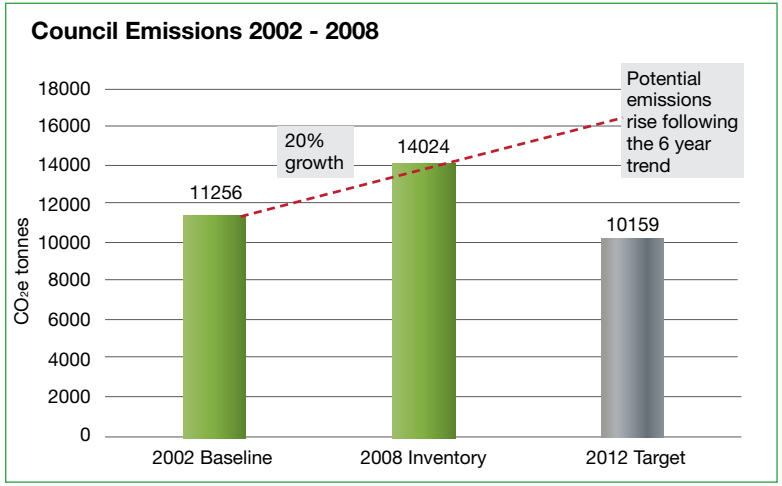


Figure 6: Potential emissions trend if Council continues in a 'business as usual'* scenario.
****BAU = Business as usual (no emissions reduction action).***
Figures adjusted to include fleet anomalies.

8 Turning the Tide - 2002 to 2012 Inventory

Council actions turned around the 6 year strong emissions growth trend.

In 2012 an inventory of the 2010/11 and 2011/12 financial years was conducted. The results revealed that Council made extraordinary emissions reduction in the four years from 2008 to 2012. Figure 7 illustrates that Council emissions plateaued from 2008 with only a minimal increase of 49 tonnes, less than 1% over the two years to 2010. From 2010 emissions started to decline. Between 2010 and 2012 there was a substantial decline of 580 CO_2e tonnes, which equates to a 4% reduction.

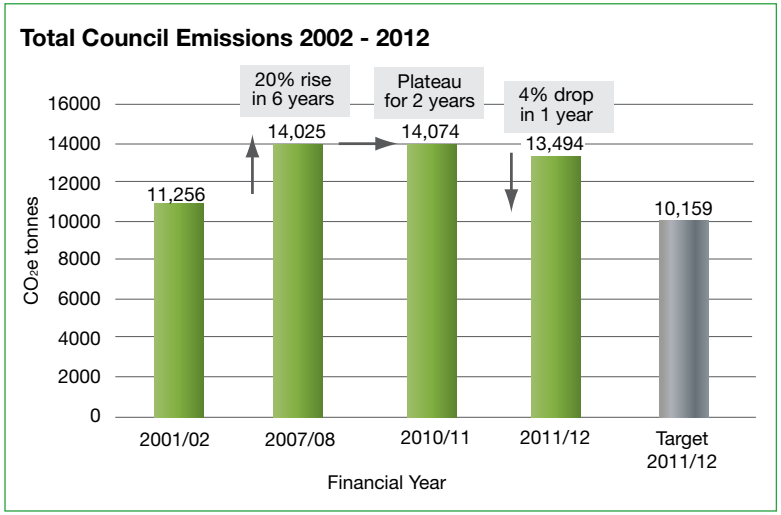


Figure 7: Actual Council emissions 2002-2012 to illustrate emissions growth, plateau, and decline. 2002 data adjusted to reflect anomalies.

Although the 2012 twenty percent emission reduction goal of 10,159 CO_2e tonnes was not met, the fact that Council was able to curb the six year strong emissions growth trend and set emissions on a downward trend is an extraordinary achievement. Key emissions reduction actions that led to this decline are provided in Section 10.

9 Analysis of Emissions by Source: 2002 to 2012

There are currently 150 sites listed on Council's emissions inventory register. The sources of Council's emissions are electricity, fuel, and waste. The sectors consuming electricity are *Water and Sewage, Buildings,* and *Street lighting.* The fuel source includes petrol, diesel, bio-diesel, and LPG. The waste source is calculated by the number of collection services to Council sites.

Looking back to the 2002 base year, Figure 8 illustrates that electricity consumption was the primary source of emissions at 60% of the total. The next highest source of emissions was 'waste activities' comprised of paper products, food waste, plant debris and textiles at 23%, and fuel at 17% .

In 2012 electricity remained the primary source of Council's emissions at 69%. Fuel is the next highest contributor at 30% compared to 17% in 2002 (Figure 9). The *Waste* sector experienced a dramatic decline in emissions from 2004, which significantly changed the composition of emissions sources. Waste went from being the highest generator of emissions at 23% in 2002 to being only 1% from 2007 onwards (Figures 7 and 8). This was primarily due to the introduction of the commercial organics service in 2004 and recycling services in 2007, which diverted organic waste and recycling from landfill. This is discussed further in Section 10.6.

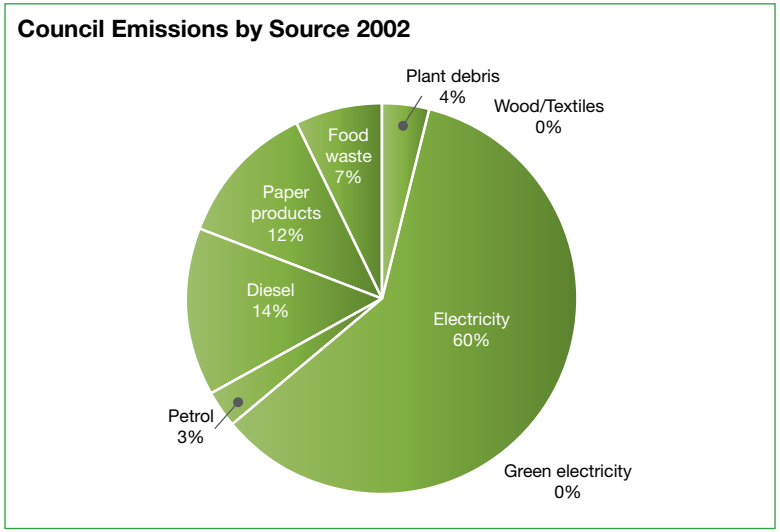


Figure 8: Source of emissions 2002.

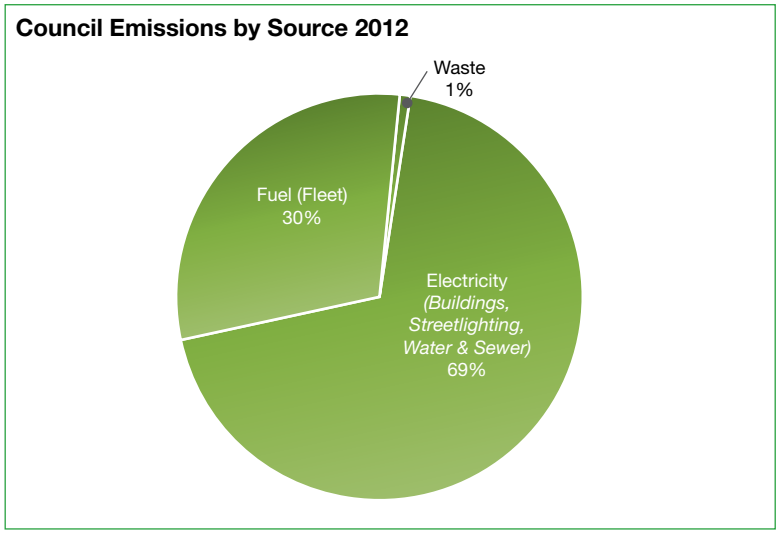


Figure 9: Source of Council emissions 2012.

In the 2011-2012 financial year Buildings consumed the highest amount of electricity . . .

9.1 Analysis of the Primary Source of Emissions - Electricity

The Council sectors consuming electricity are *Water and Sewage, Buildings, & Street lighting*. In the 2011/2012 financial year Buildings consumed the highest amount of electricity at 40%. *Streetlighting* was next at 31%, and Water and Sewer at 29%. This is generally consistent with previous years (Figure 10).

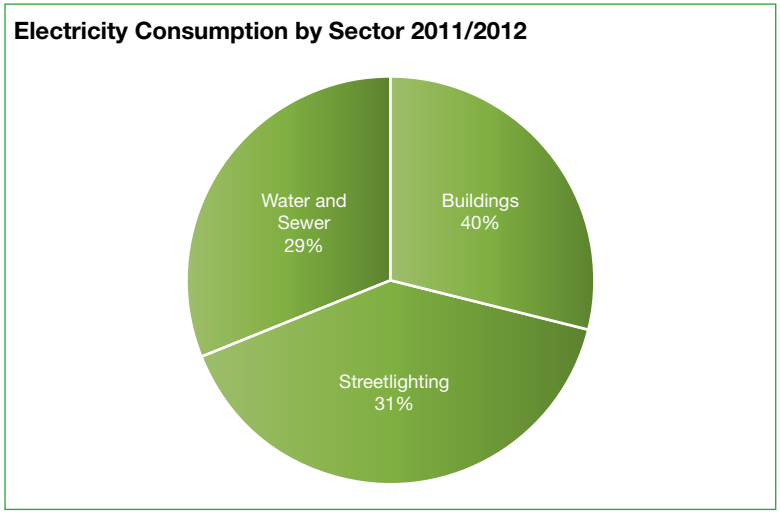


Figure 10: Council electricity consumption by sector.

Figure 11 graphically illustrates annual consumption and costs trends from 2005 to 2012. Council's annual electricity costs (excluding streetlighting) rose from $786,207 in 2007/08 to $913,330 in 2008/09, a 16% increase. Electricity consumption increased only 7% in this period. Costs increased a further 38% the following year 2009/10, to $1.2 million. Consumption in this period increased only 11%.

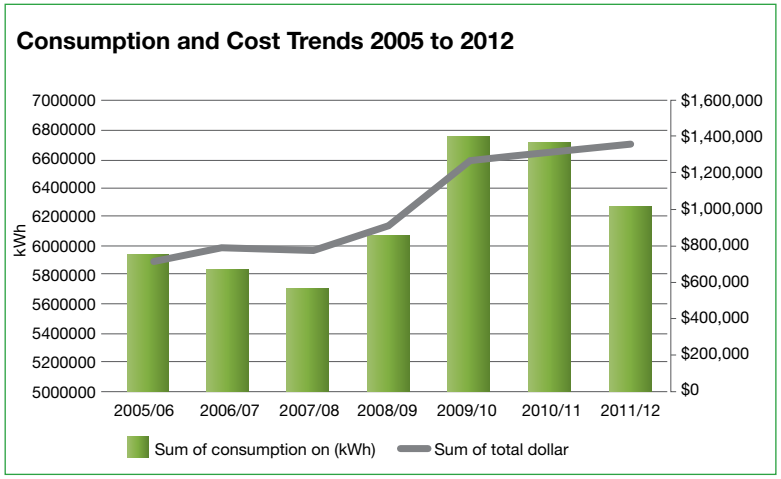


Figure 11: Electricity consumption and costs trends 2005 to 2012. Sectors contributing to these totals are Buildings, Water/sewerage, and metered Streetlight, (excludes bulk of streetlights as this is gathered in a separate report.

IPART predicted a further 18% increase in electricity costs by mid-2012. This price surge coupled with Councils consumption trend of a 9% on average increase per annum, had the potential to increase council's electricity costs by up to $500,000 per annum.

Due to considerable efforts in substantially reducing consumption from 2009, Council was protected from the full impact of the electricity price surge. Between 2010/11 and 2011/2012 Councils consumption dropped by 7%. This translated to significant financial savings and Council experienced an increase in electricity costs of only around 2% (excluding streetlighting costs). In addition to the obvious financial benefits, emissions were reduced by 580 CO2e tonnes in just one year.

10 Analysis of Emissions by Sector 2002 to 2012

When emissions are analysed by sector *Fleet* is the primary contributor in all years. *Buildings* are the next highest, followed by *Water and Sewer* and *Streetlighting* which alternate from year to year, then *Waste* (Figure 12).

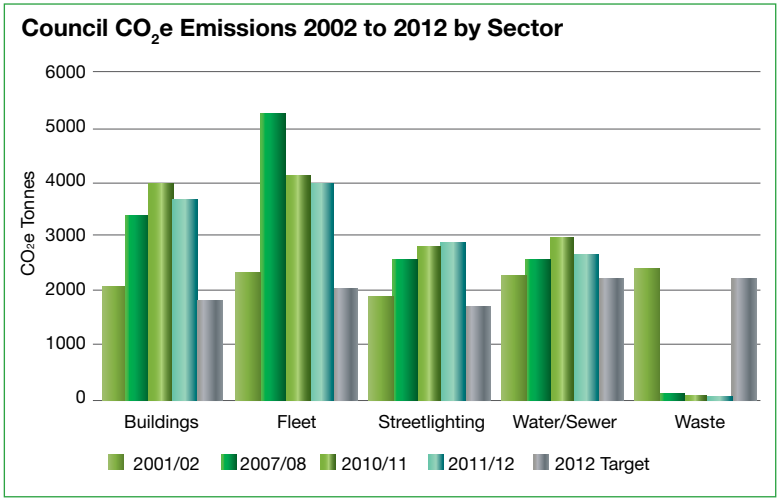


Figure 12: Council emissions by sector.

Detailed analysis of each sector over the ten years is provided in the next section of this report. In summary: *Fleet* experienced the most significant increase in emissions over the ten year period with a 55% increase from 2002 to 2008. However *Fleet* also experienced the most significant decrease from this point on with a 25% decrease in emissions between 2008 and 2012.

Buildings experienced a steep rise of 47% between 2002 and 2011 but then a decrease of 7% between 2011 and 2012. *Streetlighting* increased 31% between 2002 and 2011, and then slowed to only a 2% increase from 2011 to 2012. *Water and Sewer* emissions rose 22% between 2002 and 2011, from 2011 onwards emissions turned the corner and declined by 8%. *Waste* had the most dramatic drop in emissions of 95%, which has been maintained over the years.

Analysing emissions by sector is a beneficial way to group and compare categories. However it is important to bear in mind the source analysis in section 9. ***Fleet*** has the highest emissions when comparing the five sectors, but fuel as an emissions source is second when compared to electricity. Emissions from *Buildings, Streetlights, and Water & Sewer* are combined by source – electricity (Figure 9).

The graph below illustrates the percentage of Council emissions generated by each of the five sectors from all sources for the latest emissions inventory in 2011-2012. The percentages are consistent with the previous years from 2003.

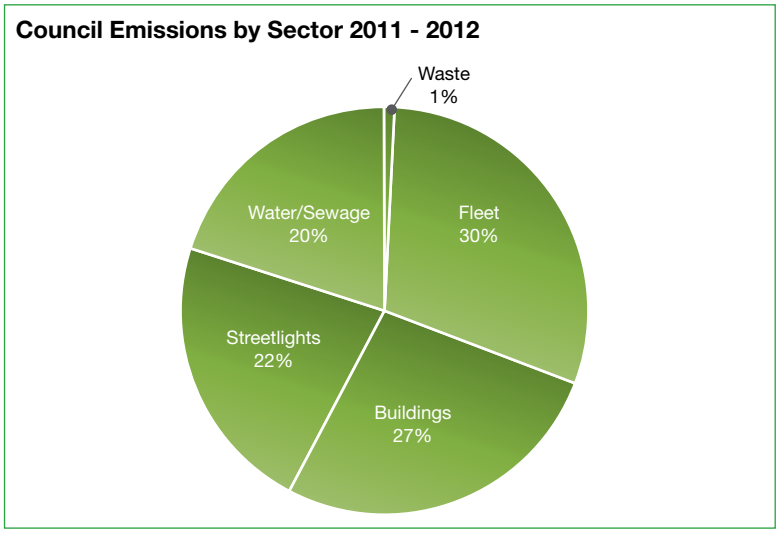


Figure 13: Council emissions by sector 2011 - 2012.

10.1 Buildings 2002 to 2012

Council currently lists 50 sites on the *Buildings* emissions inventory register. This includes toilet blocks, fire stations, and facilities such as the quarry crusher, caravan parks and recreational facilities.

Emissions from the *Buildings* sector rose significantly between 2002 and 2010 from 2122 CO_2e tonnes to 4295 CO_2e tonnes (Figure 14). This equates to a 100% rise in this category over six years. A reduction in emissions was recorded in 2007/2008. Emissions then rose again in 2009/10. In 2010/11 emissions declined and have remained on a downward trend.

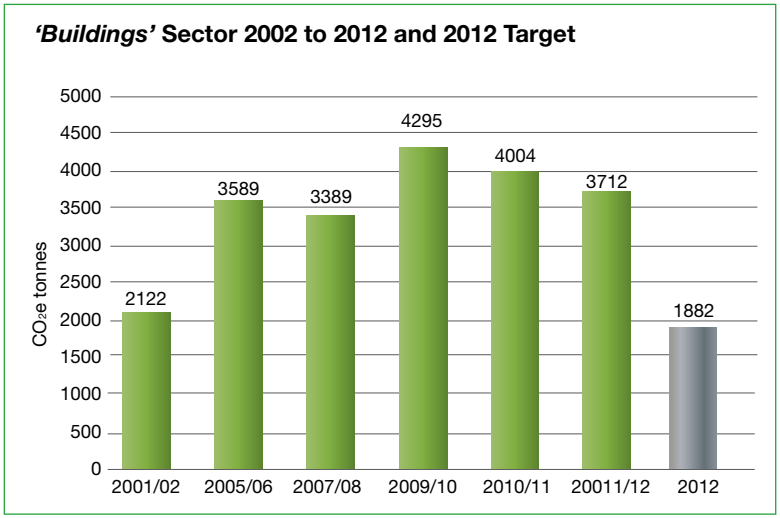


Figure 14: Emissions from the 'Building's sector 2002 to 2013 and 2012 target.

The overall rise in emissions from 2002 to 2010 can be attributed to organisational growth with limited implementation of emissions reduction action. A key contributor was the 2005 Memorial Baths upgrade. New heat pumps were installed which were efficient, but still required a larger amount of energy than the previous system. Winter pool operations commenced in 2005 and both pools were operational throughout winter in 2005 & 2006. For the two months of June and July 2006 the consumption significantly rose from the same time the previous year. Due to the high costs Council resolved to operate only the small pool with reduced hours from winter 2007. In 2010 the winter pool operations finally ceased due to the high costs. The emissions for the two winter months of 2010 reduced 87% to only 9 tonnes. The emissions for the same period up to 2012 have remained around the same.

Further factors that were identified as contributors to the *Buildings* emissions increase between 2005 and 2010 are:

'Buildings' key emissions increase factors 2002 to 2010	Year	Co_2e Increase (t/yr)
Memorial Baths upgrade	2005	156
Construction of the Material Recovery Facility	2008	52
Goonellabah Sports and Aquatic Centre opened	2009	900
Nimbin Pool – increased activity	2006-2009	20 to 55
Oakes Oval – increased events	2009	33 in 2006 to 69 in 2009

Table 5: Key emissions increase factor for 'Buildings'.

The decline in emissions from 2009 can be directly attributed to implementation of key LAP actions. The table below provides a summary list of reduction actions. Where possible estimated costs, financial and emissions savings have been entered. A comprehensive list of all actions implemented to date can be found in the LAP document (available on request).

10.1.1 Key Emissions Reduction Action

***Buildings* Key emissions reduction actions**	**Year**	**Estimated Cost**	**Est $/yr Savings**	**Est emissions savings CO_2e tonnes**
Memorial Baths: reduced winter operations to one pool	2006 - 2007			233
Council Centre air conditioning upgrade	2007			47
Council Centre lighting retrofit	2008	55,000		47
Memorial Baths cease winter operations	2010			56
SES Building PV solar panels	2010	38,480	8,526	14.50
Brunswick Depot PV solar panels	2010	38,400	6,407	10.75
CBD Centre PV solar panels	2010	18,264	3,193	6
CBD Centre lighting retrofit	2010	3,877	552	1.8
ACE Building lighting retrofit	2010	6,067	755	2
Neighborhood Centre lighting retrofit	2010	17,135	3,247	8.11
Art Gallery PV solar panels	2010	18,264	3,357	6
Library lighting retrofit	2010	25,900	9,917	30
Wastewater VSD and soft start systems at pump stations	2010 - 2012			244 +
Lismore lake closed	2010			60
Memorial Baths process changes	2010 - 2012			189
Procedural changes GSAC off peak starts and solar panel upgrade	2010			77
Streetlighting retrofit	2012			potentially 896 tonnes pa
Total over 7 years				**583**

Table 6: Key emissions reduction action for 'Buildings'.

The decline in emissions can be directly attributed to implementation of key LAP actions.

The following graphs provide illustrative examples of emissions decline at four sites as a result of energy savings action.

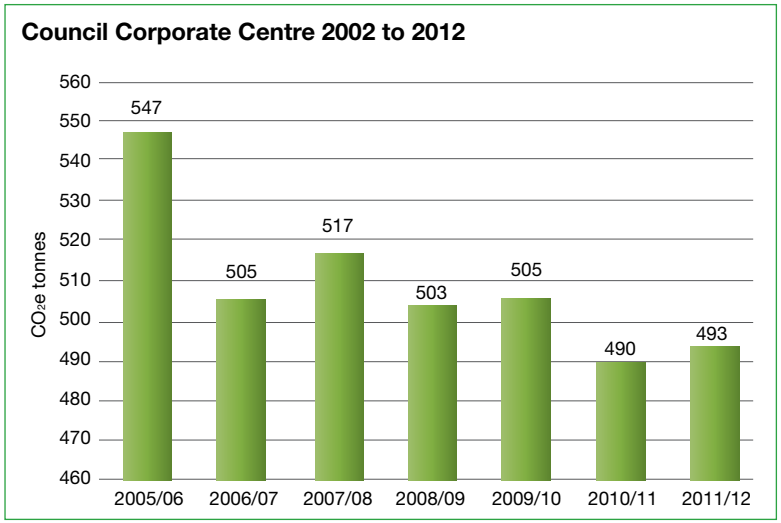


Figure 15: Council Corporate Centre emissions decline over 7 years due to lighting retrofit, air conditioner upgrade and staff education.

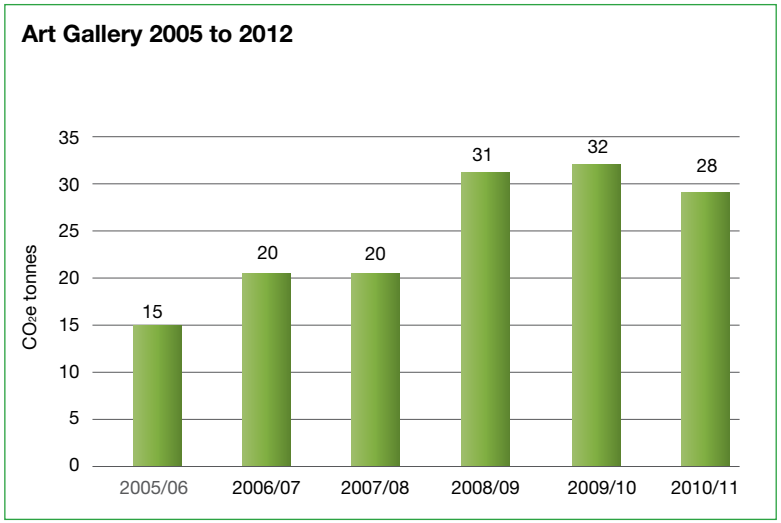


Figure 17: Art Gallery trend, decrease from 2010 - result of CBD Greenovation Program (energy efficiency retrofit, lighting, solar PV panels).

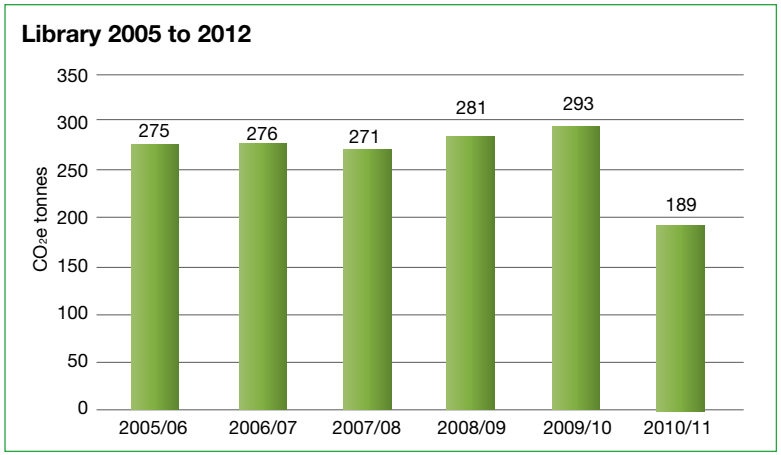


Figure 16: Library emissions decline from 2010 - result of CBD renovation project (energy efficiency retrofit).

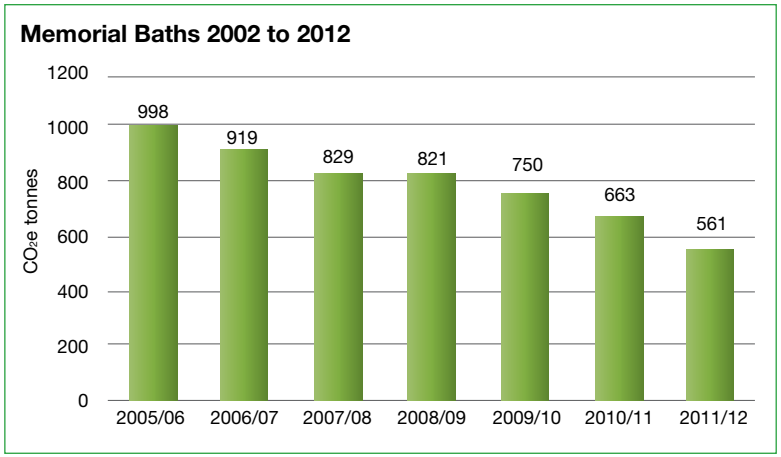


Figure 18: Memorial Baths emissions decline as a result of variable speed drives (VSD), procedural changes (off-peak operations) and ceasing winter operations.

10.2 "Buildings' Site Analysis: 2011/2012 Financial Year

When analysing the 50 *Buildings* sites over a one-year period, we are able to identify the sites that are the highest electricity consumers. This information is valuable when identifying and prioritising target areas for emissions reduction action. For the financial year of 2011/2012 Figure 19 shows that out of 50 *Buildings* sites 72% of emissions are generated by just 4 sites:

1. Goonellabah Sports and Aquatic Centre (22%),
2. Blakebrook Crusher (20%),
3. Memorial Baths (16%),
4. Council Corporate Centre (14%).

In the 2011/2012 financial year *Buildings* contributed to 40% of the annual electricity emissions and 27% of Council's emissions by sector.

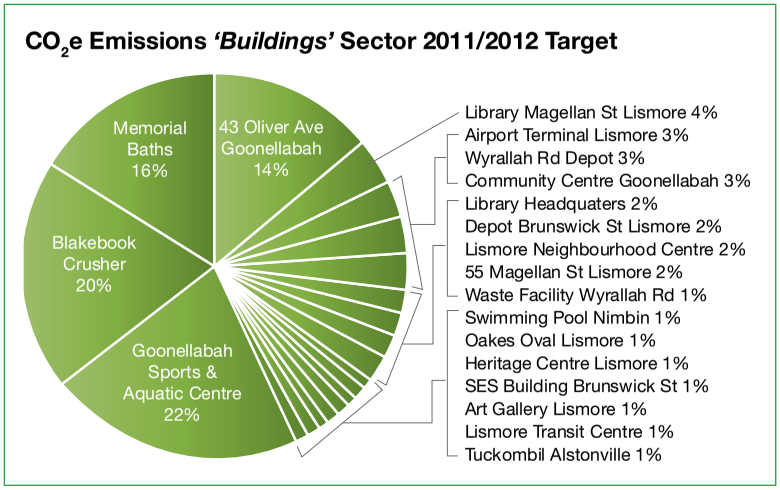


Figure 19: 72% of emissions from 'Buildings' is from the top 4 sites. 2011/2012 financial year

10.3 Streetlighting

Streetlighting includes parks and gardens lighting, toilet facilities, and streetlights. *Streetlighting* increased 31% between 2002 and 2011/12 Figure 20). The growth and expansion of villages and subdivisions over the ten year period has resulted in the installation of new street lights which has increased emissions. For example there were 22 new subdivisions in the LGA between 2002 and 2008.

The rising trend slowed from 2011 to 2012 to only a 2% increase. In 2009 an LCC Development Control Plan amendment was implemented which required the installation of energy efficient streetlights in new subdivisions. This may have contributed to the slowing of emissions generation.

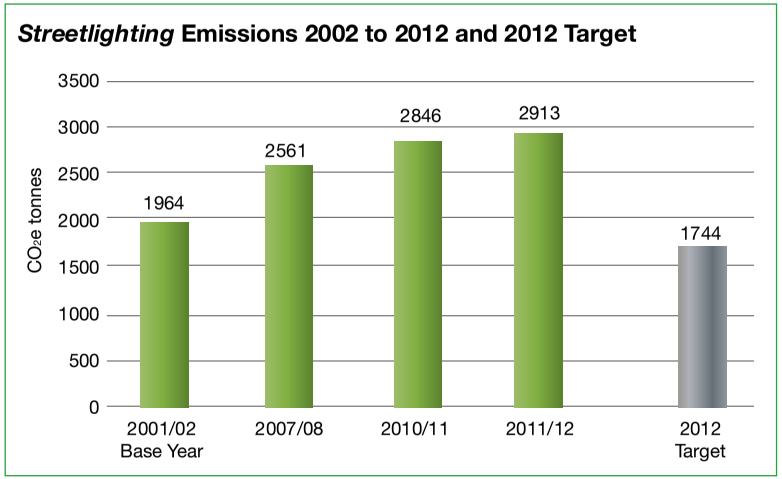


Figure 20: Streetlighting 2002 to 2012 and 2012 target.

In 2012 the emissions from *Streetlighting* contributed to 31% of electricity emissions (Figure 10) and 22% of emissions by sector (Figure 13). In 2012 a streetlighting retrofit program commenced across the LGA. Streetlights were replaced with more efficient lights, which is expected to reduce emissions significantly. The 2013 inventory will reveal this savings.

10.4 Fleet

During the 6 years between 2002 and 2008, fuel emissions rose significantly from 2,382 to 5,343 CO_2e tonnes, which equates to a 33% increase (Figure 21). This was well above the predicted 'business as usual' increase of 10% on 2002 levels. Between 2008 and 2012 emissions significantly reduced by 1,324 CO_2e tonnes, this is around a 25% reduction in emissions. The reduction in emissions from 2008 is a direct result of a number of measures which were introduced by the Fleet Services Team which significantly decreased fuel consumption. The key measures are listed below in table:

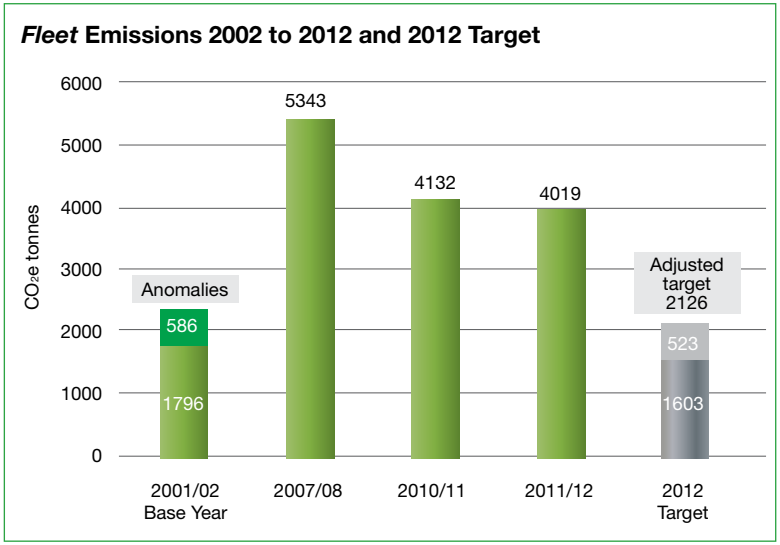


Figure 21: Fleet emissions 2002 to 2012 and 2012 target. Data adjusted to reflect anomolies.

10.4.1 Key Emissions Reduction Action

Fleet Key Emissions Reduction Action	Year	Estimated $ savings	GHG emission reduction (CO_2e)
Down sized Fleet: 6 cylinders no longer available	2010	$777,000 over four years	1324 tonnes over 4 years
User Pays system: lease holders pay for private km's	2010		
Fuel security measurement introduced for diesel	2009		
Reviewed the Vehicle Replacement Plan and brought vehicles up to date	2008		
Hybrid options available	2009		
Introduction of bio-diesel	2009		
Increased proportion of bio-diesel	2010		

Table 7: Fleet key emissions reductions action.

Streamlining of the fuel data collection process was a key factor to enable adequate recording and monitoring of the fuel data. This enabled the fuel savings to be identified and recorded.

In the 2011/2012 financial year fuel accounted for 30% of emissions by source (Figure 9) and 30% Council's emissions by sector (Figure 13).

10.4.2 Biodiesel Analysis

The introduction of biodiesel in 2009 has proven to be a contributing factor in GHG emissions reduction. One kL of biodiesel generates 0.15 CO_2e tonnes, compared to one kL of diesel which generates 2.7 CO_2e tonnes - therefore biodiesel generates 95% less emissions than regular diesel. Even though Council uses B20, 20% bio and 80% regular diesel, the savings are still significant.

Figure 22 shows the comparative figures over two years. There was an increase in total diesel usage of 4,657 litres in 2011/12 compared to the previous year. Despite this increase, emissions decreased by 24 CO_2e tonnes. The decrease is a direct result of the increased use of bio diesel. The proportion of bio diesel increased from 25% of total fuel in 2010/11 to 34% of total fuel in 2011/2012.

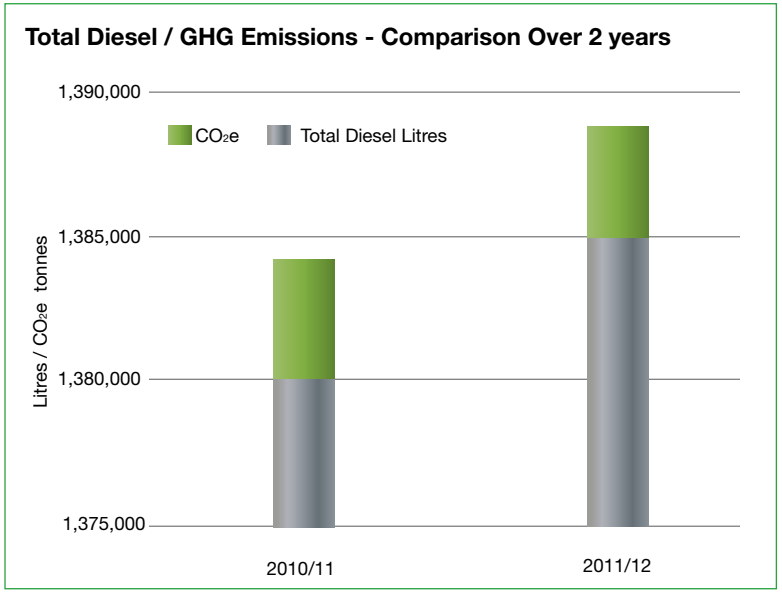


Figure 22: Total diesel/GHG emissions comparison over 2 years. Total diesel increased, but emissions decreased slightly due to increased proportion of bio-diesel.

10.5 Water & Sewerage

Emissions rose steadily between 2002 and 2010 from 2352 tonnes to 3009 tonnes. From 2010 there was a significant turnaround in emissions generation. Emissions declined 244 CO_2e tonnes in just one year, which equates to an 8% decrease (Figure 23).

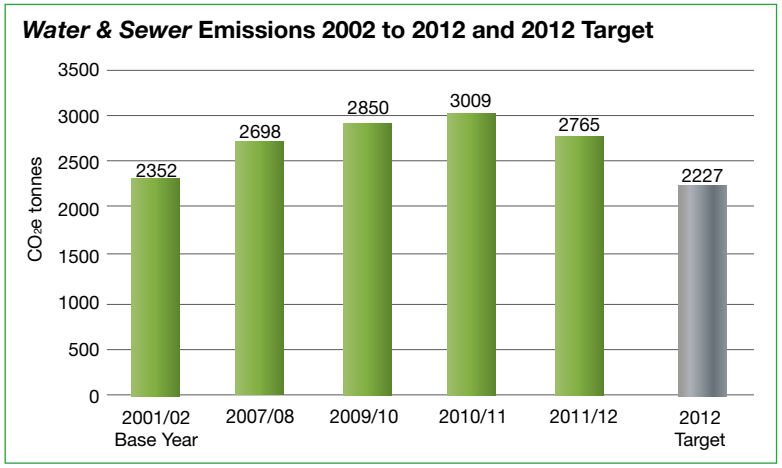


Figure 23: Water and sewer 2002-2012 and 2012 target.

This decline is a significant achievement considering the water and sewer network continues to grow with subdivision development. The decline in emissions is directly attributable to the commencement in 2010 of a program to upgrade many pump stations with variable speed drives (VSD) and soft start mechanisms. This action alone significantly reduces electricity consumption.

In the 2011/2012 financial year the *Water and Sewer* sector continued to account for 29% of the electricity emissions source (Figure 10), and 20% of Council emissions by sector (Figure 13).

10.5.1 Key Emissions Reduction Action

'Water and Sewer' Key Emissions Reduction Action	Year	Estimated $ savings	GHG emission reduction (CO_2e)
Installation of Variable Speed Drives & soft starts on pump stations	2010		244 tonnes over 1 year

Table 8: Water and sewer key emissions reduction action.

Significant savings are being achieved through diversion of waste from landfill . . .

10.6 Waste

The *Waste* sector is comprised of waste generated by Council sites that have a waste collection service. This sector has shown the most dramatic decline in emissions overall. In 2002 *Waste* emissions were 2,435 CO_2e tonnes which accounted for 23% of Council emissions. From 2007 onwards this declined dramatically to only 1% (Figure 24). This decline was a direct result of the introduction of recycling and organics waste services to the commercial sector. The diversion of organic waste and recycling from landfill significantly reduces GHG emissions. Organic waste in landfill generates methane gas by anaerobic breakdown which is 21 times more potent than carbon dioxide as a greenhouse gas.

This is the only Council sector that met and exceeded the CCP 20% emissions reduction goal. In the 2011/2012 financial year *Waste* continues to account for only 1% of Council emissions by sector (Figure 24).

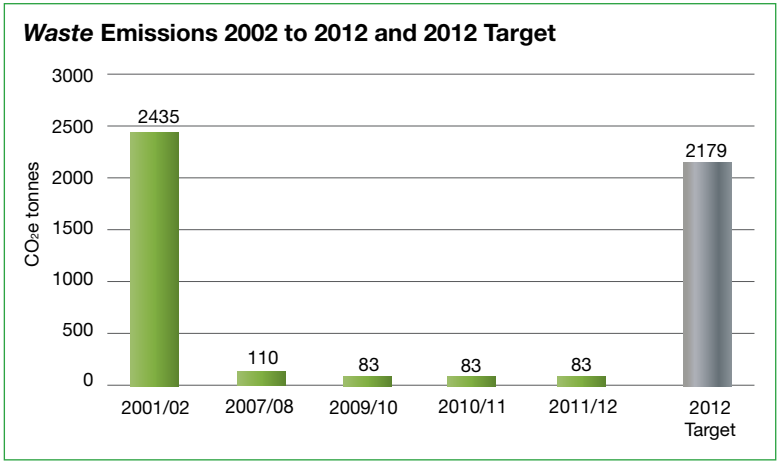


Figure 24: Council waste emissions 2002 to 2012 and 2012 target.

10.6.1 Key Emissions Reduction Action

'Waste' Key Emissions Reduction Action	Year	GHG emission reduction (CO_2e)
Introduction of recycling and organics waste services to the commercial sector	2007	2325 tonnes per year

Table 9: Waste key emissions reduction action.

11 Discussion

Reducing electricity consumption protected Council from the full impact of the electricity price surge.

Council's GHG emissions increased 20% from the Baseline in just 6 years. Emissions plateaued the following three years then commenced a decline from 2010.

The substantial increase over 6 years was a result of organisational growth with limited emissions reduction action. Between 2002 and 2008 organisational growth included:

- Memorial Baths upgrade 2005: new heat pumps & winter operations (156 tonnes per annum)
- Implementation of multiple extra garbage runs for kerb side recycling and the expansion of recycling services to commercial and rural areas
- The construction of the Material Recovery Facility in 2008 (8 tonnes p/a to 60 tonnes - 52 tonne increase)
- Nimbin Caravan Park (21 tonnes in 2006 to 68 tonnes in 2009)
- Nimbin Pool (20 tonnes to 55 tonnes)
- Oakes oval (33 to 66 tonnes 2006-2009)
- Various water and sewer pump stations increases due to Goonellabah subdivisions
- Koala Child Care (5 tonnes in 2005 to 18 tonnes in 2008)

For the sites listed above there was approximately 700 additional CO_2e tonnes generated over three years to 2009.

Council's actions up to 2008 were focused predominately on educational programs as grant funding was not available for internal Council operational initiatives at this time.

Internal education programs were aimed at raising awareness and understanding of the climate change issue, and external programs included education projects for community, school, and business. This resulted in significant benefits in terms of awareness raising, behaviour change, and emissions reduction within the community, but emissions savings were difficult to quantify. The educational focus was however fundamental to gain Council and community support for implementing future actions.

The 2007/08 inventory highlighted the urgent need to focus on implementing Council actions from Council's *CCP Local Action Plan* (LAP). LAP actions ranged from little or no cost actions such as staff initiatives and procedural or process changes, to projects that required significant capital investment. In order to see quantifiable emissions reduction results, Council would need to implement actions that required significant financial investment.

This led to the implementation of a number of key LAP reduction actions which marked the vital turning point in emissions generation. Emissions stabilised from 2008 and from 2009 significant emissions savings were being reported. The financial investment at this time was possible due to government grant funding becoming available from 2009 onwards, and the establishment of the 'CCP Implementation Fund'; a one million dollar fund accessible for energy reduction initiatives with a demonstrated payback period of less than 10 years.

Significant savings are being achieved through diversion of waste from landfill, and the installation of PV solar systems and the CBD Greenovation Project that retrofitted four Council buildings with energy savings measures. The PV solar systems demonstrated great financial savings as well as emissions savings. From July 2010 to July 2012 Council has received a total credit on electricity bills of $44,000, as well as an income of $5000 over and above the electricity costs for these buildings.

Council's organisational electricity costs (excluding streetlighting) increased from $786,207 in 2007/08 to $1.3 million in 2010/11. IPART predicted a further 18% increase in electricity costs by mid-2012. This price surge

coupled with Councils consumption trend of a 9% increase on average per annum had the potential to increase council's electricity costs by up to $500,000 per annum.

Due to successful efforts in substantially reducing consumption from 2009, Council was protected from the full impact of the electricity price surge. Between 2011 and 2012 consumption dropped by 7%, and Council experienced an increase in electricity costs of only around 2% (excluding streetlighting costs). This translated to significant financial savings when prices increased around 18% as per IPART predictions. A coinciding reduction in emissions occurred of 580 CO_2e tonnes in just one year, which is an outstanding result.

12 Conclusion

Council's participation in the CCP program has proven that greenhouse gas emission reduction makes good business sense and benefits council on all levels of sustainability. The whole of Council approach and practical actions of the CCP program significantly lowered levels of greenhouse gas emissions, provided significant financial savings to Council, and demonstrated leadership in taking action on climate change.

The program presented Council with a great opportunity to develop a comprehensive and effective emissions monitoring and reporting program. This was the first time Council had considered its corporate greenhouse gas emissions. It was a foreign method of data collection and required an enormous amount of tedious manual work to establish the program.

The CCP framework revealed that from 2002 to 2008 Council's emissions substantially grew by 20%. This was attributed to organisational growth and limited emissions reduction action. A strategic focus on emissions reduction action from 2008 resulted in an emission plateau to 2010. From 2010 further energy reduction action continued and the corner had been turned - corporate emissions started to decline. This resulted in a 580 tonne CO2e saving in one year, and this action protected council from the full impact of the electricity price surge. Between 2011 and 2012 Council experienced an increase in electricity costs of only around 2% (excluding streetlighting costs), when prices increased around 18% in line with IPART predictions.

Key action that lead to the remarkable emissions reduction included lighting retrofits, installation of solar panels, upgrading sewer and water pumps, procedural and operational improvements, and fuel efficiency measures.

While the ten year 20% emissions reduction goal was not met, the fact that Council was able to curb the strong emissions growth trend and set emissions on a downward trend is truly an extraordinary achievement.

To continue Council's advancement in emissions reduction, from 2012 onwards the program will be modified in line with the National Greenhouse and Energy Reporting (NGER) Scheme, a national framework for corporations to report on greenhouse gas emissions, energy use and energy production. Lismore City Council does not currently meet the NGER threshold for required reporting under the scheme, however, it is a National Standard and should the requirement for reporting arise in future Council will be prepared.

The program will be re-titled and the existing CCP Local Action Plan will be updated from 2013 to allow for continuous improvement and to ensure the Plan remains consistent with and responsive to Council's corporate management programs, State Of the Environment reporting, and other relevant plans and programs.

It is recommended that a new emission reduction goal be adopted to give a quantitative objective that shows leadership and commitment to Council staff and the community. The new goal will align with the inspiring 2013 'GM's Challenge' of becoming 100% self-sufficient on electricity from renewable resources by 2023. Council is currently in the process of preparing a scope for the development of a 10 year Energy Management Plan to achieve this challenge. The new emissions reduction goal will be determined as part of this process and it will be proposed in the 2012-2013 emissions report.

To achieve Councils goals and allow the organisation to grow so that the quality of life and needs of residents are met corporate carbon management must be a routine part of our business. Council's Greenhouse Gas emissions monitoring program has proven to make good business sense. The program has led to significant improvements in resource management and great financial savings. Looking into the future, the program gives a positive commitment to Council's 2013 Community Strategic Plan objectives and ultimately the community's *Imagine Lismore* visions.

13 Explanatory Notes on Data Corrections

The CCP methodology was innovative, but not without its limitations and anomalies which have been acknowledged in previous reports. The data set was difficult to establish and maintain in the initial years as Council had never considered emissions reporting before. The reliability of the data has progressively improved, and from 2009 the data is considered acceptably accurate.

Due to the extent of the data set and methods required for data collection, there is always a possibility of anomalies. Processes have been implemented to routinely reconcile the data to minimise this potential. Annual data will often retrospectively change slightly due to the current method electricity providers use of estimating data and retrospectively updating it.

13.1 Data corrections

The M5 inventory revealed a portion of the fleet's fuel use was not able to be collected in 2002 therefore a correction was made to the M1 base year data in the 2008 M5 inventory report as follows:

- M1 data: Fleet 1796 CO_2e tonnes
- Anomaly amount: 586 tonnes
- M5 data; Fleet data corrected to 2382 CO_2etonnes.

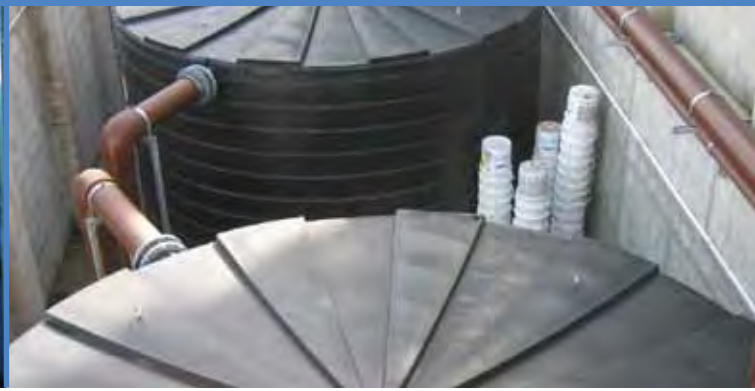
The 2012 Inventory revealed inaccuracies in the 2009 M5 Inventory data set. This was likely due to a change in staff and a misinterpretation of the previous methodology. Inaccuracies and subsequent corrections were as follows:

- The 2001-2002 M1 Waste data was incorrectly adjusted in the 2007/08 M5 report. The M1 reports Council waste as 2,435 CO_2e tonnes. In M5 it was reported as 127 CO_2e tonnes. An explanation for the retrospective data change was not found, however it appears that the percentage of organic waste, (43% from each service), was incorrectly removed from the M1 figure. There was no Council organics separation or commercial waste service at the time of the 2002 inventory, therefore organic waste was correctly included in the M1 Waste total. Therefore the Waste figure the in M5 data set has been corrected back to the original M1 figure of 2,435 CO_2e tonnes.
- The M5 report incorrectly states the Target figures in all sectors. This appears to be due to a calculation error. The M5 data set appears to have been calculated by simply taking 20% off the Base year figure. This however does not account for organisational growth over the 10 year period. The M5 data set has been corrected in this report following the correct 'Target' calculation as follows:
  - Forecast year – (20% of the Base Year) = Target (reduction goal)

The target figures of the original M5 report are incorrect. The correct calculation for the target amount is: Forecast – (20% of Base Year) = Target. This incorporates the 10.25% organisational growth expected over the 10 year period. If the calculation is simply performed by subtracting 20% from the base year, then growth is not accounted for.

To maintain consistency and minimise confusion when perusing the past 10 years of data, it is considered most appropriate to revert back to use of the original Base Year data for the final 2012 Target Year Analysis Report.

Data has progressively improved over the years, however, what is most important is that there is a meaningful comparison between the base year, re-inventory year, and target year, and that the 10 year trend is analysed. Inaccuracies of the data set in the base year are not considered to significantly influence the overall trend, and did not impact greatly on the end result.



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