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North Sydney Council Greenhouse Action Plan and Water Management Plan 2015-2020



energetics[•]

Project details

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Be efficient. Drive business improvement and realise savings

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- Best value
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2013

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2012

- Winner: Australian Business Award for Recommended Employer
- Winner: Australian Business Award for Service Excellence



2011

- Winner: BRW Client Choice Award for Best Value
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Executive summary

This document outlines North Sydney Council's Greenhouse Gas Action and Water Management Plan for 2015 – 2020.

In 2012/13, Council has achieved

- 49% reduction in greenhouse gas emissions from the 1996 baseline level.
- 35% savings in potable water consumption from the 2001/02 baseline level.

By 2020, Council can achieve:

- 70% reduction in greenhouse gas emissions from the 1996 baseline level (29% from abatement activities and 41% by continuing with its existing offset purchase program).
- 50% (34 ML) savings in water use from the 2001/02 baseline level.

By 2030, Council can:

- **be a Carbon Neutral Council**
- extend water reduction target to 60% of the 2001/02 baseline level

In 2020, the North Sydney Community can to achieve:

- 15% reduction in greenhouse gas emissions from the 1996 baseline level if Federal Government's Renewable Energy Target program is maintained
- 10% reduction in water use from the 2001/02 baseline level.

Table 1. Council's emissions and water targets and progress

	Targets set out in the 2010 – 2015 plans	Council's progress at 2012/13	What can Council achieve by 2020?
Greenhouse gas emissions	<p>Reduction of 50% from 1996 baseline by 2020.</p> <p>Absolute target of 4,233 tCO₂e per year.</p> <p>Includes scope 1 (e.g. gas, transport fuel) and scope 2 (electricity) emissions from Council owned assets and Ausgrid street lights.</p>	<p>Achieved 49% (equates to 4,147 tCO₂e) reduction in combined scope 1 and 2 emissions (including street lighting emissions). Implemented abatement activities in 2012/13 reducing 805 tCO₂e.</p> <p>Purchased offsets (around 2,610 tCO₂e) for 50% of electricity consumed by street lighting, and Council's top six energy consuming facilities.</p>	<p>Reduce its emissions by 872 tCO₂e by implementing abatement measures identified in this plan. These measures and others implemented to date will enable Council to reduce its emissions by 29% from the 1996 baseline levels.</p> <p>Purchase offsets to meet its emission reduction target of 70% from the 1996 baseline level.</p>

	Targets set out in the 2010 – 2015 plans	Council's progress at 2012/13	What can Council achieve by 2020?
Water consumption	<p>Extended initial target to a 50% reduction on the 2001/02 baseline year.</p> <p>Absolute target of 124,999 kL per year in 2020.</p>	<p>Achieved 35% reduction from revised 2001/02 baseline.</p> <p>Revised 2001/02 baseline of 124,999 kL to 207,821 kL in line with updated water usage data.</p> <p>Approximately 16ML of water was available for Council use from the Cammeray stormwater reuse system.</p>	Save 34 ML of potable water consumption by 2020, which will lead to 50% savings from Council's 2001/02 baseline levels.

Table 2. Community¹ targets for North Sydney municipality

	Targets set out in the 2010 – 2015 plans	Community's progress at 2012/13	What can the Community achieve by 2020?
Greenhouse gas emissions	<p>25% reduction on 1996 baseline by 2020.</p> <p>Absolute target of 525,915 tCO₂e per year.</p>	Decreased by 5% from the 1996 baseline (701,220 tCO ₂ e).	15% reduction in greenhouse gas emissions from the 1996 baseline level if RET ² targets are maintained.
Water consumption	<p>25% reduction of Community water consumption below 2001/02 levels by 2020 (6,080 ML per year).</p> <p>Absolute target of 6,080 ML kL per year.</p>	Community water consumption (7,006 ML) decreased by 14% from the 2001/02 baseline levels.	The North Sydney Community has the potential to reduce its water consumption by 10% of 2001/02 levels by 2020.

Action plan for North Sydney Council – achieving the targets

- **Greenhouse gas emission:** Council can achieve 70% emission reduction from their 1996 baseline levels by 2020.
 - 29% emission reduction can be achieved through implemented demand management programs and identified abatement activities in this plan (872 tCO₂e).
 - Council can continue its current commitment to purchase carbon offsets (41%) to achieve their emission reduction target of 70% from 1996 baseline levels by 2020.

For 2030, Council should consider revising their emission reduction target from 50% to 100% of the 1996 baseline level and opt for Carbon Neutrality.

¹ Community refers to residents and businesses located in the North Sydney Council local government area.

² Government's Renewable Energy Target program. See section 3.3.2 for more detail.

- **Water consumption:** Council can reduce their water consumption by 50% (37 ML) from the 2001/02 baseline level by 2020

For 2030, Council should consider extending their current water reduction target to 60% of 2001/02 baseline levels by 2030.

Management Systems

Energetics recommends that:

- Council to review its asset portfolio annually, and ensure that the master asset portfolio aligns with the various reporting systems such as Planet Footprint and Utilities.
- Council should dedicate a resource to actively manage and monitor energy and water consumption by optimising and utilising existing management systems to identify wastage and further reduction opportunities.

Abatement measures

Based on the outcomes of this plan, Council should implement a five year action plan to implement the identified emission reduction and water savings opportunities with a focus on initiatives with material impact on emission reduction and water savings.

Figure 1 and Figure 2 outline Council's emissions reduction and water savings potential until 2020.

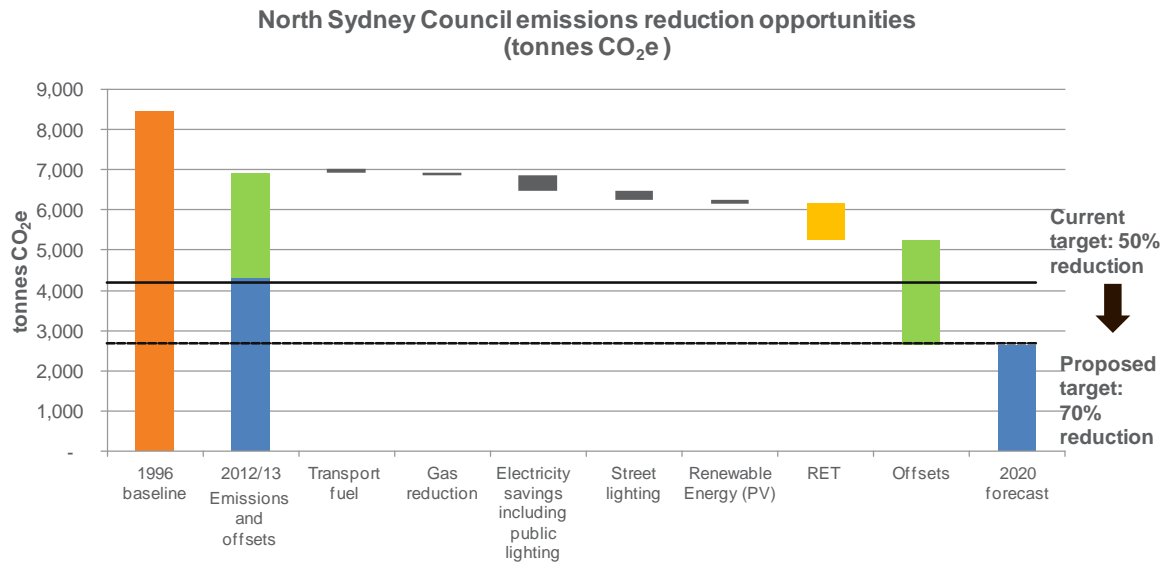


Figure 1. North Sydney Council emission reduction initiatives for 2020

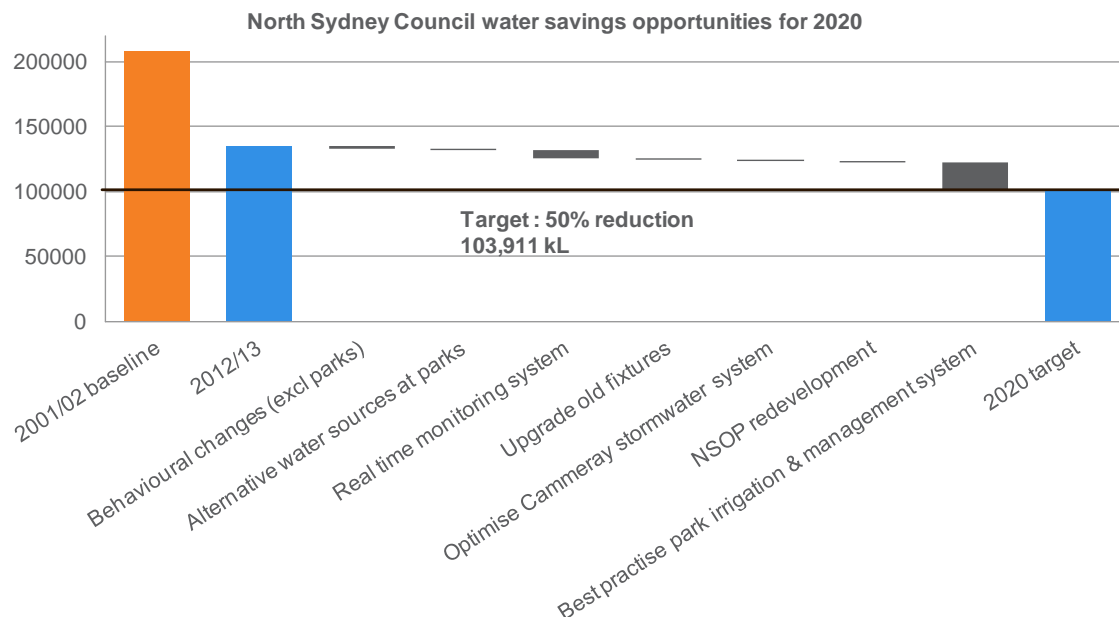


Figure 2. North Sydney Council water savings potential for 2020

Implementation costs

By 2020, the initiatives identified in this plan can reduce Council's emissions by 872 tCO₂e at a cost of around \$960k resulting in savings of \$160k annually. Based on the progress of implementing the identified abatement activities, Council should allocate between \$100k and \$170k annually to purchase offsets.

Council will pay approximately \$575k to implement the identified water savings activities to reduce its water consumption by 34ML by 2020. This is expected to result in annual water savings of around \$70k.

Further investigation

Energetics recommends Council should further investigate the following action items:

- Undertake detailed water and energy audits of high energy and water consuming facilities and other facilities that showed high water and energy consumption patterns in this report.
- Review its current electricity, gas and waste contracts to ensure all associated carbon costs have been removed.
- Conduct annual (or more frequent) reviews of all amenities to identify leaks and upgrade old water fixtures with efficient ones.
- Commission a review of the Cammeray stormwater system to optimise water reuse availability.
- Develop environmental design guidelines for rebuilds and renovations of Council properties to include water and energy saving KPIs.

Where to next for the North Sydney Community?

With regards to the North Sydney Community, Council's target for 2020 are:

- **Greenhouse gas emission:** North Sydney Community's greenhouse gas emission target should be reduced from 25% to 15% of 1996 baseline levels. This is a stretch target with a high degree of uncertainty for the Community to achieve this target. This target should be reviewed in 2020.
- **Water consumption:** North Sydney Community water reduction target should be reduced from 25% to 10% of 2001/02 baseline levels by 2020. This target should be reviewed in 2020.

Abatement measures

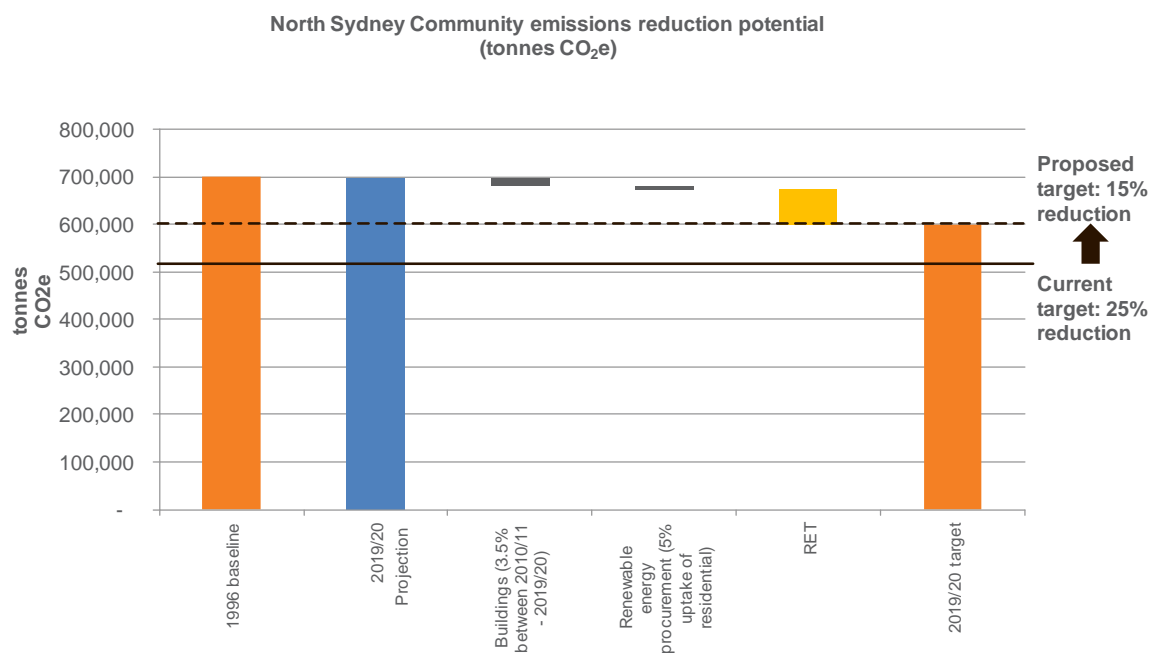


Figure 3. North Sydney Community's emission reduction potential for 2020

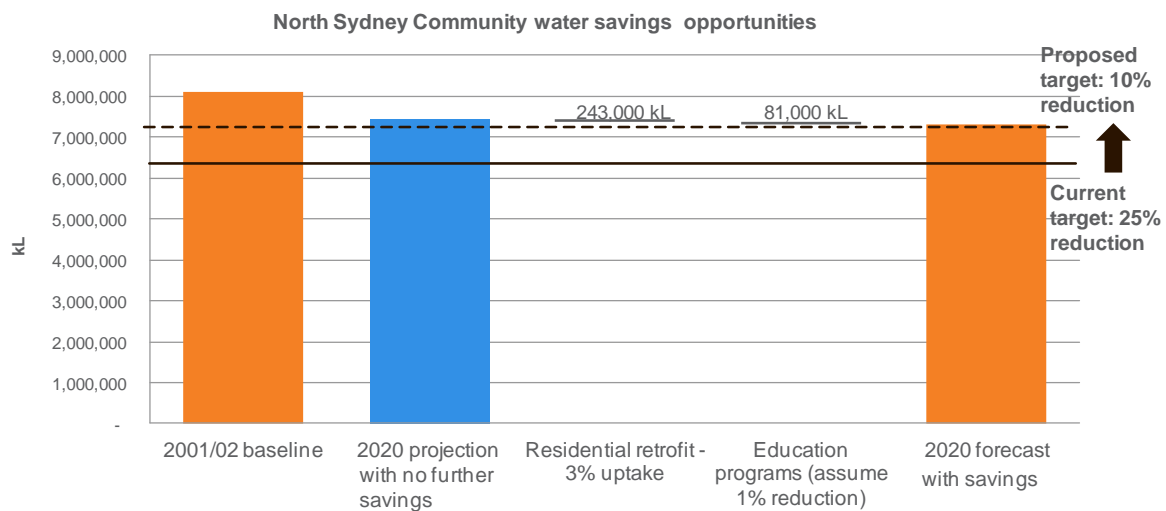


Figure 4. North Sydney Community's water savings opportunities for 2020

Implementation costs

It will cost Council around \$350k per year to continue with education measures and \$400k to undertake feasibility studies to enable the Community to realise 15,506 tCO₂e emissions reduction by 2020.

Council will pay approximately \$490k per year to implement a sustainability engagement strategy and retrofits targeted at the residential sector to drive water reduction opportunities.

Way forward

- Communicate the results of this plan and inform the Community about their progress, identified savings initiatives and new targets.
- Continue to facilitate forums and education programs to increase awareness and uptake of sustainability initiatives within the Community.
- Continue to implement business educational programs and incentives to reduce energy and water consumption.
- Develop and implement a targeted Sustainability Engagement Strategy to help reduce residential energy and water consumption.
- Continue to investigate financing and funding options that will incentivise and provide rebates to the Community to reduce their water and energy consumption.
- Commission feasibility study for Council to facilitate the purchase of electricity from renewable sources for customers in the North Sydney Community.

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North Sydney Council's journey

1. Background

Since the early 2000's, North Sydney Council (Council) has been constructively focussed on reducing greenhouse gas emissions and potable water consumption within its municipality. These efforts have been focussed on both Council's own operations and supporting and influencing the Community within its Local Government Area (LGA) to improve sustainability in regards to greenhouse gas emissions and water use.

In 2002, North Sydney Council endorsed greenhouse gas emissions reduction targets for Council and Community emissions as part of the International Council for Local Environmental Initiatives (ICLEI) Cities for Climate Protection (CCP) program. This was followed in 2004, when North Sydney Council endorsed water reduction targets for Council and Community water use as part of the ICLEI Water Campaign program. In 2002, Council established Greenhouse action and Water Management plans to cover 2005-2010. These were updated in 2009 to cover the 2010-2015³ period. In 2012, Council also updated its 2007 Energy Efficiency Plan and a Water Efficiency Plan to:

- fulfil state regulatory requirements
- to reduce energy and water consumption for their largest emitters/consuming facilities
- align with the targets to reduce emissions and water consumption by 2020.

Council's present targets for its own operations are:

- To achieve a reduction of 50% in greenhouse gas emissions from Council's 1996 baseline by 2020, equivalent to reaching an absolute target of 4,233 tCO₂e per year for combined scope 1 and 2 emissions.
- To achieve a 50% potable water consumption reduction on the 2001/02 baseline year by 2020. This translates to reducing consumption from 207,821, kL in 2001/02 to approximately 103,911 kL per annum in 2020.

Note: Council revised the original target of 25% reduction in water consumption compared to the 2001/02 baseline year by 2020, after achieving this by 2008/09.

Aspirational Community targets for North Sydney municipality:

- Council's 2010-2015 Greenhouse Action Plan set a target of a 25% reduction on its 1996 baseline for scope 1 and 2 emissions within the municipality by 2020.
- The 2010-2015 Water Management Plan recommended a target of 25% reduction of Community water consumption below 2001/02 levels by 2020.

³ <http://www.northsydney.nsw.gov.au/files/823c14bd-8199-4ea9-8930-a10700ff80e3/GreenhouseActionPlan2010.pdf> and <http://www.northsydney.nsw.gov.au/files/ba4615d0-3e2b-41bc-bfdc-a10700ffa9f5/WaterManagementPlan20101.pdf>

Council's 2010-2015 plans will expire in June 2015 and therefore require review and updating in order to develop a realistic action plan to meet Council's 2020 targets. Council has engaged Energetics to review its progress against targets, develop new management plans for 2015 - 2020, assess how to achieve the 2020 targets and recommend new targets for 2030.

2. Approach and methodology

Energetics worked with North Sydney Council and its Environment Reference Group to review the progress against targets and inform the development of the 2015-2020 plans. An overview of the approach taken is outlined in Figure 5 below.



Figure 5: Our approach to undertake the review and update of the 2010-2015 Greenhouse Action and Water Management Plans and develop 2030 targets

Consultation workshops 1 and 2 were held prior to the development of the plans. The purpose of these workshops was to provide feedback to the respective groups on the plans update and review process and gather responses on what reduction opportunities should be explored in the 2015-2020 plans.

2.1. Data review

To assess Council's progress towards its existing 2020 targets, Energetics commenced desktop analysis with a review of the emissions and water consumption profiles for Council operations and the North Sydney Community between 2009/10 and 2012/13.

The review focussed on greenhouse gas (GHG), energy and water inventories, based primarily on data compiled by Planet Footprint and Sydney Water, and augmented by further information from Council.

2.1.1. Council operations

The source data used to determine Council's emissions profile was downloaded from Planet Footprint's database. The interim emissions profile and results were discussed with Council staff and Community representatives at Consultation Workshops 1 and 2.

For the water consumption profile, data alignment between Planet Footprint and Sydney Water was not achievable for all years due to changes in Council's asset portfolio. As a result of these data discrepancies, Sydney Water data was used to develop the water usage profile for the review period.

2.1.2. Community consumption

The emissions and water consumption profiles for the municipality were quantified based on average gas, electricity and water consumption profiles for each of residential and commercial sectors, as obtained from the utilities.

The emissions associated with residential and employee travel for the Community were estimated based on various assumptions as outlined in section 10.

2.2. Stakeholder consultation

Energetics worked with Council to identify and consult with relevant stakeholders in order to enhance the uptake and implementation of the 2015-2020 plans. The approach that was employed for the stakeholder consultation is outlined in Table 3.

Table 3: Process and outcomes for stakeholder consultation

Stakeholders engaged	Purpose
08 July 2014 Community online survey	To gather feedback from the Community regarding past and future reduction activities
12 July 2014 Workshop 1 – Environment Reference Group	To provide feedback on the Council's progress against target. To identify relevant committed actions from current plans. To provide feedback on locally relevant actions. To collate feedback for future initiatives relevant to the Community.
16 July 2014 Workshop 2 - Senior North Sydney Council staff.	To provide feedback on the Council's progress against target. To identify relevant committed actions from current plans. To assess feasibility of new evidence-based and locally relevant actions.
13 August 2014 Workshop 3 with senior North Sydney Council staff.	To review the first draft of the GHG and Water Management Action Plans and obtain feedback to inform further development.
08 September 2014 Councillor briefing with Environment Reference Group	To facilitate a 20-minute discussion and provide overview of the second draft of the plans.
15 September 2014 Council briefing 2	To facilitate a 20-minute discussion and provide a summary of the plans.

The feedback received from the online survey, workshops, draft reviews and directed consultation was incorporated into the development of the plans.

What will drive reduction in emissions and water consumption?

Council has made great progress towards its goals for operational improvements, much through its own effort and commitment, but aided by a raft of State and Federal legislation, programs and other external drivers including, but not limited to;

- Water restrictions imposed by the State Government
- Renewable Energy Target (RET) requiring 20% of Australia's electricity to come from renewable sources
- Carbon pricing and state based abatement schemes
- Rising water and energy prices that drives efficiency
- Reductions in the price of "cleaner" technologies

These drivers have also provided impetus for stabilising GHG emissions and water consumption within the North Sydney Community.

However, some of these are changing, such as the repeal of the carbon pricing mechanism and review of the RET by the Federal Government. This section addresses what drivers are likely to exist over the remaining target period.

3. Drivers and policy

The North Sydney Community Strategic Plan⁴ underpins Council's vision of "*Shaping a progressive, diverse and vibrant North Sydney Community*". The plan is the key strategic document that informs and guides decision making and planning for North Sydney until 2023. Sustainability is one of the pillars in the strategic plan and is a significant driver for Council to reduce greenhouse gas emissions and water consumption.

In early 2001/02, Council participated in various voluntary greenhouse gas reduction and water reduction programs that led to the development of its Greenhouse Action and Water Management plans. In 2009, Council revised their initial Greenhouse Action Plan and Water Management Plan. These plans are due to come to an end in June 2015 and required an update for the 2015-2020 period to inform budget development and project delivery for the next five year period.

The 2015-20 plans and targets will be publicly available and Council will be held accountable by its constituents.

3.1. Environmental levy

Council has an environmental levy to fund sustainability initiatives. Table 4 outlines the allocation of the levy for the Greenhouse Action and Water Management Plans for the period 2010/11 – 2014/15.

⁴ North Sydney Community Strategic Plan 2013 - 2023

Table 4. Environmental levy spending allocation for 2010/11 – 2014/15

Project	Year11 (2010/2011)	Year 12 (2011/2012)	Year 13 (2012/2013)	Year 14 (2013/2014)	Year 15 (2014/2015)
Port Jackson	\$260,960	\$267,484	\$274,171	\$281,025	\$288,051
Middle Harbour	\$155,000	\$158,875	\$162,847	\$166,918	\$171,091
Port Jackson and Middle Harbour Catchments	\$359,098	\$388,598	\$373,698	\$337,903	\$340,218
Water Management Plan	\$298,000	\$308,000	\$298,000	\$298,000	\$318,000
Greenhouse Action Plan	\$805,000	\$775,000	\$685,000	\$625,000	\$605,000
Environmental Levy Administration	\$80,000	\$80,000	\$80,000	\$80,000	\$80,000
Total	\$1,958,058	\$1,977,957	\$1,873,716	\$1,788,846	\$1,802,360

Part of these funds have been utilised to implement the following initiatives:

- Cogeneration system at North Sydney Olympic Pool
- Solar PV and energy efficient upgrades at a number of Council buildings and facilities
- Installation of 11 solar hot water systems at Council facilities
- Stormwater re-use system that irrigates high profile sporting and recreational facilities
- Installation of rainwater tanks at 12 sites
- Purchase of 50% offset (GreenPower™) for street lighting and the top six energy using Council sites
- Supporting local residents, schools and businesses to reduce their water and energy consumption through a range of programs and initiatives.

3.2. Government funding

Council has previously accessed funding for a number of projects through NSW State and Federal Government grant programs. These activities include:

- A suite of energy efficiency actions completed, funded by a grant from the Commonwealth Government Community Energy Efficiency Program (CEEP), and the Waste and Sustainability Improvement Payments (WASIP), as well as through North Sydney Council's Environmental Levy.
- The cogeneration plant at the North Sydney Olympic Pool (NSOP), funded by the CEEP and the North Sydney Council Environmental Levy.

There are a number of factors in the changing political and regulatory framework that may impact on Council. These are discussed below.

3.2.1. Grant funding opportunities

- The programs that have previously been used as a grant funding source – CEEP, WASIP – will not be operational from 2016 onwards.
- Funding is available at the State Government level by creating (and selling) energy savings certificates (ESCs) through the NSW Energy Savings Scheme (ESS). The potential of the ESS to offset the capital costs of future projects should be considered in energy savings projects.
- The Entrepreneurs' Infrastructure Program will have up to \$484.2 million available to fund the commercialisation of good ideas, job creation and improving the performance of small businesses. The Entrepreneurs' Infrastructure Programme offers support to businesses through three streams of business management, research connections and commercialising ideas through the support of a national network of experienced private sector advisers.

Available programme offerings for 2014 include business evaluations and business growth grants. It is expected that practical support for businesses to establish collaboration and connection opportunities will come online in late 2014.

North Sydney Council should continue to offset costs of all future energy savings projects (where possible) through the NSW ESS program.

Funding from the Entrepreneur's Infrastructure Program could be available to small businesses within the North Sydney Community to identify and implement energy and water savings projects as part of business improvement plans.

3.3. Government policy

3.3.1. Emission Reduction Fund

Pending the passing of the relevant legislation, Federal Government funding opportunities should be available from the Emissions Reduction Fund (ERF). Projects that qualify will be able to bid into "reverse auctions", where contracts to sell emission reductions to the Government will be awarded to the lowest bidders. The potential for Council to participate within the ERF will be impacted by the following factors:

- Energy efficiency projects will be the quickest and most straightforward to prepare and pre-qualify for the first ERF auctions. Projects that are ready to implement can secure funding, potentially at a higher rate than subsequent auctions. The Clean Energy Regulator will only be purchasing genuine, lowest cost abatement that falls below a benchmark ceiling price of abatement.
- Successful projects will need to demonstrate a minimum abatement average of 2,000 tCO₂e per year over the life of the contract. However, it is possible to aggregate multiple projects to a total above the minimum and bid these into the auction together.

Council should consider opportunities to aggregate abatement projects across facilities and in collaboration with other Councils to take advantage of the economies of scale and be more competitive in the reverse auction process.

3.3.2. Renewable Energy Target – currently under review

The Federal Government's Renewable Energy Target (RET) scheme is designed to ensure that 20% of Australia's electricity comes from renewable sources by 2020 to facilitate the transition away from fossil fuels in order to reduce greenhouse gas emissions. Since January 2011 the RET scheme has operated in two parts:

- Small-scale Renewable Energy Scheme (SRES) creating small-scale technology certificates (STCs)
- Large-scale Renewable Energy Target (LRET) creates large-scale generation certificates (LGC). The large-scale targets ramp up until 2020 when the target is currently legislated to be 41,000 GWh of renewable electricity generation

The RET legislation has transformed Australia's electricity generation mix to cleaner and more diverse sources and supporting growth and employment in the renewable energy sector.

The RET is currently under review. The Government has yet to announce any clear direction for the RET. Energetics recommends a watching brief on any changes to the RET and implications for Council. For example, the removal of the RET could alter emission reduction targets by up to 10%.

3.3.3. Other legislative considerations

With the repeal of the Carbon Pricing Mechanism, Council should review its energy and waste contracts for carbon inclusive or exclusive clauses. Where carbon costs had previously been incorporated into the invoice, these should now be removed by the energy supplier.

Energetics recommends that Council should review its current electricity, gas and waste contracts to ensure all associated carbon costs have been removed.

3.4. Electricity and gas price forecast

3.4.1. Electricity

Electricity markets have changed significantly over recent times. Demand in the network has been declining since 2009 and this has made it more competitive for generators, who have dropped their prices to sell electricity in response. This means lower electricity charges are likely as contracts are renewed. Total prices are expected to remain relatively constant at around \$140/MWh (or 14 cents per kWh). Within that total, whilst the energy costs (i.e. the price paid to the generators) remain relatively static, network charges increase in 2014/15 and then level out. Carbon charges are removed from 2014/15. A price on carbon has been removed and this should see a reduction in costs for Council of around 14%.

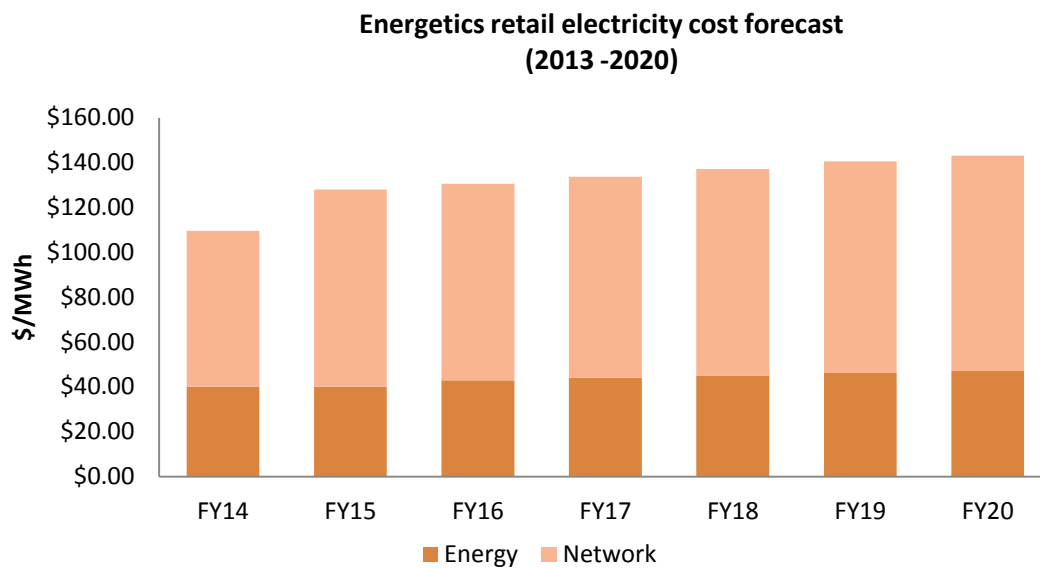


Figure 6. Retail electricity cost forecast

Figure 7 below shows the breakdown of the delivered electricity costs. Network charges account for 50% of electricity costs and are now plateauing. Network charges, essentially the cost for the “poles and wires”, have been the major cause of cost increases in the last 5 years. Governments are now less comfortable with spending for upgrades in this period of declining consumption.

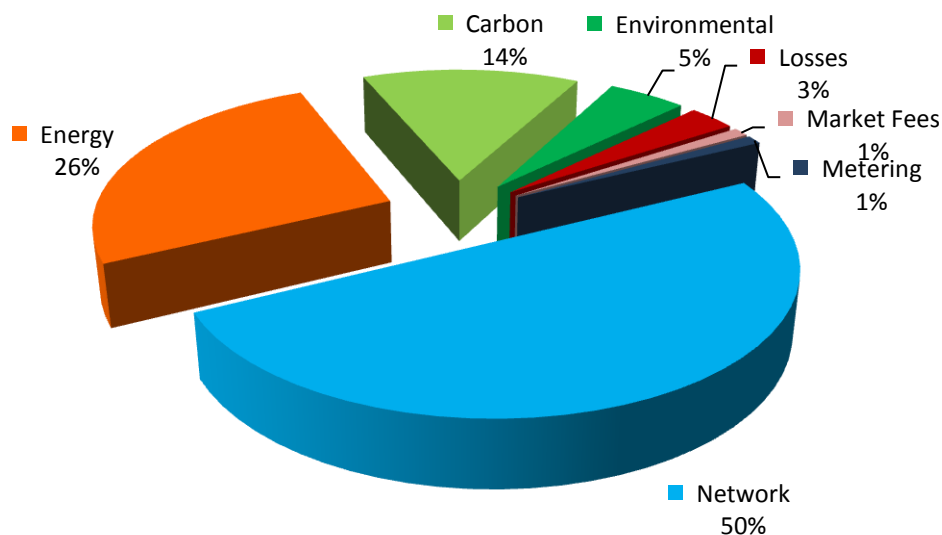


Figure 7. Delivered electricity cost breakdown

The environmental charges in Figure 7 are passed through to the consumers for implementing the RET.

3.4.2. Gas price forecast

The natural gas market on the east coast of Australia is also undergoing a period of unprecedented change. Up until now Australian gas pricing has been amongst the cheapest in the world, based on the abundance of reserves available.

This is set to change with east coast gas being exported and sold to Asia in its liquefied form, LNG. Suddenly east coast gas producers are able to get international prices for gas and this means that the gas price is expected to double between now and 2017 – 2018 for local customers. Figure 8 shows Energetics' gas price forecast out to 2020. The doubling of gas prices is an incentive to reduce gas consumption.

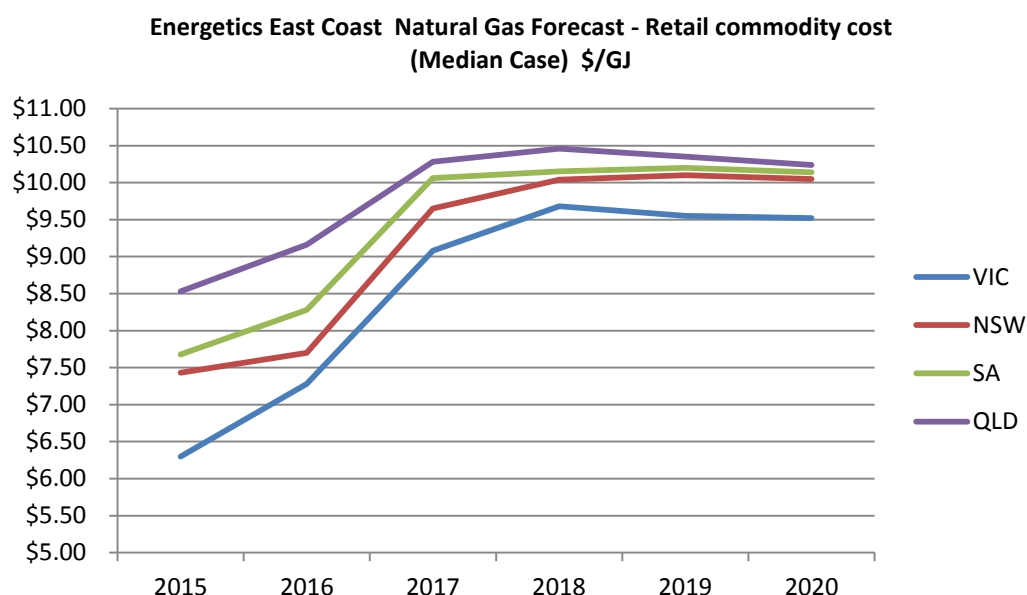


Figure 8. Energetics East Coast Natural Gas price forecast

Recently IPART, the NSW price regulator, ratified a request by gas retailers to increase pricing for domestic and small business by around 17% for 2014/15. This will be tempered a little by the removal of carbon charges but consumers are set for large increases over the next few years.

Rising gas prices will provide incentives to reduce gas consumption and subsequently the emissions associated with Council's gas use. This will not have a significant impact on Council's emissions as emissions from Council's gas usage account for less than 10% of Council's total emissions excluding the street lights. As such, the rising gas prices and incentives will not drive significant absolute emission reduction for Council. However, gas price will direct strategic investment in any further cogeneration or trigeneration systems.

Electricity is the focus for Council

In 2013, emissions from grid electricity emissions accounted for 75%, excluding street lights, of Council's total emissions. This is by far the single largest emissions source for Council. As such, driving electricity emissions reduction in the next five year should be the key focus for Council.

Yet complexities arise around:

- change in energy mix of the grid

-
- increased electricity supply
 - lower costs
 - uncertainty around the RET. If the RET is kept at its current target, Council's electricity emissions will decrease by 10% by 2020 without the implementation of any abatement activities.

In light of these issues, North Sydney Council should actively monitor and manage electricity consumption for Council owned properties through existing management systems.

Council's progress against targets

This section outlines how Council's emissions and water usage is performing against the targets that were set in the 2010-15 Greenhouse Action and 2010-15 Water Management Plans. These targets were:

- 50% on its 1996 baseline emissions by 2020, equivalent to an absolute target of 4,233 tCO₂e per annum for scope 1 and 2 emissions.
- 50% reduction on the 2001/02 water consumption baseline year by 2020, which means reducing consumption from 125,000kL in 2001/02 to approximately 62,500 kL per annum in 2020.

4. Greenhouse gas emissions

The 2010 Greenhouse Action Plan sets the boundary and emissions scope included in Council's greenhouse gas emissions inventory. The emissions of the assets over which Council has operational control of are:

- Scope 1 (direct) emissions from liquid fuel use in Council owned vehicles
- Scope 1 (direct) emissions from gas consumed at Council owned buildings
- Scope 2 (indirect) emissions associated with electricity use at Council owned buildings
- Scope 2 (indirect) emissions associated with electricity use of the street lights operated by Ausgrid but owned by Council

Scope 3 (indirect) emissions arising from the distribution of electricity or gas are not included in the emission profile or the reduction opportunities.

In 2012/13 Council has achieved a **49%** reduction, which equates to 4,147 tCO₂e in combined scope 1 and 2 emissions, including street lighting emissions from the 1996 baseline level.

In 2012/13, Council implemented abatement activities resulted in **805 tCO₂e** emission reductions and offset purchase (GreenPower™) amounted to **2,610 tCO₂e**. Over the ten year period between 2003 and 2013, Council's cumulative abatement activities resulted in **2,560 tCO₂e** emission reduction.

Figure 9 below shows the Council's progress in 2012/13 against the 1996 baseline.

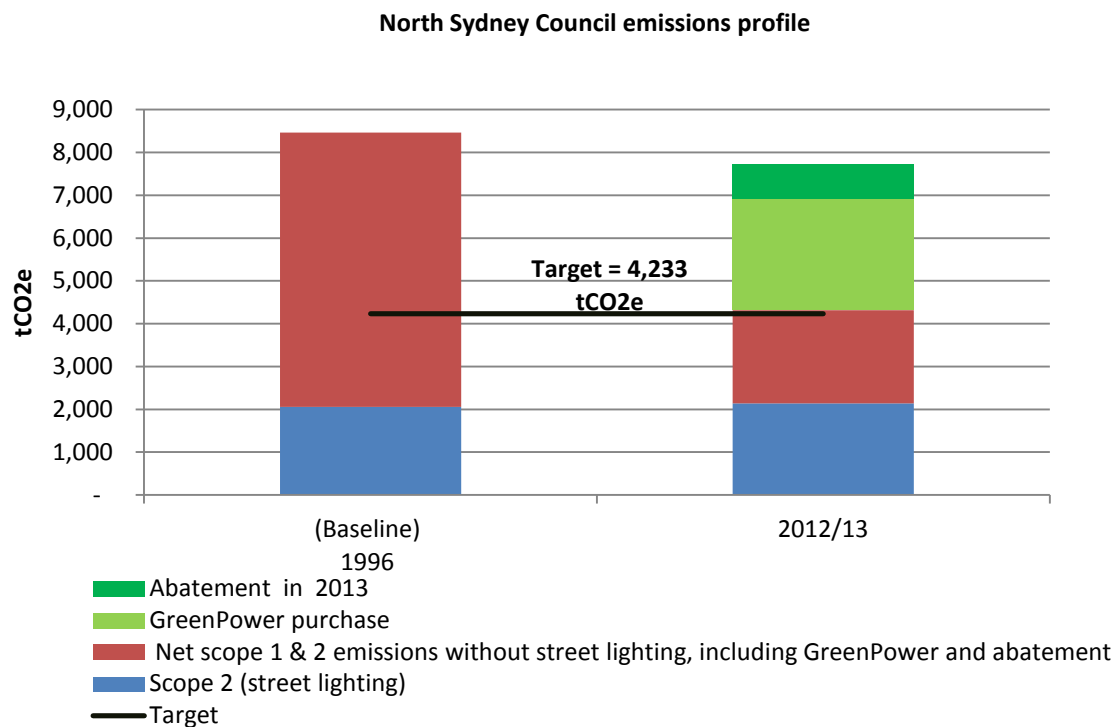


Figure 9: North Sydney Council's greenhouse gas emission in 2012/13 and the baseline year.

The breakdown of emissions in 2012/13 in Figure 10 shows that the major part of Council's emissions come from Council owned buildings, street lighting and the North Sydney Olympic Pool (NSOP). These results are discussed in the sections below.

North Sydney Council scope 1 and 2 emissions breakdown 2012/13

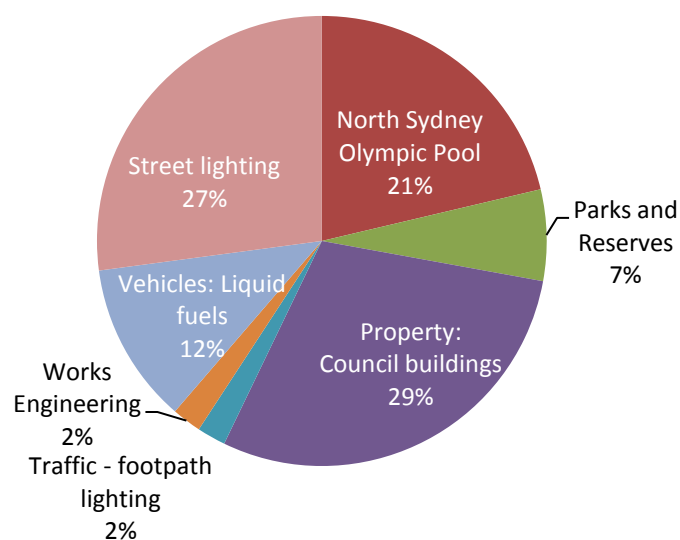


Figure 10. Breakdown of the scope 1 and 2 emissions for 2012/13

The emissions categorised as “Street lighting” comes from the 4,000 Ausgrid operated street lights. North Sydney Council owns and operates approximately 1,200 public lights that are mostly used in parks and reserves with a minimal part of these lights also used to light up public streets in North Sydney.

A component of emissions associated with the 1,200 public lights is captured by “Traffic – footpath lighting” in Figure 10. Council is undertaking a review of these lights with a view to develop an inventory that will provide the type and number of lamps that fall under this category. It is expected that the review and inventory will be completed by October 2014.

4.1. Property: Council buildings

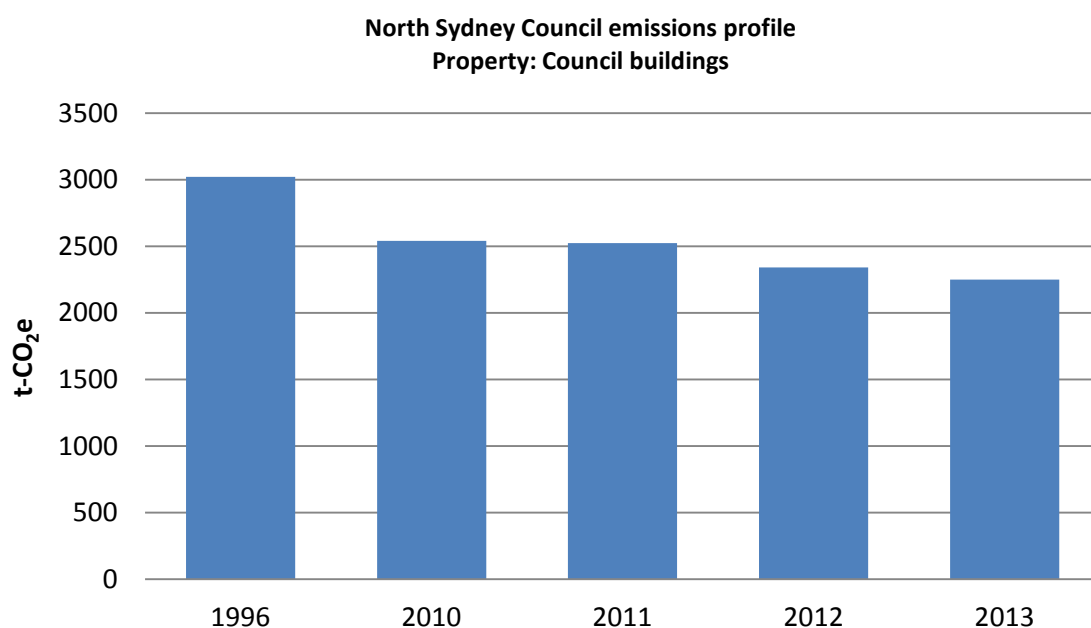


Figure 11. Combined scope 1 and 2 emissions profile for Council owned buildings

The emissions profile of Council owned buildings is shown in Figure 11. In 2012/13, Council has reduced its emissions by **26%** from their 1996 levels.

Examples of abatement activities undertaken by Council include but are not limited to:

- Installation of Variable Speed Drives (VSDs)
- Lighting retrofits and heating ventilation and air conditioning upgrades
- Building Management System installation and upgrades
- Solar photovoltaic (PV) and energy efficient upgrades at a number of Council buildings and facilities
- Solar hot water systems at various sites
- Cogeneration system at North Sydney Olympic Pool

A cumulative emission reduction of ca. 1,119 tCO₂e was achieved over 2009/10 – 2012/13, with the majority (72%) implemented in 2013. This significant reduction resulted from the cogeneration system installed at North Sydney Olympic pool.

Figure 12 shows the breakdown of the energy savings activities undertaken.

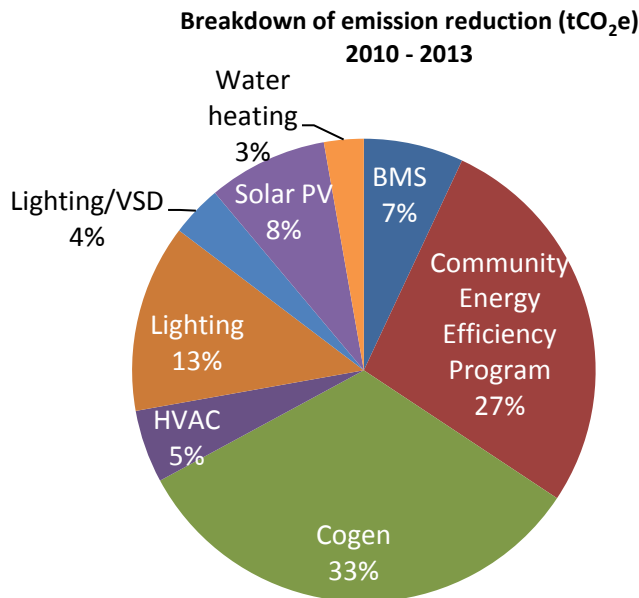


Figure 12. Implemented emission reduction activities

Figure 13 shows the equivalent tCO₂e of implemented abatement and offsets (GreenPower™) purchased by Council. Offset purchase (GreenPower™) increased from 25% to 50% of electricity consumed by street lighting and top six energy consuming facilities in 2010/11.

Council purchased 3,000 MWh (equivalent of 2,610 tCO₂e) of offsets (GreenPower™) at a cost of about \$170k in 2012/13.

Council implemented abatement activities to reduce 1,119 tCO₂e between 2010 and 2013 at a cost of around \$2.2 million, much of which was secured through grant funding.

While abatement activities cost more per tCO₂e saved, they also achieve ongoing cost savings through the reduced energy demand that they create. In this case Council can expect to achieve cost savings of \$228,000 annually resulting in a simple payback of just under 10 years.

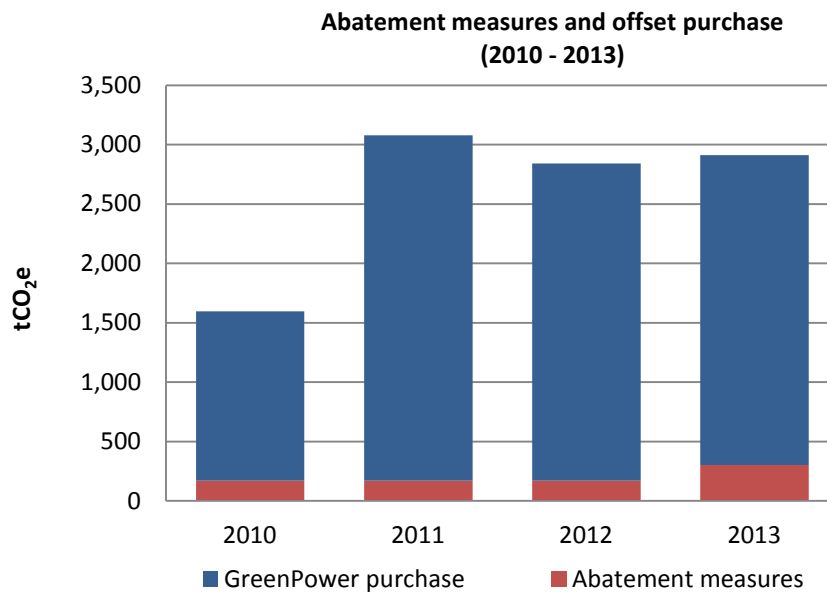


Figure 13. The abatement measures and offset purchase of Council

4.2. Street lighting

In 2012/13, street lighting emissions increased by 4% from the 1996 levels. Figure 14 shows Council's emissions associated with street lighting.

Council is working with the Southern Sydney Regional Organisation of Councils (SSROC) to implement a street lighting improvement program. This advocacy has led to a slight decrease in street lighting emissions from 2009/10 as can be seen in Figure 14.

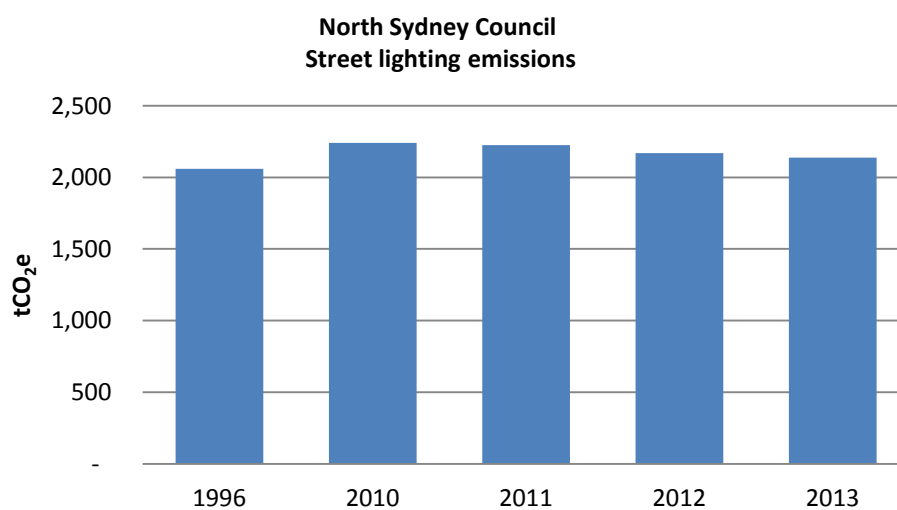


Figure 14. Emissions profile for street lighting

Ausgrid owns and maintains approximately 4,000 streetlights on behalf of North Sydney Council. Ausgrid has made a “street lighting promise” to replace all street lights that fail with more efficient ones. If, as expected, this programme is rolled out at an annual replacement of 5% of the streetlights per year, it has the potential to realise 45% savings in street lighting emissions over 20 years. This is equivalent to 2.25% energy savings per year resulting in a cumulative saving 11.25% savings by 2020. However, Ausgrid is not contractually bound to this promise and as such there is high degree of uncertainty in achieving this emission reduction.

Council is also advocating for an accelerated replacement program to replace all worst performing street lights in the Community.

4.3. North Sydney Olympic Pool

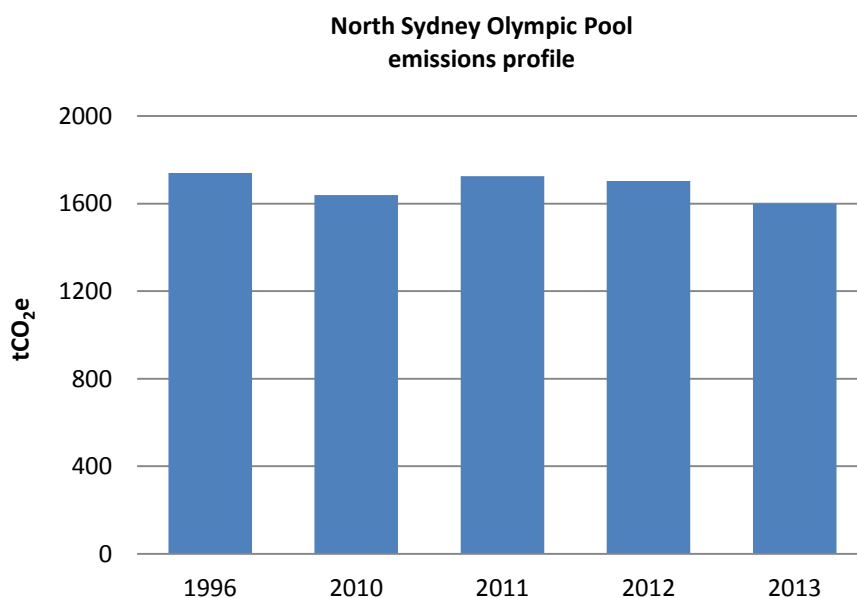


Figure 15. North Sydney Olympic Pool emissions profile

In 2012/13, the North Sydney Olympic Pool (NSOP)’s emissions decreased by approximately 8% from the 1996 baseline. NSOP is one of the major energy consumers of the Council owned facilities which consists of a 50 metre heated pool, a 25 metre indoor pool, gymnasium, sauna, spa and cafe.

The following energy savings measures have been implemented at NSOP:

- Solar panels and harbour connected heat pumps to heat both the 25m and 50m pools
- Pool blankets to reduce heat losses overnight
- Pool-make up pumps and controls
- Voltage reduction units on the fluorescent lighting circuits
- Energy efficient lamps
- Delamped twin fluorescent light fittings to single fittings
- Installed variable speed drives to filtration pumps

- Installed occupancy lighting controls on pool plant rooms

A level 3 energy audit of the pool completed in 2010/11 identified three energy efficiency projects, which have since been implemented:

- Installation of a cogeneration system and plant room
- Upgrading the Building Management System (BMS) to integrate it into a web control system
- Installation of lighting sensor in the locker rooms, change rooms to switch off the lights when unoccupied.

Additional lighting sensors were also recommended for corridors but were not implemented due to safety concerns.

4.4. Fleet – vehicles

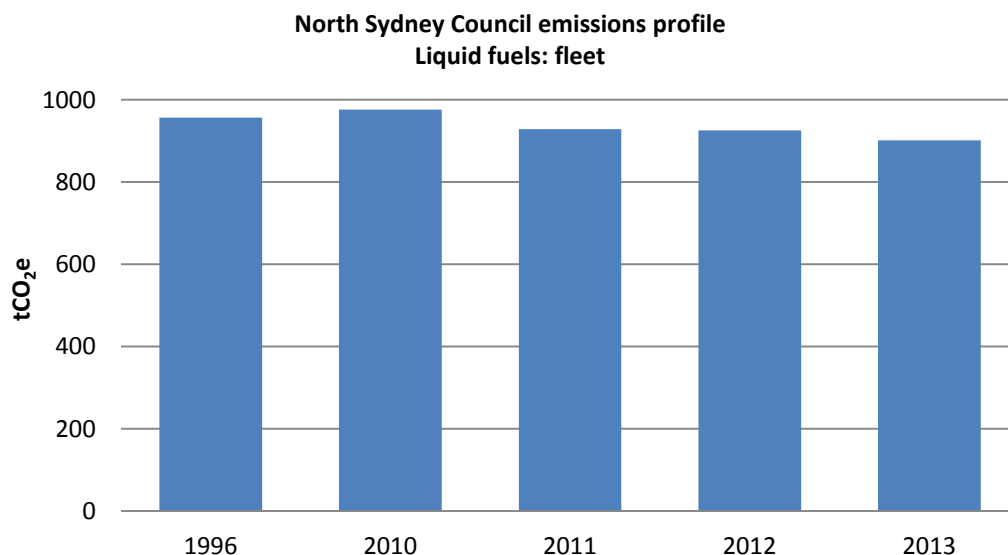


Figure 16. Emissions profile for Council owned fleet

Emissions from liquid fuel consumption for Council owned fleet decreased by 6% in 2012/13 from the 1996 baseline level. Council continues to select fuel efficient pool vehicles as part of the fleet replacement plan. Council also purchased two new hybrid garbage compactor trucks in 2013 that resulted in significant reductions in fuel consumption and therefore emissions. Based on discussions with Council personnel, it is expected that Council will continue to procure hybrid fleet vehicles, where economical.

4.5. Other emissions

4.5.1. Parks and Reserves

Of the remaining 11% of Council's emissions, energy consumed at parks and reserves dominates (63%). This energy use is associated with the pumping of water to distribute stormwater across the irrigated fields and the lighting in the parks and reserves.

From Figure 17 below, it can be seen that the emissions remained fairly constant over the four year period.

To improve energy consumption at the parks and reserves, Energetics recommends for Council to:

- install High Efficiency Motors (HEMs) and Variable Speed Drives (VSDs) for the pumping system
- install energy efficient lights for pathway lighting

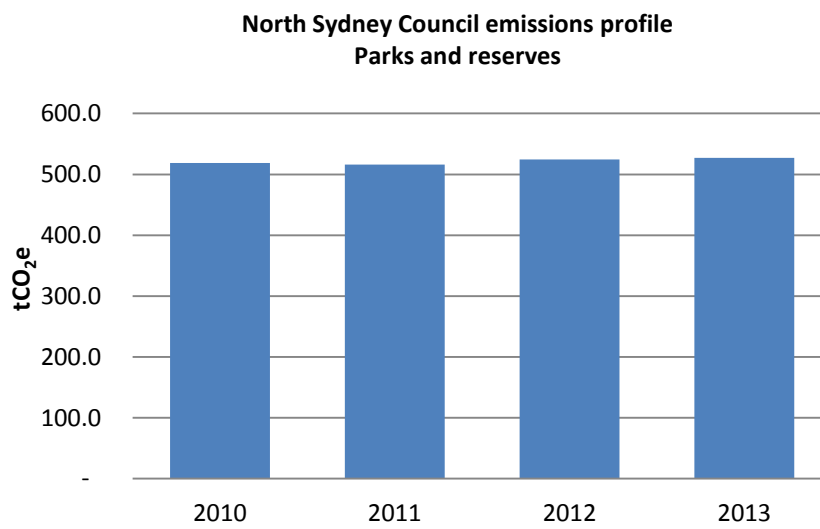


Figure 17. Emissions profile for the parks and reserves

4.5.2. Footpath lighting and works engineering

The remaining four percent (235 tCO₂e) of Council's emissions is associated with the electricity used to light footpaths and energy consumed by the works/engineering department.

5. Council's water consumption

5.1. Baseline updated to reflect best available data

In 2004, Council adopted a 25% absolute reduction target in Council's 2001/02 baseline water consumption of 124,999 kL to 93,749 kL per year by 2020.

In 2008/09 the water management plan was revised and the reduction target was increased to 50%, changing the absolute consumption⁵ to 62,500 kL per year by 2020.

In the current review, additional current and historic water use data has become available. Based on these latest water consumption figures for 2001/02 outlined in Table 5, Council has updated its baseline from 124,999 kL to 207,821 kL to ensure past and present usage levels are based on the same complete data sets. Subsequently the absolute target also changes from 62,500 kL to 103,911 kL.

Table 5. Summary of change in water baseline for 2001/02

Update year	2001/02 baseline (kL)	% reduction target	Absolute consumption by 2020 (kL)
2004	124,999	25%	93,749
2008/09	124,999	50%	62,500
2012/13	207,821	50%	103,911

In 2012/13 Council's water consumption was 135,416 kL. This equates to a reduction of 35% (72,405 kL) against the 2001/02 baseline of 207,821 kL. Figure 18 shows Council's water consumption in 2012/13 against the revised 2001/02 baseline and target.

⁵ The absolute consumption is equivalent to the baseline consumption minus the reduction target.

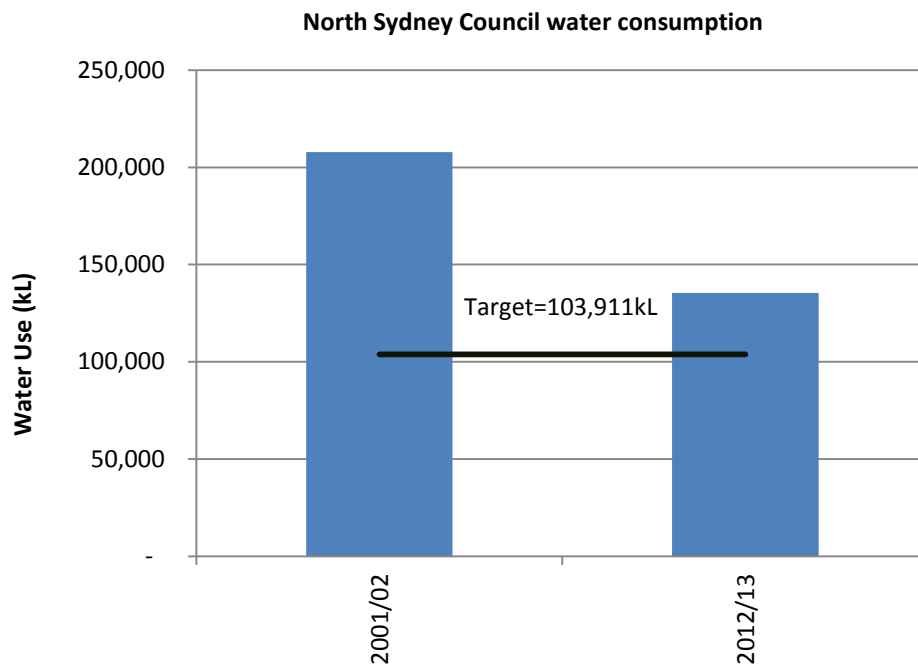


Figure 18. Council's water consumption in 2012/13 compared to the baseline

5.2. Water consumption and average rainfall

Figure 19 shows Council annual water consumption against the average rainfall over the last four years. In the first three years, water consumption was inversely proportional to average rainfall. This is to be expected – more rain means less need to water grass/gardens or fill swimming pools. The increase in water consumption in 2012/13 resulted from the expansion of Tunks Park and the additional water use associated with the re-establishment of the park after the expansion.

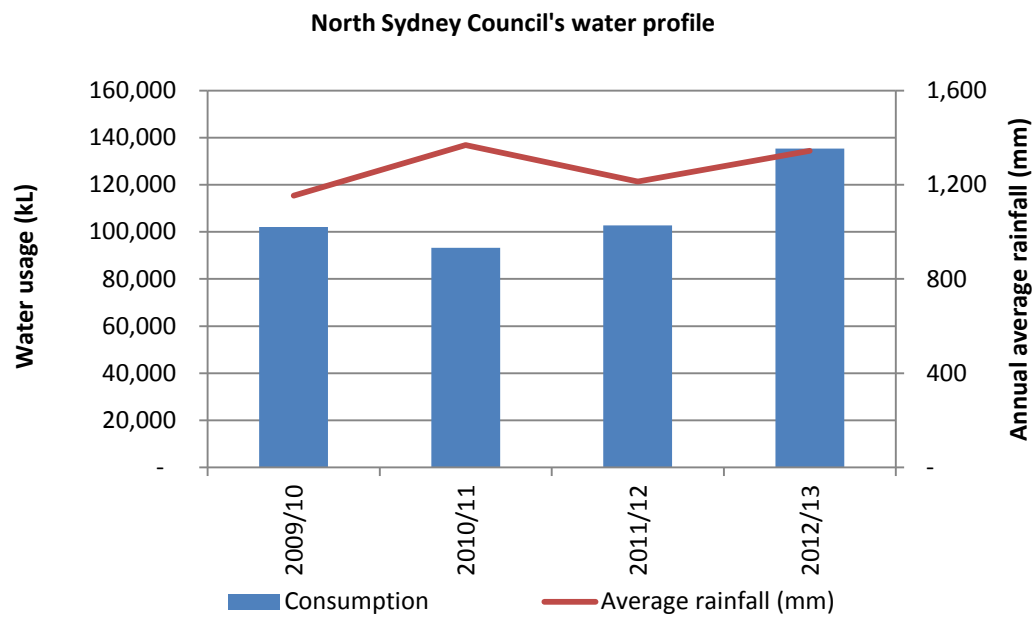


Figure 19. North Sydney Council's water consumption profile

5.3. North Sydney Council water use breakdown

Figure 20 below shows the water consumption breakdown as categorised by Sydney Water.

North Sydney Council water consumption breakdown for 2012/13

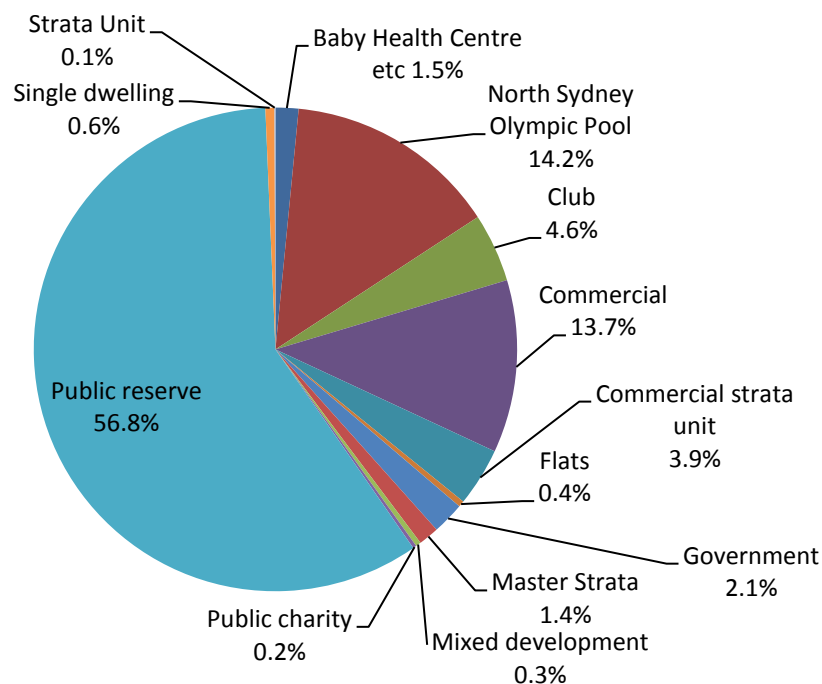


Figure 20. North Sydney Council water consumption breakdown for 2012/13

5.4. North Sydney Council – Public reserve water breakdown

The parks and reserves are the largest water consumer for North Sydney Council as shown in the water breakdown for 2012/13 in Figure 21. The major water consumers of Council are:

- Tunks Park
- North Sydney Olympic Pool (NSOP)
- North Sydney Oval.

The facilities at North Sydney Oval consist of staff amenities, a function centre and a kindergarten. These facilities together consume 4% of the total water consumed by the parks and reserves.

Parks and reserves water consumption breakdown for 2012/13

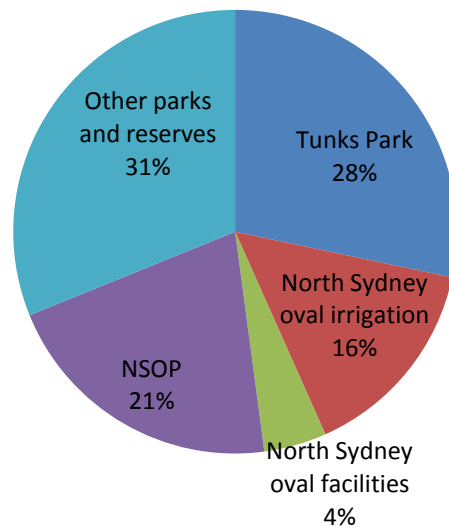


Figure 21. Breakdown of Council's public reserves

Figure 22 shows the water consumption profile for parks and reserves only (excluding the pool) for the period 2009/10 to 2012/13. Based on analysis of the water consumption data for 2012/13, no single park in the "Other Parks" category consumed more than 5% of the total water consumed by the parks and reserves.

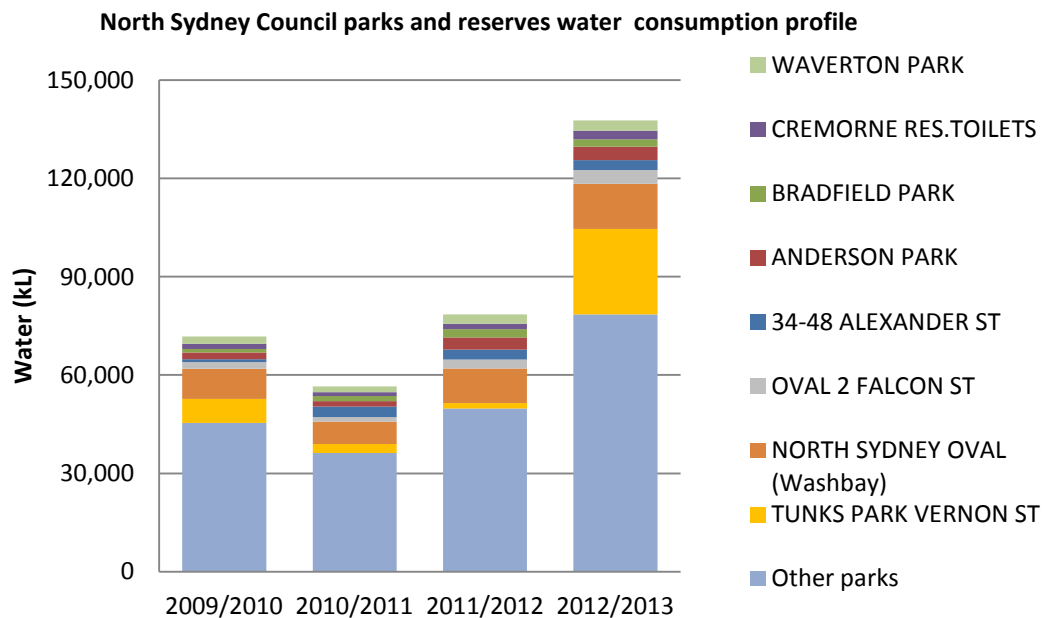


Figure 22. Council's parks and reserves water consumption profile (excluding pool)

5.4.1. North Sydney Olympic Pool

The Water Efficiency Action Plan⁶ developed in 2011 estimates the baseline water consumption of the pool to be approximately 19,200 kL per year which equates to 53 kL per day. From the consumption profile of the pool in Figure 23, it can be seen that the pool's consumption is tracking fairly close to the baseline of 19,200 kL per year as indicated by the line in the figure below.

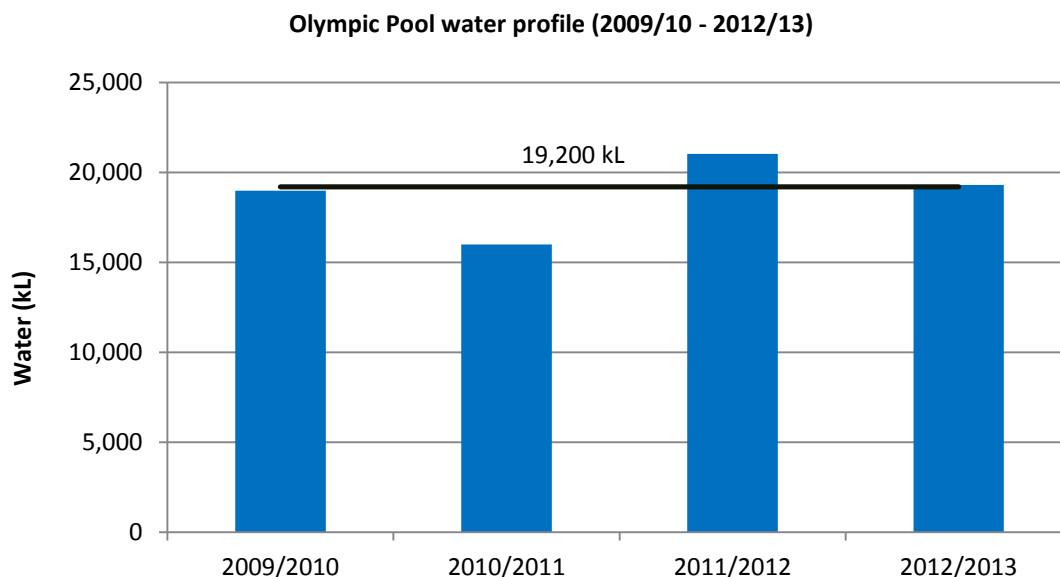


Figure 23. Water consumption profile of the North Sydney Olympic Pool

5.5. Commercial property

Council's water use in its commercial facilities is shown in Figure 24. This category comprises of Council's administration building, shops, canteens and car parks. The facilities' consumption amounted to 13.7% of Council's total water consumption in 2012/13.

Based on the consumption profile, Civic Park, Council administration building, 1 James Place and the Sandwich Shop is the largest consumer in this category. The Sydney Kings basketball team now occupies the North Sydney indoor sports centre making it the second major consumer of potable water within the commercial building category.

Council should do a water audit of the high water users in the commercial property category to identify potential water reduction opportunities.

⁶ North Sydney Council, Water Efficiency Action Plan, 2011

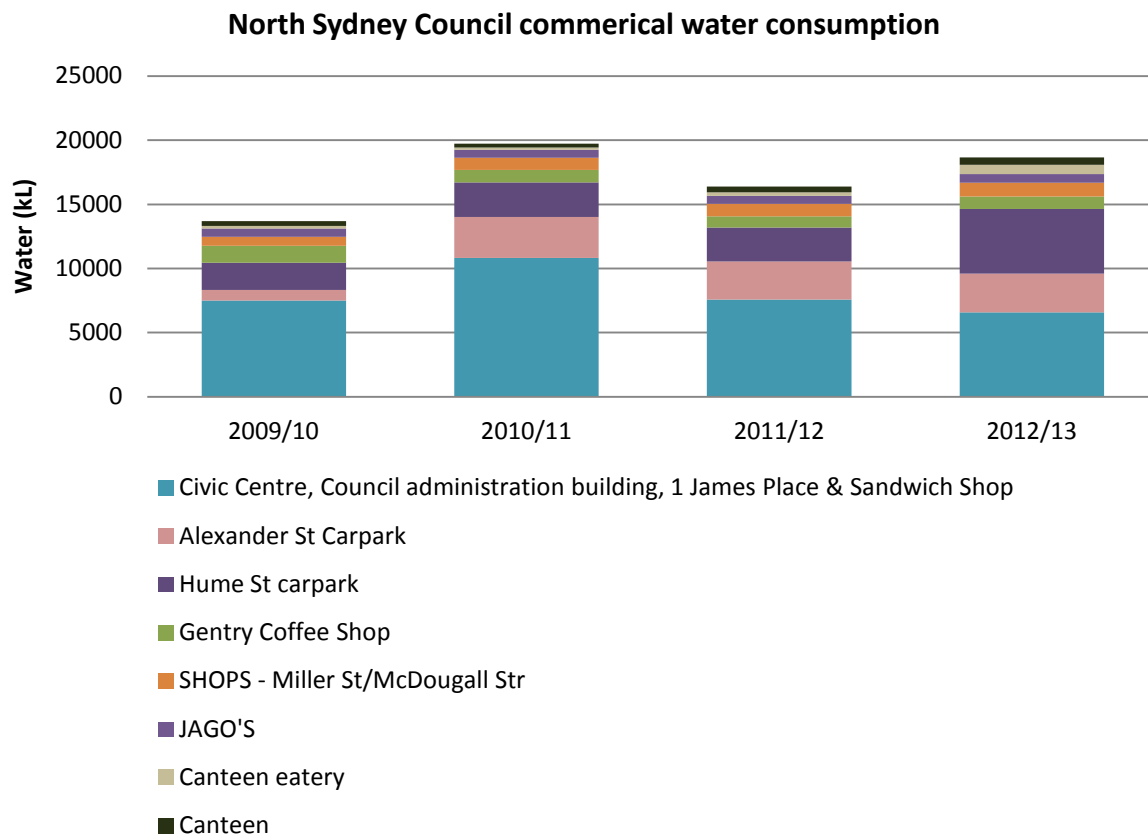


Figure 24. Water consumption profile of the commercial facilities

5.6. What water savings have been achieved?

The water audits conducted in 2011 to inform the development of the water efficiency plan identified savings opportunities to upgrade of the amenities at the parks and ovals. Based on data provided by Council, the breakdown of implemented water reduction activities that contributed to a cumulative water savings of 5.7ML between 2010 and 2013 is shown in Figure 25.

These activities included:

- Repairing leaking cisterns to toilets
- Installing waterless urinals in bathrooms
- Installing cistern modifiers to single and twin flush toilets and urinals
- Replacing single flush toilets with dual flush toilets

These initiatives were implemented at a cost of ca. \$70,000 and resulted in annual savings of ca. \$13,000. Over and above the water cost savings, other benefits include less water leaks, reduced water consumption and maintenance costs.

Energetics recommends that Council should be conducting an annual (or more frequent) review of all amenities to identify leaks and upgrade old water fixtures with efficient ones.

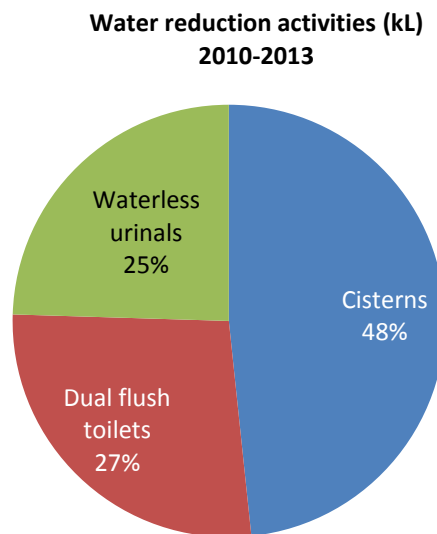


Figure 25. Breakdown of water savings activities

5.6.1. Cammeray stormwater reuse project

The North Sydney Stormwater Reuse project harvests, filters and treats stormwater from an urban catchment and circulates it for irrigation of sporting and recreational parks and reserves, including North Sydney Oval and Cammeray Golf Course.

The first stage of the scheme, completed in October 2007, was to provide recycled stormwater to St Leonards Park and North Sydney Oval. Water is pumped from a Gross Pollutant Trap (GPT) on the Cammeray Golf Course, filtered and stored in underground tanks within St Leonards Park. It is further treated before being irrigated through a fully automated system.

The second stage was completed in March 2008 and includes the dam on Cammeray Golf Course, which captures stormwater run-off draining to Willoughby Bay. The water is filtered before being used to irrigate the golf links as well as Cammeray soccer oval and croquet lawns. Water from the dam was reticulated to Primrose Park and Forsyth Park in December 2010 and Tunks Park in March 2011.

The Council's water efficiency plan states that the estimate savings from the storm water scheme would be approximately 90,000 kL of potable water each year. However based on measured figures below, the reused water available to Council from the stormwater system is less than a third of that expected.

Table 6. Measured Council water use from the stormwater catchment

Financial year	Reused water (kL)
2011/12	23,367
2012/13	14,680

These water reuse figures in Table 6 include water supplied to the Cammeray Golf Course for irrigation purposes. Based on discussions with Council's parks and reserves team, it is understood that minimal stormwater is available to Council to reduce its own potable water consumption.

Energetics recommends that Council commission a review of the Cammeray stormwater system with a view to optimise water reuse.

How should Council move forward?

This section identifies Council's emission reduction activities and water savings opportunities until 2020 and recommends targets to be adopted in its journey to 2030.

Council can achieve a cumulative 70% emission reduction from the 1996 baseline levels by 2020 through new (872 tCO₂e) and previously implemented abatement activities and offsets. For 2030, Council should consider revising the emission reduction target from 50% to 100% of the 1996 baseline level and aim for Carbon Neutrality.

Council can meet its 50% water reduction target by saving 37ML of potable water by 2020. Council should consider extending the current water reduction target to 60% of 2001/02 baseline levels by 2030.

6. Council's emissions reduction activities

Abatement measures identified in this section (872 tCO₂e) can reduce Council's scope 1 and 2 emissions from 6,928 tCO₂e in 2012/13 to 6,056 tCO₂e by 2019/20. This is equivalent to a cumulative emission reduction of 28% from 1996 baseline levels.

Purchasing offsets (2610 tCO₂e) will further reduce Council's emissions to a total of 70% of the 1996 baseline levels as shown in Figure 26.

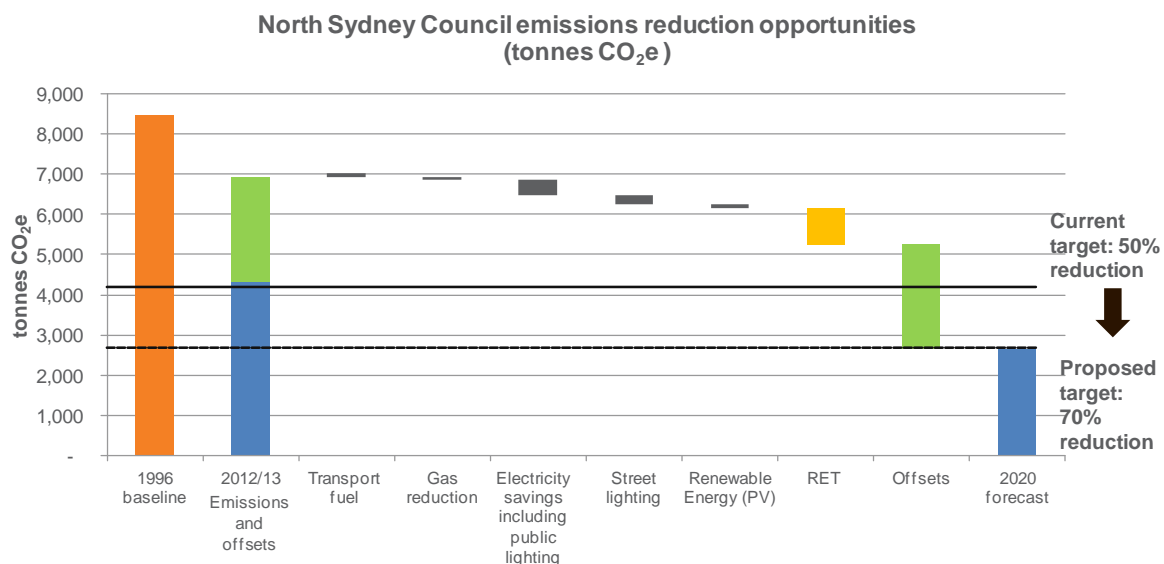


Figure 26. Emissions reduction potential for North Sydney Council by 2020

The emissions savings potential that can be achieved by North Sydney Council through identified abatement measures is detailed in Table 11 and Table 12. Each of these abatement activities is described throughout this section.

6.1. Transport fuel efficiencies

Transport efficiencies in Council's fleet identified are:

- Influencing behaviour of fleet drivers, operators and maintenance team through training, adopting efficiency measures to optimise fuel consumption and procuring efficient vehicles through the transport cycle.
- Annually reviewing fleet procurement to reduce emissions by changing over to hybrid for Council owned vehicles where financially viable.
- Efficient use of existing vehicle should be prioritised over procurement of new vehicles based on the life cycle costs and transport efficiencies.

The opportunities identified for transport fuel has the potential to decrease Council's emissions by 110 tCO₂e by 2020, representing a 12% reduction on Council 1996 transport emissions. This equates to approximately 30 tCO₂e per year over the next five years.

6.2. Gas reduction opportunities

The opportunities identified for reducing gas consumption are:

- Active management of high end gas users through real time information from the Building Management Systems (BMS). Using the BMS will also increase operator and user awareness to adjust and adapt to temperature set points during seasonal changes.

Training the NSOP personnel to utilise the new installed BMS system to actively monitor and manage the pool's energy will realise energy savings between 5% and 10%.

- Continue to replace all in-efficient equipment with efficient ones.
- The gas consumption of two tenants at the North Sydney Olympic Pool (NSOP) is currently categorised as the pool's consumption. Sub-metering and removing the tenants' gas consumption (e.g. café and restaurant at NSOP) from Council's consumption will lead to a minor reduction in NSOP's gas consumption. This will also realise cost reduction if the tenants are currently not paying for gas.
- Improving the building envelope will lead to reduced gas usage in heating and cooling buildings. For building retrofits, augmenting the building envelope is an expensive exercise with long pay back periods except for worst performing buildings. Nonetheless, Council should review performance and improve the building envelope of its worst performing commercial properties.

Total emission reduction identified from reduced gas usage is 47tCO₂e by 2020, equivalent to an average of 10 tCO₂e reduction year on year.

6.3. Electricity savings

Electricity is the single largest source of emissions for Council arising from Council owned buildings, public lighting (mainly in the parks and reserves), and street lighting owned by Council and maintained by Ausgrid.

6.3.1. Council buildings

The opportunities identified for reducing electricity consumption are:

- Active management of building energy consumption through real time information. Using a dedicated resource to manage energy consumption through the BMS system, by continually adjusting set points for thermal comfort, controlling equipment start-up and shut-down, can realise at least 2% energy savings.

Council should have a dedicated staff resource who is responsible for using the existing BMS systems to optimise energy use in all Council owned buildings. A review of all worst performing buildings should be undertaken to identify further energy savings opportunities.

- Continue with energy efficiency upgrades including a combination of adjusting controls for heating and ventilation and BMS, replacing appliances and equipment with efficient ones which is an ongoing activity that Council is already undertaking.

Council should also conduct an energy audit of all Council owned properties to identify energy efficiency opportunities and an implementation plan. A combination of these efficiency initiatives can save up to 5% energy consumed in buildings.

- Pass on electricity costs to end users where possible. A critical review of Council tenancy agreements and electricity contracts is recommended. Council should ensure that when a tenancy agreement ends in Council owned-buildings, any new tenancy agreement passes on electricity and gas bills. This may require the installation of sub-metering. This activity can typically save between 5% and 10% of energy savings.

To actively manage Council's property portfolio, accurate data and up to date information is required. Council should review its property portfolio and ensure that a "Master List" is used to align the emissions reporting in "Planet Footprint" and other management systems.

Total emission reductions identified from electricity savings in buildings equate to 184 tCO₂e over 5 years by 2020 at a cost of \$120,000.

6.3.2. Public lighting – owned and controlled by Council

Council owns approximately 1,236⁷ public lights (not operated by Ausgrid) that lights footpaths, parks and reserves and some streets. Council is currently developing an inventory of these lights to determine the type and number of lights under this category.

Based on the draft inventory, the opportunity identified for reducing electricity consumption is:

- to replace approximately 786 (54%) of existing public lights with Light Emitting Diodes (LEDs). Council should prioritise replacement of the worst performing lights identified in the audit. By 2020 Council will reduce emissions by approximately 200 tCO₂e equivalent to 40 tCO₂e per year over the next five years.

Emission reduction from this initiative was estimated based on:

- Replacing mercury vapour lights with 29W LEDs

⁷ Draft lighting inventory at 11 September 2014

- Replacing halogens and metal halides that are greater than 70W with LEDs
- These lights currently being switched on for 10 hours per day for 365 days in the year

A confidence factor of 70% was applied to the estimated energy savings to calculate a saving of around 204 tCO₂e. Based on research, LED street lights range between \$50 and \$500 per lamp based on type, size and use of lamp. For this initiative an installed cost of \$200 per LED was assumed to incorporate installation costs which are conservative based on information obtained from a supplier⁸.

Total emission reduction identified from electricity savings of public lights is equivalent to 204 tCO₂e at a cost of \$160,000.

6.4. Street lighting – controlled by Ausgrid

North Sydney Council, in collaboration with Southern Sydney Regional Organisation of Councils (SSROC), is undertaking a Street Lighting Improvement (SLI) program where Ausgrid has made a “street lighting promise” to replace all street lights that fail going forward with more efficient ones. This is expected to take place at no cost to Council and will result in decreased annual electricity costs associated with the electricity saved.

The roll out is expected to take place at an annual replacement rate of 5% per year across 44 regional Councils in NSW. This roll out has the potential to realise 45% savings in street lighting emissions over 20 years. This will result in 11.25% energy savings by 2020 which is a conservative estimate based on the discussions with the program manager. It is very likely that more than 11.25% savings will be realised by 2020.

The opportunity identified for reducing electricity consumption is:

- To continue to work collaboratively with Ausgrid to replace failing lights with high efficiency lights

Ausgrid is not contractually bound to this promise and as such there is high degree of uncertainty in achieving this emission reduction. Due to the high degree of uncertainty, an 85% confidence factor was applied to the 11.25% energy savings resulting in 230 tCO₂e. This initiative will not incur capital costs on Council but will realise savings in electricity cost from reduced energy consumption of the LED lights.

6.5. Renewable energy – solar photovoltaic

The most attractive electricity generating technology available today for local electricity production is solar PV as it is generally more appropriate for most areas. Three specific project opportunities were identified to:

- Install and supply a 7kW solar PV system on the Kirribilli Neighbourhood Centre at a cost of \$11,000 and emission reduction of 11 tCO₂e per year.
- Install and supply 30kW solar PV system on the Crows Nest Community Centre / Holtermann St car park, which is expected to cost \$80,000 and save 26 tCO₂e per year.

⁸ <http://www.digilight.com.au/floodlightcalculator/>

- Install and supply a standard 45kW solar PV system on the Coal Loader platform, which is expected to cost from \$80,000 and save 60 tCO₂e per year. The system has been sized based on discussions with Council personnel that the extra electricity requirements of the Coal Load facility will double the current consumption of the facility. The size, design and capacity of the PV system should be finalised based on final electricity consumption calculation for the Coal Loader. Further design considerations such as shading, aesthetic value will impact the cost and have not been considered in this cost estimate.

The implementation of these solar PV projects can further reduce Council's emissions by 97 tCO₂e by 2020.

Council should investigate further opportunities for installing solar PV panels to supplement electricity consumption based on:

- Availability of space and footprint
- Building designs and integration into urban landscape (shade cover, car parks, etc)
- Solar technology innovation such as thin film
- Any changes to business such as grants, feed in tariffs, exchanges rates (lowering technology cost)

7. Council's water savings initiatives

Water savings of 37 ML have been identified to reduce Council's water consumption from 135 ML to 99 ML by 2020. The identified water saving measures are summarised in Figure 27. Implementation will require \$575k to realise these savings.

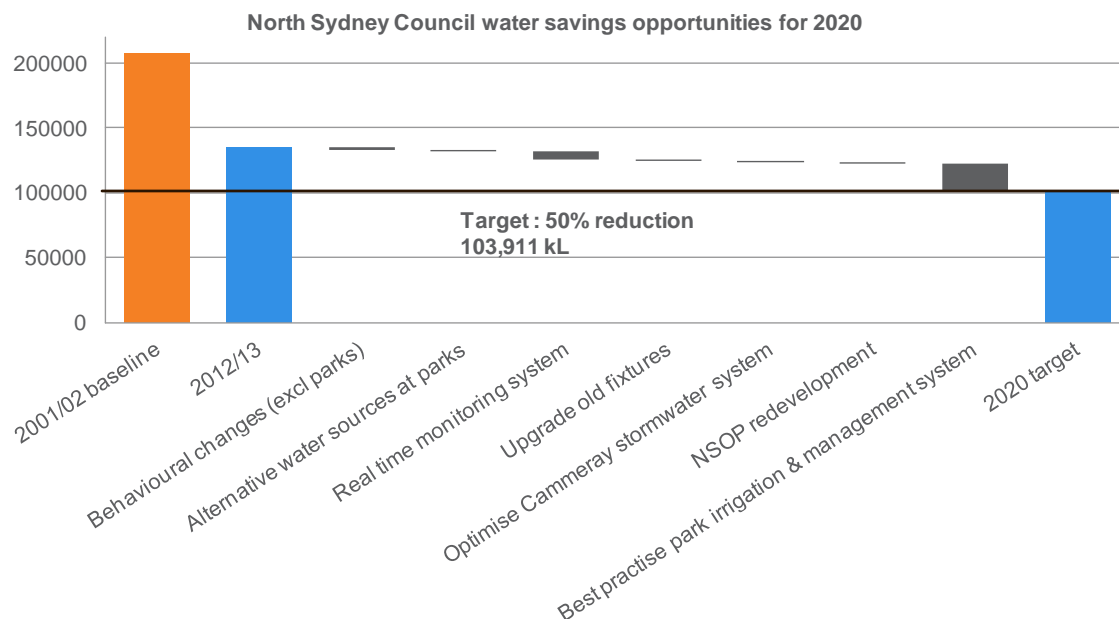


Figure 27. Identified water savings initiatives for North Sydney Council

The details of the initiatives, basis of calculation to estimate the water and cost savings as well as the cost of implementation, are outlined in Table 13.

7.1. Behavioural changes

Council relies on expertise and experience for water management. Council monitors water consumption, yet there is a lag between use and reported water consumption.

The opportunities identified for reducing water consumption are:

- Active management of water consumption. Under this initiative, Council would use a dedicated resource to monitor and manage Council's water use and would make sure that water consumption figures align between existing management systems (Planet Footprint, irrigation system and maintenance scheduling system) and utility data (Sydney Water accounts) to ensure actions items are implemented. This will:
 - Alert any significant variations in water consumption and rectify quickly.
 - Result in faster response to any detected leaks. These can be prioritised by dedicating a maintenance / plumbing resource to repair the leaks.
- Pass on the water cost to end users from Council's property portfolio. A critical review of Council tenancy agreement and water contracts is recommended. Council should ensure that when a

tenancy agreement ends in Council owned-buildings, any new tenancy agreement passes on water bills.

An estimated saving of 10% on Council's 2012/13 water consumption can be achieved by 2020 for these activities. This savings is applied only to Council owned facilities excluding the parks and reserve. A conservative cost estimate of \$25,000 was assumed to implement a combination of these initiatives.

7.2. Alternative water sources

Where feasible, identify and implement alternative water sources including stormwater, wastewater, storage and rainwater harvesting. This also includes recycled grey water, rainwater collection treatment and redistribution systems.

The opportunities identified for reducing water consumption are to:

- continue to identify and investigate further opportunities to harvest surface water, groundwater and alternative water sources where feasible
- increase the use of the Cammeray stormwater for irrigation purposes in the parks and reserves

Council has identified a Bradfield Park water capture and reuse scheme, involving the capture of surface street and Harbour Bridge runoff for the catchment bounded by Fitzroy, Broughton, Alfred Street South and Olympic Drive. A feasibility study, construction plans and development assessment have been completed and approved to install a 400 kL subsurface tank. The tank will be integrated into the existing park irrigation system.

The following sites and storage capacity have been identified as potential water reuse opportunities:

- Coal Loader water storage tunnel capacity of 250kL
- Hume Street car park / North Sydney Indoor Sports Centre water capture and reuse scheme, involving the capture of roof catchment for reuse at the sports centre
- Rainwater harvesting and storage at St Leonards Park

Two of the quantified alternative water sources amount to 650k (400kL and 250 kL) at Bradfield Park and Hume Street car park / North Sydney Indoor Sports Centre.

The Cammeray storm water system was designed as a 90ML system but the current catchment from this storm water system provides approximately 20ML per year. This stormwater is utilised by the Cammeray Golf Course which leaves minimal volume available for Council to reduce its water consumption. Optimising the stormwater system should be able to identify at least 10% increase in storm water usage based on the monitored results of the last two years. Council should also commence a feasibility study to optimise the Cammeray storm water.

Additional benefits for alternative water sources should also be considered including:

- nutrient reduction
- peak flow mitigation
- aquatic ecosystem interaction and potential impact
- passive and active amenity value

The cost estimate of \$300k from cost estimates supplied to Council.

7.3. Real time monitoring

Council relies on expertise and experience for water management particularly for Parks and Reserves. Years of experience, particularly for grounds water management taking into account turf specification, soil characteristics and use, determines the water consumption.

The opportunity identified for reducing water consumption is:

- Installation of a centralised control system for real time monitoring and management. This will realise water savings by converting Council's partly automated irrigation system (Irrinet) to a fully automated system.

Centralised control systems can save water because they can receive information about soil moisture from soil sensors, rainfall and temperature from the Bureau of Meteorology and use it to adapt the irrigation schedule.

Based on industry experience and research⁹ at least 10% in savings is achievable even when existing centralised irrigation systems are optimised. As such, a 10% saving of Council's 2012/13 parks and reserves water consumption of parks is achievable by 2020.

A cost of \$20,000 was allocated for this initiative which should be implemented in conjunction with the Parks and Reserves Water Management plan below.

7.4. Parks and Reserves water management plan

Council's parks and reserves can adopt a formal irrigation management plan to reduce Council's 2012/13 water consumption to best practice guidelines. This savings initiative was quantified based on the analysis that water consumption of Anderson Park, North Sydney Oval and Tunks Parks will decrease from current benchmark levels to best practice guidelines.

The opportunity identified for reducing water consumption is to develop and implement a formal water management plan for Parks and Reserves. This plan will encompass the following initiatives:

- Undertake quarterly irrigation audits to benchmark irrigated parks' water consumption against best practice guidelines. Use new technologies to monitoring water performance of parks and reserves.
- Increase use of drought tolerant grasses and more shading for sporting fields.
- Optimise and reduce area of irrigated parks where and when possible.
- Use deep mulches on garden beds and revegetated areas to reduce evaporation.

Council should implement the automated centralised control system in section 7.3 at:

- Anderson Park
- North Sydney Oval

⁹ Saving water on Sports Ovals in Canberra, CSIRO Land and Water,
http://www.fullstop.com.au/HTMLfilesv2/100_PublishedPapers/300_Reports/020_Sportsgrounds/SportsgroundIrrign4p.pdf

- Tunks Parks

with the intent to roll it out to other irrigated parks as required.

The cost estimate is \$100,000 to purchase, install and configure soil moisture sensors, rain sensors and gauges, wind, frost and flow sensors at the identified parks. An implemented automated centralised irrigation system combined with a formal management plan will result in water consumption of 23.9 ML.

The water savings associated with this initiative were quantified based on reducing the current consumption benchmarks (refer to Table 14 against best practice irrigation levels). A confidence factor of 80% was applied to the 29.9 ML quantified in Table 14 to estimate the 23.9ML savings.

7.5. Other initiatives

Council should continue to review its amenities in parks and reserves to upgrade old fixtures with water efficient ones.

- Based on discussions with parks and reserves personnel, this is a current initiative undertaken by Council that has room for further improvement and upgrade.
- Council can achieve at least 2% water savings of the 2012/13 water consumption of parks and reserves by upgrading amenities.
- A confidence factor of 70% was applied to the 2% savings to achieve the absolute reduction of 1,118 kL.

Council should implement water savings initiatives for the redevelopment of the North Sydney Olympic Pool. Reverse osmosis and ultra violet filters were identified as potential opportunities for implementation when the pool is redeveloped. Reverse osmosis is an expensive process with high capital and maintenance costs which is not financially viable based on current water costs. As such a detailed cost versus benefit exercise should be undertaken before implementing this at the pool.

Re-development of the pool should identify at least 10% savings based on the pool's current consumption. It is also assumed that there will be no additional costs other than the allocated redevelopment costs

A combination of these initiatives can lead to further reduction of approximately 3.7 ML of potable water.

8. Setting targets for Council

This section examines the current greenhouse gas emission and water consumption targets. Energetics has projected Council's emissions and water forecast for the next 5 years. Targets are derived from the identified emissions and water savings combined with the expected growth profile forecasts.

8.1. Greenhouse gas emissions targets

Council can achieve a 70% reduction in greenhouse gas emissions from the 1996 baseline level. This reduction will come from abatement activities (29%) and a continuation of its existing offset purchase program (41%).

This will result in a total scope 1 and 2 emission of 5,156 tCO₂e, equivalent to a reduction of 39% from the 1996 baseline emissions. Purchasing offsets of 2,610 tCO₂e will enable Council to achieve an overall 70% reduction by 2020 as shown in Figure 28.

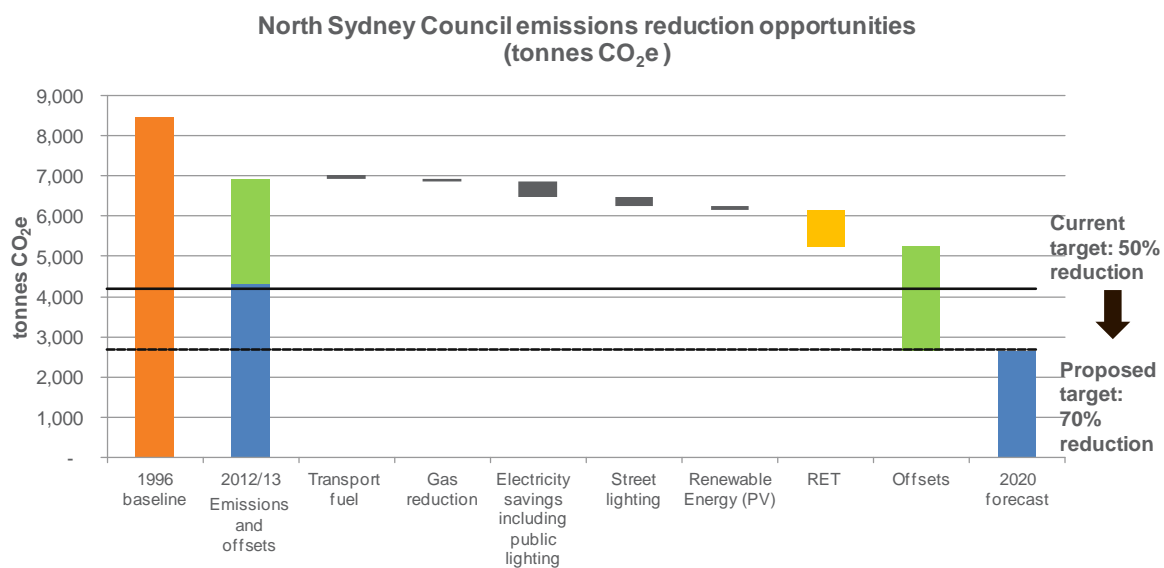


Figure 28. Forecasted emissions profile for North Sydney Council for 2020

The forecast assumed a constant emission profile with no significant changes (e.g. property consolidation, new buildings, etc) for the next five years.

Carbon neutral target for 2030

Energetics recommends that North Sydney Council aims to become Carbon Neutral by 2030.

8.1.1. Purchasing carbon offsets

Council can use a variety of carbon offsets to reduce its emissions profile and/ or become carbon neutral. Australia's carbon neutrality program, National Carbon Offset Standard (NCOS), provides a robust framework for defining the organisational scope and boundary for carbon neutrality. NCOS provides consistency to Australia's voluntary offset market. This program is currently under review by the Government.

The NCOS Carbon Neutral Program allows organisations, products and events to be certified as carbon neutral. Council can become carbon neutral by measuring, reducing and offsetting the remaining emissions associated with its activities. The net associated emissions, which typically include the full life cycle emissions (scope 1, scope 2 and scope 3), are thus equal to zero.

Offsets available for Council are summarised in Table 7.

Table 7. Available carbon emission reduction units in the local and international market

Type of offset	Program applicability	Price per offset (AUD)	NCOS eligibility
Australian Carbon Credit Unit (ACCU)	Generated under the Carbon Farming Initiative (CFI).	\$24.15 / ACCU	✓
Certified Emission Reduction (CER)	Generated under the Kyoto Protocol's Clean Development Mechanism (CDM)	< \$1 / CER	✗
European Union Allowance (EUAs)	Used to offset liability in the European Union Emissions Trading Scheme (EU ETS)	<\$10 / EUA	✗
Gold Standard Voluntary Emission Reduction (GS-VER) Gold Standard Certified Emission Reduction (GS-CER)	These are high quality premium international offsets that provide socio-economic benefits and are generated from energy efficiency and renewable energy projects in developing countries	\$15 - \$30 / tCO ₂ e	✓
GreenPower™	Purchased GreenPower™ from an electricity retailer	\$60 / tCO ₂ e	✓
Small-scale technology certificate (STC)	Generated in Australia by renewable energy projects under 100 kW	~\$40 / STC	✗

Type of offset	Program applicability	Price per offset (AUD)	NCOS eligibility
Voluntary Emission Reduction (VER)	International offset generated under the Voluntary Carbon Standard (VCS)	\$12 / tCO ₂ e	✓
Large-scale Generation Certificates (LGCs)	Generated in Australia by renewable energy projects greater than 100 kW	~\$30 / LGC	✗

Additional costs for participation include preparing the base-year carbon footprint and NCOS submission (\$30k), independent auditing (approx. \$10k/yr – note bi-annual costs can bring this down), certification (\$20k/yr) and ongoing reporting (6 weeks additional staff resource time plus consultant fee if assistance is required).

The contribution of carbon offset to Council's emission reduction activities can be revised based on actual abatement achieved on a year on year basis. Additional benefits can also be incorporated into the selection of offsets. For example only GreenPower™ contributes to a building's NABERS rating. Purchasing GreenPower improves Council buildings NABERS rating.

8.1.2. Contribution from Community based solutions

A further option for Council is to purchase electricity from a Community based wind or solar farm (refer to Section 10.3.3).

Council pays approximately \$180 / MWh and \$55 / MWh for offsets (i.e. GreenPower™). Based on current electricity and offset purchase costs, procuring long term renewable energy from a dedicated renewable energy plant (refer to Table 9 for comparative costs) is a potential strategy for North Sydney Council to offset its electricity emissions.

A case in point, Council can reduce 97% of emissions from grid electricity by purchasing around 4,700 MWh per year (all electricity generated by a Community owned 3 MW PV power plant). This equates to a reduction of around 4,200 tCO₂e per year, at approximately \$1.5 million per year.

8.2. Water reduction targets

Council's water consumption was modelled to forecast its consumption in 2020 (refer to Figure 29). By implementing the identified water savings opportunities (excluding the better parks irrigation strategy) North Sydney Council can achieve a 41% reduction on the revised 2001/02 baseline levels.

By reducing the Parks' water consumption (for 2012/13) for irrigation, to best practice benchmark levels (refer to Table 14) a further 10% reduction from water consumption baselines in 2001/02 is achievable. This will enable Council to meet its current target of 50% reduction on the revised 2001/02 baseline levels.

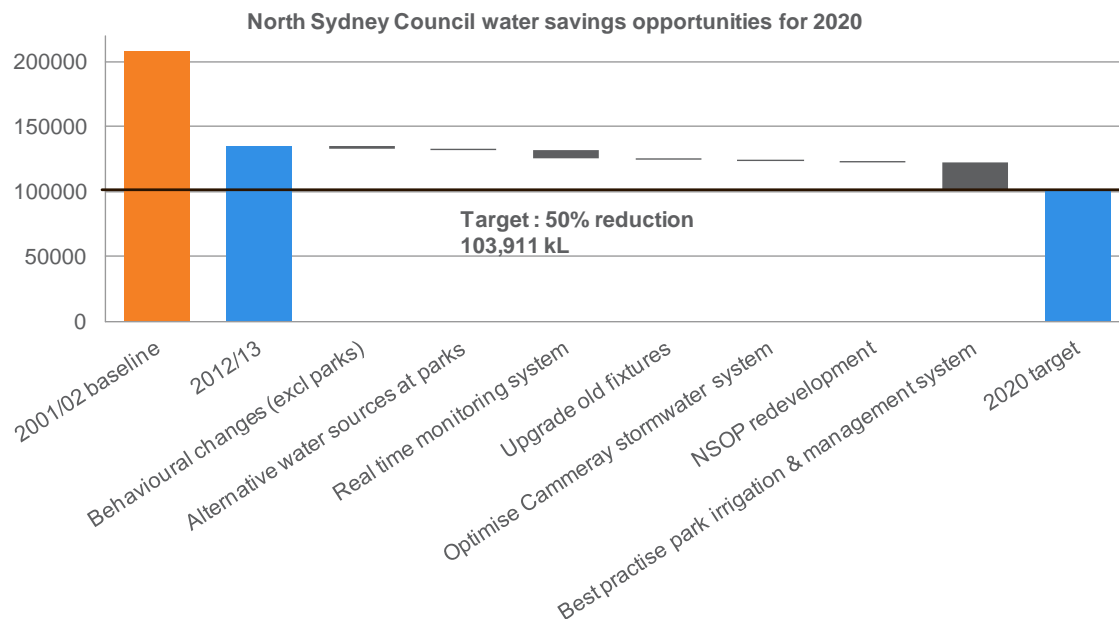


Figure 29. Forecasted water profile of Council until 2020

The following assumptions were made in the development of this target:

- The water consumption of Council's facilities will remain relatively constant based on 2012/13 consumption level as supported by the use being relatively unchanged across the 2008/09 – 2011/12.
- The model did not take account for climate variability.

Based on expected decrease in rainfall, increase in rainfall intensity and the identified water savings opportunities; Council should consider extending its current water reduction target to 60% from 2001/02 baseline levels by 2030.

9. Recommendations for Council

Council has made significant progress in monitoring and measuring its own energy and water consumption through various abatement activities, innovative projects and management systems.

Targets

Based on the Council's emissions and water projections for 2020, Energetics recommends the following:

Greenhouse gas emission: North Sydney Council should increase its emission target from 50% to 100% of Council's 1996 baseline level and opt for Carbon Neutral path to 2030. This option will necessitate Council to purchase offsets (including GreenPowerTM) in the journey to become Carbon Neutral by 2030.

Water consumption: Council should consider extending the current water reduction target to 60% of 2001/02 baseline levels by 2030.

Management System

Based on the review of the various management systems, Council could account for emissions and water consumption associated with tenants and assets that are outside of the Council's operational control. Accurate reporting between the management systems could result in decreased consumption profiles. Utilising and optimising current automated systems will enable Council to identify wastage and further reduction opportunities.

Energetics recommends:

- Council to review its asset portfolio annually, and ensure that the master asset portfolio aligns with the various reporting systems such as the Planet Footprint and Utilities.
- Council to dedicate a resource to actively manage and monitor energy and water consumption by optimising and utilising existing management systems to identify wastage and further reduction opportunities.

Abatement measures

Based on the outcomes of this plan, Council should implement a five year action plan to implement the identified emission reduction and water savings opportunities to achieve the targets with a focus on the initiatives with material impact on emission reduction and water savings.

Further investigation

Energetics recommends Council should further investigate the following action items:

- Undertake detailed water and energy audits of high energy and water consuming facilities and other facilities that showed high water and energy consumption patterns in this report.
- Council should review its current electricity, gas and waste contracts to ensure all associated carbon costs have been removed.

-
- Council conduct an annual (or more frequent) review of all amenities to identify leaks and upgrade old water fixtures with efficient ones.
 - Council should commission a review of the Cammeray stormwater system to optimise water reuse availability.
 - Develop environmental design guidelines for rebuilds and renovations of Council properties to include water and energy saving KPIs.

North Sydney Community emission and water reduction – current progress

Council's 2010-2015 Greenhouse Action Plan set a target of a 25% reduction on the Community's 1996 baseline for scope 1 and 2 emissions by 2020.

Council adopted a target of 25% reduction of the Community's water consumption below its 2001/02 baseline levels by 2020 which is an absolute target of 6 GL per year.

This section outlines how the North Sydney Community, including residents and businesses, is progressing towards achieving these targets.

10. North Sydney Community's emissions

In 2012/13, the Community's emissions decreased by 5% from the 1996 baseline (701,220 tCO₂e) as shown in Figure 30. While the plan expresses usage data and targets on a Community wide basis, it is also worth noting that due to the increase in population in the Community, per capita consumption has reduced more significantly by 23% for greenhouse gas emissions.

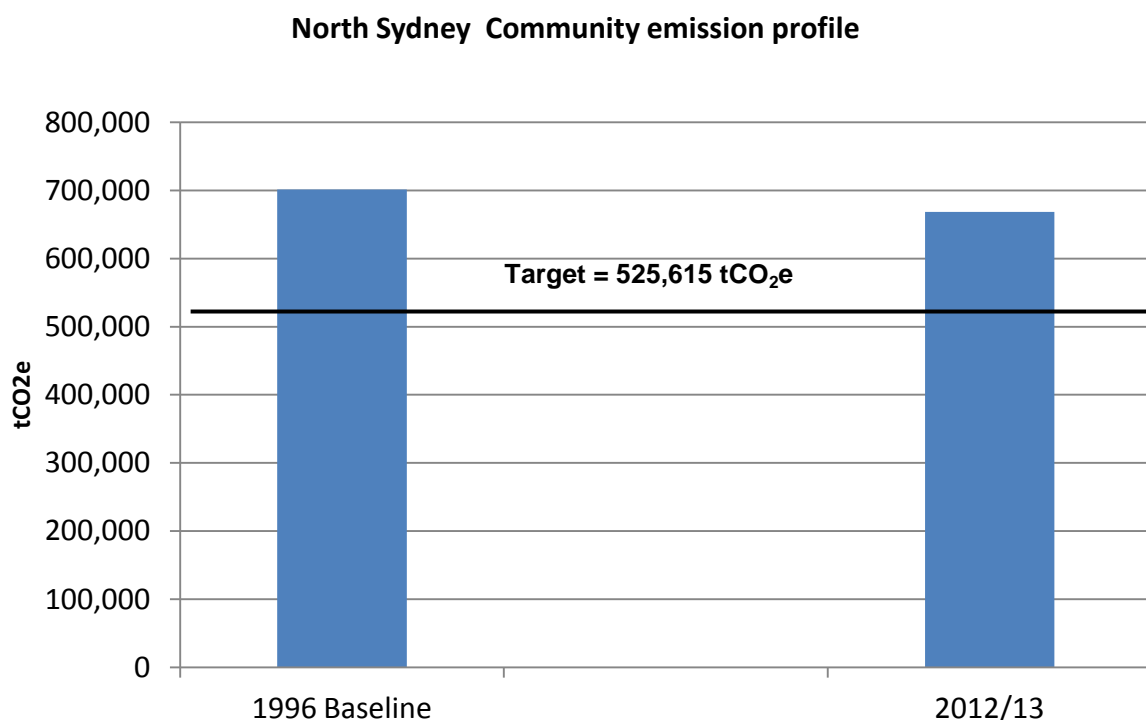


Figure 30. North Sydney Community's emissions profile in 2012/13

The Community's emissions breakdown comprises of electricity and gas consumption in commercial and residential buildings, as obtained from the utility providers, as well as Community resident and employee travel.

Emissions calculations for residential and employee travel were based on the following assumptions:

- Number of residents and workers in North Sydney based on a recent study¹⁰
- 40% of residents use their car to travel approximately 20 km per day for work purposes
- 52% of the workers in the North Sydney Community travel around 40 km per day for work purposes

Based on the Community emissions estimation in the 2010 Greenhouse Action Plan, in 2012/13 the North Sydney community emissions decreased by 33% from the 2007/08 levels as seen in Figure 31. As the basis of calculation for the 2007/08 emissions was unavailable, the assumed underlying causes of the decrease in emissions from 2007/08 to 2012/13 are improvements in the operation of buildings, improved energy efficiency standards and more efficient appliances and distributed energy generation.

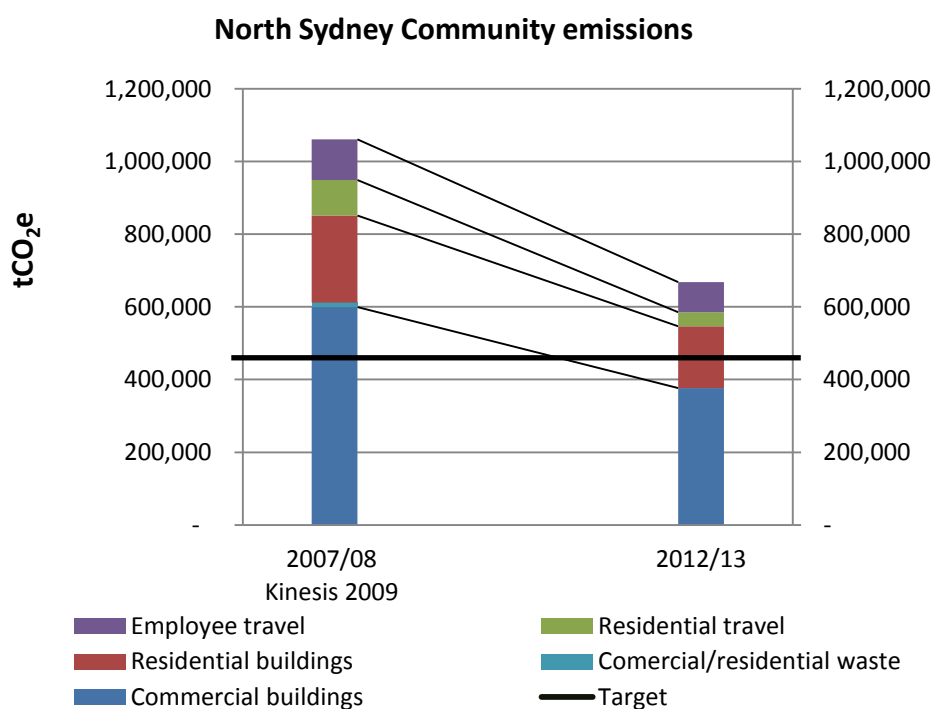


Figure 31. North Sydney Community's emissions decrease from 2007/08

10.1. What has been implemented by Council?

Council has engaged in various sustainability programs such as supporting local residents, schools and businesses to reduce their water and energy consumption through a range of program initiatives including:

- Sustainable Living workshops including:
 - Smart lighting forums
 - Energy and water efficiency workshops
 - Sustainable building tours
- My Green Apartments energy efficiency program

¹⁰ North Sydney Commercial Centre Study, Urbis, February 2013.

- CitySwitch Green Office program
- Environmental Upgrade Agreement
- Climate Clever Shop
- Coal Loader education programs
- GreeNSchools grants
- Better Business partnership targeting Small to Medium sized Enterprises (SMEs)
- Home power savings program
- Green Events electronic newsletter
- Community food gardens

In addition to existing programs identified in the 2010-2015 Greenhouse Action and Water Management Plan, other initiatives identified during the consultation workshops are:

- Targeted energy and water reduction campaigns to specific commercial sectors such as hospitals, hotels, schools and shopping centres within the Community.
- Facilitating low interest loan financing from financial institutions and/or the Clean Energy Finance Corporation to assist and implement energy and water efficiency upgrades on a community level.

Based on the responses by the Community (Appendix II - North Sydney Community's feedback) and the successful participation of previously implemented activities, Council should continue these sustainability engagement initiatives. Council should continue to further develop a business and incentives program to assist the Community to further reduce their energy consumption and associated emissions.

The programs relating to energy and emissions reduction are expected to reduce emissions by 15,000 tCO₂e at a cost of \$250,000 per year. Energetics recommends that Council maintain and further development their sustainability engagement programs. These programs will be implemented through the Sustainability Engagement Strategy and associated implementation plan.

10.2. Energy efficiency financing options for the business Community

Energy efficiency improvements often come at high upfront costs to pay for new equipment and the efforts associated with installation. However, the benefits of these improvements, especially the reduced energy cost cash outflows, are generated over several years.

Council should continue to provide the Environmental Upgrade Agreement (EUA) program targeting the commercial buildings sector.

In addition to the first-cost hurdle and timing mismatch, energy efficiency projects often involve many stakeholders, including site owners, end-users, technology providers, project developers, financiers and utilities. There can be split incentives across these stakeholders to implement energy efficiency upgrades and renewable energy projects in the buildings sector that contribute to more than 70% of the North Sydney Community's emissions profile.

Over recent years a number of new financing and business models have become available. There are now ways to structure a financing solution that alleviate some of the barriers experienced by project proponents. These are summarised in the following table.

Table 8. Energy efficiency financing mechanisms

Financing model	Financing mechanism	Balance sheet impact	Typical term (years)	Repayment mechanism	Comments
Self-funded	Revolving energy efficiency fund with initial seed funding	On	1-5	n/a	A fund is set up with initial seed funding and is replenished by project cost savings (typically energy cost savings) over time
Energy efficiency specialist loan	Bank loan	On	1-7	Debt repayment	<p>Reduced or eliminated up-front cost</p> <p>Customer depreciates the equipment resulting in tax benefits</p> <p>Repayments matched with energy cost savings</p> <p>Clean Energy Finance Corporation product</p> <p>Some banks offer better loan terms for energy efficiency equipment</p>
Lease agreement (or master lease agreement)	Operating lease	Off	1-10	Lease payment	<p>Energy efficiency equipment is owned by the financier and leased to the customer</p> <p>At the end of the lease, financier retains equipment ownership</p> <p>Risk shifted to financier. Note: this generally comes at a higher finance cost and is often only available for very large projects</p> <p>Repayments matched with energy cost savings</p> <p>Clean Energy Finance Corporation product</p>
	Capital lease	On	1-15	Lease payment	<p>Energy efficiency equipment is owned by the financier and leased to the customer</p> <p>At the end of the lease, equipment ownership transfers to the customer</p> <p>Customer depreciates the equipment (tax benefits)</p> <p>Repayments matched with energy cost savings</p> <p>Clean Energy Finance Corporation product</p>

Pay-as-you save models	Utility on-bill financing	Off	1-5	Debt repayment included into energy bills	Retailer/third party financier provides up-front capital costs and recoups by incorporating loan repayments into energy bills
	Energy Service Company (ESCO) financing with Energy Performance Contract (EPA)	Off	1-15	Shared energy saving agreements	ESCO carries performance and credit risk as it typically carries out the financing Cost savings are split for a pre-determined length of time in accordance with a pre-arranged percentage
	Energy Savings Agreement (ESA) / Power Purchase Agreement (PPA)	Off	10-15	Through an agreed rate (\$ per avoided unit of energy, \$ per unit energy supplied)	An ESA/PPA provider owns and maintains generation/energy efficiency equipment (e.g. a chiller). Customer agrees to pay based on realised savings/energy generated
Others	Managed Energy Savings Agreement	Off	15-20	Fixed repayment schedule	ESCO charges a fixed fee; end-user receives a guaranteed level of service (e.g. space heat, lighting, motive power, etc.) Risk of energy price volatility transferred to the ESCO
	Environmental Upgrade Agreement	Off or on	5-20	Council rates	Loan tied to building and transfers with change in building ownership Lower risk for financier, so better rates Enables transparent pass-through of repayments to tenants, so can overcome owner/tenant split incentive Repayments matched with energy cost savings Clean Energy Finance Corporation product

Most types of energy efficiency and renewable energy projects can be financed through the mechanism outlined above.

A preliminary review is needed to identify the option that best fits the customer's financial restrictions and meets their risk requirements before implementing any energy efficiency upgrades or energy generation projects in the effort to reduce emissions.

10.3. Local renewable electricity generation uptake

The most attractive electricity generating technologies available today for local electricity production are solar photo-voltatic (PV) and wind. These systems are cost-competitive with grid electricity in a number of locations in Australia. Solar PV is generally more appropriate for the North Sydney municipality.

North Sydney Council can facilitate:

- Increased uptake of renewable energy generation at the individual property level e.g. Solar PV at a household or business premise
- Development of green precincts
- Access to renewable energy through group purchasing

Each of these initiatives are explored in more detail following.

10.3.1. Increased uptake of local renewable energy generation

The rapidly falling cost of solar PV modules, the efficient cost for installation combined with the rising electricity prices (electricity prices doubled from 2008 to 2013 – primarily driven by increased network costs) have seen a rapid improvement in the uptake of solar PV within the Community.

Council should encourage uptake of solar PV installation for commercial and residential customers in the Community by:

- Developing and implementing workshops and forums with accredited solar PV providers with the North Sydney Community to:
 - provide technical and financial information about solar PV systems
 - use demonstration projects (e.g. Coal Loader platform) to communicate benefits (ongoing energy savings, renewable energy certificates, emission reduction)
- Facilitating access to accredited solar PV solutions providers for residential and commercial with the Community.

Council should utilise the workshops and forums to identify interest and potential uptake of solar PV within the Community.

10.3.2. “Green Precincts” for North Sydney business hub

North Sydney Council has the opportunity to create a green precinct within the municipality. A distributed energy generation network can provide an alternative to grid supplied electricity and gas networks. International experience has successfully developed distributed energy systems that include the supply of energy, heating and cooling to buildings and industrial sites.

Historically, commercial cogeneration and trigeneration systems have demonstrated cost effectiveness for commercial buildings and industrial applications. In fact, cogeneration/trigeneration systems are now a typical design consideration for most new commercial buildings.

Internationally, precinct cogeneration/trigeneration systems are already cost effective. Yet the North Sydney Community does not have the same heating demands that are experienced in colder European countries. Here is where residential cogeneration/trigeneration systems have successfully been installed. The opportunity for North Sydney is the creation of a “Green Precinct” within the business hub focusing on commercial properties. Yet businesses face hurdles.

Current barriers to a green precinct

The barriers to a green precinct include:

- Escalating gas prices - we expect to shift the economics of our past experience with the expected escalation of natural gas prices (refer to Section 3.4.2). Cost effective long term gas contracts are critical for price certainty with cogeneration/ trigeneration systems.
- Complex and burdensome connection process to the mains grid supply, particularly the lack of a standard connection process and each case is considered individually.
- Regulatory barriers that currently prevent streamlined connection process. These need to be addressed with the State and local government levels. Energy production needs to be permitted on a broader scale within the Community and reflected in planning controls.
- Timing of project upgrades and ownership of buildings.

The planning barriers have been previously examined in the *North Sydney Council Ecologically Sustainable Development Best Practice Project (2013)*.

North Sydney Council can address some of these barriers by creating an enabling environment where novel energy systems can be implemented.

We recommend that North Sydney Council:

- Undertake a feasibility plan to assess the potential uptake from a district cogeneration / trigeneration systems. This plan will:
 - Identify buildings and sites for potential connection to a district system
 - Create a masterplan for North Sydney's green precinct that identifies "hot spots" where the maximum value can be attained from precinct scale cogeneration/trigeneration systems
 - Identify "easy wins" such as the connection of neighbouring properties with a simple heat loop (sharing of heat transfer for more efficient cooling)
- Implement recommendations by *North Sydney Council Ecologically Sustainable Development Best Practice Project (2013)* to enable energy production within the Community and associated amendments to the Development Control Plan.

10.3.3. Renewable energy - Community purchasing

North Sydney Council can facilitate a community purchasing initiative to promote development of renewable energy projects. Council's role will be to coordinate residential and business community members to participate in electricity purchase agreements from renewable sources. This could take the form of an energy auction. The aim of the renewable energy auction program will be to:

- deliver renewable energy to the Community at lowest possible delivered cost
- reduce greenhouse gas emissions by surrendering renewable energy certificates annually.

Council's role in this process will be to:

- facilitate the process for customers in the Community to access renewable electricity
- identify enough customers in the Community to participate in the program.

Table 9. Indicative cost of electricity from renewable and non-renewable sources.

Energy source	Delivered cost of electricity to commercial customers (\$/MWh)
Coal power	\$210 (varies)
Wind farm	\$250 - \$270
Solar farm	\$325 - \$365

North Sydney Council can also collaborate with other Councils to facilitate uptake of more customers. Collectively, this will enable purchase from a larger renewable energy power plant (such as 50MW), resulting in decreased delivered cost of electricity due to economies of scale.

Council should undertake a detailed feasibility study to determine:

- receptivity and potential uptake from customers within the Community
- risks and cost benefit analysis
- implementation strategy

Details for solar and wind auction scenarios are provided in detail in Table 16 for various scenarios.

10.4. North Sydney Community's emissions reduction path and target

The North Sydney Community's emissions profile forecast was calculated as shown in Figure 32 below. The following assumptions were made in forecasting the emissions profile:

- Residential and employee travel emissions will increase with the population and employee growth figures as outlined in a study¹¹ conducted for the Community.
- The electricity and gas consumption of the commercial and residential sector will increase based on increased population growth but the average electricity and gas consumption per household/unit will remain constant.

Research¹² shows in spite of expected growth in the residential and commercial buildings, emissions reduction activities will continue to drive a 7% reduction in buildings emissions between 2010/11 and 2019/20.

The opportunities identified for reducing emissions within the Community are:

- Implementing energy efficiency upgrades in commercial building through monitoring and automation, upgrades to lighting and improvements to heating, cooling and ventilation systems.
- Flexible financing, government grants and energy saving certificates (ESCs) could also drive further improvements in residential and building performance.

¹¹ North Sydney Commercial Centre Study, Urbis, February 2013.

¹² 4. Buildings – summary report, Tracking towards a low carbon economy, July 2013

- Facilitate renewable auction programs to enable the residential and / or commercial customers to procure renewable energy.
- Implementing the North Sydney Council Sustainable Transport Action Plan and Integrated Cycling Strategy.
- Developing and implementing a targeted Sustainability Engagement Strategy to continue to work with the Community to help reduce its greenhouse gas emissions, including Coal Loader education programs, Green Events, GreeNSchools, CitySwitch, Better Business Partnership, and the My Green Apartments program.

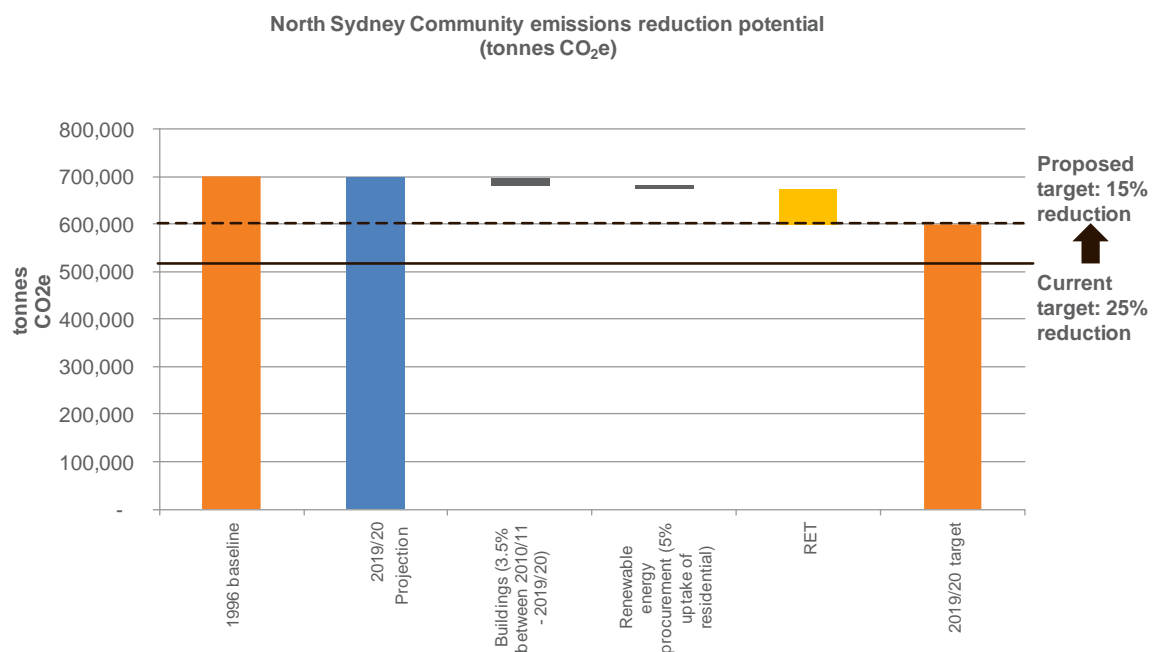


Figure 32. Forecasted emissions profile for North Sydney Community

Based on these opportunities outlined above, an abatement of 3.5% is achievable between 2010/2011 and 2019/20 in the Community including educational initiatives. This will result in 0.4% emission reduction per year in commercial and residential sector, equivalent to a 3% reduction in total emissions from the 1996 baseline levels.

A further 1% reduction in emissions can be realised, if 5% of the residential customers in North Sydney Community procures electricity from renewable energy source.

If the RET carries on its current target, the Community can achieve a total of 15% emissions reduction from the 1996 baseline emissions levels.

Energetics recommends North Sydney Community adopt two adopt two greenhouse gas emission targets to cater for the uncertainty future of the RET

- Continuing with the RET: 15% reduction of the 1996 baseline levels.
- Discontinuation of the RET: 5% reduction of the 1996 baseline levels

11. Community water consumption

The baseline water consumption set by Council for the North Sydney Community in 2001/02 was 8,106 ML and the target adopted for reduction is 25% by 2020 which equates to an absolute target of 6,080 ML per year.

Council undertakes various educational programs and other sustainability initiatives to increase awareness of resource consumption.

In 2012/13, the Community's water consumption decreased by 14% from the 2001/02 baseline levels to 7,006 ML, as seen in Figure 33 below. While the plan expresses usage data and targets on a Community wide basis, it is also worth noting that due to the increase in population in the North Sydney Community, per capita consumption has reduced more significantly by 27% for water consumption.

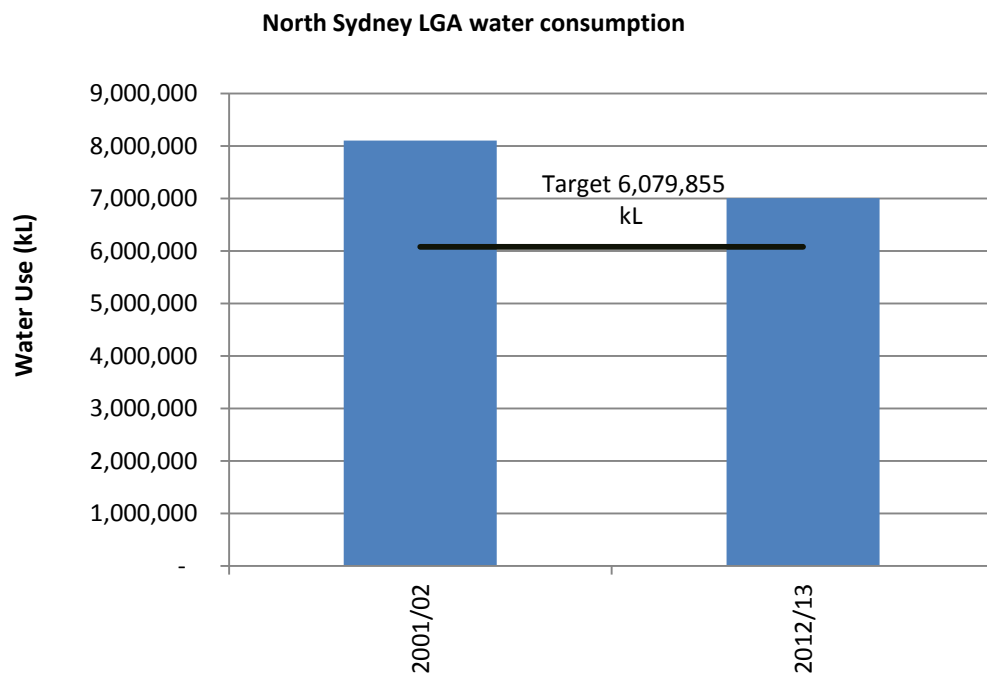


Figure 33. North Sydney Community's water consumption in 2012/13

Figure 34 shows the Community's water consumption remained static over the four year period between 2009/10 to 2012/13.

Residential consumers in houses and apartments (units/flats) together consume more than 70% of the Community's total water consumption.

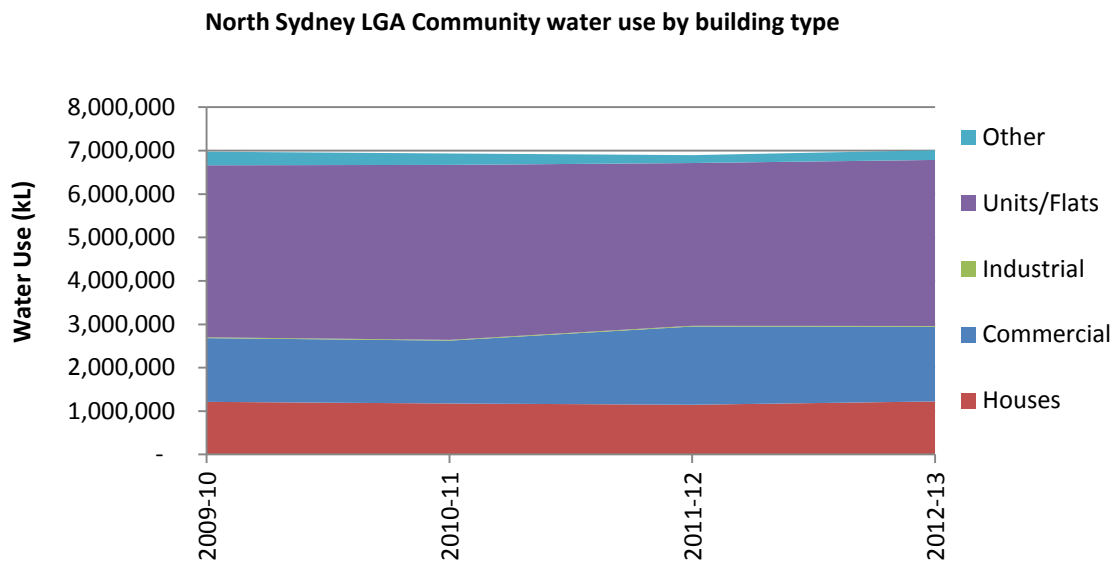


Figure 34. North Sydney Community's water use by building type

Based on the average water consumption profile of the Community, residential and unit/flat dweller's performance is below the Sydney wide average but higher than practice benchmarks. This is indicative of the potential for water savings in the residential sector. The average water consumption per building type, per individual unit (household, unit, industrial premises), per year is shown in Table 10.

Table 10. Benchmarking North Sydney Community vs. Sydney wide average water consumption of buildings

Building type	Average consumption 2012/13 Sydney wide average (kL per unit per year)	Average consumption 2012/13 North Sydney Community (kL per unit per year)	Good practice benchmark ¹³ (kL / household / year)
Commercial	979	560	
Houses	221	204	130
Industrial	1,309	361	
Other	159	152	
Units/Flats	159	130	108

Based on good practice benchmarks, houses and units/flats can improve their consumption performance by 60% and 20% respectively. Since houses and flats/units together account for the majority of the water consumed in the Community, Council should make this a focus area to target water saving activities in the next five years.

¹³ Fyfe, J., Retamal, M., Rickwood, P., May, D. and Mitchell, C., 2012, City of Sydney Decentralised Water Master Plan: Water Efficiency Plan. Prepared for City of Sydney and GHD by the Institute for Sustainable Futures, University of Technology, Sydney.

The first step is to encourage individual meter of units and apartments. This connects the end user to the cost implication. A collaborative approach between Council and Sydney Water providing technical support, incentives and/or subsidies will lead to a reduction in water usage by the Community.

11.1. Community water savings path and target

The Community's water savings potential was applied to the Community's 2012/13 water consumption figure to determine the savings potential across the residential and commercial sectors.

The water consumption forecast of the North Sydney Community from 2013 to 2020 is shown in Figure 35. The water consumption was modelled based on the Community's 2012/13 consumption data based on the following assumptions:

- Projected population rise as outlined in the Urbis Commercial Centre Study¹⁴
- An average of 2 people will occupy a unit/flat/residence
- Under a Business as Usual (BAU) scenario, the average water consumption per unit (kL/household) will remain the same until 2020

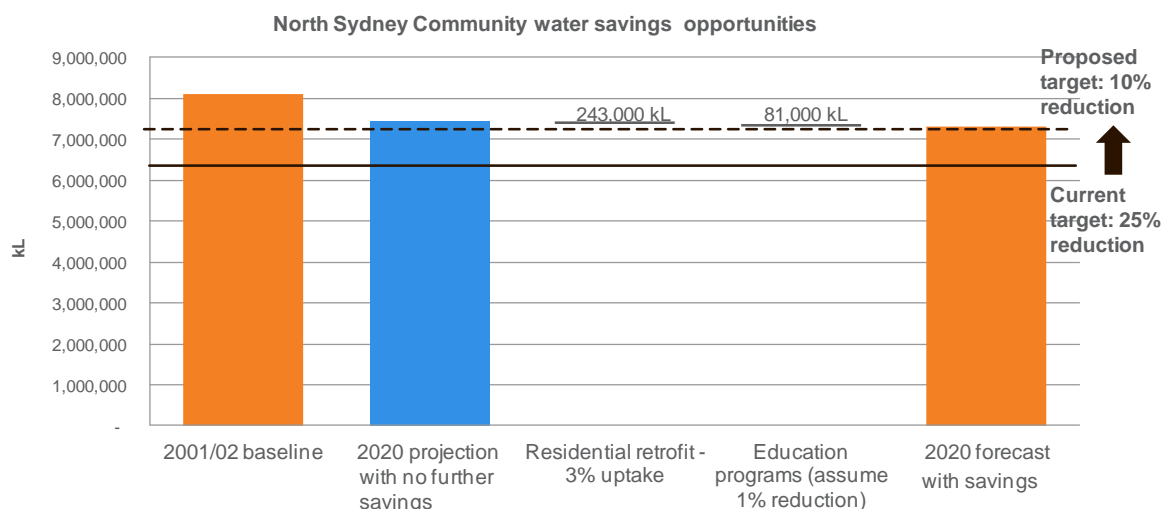


Figure 35. Projected water consumption for the North Sydney Community

¹⁴ North Sydney Commercial Centre Study, Urbis, February 2013

The water savings opportunities identified for the Community are:

- Residential retrofit programs:
 - Installation of low flow devices and exchange of inefficient showerheads for low flow efficient showerheads
 - Implementation of behavioural change project for households to learn where their water is used and undertake actions to reduce water use
 - Conducting water audit and retrofit projects targeted at older apartment buildings within the North Sydney Community. This could be combined with the installation of water efficient showerheads, tap aerators and repair of visible leaks.

Significant savings have already been achieved through water conservation and there are only incremental savings to be achieved in the residential sector. This residential retrofit program consists of installing water efficient devices.

Based on historical data, there was 6% uptake of residential retrofit programs in 2002/03¹⁵. Energetics assumed a further 3% (~1,100 houses / apartments) uptake of residential retrofit programs (excluding toilet retrofits) is achievable by 2020.

Other water savings initiatives that can be implemented by the Community are:

- undertake targeted water reduction campaigns to work with schools, hotels and hospitals
- continue to work with small to medium enterprise partnership to reduce water consumption.

Council should develop and implement a targeted Sustainability Engagement Strategy to continue to work with the Community to help reduce its water consumption, including Coal Loader education programs, Green Events, GreeNSchools, Better Business Partnership, and the My Green Apartments program.

Based on identified water reduction opportunities with an uptake of 3% from the residential sector and undertaking educational initiatives can result in the maximum water savings of 10% on the 2001/02 baseline levels by 2020.

Energetics recommends that the North Sydney Community decrease its current water reduction target from 25% to 10% of the 2001/02 baseline levels. This is a stretch target that will require uptake of residential retrofit programs in approximately 1,100 units by 2020.

¹⁵ https://www.sydneywater.com.au/web/groups/publicwebcontent/documents/document/zgrf/mdq1/~edisp/dd_045260.pdf - Sydney Water Corporation, Water conservation strategy, 2010 - 2015

12. Recommendations for the Community

The commercial and residential sectors are the largest energy and water consumers within the North Sydney Community. To continue with the engagement with the Community, we recommend the following:

Greenhouse gas emission: The North Sydney Community's greenhouse gas emission target should be reduced from 25% to 15% of the 1996 baseline levels by 2020.

Water consumption: The North Sydney Community's 2020 water reduction target should be reduced from 25% to 10% of 2001/02 baseline levels.

A collaborative approach between Council, the utilities and State Government is vital to incentivise residents and local businesses, and provide adequate technical support that will enable the community to achieve tangible water and energy reduction. Energetics recommends Council to:

- communicate the results of this plan and inform the Community about their progress, identified savings initiatives and new targets.
- continue to facilitate forums and education programs to increase awareness and uptake of sustainability initiatives within the Community.
- continue to provide the Environmental Upgrade Agreement (EUA) program targeting the commercial buildings sector.
- continue identify business educational programs and incentives to reduce energy and water consumption
- develop and implement a targeted Sustainability Engagement Strategy to help reduce residential water consumption
- undertake a feasibility study to facilitate the purchase of electricity from renewable sources for the aggregated customers of North Sydney Community.
- investigate financing and funding options that will incentivise and provide rebates to the Community to reduce their water and energy consumption.

Appendix 1: Identified energy and water savings initiatives

Table 11. Summary of emissions savings for transport fuels and gas initiatives for Council

Sub-sector / Source	Reduction initiative and project details	Basis of calculation for savings and assumptions made	Estimated reduction (tCO ₂ e)	Cost (\$)	Savings (\$) per year	Simple payback (years)
Fleet / Transport fuel	Behavioural measure: <ul style="list-style-type: none"> Develop and deliver an education program to drivers to ensure optimal use of vehicles. Continue to ensure that appropriately sized vehicles are used for each load or trip to minimise fuel consumption – avoiding overloading and using large vehicle for small loads. This is an ongoing activity which Council should continue. Continue to schedule tasks to maximise the number of drop-offs in each run and minimise empty running of vehicles. This is also an ongoing activity which Council should continue. 	<p>Based on industry experience at least up to 5% savings can be achieved by training drivers on fuel efficient driving behaviour.</p> <p>A conservative estimate of 2% savings on Council's 2012/13 transport emission was assumed with a confidence factor of 50%, which equates to a 1% saving in emissions.</p> <p>The costing is based on using an additional Council resource or an external consultant to monitor and identify reduction opportunities. Assumed cost of \$250 per hour for 4 hrs a week plus additional costs for education materials and driver training.</p>	9	\$20,000	\$7,000	~3 yrs

Sub-sector / Source	Reduction initiative and project details	Basis of calculation for savings and assumptions made	Estimated reduction (tCO ₂ e)	Cost (\$)	Savings (\$) per year	Simple payback (years)
	<p>Efficiency measure: Continue regular maintenance, ensure vehicle is fit for purpose and utilise more renewable fuels.</p> <ul style="list-style-type: none"> Optimise tyre performance to reduce fuel consumption by selecting lighter wheel and tyre systems and tyres that lower rolling resistance. Check tyre wear at least monthly and keep tyres inflated at, or 10% above, the recommended level. Monitor fuel consumption for each vehicle (e.g. via fuel cards) to identify vehicles with unusually high fuel consumption. High fuel consumption is indicative of possible need of maintenance – maintain vehicles for optimum fuel efficiency. <p>Procurement measure: fleet review and optimisation to reduce emissions by changing over to hybrid for Council owned vehicles.</p> <ul style="list-style-type: none"> Use the dedicated Council resource to monitor transport fuel consumption and optimise fleet profile. <p>Council should ensure there is a genuine need, and make efficient use of existing vehicles, rather than purchasing new vehicles.</p>	<p>Based on industry experience more than 10% savings is achievable for a combination of efficiency and procurement measures.</p> <p>For a combination of these initiatives, a 10% emission reduction with a 75% confidence factor equates to about 100 tCO₂e over the next 5 years, based on the 2012/13 transport emissions.</p> <p>The cost estimate of \$300k is to cater for incremental costs for fleet replacement and added maintenance. This does not include the cost of purchasing new vehicles.</p>	101	\$300,000	\$52,000	~5 yrs
Sub-total			110	\$320,000	~\$60,000	

Sub-sector / Source	Reduction initiative and project details	Basis of calculation for savings and assumptions made	Estimated reduction (tCO ₂ e)	Cost (\$)	Savings (\$) per year	Simple payback (years)
Buildings / Gas	<p>Behavioural measure: active management of high end gas users</p> <ul style="list-style-type: none"> • Use existing Council resource to monitor and manage high end gas users to optimise consumption utilising existing Building Management Systems (BMS) • Increase operator awareness to adjust set points for seasons • Promote user awareness to adapt to set point adjustment 	<p>Based on industry experience at least 2% savings on gas consumption can be realised. Using a confidence factor of 50% equates to a savings of 4 tCO₂e by 2020.</p> <p>Cost is based on using existing Council resource to work with the BMS supplier to set up KPIs in current BMS.</p>	4	\$5,000	\$600	~ 8 yrs
Buildings / Gas	<p>Procurement measure: ensure that all inefficient equipment is replaced with efficient models (ongoing activity for Council)</p> <p>Efficiency measure: For new and old Council owned buildings, augment building envelope where possible:</p> <ul style="list-style-type: none"> • Through proper insulation • Reduce heat loss / infiltration and minimize air leakage through buildings' exteriors • Optimise window / blind operation • Use double glazing • Reduce summer heat with cool roofs • Plant a "green roof" where feasible <p>For existing buildings, augmenting building envelope is an expensive exercise except in the case of worst performing buildings.</p>	<p>Between 5% and 10% savings in gas consumption is achievable over 5 years considering cogeneration supply for the North Sydney Olympic Pool. A confidence factor of 50% has been applied to estimate the emission reduction at 20 tCO₂e which is conservative.</p> <p>The cost is a high level estimate and variable. This is dependent on adopted initiatives and the subsequent roll out to Council owned buildings.</p>	21	\$30,000 - \$100,000	\$3,000	>10yrs

Sub-sector / Source	Reduction initiative and project details	Basis of calculation for savings and assumptions made	Estimated reduction (tCO ₂ e)	Cost (\$)	Savings (\$) per year	Simple payback (years)
NSOP/ Gas	<p>Reporting measure: Sub-metering and disaggregate tenants from Council's consumption.</p> <ul style="list-style-type: none"> Sub-meter and remove consumption of tenants (e.g. café and restaurant at NSOP) from Council's consumption Train personnel to utilise the new BMS system at NSOP to actively manage energy consumption 	<p>The savings have been calculated based on estimated gas usage for an industrial oven cooking, assuming gas is only consumed for cooking.</p> <p>The cost savings can be realised by Council if the cafe and restaurant are currently not paying for gas.</p>	22	\$1,500	\$3,200	0.5 yrs
Sub-total			47	\$36,000 - \$107,00	~\$7,000	

Table 12. Summary of emissions savings for electricity generation and renewable energy for Council

Sub-sector / Source	Reduction initiative and project details	Basis of calculation for savings and assumptions made	Estimated reduction (tCO ₂ e)	Cost (\$)	Savings (\$) per year	Simple payback (years)
Buildings Electricity	<p>Behavioural measure: active management of high end electricity users:</p> <ul style="list-style-type: none"> Use the dedicated resource to monitor and manage high-end electricity users to optimise consumption Increase awareness of operators and users of buildings. 	Based on industry experience at least 2% savings on electricity consumption can be realised. Using a confidence factor of 50% equates to a saving of 23 tCO ₂ e by 2020.	23	\$3,000	\$2,800	< 2 yrs
	<p>Reporting measure: leakage reduction, optimising emissions and energy consumption through Energy Management Systems (EMS) and bill validation</p> <ul style="list-style-type: none"> Leakage reduction: Ensure that all tenant consumption is disaggregated from Council, and Council is not paying tenants' bills. Continue to optimise emissions / energy management systems: <ul style="list-style-type: none"> Monitor systems/platforms to set up alerts Set up KPIs/Environmental PIs /GHG-PIs Validate utility bills and review energy procurement Verify/validate and assurance of emissions Train staff and utilise the newly installed BMS system at the pool to actively manage energy consumption More frequent reporting of target versus actual for energy use for Council owned buildings that have installed BMS. Council currently reports on targets 	<p>Based on industry experience, between 5% and 10% savings can be realised. For this initiative, 5% savings can be realised with a 70% confidence resulting in a savings of 81 tCO₂e.</p> <p>The cost is assumed to be an incremental cost of \$20,000 over 5 years to actively work with Planet Footprint to disaggregate tenants' electricity consumption from NSC. Costing for an emissions management system is based on the 15% of the wage of a technical resource for a year assuming that they will spend 15% of their time exclusively on energy and emissions management for Council.</p>	81	\$20,000	\$10,000	< 2 yrs

Sub-sector / Source	Reduction initiative and project details	Basis of calculation for savings and assumptions made	Estimated reduction (tCO ₂ e)	Cost (\$)	Savings (\$) per year	Simple payback (years)
	and actual on a quarterly basis for energy.					
	<p>Efficiency measure: adjusting controls, equipment replacement and energy efficiency upgrades.</p> <p>Examples of these initiatives are listed below.</p> <p>Control measures are classified:</p> <ul style="list-style-type: none"> no cost adjustment such as temperature set point adjustment, low cost adjustment such as control strategy for heating and ventilation systems, and medium cost adjustment through changes in BMS. <p>Equipment replacement: continue replacing current equipment (chillers, motors, heating and ventilation, hot water systems, lighting) with more efficient ones.</p> <p>Energy efficiency upgrades for building include:</p> <ul style="list-style-type: none"> Installing variable speed drives Efficient lamp replacement Promoting super-insulated exterior walls where feasible Allow external insulation beyond zoning limits Planting trees where feasible to reduce heat load on buildings, winter winds, pollution, and noise. 	<p>Based on industry experience at least 5% savings can be achieved over the next five years.</p> <p>For this emissions savings estimation, a 70% confidence factor was applied to the 5% savings of Council's 2012/13 emissions resulting in 81 tCO₂e over the next five years.</p>	81	\$100,000 or more	\$9,900	10

Sub-sector / Source	Reduction initiative and project details	Basis of calculation for savings and assumptions made	Estimated reduction (tCO ₂ e)	Cost (\$)	Savings (\$ per year)	Simple payback (years)
Public lights / Electricity	<p>Efficiency measure: upgrading half of Council owned public lights to LED by 2020.</p> <p>Council owns approximately 1,236 public lights (not operated by Ausgrid) that light footpaths, parks and reserves and some streets.</p> <p>Based on the draft inventory, the opportunity identified for reducing electricity consumption is to replace approximately 786 of existing public lights with Light Emitting Diodes (LEDs).</p> <p>Review Council owned civil lighting (luminaires and globes) and what improvements can be made when the current inventory audit will be completed by October 2014. Undertake lighting replacement plan to improve current street lighting, park and reserves, and other public lights to energy efficient and LED technology.</p> <p>This should also examine cost of faster roll out of energy efficient lighting versus energy use and cost.</p>	<p>Assumption made to estimate savings are:</p> <p>Replacing mercury vapour lights with 29W LEDs</p> <p>Replacing halogens and metal halides that are greater than 70W with LEDs</p> <p>Lamps are switched on for 10 hrs per day for 365 days</p> <p>A confidence factor of 70% was applied to the energy savings used to estimate the emissions reduction</p> <p>Cost of \$200 per lamp was used for this estimation.</p>	204	\$160,000	\$25,200	~6 years
Sub-total			388	\$360,000	\$47,800	

Sub-sector / Source	Reduction initiative and project details	Basis of calculation for savings and assumptions made	Estimated reduction (tCO ₂ e)	Cost (\$)	Savings (\$) per year	Simple payback (years)
Street lights / Electricity	<p>Continue with the street lighting improvement program (SLI) program with Ausgrid.</p> <p>North Sydney Council in collaboration with Southern Sydney Regional Organisation of Council (SSROC) is undertaking a Street Lighting Improvement (SLI) program where Ausgrid has made a “street lighting promise” to replace all street lights that fail with more efficient ones. This is expected to take place at no cost to Council and will result in reduced annual electricity cost associated with the electricity saved.</p> <p>The roll out will result in 11.25% energy savings by 2020. Ausgrid is not contractually bound to this promise and as such there is high degree of uncertainty in achieving this emission reduction.</p>	<p>Based on discussions with the SLI program manager, in all likelihood more than 11.25% savings can be achieved by 2020.</p> <p>However, due to high degree of uncertainty associated with the Ausgrid promise, an 85% confidence factor was applied to the 11.25% energy savings resulting in 230 tCO₂e.</p>	230	0	\$28,400 per year	
Sub-total			230	0	\$28,400	
Electricity generation / Renewable Energy	Install and supply 7kW solar PV system on the Kirribilli Neighbourhood Centre.	The estimated emissions reduction, cost and savings were provided by Council as per the completed assessment.	11	\$11,000	\$2,400	~5 years

Sub-sector / Source	Reduction initiative and project details	Basis of calculation for savings and assumptions made	Estimated reduction (tCO ₂ e)	Cost (\$)	Savings (\$) per year	Simple payback (years)
Electricity generation / Renewable Energy	Install and supply 30kW solar PV system on the Crows Nest Community Centre / Holtermann St car park.	The estimated emissions reduction, cost and savings were provided by Council as per the completed assessment.	26	\$80,000	\$5,500	~15 years
Electricity generation / Renewable Energy	Install 45kW solar array on the coal loader platform: The system has been sized based on discussions with Council personnel that the extra electricity requirements of the Coal Load facility will double the current consumption of the facility. The size of the PV system should be finalised based on final electricity consumption calculation for the Coal Loader.	These savings have been calculated based on a 45kW system. The cost was estimated on \$2500 per kW installed. Revenue from small generation unit revenue was offset from the capital costs.	60	\$80,000	\$7,415	~11 years
Sub-total			97	\$171,000	\$15,315	
Total estimated savings			872	\$960,000		

Table 13. Summary of water savings initiatives identified for Council

Sub-sector	Program description	Basis of calculation for savings calculation	Estimated reduction (kL / year)	Cost (\$)	Savings (\$)	Payback (years)
All except parks and reserves	<p>Changing behavioural patterns through active management and monitoring of Council's water consumption.</p> <ul style="list-style-type: none"> • Use a dedicated resource to monitor and actively manage Council's water use. • Use Council's dedicated maintenance / plumbing resource to actively and frequently undertake leak detection review and fix leaks. • Ensure there is alignment between various existing management systems (Planet Footprint, irrigation system and maintenance scheduling system) to ensure action items are implemented. • Review asset portfolio on Planet Footprint and Sydney Water to disaggregate tenants (who are paying for water) from Council's water consumption. • Prioritise services to maximise revenue and outputs, diversify portfolio, minimise risk, and manage water resources efficiently. An example of this initiative would be to review the stormwater tariff for the Cammeray Golf Course. Review and revision of the stormwater tariff could result in efficient water use by Cammeray Golf Course. This could lead more storm water being available to Council thereby leading to a decrease in Council's potable water consumption. 	<p>A conservative estimated saving of 10% on Council's 2012/13 water consumption can be achieved by 2020.</p> <p>This saving is applied only to Council owned facilities excluding the parks and reserve.</p> <p>A conservative cost estimate of \$25,000 was assumed to implement a combination of these initiatives.</p>	2,900	\$25,000	\$5,800	~5 years

Sub-sector	Program description	Basis of calculation for savings calculation	Estimated reduction (kL / year)	Cost (\$)	Savings (\$)	Payback (years)
Parks & reserves	<p>Where feasible, identify alternative water sources including stormwater, wastewater, storage and rainwater harvesting. This also includes recycled grey water, rainwater collection treatment and redistribution systems.</p> <p>Currently identified alternative water sources for Council are:</p> <ul style="list-style-type: none"> Bradfield Park water capture and reuse scheme involving the capture of surface street and Harbour Bridge runoff for the catchment bounded by Fitzroy, Broughton, Alfred Street South and Olympic Drive. Feasibility study, construction plans and development assessment has been completed and approved to install a 400 kL subsurface tank. The tank will be set up such that the existing irrigation system for the park will pump out of the newly installed tank. The following sites and storage capacity have been identified as potential opportunities: <ul style="list-style-type: none"> Coal Loader water storage tunnel capacity of 250kL. Hume Street car park / North Sydney Indoor Sports Centre water capture and reuse scheme involving the capture of the roof catchment for reuse at the sports centre. Rainwater harvesting and storage at St Leonards Park. Council should identify and investigate further opportunities to harvest surface water, 	<p>Two of the quantified alternative water sources amount to 650k (400kL and 250 kL) at Bradfield park and Hume Street car park / North Sydney Indoor Sports Centre. Council can identify further alternative sources of 350 kL by 2020.</p> <p>The cost estimate received by the Council for the tank and associated infrastructure (connecting stormwater pipes, gpt etc) was approximately \$274,000 for a 400KL tank in 2005. This cost estimate has been adjusted for CPI increases..</p>	1000	\$300,000	\$1,620	>20 years

Sub-sector	Program description	Basis of calculation for savings calculation	Estimated reduction (kL / year)	Cost (\$)	Savings (\$)	Payback (years)
	groundwater and increase use of the Cammeray stormwater for irrigation purposes in the parks and reserves					
	<p>Central control system and real time monitoring and management by expanding and/or converting the current partly automated irrigation system to a fully automated system.</p> <p>This should be combined with the following initiatives:</p> <ul style="list-style-type: none"> • Undertake quarterly irrigation audits to benchmark irrigated parks' water consumption against best practice guidelines. Use new technologies to monitor water performance of parks and reserves. • Increase use of drought tolerant grasses and more shading for sporting fields. • Optimise and reduce area of irrigated parks where and when possible. • Use deep mulches on garden beds and revegetated areas to reduce evaporation. <p>Centralised control systems can save water because they can receive information about soil moisture from soil sensors, rainfall and temperature from the Bureau of Meteorology and use it to adapt the irrigation schedule.</p> <p>Council should implement the automated centralised control system at Anderson Park, North Sydney Oval and Tunks Parks with the intent to roll it out to other</p>	<p>Based on industry experience and research¹⁶ shows that at least 10% savings is achievable even when existing centralised irrigation systems are optimised. As such, a 10% saving of Council's 2012/13 parks and reserves water consumption of parks is achievable for 2020.</p> <p>A cost of \$20,000 was allocated for this initiative which should be implemented in conjunction with the initiative below.</p> <p>The cost allocated to this initiative should be used to undertake audits and optimise water use.</p>	5,591	\$20,000	\$11,183	~2 years

¹⁶ Saving water on Sports Ovals in Canberra, CSIRO Land and Water, http://www.fullstop.com.au/HTMLfiles/v2/100_PublishedPapers/300_Reports/020_Sportsgrounds/SportsgroundIrrign4p.pdf

Sub-sector	Program description	Basis of calculation for savings calculation	Estimated reduction (kL / year)	Cost (\$)	Savings (\$)	Payback (years)
	irrigated parks.					
	<p>Better parks irrigation management that will require the Parks and Reserves to reduce Council's 2012/13 current consumption to best practice guidelines as outlined in Table 14 below.</p> <p>This initiative should be implemented in conjunction with the centralised control system implementation above. The \$100,000 (for this initiative) should be allocated to install and configure soil moisture sensors, rain sensors and gauges, wind, frost and flow sensors at irrigated parks.</p>	<p>This initiative will require water consumption of Anderson Park, North Sydney Oval and Tunks Parks to decrease from current benchmark levels to best practice guidelines.</p> <p>A confidence factor of 80% was applied to the 29.85 ML quantified in Table 14 to estimate the 24ML savings.</p>	23,877	\$100,000	\$47,700	>2 years
	Review amenities and upgrade old fixtures with water efficient ones.	Based on the assumption that 2% savings of the 2012/13 water consumption of parks and reserves can be achieved.	1,118	\$10,000	\$2,237	>4 years
	<p>Optimising the Cammeray dam storm water system. The Cammeray storm water system was designed as a 90ML system. The current catchment from this storm water system provides approximately 20ML per year. This stormwater is utilised by the Cammeray Golf Course which leaves minimal quantity available for Council to reduce its water consumption.</p>	Assume that the system can be optimised to increase usage by at least 10% of the average storm water usage of the last two years.	1,522	\$20,000	\$3,044	~7 years

Sub-sector	Program description	Basis of calculation for savings calculation	Estimated reduction (kL / year)	Cost (\$)	Savings (\$)	Payback (years)
NSOP	<p>Implement water savings initiatives for the redevelopment of the Olympic Pool.</p> <p>Reverse osmosis and ultra violet filters were identified as potential opportunities for implementation when the pool is redeveloped. Reverse osmosis is an expensive exercise with high capital and maintenance costs which is not financially viable based on current water costs. As such a detailed cost versus benefit exercise should be undertaken before implementing this at the NSOP.</p>	<p>Assume 10% savings can be achieved on the pool's current consumption.</p> <p>Allocated \$100,000 to this initiative which is a high level estimate.</p>	1,080	\$100,000	\$2,161	
Total estimated savings			34,018	\$575,000	\$68,000	

Benchmarking Council's parks

Table 14 provides further details on how the 27ML / year water savings associated with better park irrigation was quantified. The water consumption of the Council's irrigated Parks and Reserves were benchmarked against best practice irrigation guidelines¹⁷. These guidelines provide recommended ranges of water usage intensity (kL / m² / yr) against open space categories (such as elite for professional sporting use versus regional for general park use by the local community). Savings were identified in instances where the current water consumption in 2012/13 was greater than the average of the range recommended in the best practice guideline.

Table 14. Benchmarking North Sydney Council's irrigated parks and reserves

	Open space categorisation	Best practice irrigation	Benchmarks (kL / m ² / year)				Savings calculation
			2009/2010	2010/2011	2011/2012	2012/2013	
Anderson Park	Local Sportsfield	0.15 - 0.35	0.430	0.344	0.779	0.845	Reducing Anderson Park's irrigation from 0.845 kL/m ² /year to 0.25 kL/m ² /year can result in a 2,857 kL / year water savings.
Bradfield Park	Regional	0 – 0.25	0.058	0.079	0.136	0.135	
Cammeray Park	Local Sportsfield	0.15 - 0.35	0.002	0.003	0.011	0.015	Based on open space categorisation, Cammeray Park is using less water than the best practice guidelines.
Forsyth Park	Local Sportsfield	0.15 - 0.35	0.376	0.023	0.037	0.000	Based on open space categorisation, Forsyth Park is using less water than the best practice guidelines.
North Sydney Oval	Elite	0.4 – 0.9	0.862	0.631	1.020	1.376	Reducing the Oval's irrigation from 1.376 kL/m ² /year to 0.65 kL/m ² /year can result in a 9,506 kL / year water savings.

¹⁷ Best practice guidelines for holistic open space turf management in Sydney, Sydney Water, 2011

	Open space categorisation	Best practice irrigation	Benchmarks (kL / m ² / year)				
Primrose Park	Local Sportsfield	0.15 – 0.35	0.028	0.048	0.046	0.029	Based on open space categorisation, Primrose Park is using less water than the best practice guidelines
St Leonards Park	Regional	0 – 0.25	0.004	0.004	0.002	0.002	
Tunks Park	Local sports field	0.15 - 0.35	0.235	0.085	0.053	0.838	Reducing Tunks Park's irrigation from 0.836 kL/m ² /year to 0.25 kL/m ² /year can result in a 14,388 kL / year water savings.
Waverton Park	Local Sportsfield	0.15 – 0.35	0.692	0.644	1.030	0.987	Reducing Waverton Park's irrigation from 0.987 kL/m ² /year to 0.25 kL/m ² /year can result in a 3,096 kL / year water savings.
Maximum savings potential							29,847 kL or 30% of Council's 2012/13 water consumption

The results show that Anderson Park, North Sydney Oval, Tunks Park and Waverton Park are high consumers of water for irrigation purposes in comparison with best practice irrigation guidelines. Reducing the water consumption of these four parks to average best practice irrigation levels can result in significant water savings to the Council.

Adopting a better parks irrigation strategy by reducing current irrigation levels to average best practice guideline levels at the four parks has the potential to reduce the parks and reserves 2013 water consumption by approximately 30% (29,847 kL). A confidence factor of 70% was applied to the maximum savings potential of 29.85 ML (in Table 13) to obtain the 21ML savings outlined in Table 14.

Table 15. Summary of emissions reduction initiatives for North Sydney Community

Sub-sector / Source	Reduction initiative and project details	Basis of calculation for savings and assumptions made	Estimated reduction (tCO ₂ e)	Cost (\$)	Savings (\$) per year	Simple payback (years)
Renewable Energy	Undertake a feasibility study to investigate uptake of renewable energy auction program to aggregate large scale customers (including Council) in the North Sydney Community.	The cost is a once off cost to undertake the feasibility study to uncover potential and associated costs.	N/A	\$60,000	N/A	N/A
Green Precinct	Undertake a feasibility plan to assess the potential uptake from a district cogeneration / trigeneration systems. This plan will: <ul style="list-style-type: none"> Identify buildings and sites for potential connection to a district system Create a masterplan for North Sydney's green precinct that identifies "hot spots" where the maximum value can be attained from precinct scale cogeneration/trigeneration systems Identify "easy wins" such as the connection of neighbouring properties with a simple heat loop (sharing of heat transfer for more efficient cooling) 	The cost is a once off cost to undertake the feasibility study to uncover potential and associated costs.	N/A	\$150,000	N/A	N/A
Financial options	Continue to offer Environmental Upgrade Agreements (EUAs) to drive energy efficiency and renewable energy in the commercial building sector.	Council should allocate approximately \$40,000 annually to uncover potential opportunities.	1400	\$40,000/yr	\$20,000	2 years

Sub-sector / Source	Reduction initiative and project details	Basis of calculation for savings and assumptions made	Estimated reduction (tCO ₂ e)	Cost (\$)	Savings (\$) per year	Simple payback (years)
Engagement programs	Develop and implement a targeted Sustainability Engagement Strategy including staffing, to help reduce residential and business energy consumption. This should build on Council's existing, and explore new, behavioural change projects for households and businesses such as Coal Loader education programs, Green Events, GreeNSchools, City Switch, Better Business Partnership, and My Green Apartments.	Assume that 1000 households and 100 SMEs are engaged in energy reduction activities and that they each make an average 20% energy reduction as a result.	15,000	\$250,000/yr	\$85,000	3 years
Transport	Implement the North Sydney Council Sustainable Transport Action Plan and Integrated Cycling Strategy including staffing. Promote walkability through strategic planning and public domain upgrades.	Implementation of engagement initiatives contained within the Sustainable Transport Action Plan.	5,600	\$100,000/yr	\$35,000	3 years
Total			22,000	\$450,000		

Solar and wind auction programs

Table 16 provides a summary of the renewable energy options, costs and opportunities that are most relevant to the Council as part of their strategy to reduce emissions.

Table 16. Summary of renewable energy generation options for North Sydney Community

Renewable energy type	Details	Opportunities	Risks	Costs, payback etc
Procuring energy generated from a 15MW wind farm offsite	<p>Under this scenario, Council can purchase electricity through a retailer from a new offsite wind farm in collaboration with other Councils or Regional Organisation of Councils.</p> <p>The aim will be to reduce the emissions of the North Sydney Community over a longer period of time.</p> <p>Council can facilitate a wind auction where proposals are sought from generators in order to receive competitive prices from wind farm developers.</p> <p>Typically, the wind farm developer will require at least a 10 year commitment to purchase this power from the Community.</p>	If successfully implemented, the North Sydney Community together with other Councils will enable the uptake of renewable energy and reducing emissions.	<p>Lack of supply risk as wind energy is not reliable due to the unpredictable supply. This supply vs. demand is a balancing act for which the retailer will charge a premium.</p> <p>Uncertain policy and legislative setting in terms of RET review.</p> <p>The Community will have to sign a long term (~15 year) power purchase agreement.</p> <p>The contractual arrangements are tedious and time consuming though a large scale wind farm auction has been successfully implemented by the ACT Government to reduce their emissions.</p>	<p>Electricity procured:</p> <ul style="list-style-type: none"> ca. 49 GWh per year ca. 8% of Community's consumption <p>Emissions reduction potential:</p> <ul style="list-style-type: none"> ca. 43,000 tCO₂e per year if all the energy generated from the 15MW plant is purchased by residences in the North Sydney Community.
Procuring energy generated from a	Council can purchase electricity through a retailer from a new offsite	A small scale community-owned wind farm has been successfully	Uncertain policy and legislative setting in terms of RET review and	<p>Electricity procured:</p> <ul style="list-style-type: none"> ca. 9.8 GWh per year

Renewable energy type	Details	Opportunities	Risks	Costs, payback etc
3MW community owned wind farm	<p>community owned wind farm.</p> <p>A new community owned wind farm could be installed in NSW.</p> <p>Council can facilitate a wind auction where proposals are sought from generators in order to receive competitive prices from wind farm developers.</p> <p>The wind farm developer will require at least a 10 year commitment from the community to purchase this power.</p>	implemented by a community in Victoria.	<p>low investment appetite for new wind farms.</p> <p>The Community will have to sign a long term (~10 year) power purchase agreement.</p>	<ul style="list-style-type: none"> ca. 2% of Community's consumption <p>Emissions reduction potential:</p> <ul style="list-style-type: none"> ca. 8,700 tCO₂e per year. <p>All the energy generated from the 3MW plant is purchased by residences in the North Sydney Community.</p>
Procuring energy generated from community owned 3MW PV plants	Under this scenario, Council should seek requests for proposals for a solar auction from solar providers to small solar power plants.	<p>Power purchase agreement will be shorter than 10 years.</p> <p>The electricity can be generated within the North Sydney Community based on availability of space.</p> <p>A retailer is not required if the electricity generated on site can be used on site.</p>	Uncertain policy and legislative setting in terms of RET review.	<p>Electricity procured:</p> <ul style="list-style-type: none"> ca. 4.7 GWh per year ca. 1% of Community consumption <p>Emissions reduction potential:</p> <ul style="list-style-type: none"> ca. 4,200 tCO₂e per year. <p>All the energy generated from the 3MW plant is purchased by residences in the North Sydney Community.</p>

Table 17. Summary of water savings activities for North Sydney Community

Sub-sector / Source	Reduction initiative and project details	Basis of calculation for savings and assumptions made	Estimated reduction savings (kL)	Cost (\$)	Savings (\$) per year	Simple payback (years)
Education measure	Develop and implement a targeted Sustainability Engagement Strategy including staffing to help reduce residential and business water consumption. The strategy should build on Council's existing, and explore new, behavioural change projects for households and businesses such as Coal Loader education programs, Green Events, GreeNSchools, Better Business Partnership, and My Green Apartments.	Assume that 1000 households and 100 businesses are engaged in energy reduction activities and that they make an average 20% water reduction as a result.	81,000	\$250,000 per year	\$160,000	2 years
Residential retrofits	Water efficient devices and toilet retrofits program as outlined in Table 18.	Council should allocate approximately \$240,000 annually to continue the program not including staffing.	243,000	\$240,000 per year	\$486,000	0.5 years
Total			324,000	\$490,000		

Table 18 provides an indication of savings potential that can be achieved by the North Sydney Community.

Table 18. North Sydney Community's water savings potential

Sub-sector	Program	Indicative savings from past programs (kL/unit/year)	Indicative levelised cost (\$/kL)	Maximum savings potential (ML/year)	Comments
Residential	<p>Water efficient devices and toilet retrofits:</p> <ul style="list-style-type: none"> Installation of low flow devices and exchange of inefficient showerheads for low flow efficient showerheads. Undertake water audit and retrofit projects for targeting older apartment buildings in the Community. 	<p>69 kL / household/ year (excluding toilet retrofit)</p> <p>89 kL / household / year (including toilet retrofit)</p>	<p>\$2.08¹⁸ (excluding toilet retrofit)</p> <p>\$4.5 / kL (including toilet retrofit)</p>	<p>65,157 kL water savings is achievable based on an uptake 3% (1,100 units) of the total number of 35,387 houses, units/flats in the North Sydney Community at 2012/13.</p>	<p>The levelised cost of \$2.08 per kL saved is the indicative cost for a plumber's visit to replace shower heads, install tap flow regulators in kitchens and bathrooms, repair leaks and provide advice. Typical showerheads cost between \$10 and \$100 per unit. Council should allocate between \$100k and \$150k for this initiative on an annual basis plus staffing.</p> <p>Maximum savings potential if all 35,387 units in the Community undertakes residential retrofits:</p> <ul style="list-style-type: none"> 2,430 ML (excluding toilet retrofits) 3,163 ML (including toilet retrofits)

¹⁸ Fyfe, J., Retamal, M., Rickwood, P., May, D. and Mitchell, C., 2012, City of Sydney Decentralised Water Master Plan: Water Efficiency Plan. Prepared for City of Sydney and GHD by the Institute for Sustainable Futures, University of Technology, Sydney.

Sub-sector	Program	Indicative savings from past programs (kL/unit/year)	Indicative levelised cost (\$/kL)	Maximum savings potential (ML/year)	Comments
Hotels	Water audit and maintenance	20% savings per hotel	\$0.4 / kL	Not quantifiable at present due to lack of disaggregated data for hotels in the Community	The total number of hotels and respective consumption is unavailable based on Sydney Water data for the Community
Commercial / industrial	Water audits, savings action plans, identify leaks and upgrading inefficient fixtures	10% - 20%	\$0.3/kL – 0.5 / kL	172 ML at 10% 344 ML at 20%	This was not included in the estimated savings calculation.

Appendix II - North Sydney Community's feedback

Council received 23 responses from the Community consisting of 22 residents and 1 business. These results were analysed and are tabulated below.

The respondents outlined the following initiatives that have been successfully implemented to reduce energy and water in their household

- Use of the Go-Get car share has enabled North Sydney residents to not invest in a car.
- Switching to LED lighting, walking, cycling and using more public transport.
- Roof insulation, improved insulation in the building, use of curtains and blinds and wearing more thermals indoor has helped residents to reduce heating and cooling energy use.
- Using electrical appliances during off-peak hours as a means to reduce energy costs.
- Installation of water efficient devices such as low-flow showerheads and water efficient washing machines.
- Using less water for gardening and planting of native trees.

Based on the feedback received from respondents, the areas highlighted for support are:

- About 52% of the respondents requested that Council facilitates and advocates where possible, more means of alternate transport to private car usage in North Sydney.
- Most of the respondents have requested Council to provide access to technical information and advice on how to reduce energy and water in the residence sector.
- More than half of the respondents requested Council to invest in more energy and water efficient technology.
- Provision of incentives and subsidies to finance energy and water efficiency upgrades in the residential and commercial sector was also identified. Provision of filtered water outlets by Council to reduce bottled water consumption within the Community has been highlighted as an opportunity in an effort to discourage bottled water use.
- Less than half of the respondents indicated that Council should use more non-potable water.
- Only one respondent indicated that Council should purchase offsets as a means to reduce emissions.
- Council should develop a waste policy to handle electronic waste policy to deal with end of life management of solar panels.
- Two of the respondents indicated that a delay in fixing water leaks had led to excessive water in their residence.

Appendix III - Glossary of acronyms

ACCU	-	Australian Carbon Credit Unit
BAU	-	Business as Usual
BMS	-	Building Management System
BoM	-	Bureau of Meteorology
Ca.	-	circ: at, in or approximately
CCP	-	Cities for Climate Protection
CDM	-	Clean Development Mechanism
CEEP	-	Community Energy Efficiency Program
CER	-	Certified Emission Reduction
CFI	-	Carbon Farming Initiative
Community	-	Residents and businesses located in the North Sydney Council LGA
EMS	-	Energy Management Systems
EUA	-	European Union Allowance
EU ET	-	European Union Emissions Trading Scheme
FiT	-	feed in tariff
GHG	-	green house gas
GHG-PI	-	green house gas performance index
GJ	-	gigajoule
GPT	-	gross pollutant trap
GS-CER	-	Gold Standard Certified Emission Reduction
GS-VER	-	Gold Standard Voluntary Emission Reduction ()
HEM	-	high efficiency motors
HVAC	-	heating ventilation and air conditioning
ICLEI	-	International Council for Local Environmental Initiatives
IPART	-	independent pricing and regulatory tribunal
kL	-	kilolitres
KPI	-	key performance index
kWh	-	kilowatt hour
LED	-	light emitting diodes

LGA	-	local government area
LGC	-	Large-scale Generation Certificates
LRET	-	large-scale renewable energy target
ML	-	mega litres
MWh	-	megawatt hour
NSOP	-	North Sydney Olympic Pool
PPA	-	Power Purchase Agreement
PV	-	photovoltaic
RE	-	Renewable Energy
RET	-	Renewable Energy Target
RFP	-	Request for Proposal
SLI	-	Street lighting improvement
SRES	-	Small-scale Renewable Energy Scheme
STC	-	Small-scale technology certificate
SSROC	-	Southern Sydney Regional Organisation of Councils
tCO ₂ e	-	tonnes carbon dioxide equivalent
VSD	-	Variable Speed Drives
VCS	-	Voluntary Carbon Standard
WASIP	-	Waste and Sustainability Improvement Payments

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