

Responding to climate change strategy

This strategy accompanies the *Responding to climate change* policy.

It gives detail on the context, opportunities and methods for responding to climate change and our plan for achieving the policy commitments.

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Part 1: Context and rationale

1. Introduction

This document supports the Blacktown City Council policy: *Responding to climate change*. There are two parts to this document:

- Part 1: context and rationale
- Part 2: implementation actions

We have aligned the actions with the Community Strategic Plan *Our Blacktown 2036*.

2. Policy context

Blacktown City Council's policy objectives are to:

- increasingly improve energy efficiency and transition to renewable energy to reduce the greenhouse gas emissions from our operations
- work with our community to achieve the NSW aspirational targets of net-zero emissions by 2050 and becoming more resilient to a changing climate – especially to increases in urban heat
- take a balanced approach that considers our quadruple bottom line – social, environmental, economic and civic leadership responsibilities
- increasingly integrate our climate change responses into the Community Strategic Plan *Our Blacktown 2036*, as well as our four-yearly delivery programs and annual operational plans and reporting.

Our policy: *Responding to climate change* was developed in the context of global, Australian and NSW climate change policies.

2.1 Global commitment to climate change

Currently, two international agreements address climate change in a major, strategic way.

The United Nations Sustainable Development goals include addressing climate change

The United Nations' members, including Australia, agreed on the Sustainable Development Goals in September 2015. The goals were developed to be comprehensive, far-reaching and people-centred. Each goal has specific targets.

The following goals and related targets are those that most specifically respond to climate change and have relevance for Blacktown City:

Table 1: Relevant Sustainable Development goals.

Goal 1	End poverty in all its forms everywhere
	<ul style="list-style-type: none">• (Target 1.5) By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters.
Goal 7	Ensure access to affordable, reliable, sustainable and modern energy for all
	<ul style="list-style-type: none">• (Target 7.1) By 2030, ensure universal access to affordable, reliable and modern energy services.• (Target 7.2) By 2030, increase substantially the share of renewable energy in the global energy mix.• (Target 7.3) By 2030, double the global rate of improvement in energy efficiency.
Goal 13	Take urgent action to combat climate change and its impacts
	<ul style="list-style-type: none">• (Target 13.1) Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.• (Target 13.3) Improve education, awareness-raising and human and institutional capacity on climate change.

The Paris Agreement is the major current international climate change strategy

The Paris Agreement aims to limit a global temperature rise in this century to ‘well below’ 2 degrees Celsius over pre-industrial levels, and to try to hold the increase to 1.5 degrees. The Agreement entered into force on 4 November 2016 and most of its provisions take practical effect from 2020.

Australia has commitments under the Paris Agreement

Parties to the Agreement (including Australia) have committed to:

- reach the global peak of greenhouse gas emissions as soon as possible (Article 2)
- balance emissions and removals (of greenhouse gases from the atmosphere) to achieve ‘carbon neutrality’ or ‘zero net emissions’ during the second half of this century
- state their nationally determined contribution once they have ratified the agreement, and every five years from 2020, with each successive contribution being a progression on the last
- report on national emissions and progress towards targets
- promote action to adapt and build resilience to climate impacts.

The Agreement builds on United Nations Framework Convention on Climate Change

For the first time, all nations have joined in, committing to efforts to combat climate change, adapt to its effects and support developing countries to do so. Syria and Nicaragua joined later than others, in November 2017, and the United States has formally given the necessary three years’ notice of its intention to withdrawⁱ. Agreement parties are negotiating details of the Agreement’s ‘rule book’. Key provisions are to be agreed by the end of 2018. By December 2017, of the 197 parties who had signed and/or ratified the Agreement, 169 parties including Australia had ratified it. Australia’s participation entered into force on 9 December 2016^{ii, iii, iv}.

2.2 Australia's commitment to climate change

Until 2020, the Kyoto Protocol determines our target

Until 2020, Australia is still bound by the second commitment period of the Kyoto Protocol. The Australian Government's 2017 review of its climate policies^v indicated that Australia is on track to beat its 2020 Kyoto Protocol target.

Australia's Nationally Determined Contribution to the Paris Agreement 2021 to 2030

Australia's Nationally Determined Contribution to the Paris Agreement is a greenhouse gas reduction of 26 to 28 per cent below 2005 levels by 2030. This would halve Australia's per capita emissions (compared with 2005) and reduce emissions per unit of Gross Domestic Product by about 65 per cent^{vi}. This greenhouse gas reduction target applies over the period 2021 to 2030.

Australia's current policies are unlikely to achieve its Paris commitment

Australian Government projections^{vii} and the latest United Nations Emissions Gap Report^{viii} indicate that Australia's current policies will not achieve this Nationally Determined Contribution (of 26 to 28 per cent emission reductions below 2005 levels by 2030). Both reports were published late in 2017, and do not take account of Australian policies currently being developed, including the National Energy Guarantee and proposals for improvements to Australia's fuel standards.

The current Renewable Energy Target will coexist with the National Energy Guarantee

The Renewable Energy Target creates a financial incentive for installing renewable energy. It has two aspects: one for small installations up to 100 kilowatt (kW) in capacity and one for larger installations. One Large Scale Certificate is created for each megawatt-hour of renewable electricity.

These certificates can be sold to electricity retailers who surrender them to the Clean Energy Regulator as evidence that they have complied with the scheme's annual renewable energy target. The legislated large-scale targets ramp up until 2020 when the target will be 33,000 gigawatt-hours of renewable electricity generation. It is expected that this target will be easily met.

Table 2: Summary comparing Liberal National Coalition and Australian Labor Party Policies on emissions reduction and energy

	LNP coalition	ALP
Emission reductions	<ul style="list-style-type: none"> • 26 to 28% reduction on 2005 levels by 2030 - as indicated by Australia's Nationally Determined Contribution to the Paris Agreement. • The current Emissions Reduction Fund (ERF), which credits reductions in greenhouse gas emissions to help meet Australia's targets. • ERF projects can store carbon in vegetation or soil, reduce emissions or save energy from manufacturing, commercial buildings, landfill waste, coal mines and transport. • Emissions reductions from ERF projects can be used as emissions offsets. 	<ul style="list-style-type: none"> • 45% emissions reduction on 2005 levels by 2030 - consistent with the advice of the Climate Change Authority. • Net-zero emissions by 2050 consistent with the international agreement to achieve a balance between emissions generated and those offset, sequestered or removed in the second half of this century. • Emissions trading scheme, placing a legal cap on the emissions of large polluters, and supporting industry by ensuring access to international carbon offsets.
Energy	<p>Under the proposed National Energy Guarantee:</p> <ul style="list-style-type: none"> • 28-36% of Australia's electricity would be sourced from renewable sources by 2030. This is not a target. Rather it is what the Energy Security Board expects the National Energy Guarantee would achieve. • The reliability guarantee aspect would start in 2019. This aspect aims to ensure there is enough 'dispatchable' (or on-call) electricity. • The emissions guarantee would only take effect once new investment under the RET scheme finishes in 2020. • The Energy Security Board advised that projects financed by the RET (until 2020) would be 'grandfathered' from 2020 and continue to earn certificates until 2030^{ix}, ^x. • Policy detail is due to be reported to the Council of Australian Government Energy Ministers in August 2018, and there is controversy, with several states wanting stronger emissions targets^{xi}. 	<ul style="list-style-type: none"> • A target of 50% of Australia's electricity sourced from renewable energy by 2030, with an orderly transition from coal-fired generation and support for workers and communities. • Stakeholder consultation to help determine the best policy settings after the 2020 close of the RET for new renewable energy installations and flexibility for the Clean Energy Finance Corporation. • More funding for the Australian Renewable Energy Agency (ARENA) and community renewables projects. • Establishing a Community Power Network. • Commonwealth to lead by example as a direct purchaser of renewable energy. • Doubling Australia's national energy productivity by 2030, through improved energy efficiency^{xii}.

Local government can reduce the gap

The United Nations Emissions Gap Report indicates that global 2020 emissions are likely to be at the high end of the range for limiting global temperature increases to 1.5° - 2°C, and that this will make it difficult to meet the 2030 targets. The report states that regional and local governments and businesses have significant potential to assist in achieving the targets. The population size of Blacktown City and our ongoing development means that our actions are important. Council is well-placed to take a leadership role on addressing climate change.

2.3 NSW's commitment to climate change

NSW aspires to achieving net-zero emissions by 2050, and to making NSW more resilient to a changing climate. NSW Government has budgeted \$1.4 billion for its Climate Change fund, 2017-2022. Of this, \$900 million is for climate resilience and adaptation, and \$500 million is for mitigation. This budget is administered by the Office of Environment and Heritage, and there is potential for some funding to become available to Council through yet-to-be announced competitive grant opportunities^{xiii}

The NSW Government Resource Efficiency Policy came into effect in 2014. It requires NSW Government agencies to:

- incorporate resource-efficiency considerations in all major decisions
- focus on the challenge posed by rising costs for energy, water, clean air and waste management
- seek to leverage their purchasing power when procuring resource-efficient technology and services
- publish annual statements of their performance against the policy.

This policy includes specific targets for water, energy, waste and clean air^{xiv}. The NSW Government has not made the policy mandatory for local government but is considering this for the future.

2.4 Greater Sydney Commission

The Greater Sydney Commission's draft regional and district plans include objectives, directions and planning priorities that relate to Blacktown City and climate change. These plans are:

1. *Our Greater Sydney 2056: A metropolis of three cities – connecting people*^{xv} outlines the vision and objectives of Sydney as a combined Eastern Harbour City, a Central River City based around Parramatta and including Blacktown, and a Western Parkland City stretching from South Creek outward.
2. *Our Greater Sydney 2056: The Revised Draft Central City District Plan*^{xvi} outlines directions and planning priorities for the Central River City's central city district of Blacktown, Cumberland, Parramatta and The Hills.

Table 2 shows how the directions and planning priorities in the revised draft Central City District plan align with relevant objectives of the draft Greater Sydney plan.

Table 3: Alignment of relevant objectives of Greater Sydney Commission plans

Relevant objectives in	Related directions and planning priorities in
<i>Our Greater Sydney 2056: A metropolis of three cities – connecting people</i>	<i>Our Greater Sydney 2056: Revised Draft Central City District Plan</i>
Objective 33: A low-carbon city contributes to net-zero emissions by 2050 and mitigates climate change	Direction: An efficient city – using resources wisely
Objective 34: Energy and water flows are captured, used and re-used	Planning Priority C19: reducing carbon emissions and managing energy, water and waste efficiently
Objective 35: More waste is re-used and recycled to support the development of a circular economy	
Objective 36: people and places adapt to climate change and future shocks and stresses	Direction: a city in its landscape – valuing green spaces and landscape
Objective 37: exposure to natural and urban hazards is reduced	Planning Priority C16: increasing urban tree canopy cover and delivering Green Grid connection
Objective 38: heatwaves and extreme heat are managed	Direction: a resilient city – adapting to a changing world
	Planning priority 20: adapting to the impacts of urban and natural hazards and climate change

2.5 Resilient Sydney

In 2015, following a competitive process, Sydney was accepted into the 100 Resilient Cities program. This is an international program established by the Rockefeller Foundation to support and guide cities building resilience to chronic stresses (e.g. inefficient public transport systems or potential water shortages) and acute shocks (e.g. floods or extreme heatwaves).

Hosted by City of Sydney, Resilient Sydney looks holistically at the systems that keep Sydney working. Energy, health, transport, housing and water, finance, employment and other systems are all considered. Resilient Sydney is a collaboration of organisations planning adaptive ways to overcome or minimise stresses and minimise disruption and danger from shocks. Each of Sydney's local councils, including Blacktown, has a resilience ambassador to represent their area in building Sydney's resilience strategy. There are three phases to building the strategy:

1. Phase I – development of the Preliminary Resilience Assessment – completed.
2. Phase II – development of the Resilient Sydney Strategy – currently in draft.
3. Phase III – implementation of the Resilient Sydney Strategy.

The Preliminary Resilience Assessment identified the key acute shocks that would lead to short-term disruption and stresses that would lead to long-term disruption^{xvii}. Tables 3 and 4 show those that relate to (or could relate to) climate change and that would affect Blacktown City.

Table 4: Key acute shocks and examples related to climate change and Blacktown City

Key acute shocks	Examples
Extreme weather	Heatwaves, storms, flooding and bushfires.
Infrastructure failures	Power outages, which then have flow on effects such as the trains stop running.
Disease pandemic	Which may be caused or exacerbated by increased heat or more intense weather events.
Water crisis – too much or too little	Water shortages during drought periods or floods.

Table 5: Key chronic stresses and examples related to climate change and Blacktown City

Key chronic stresses	Examples related to climate change and Blacktown City
Increasing health services demand	The most directly relevant to climate change, especially where caused or exacerbated by increasing intensity in heatwaves and storms, or bushfire smoke.
Diminishing social cohesion	People may not feel like they could rely on the neighbours to help them in times of difficulty.
Loss of housing affordability	Homeless people are very vulnerable in extreme heat or weather events.
Increasing chronic illnesses	Those with chronic illnesses are particularly vulnerable to heatwaves, affecting them personally and adding demands to the health system.

The report identified that some critical assets were vulnerable. Table 6 shows these assets and Council's sphere of responsibility for each – whether it be control, influence or concern.

Table 6: Critical infrastructure and Council's relationship to each

Critical assets	Council's level of responsibility
Health infrastructure - increased demand from ageing and growing population	Concern
Airports - critical economic links	Concern
Railways - past major network failures	Concern
Wastewater and stormwater - capacity constraints and ageing network polluting the city's waterways	Wastewater - concern Stormwater - control in most circumstances shared control in others - influence and concern
Commercial buildings and structures - interdependencies with city systems	Limited control in some circumstances, influence and concern
Communication networks - criticality of information technology services	Concern
Energy network - strong interdependency for a reliable supply	Concern and the potential for increased direct control and influence
Water supply - limited diversity and availability during droughts.	Influence, concern

Resilience is more than ‘bouncing back’ in the face of shocks or stresses

While resilience can include ‘bouncing back’ to the former status quo, in response to shocks and stresses, it also includes adapting to become stronger in the face of changed circumstances. Plans to build resilience in the face of climate change need to consider a range of factors, including the three-way relationship of:

1. Cities being a major contributor to greenhouse gas emissions.
2. The key climate change threats to urban infrastructure and quality of life.
3. How cities grow and operate matters for energy demand^{xviii}.

2.6 Blacktown City’s commitment to climate change

The context includes our spheres of control, influence and concern

As outlined in *Our Blacktown 2036:Community strategic plan*, we have the following three spheres of influence:

1. Control - strategy areas that are in direct control of local government.
2. Influence - issues that local government does not control but can influence.
3. Concern - areas that local government neither controls nor is likely to influence but are of concern to the community and affect its wellbeing.

Blacktown City would typically use concern and influence indicators to lobby the NSW or Australian Governments or their agencies to address the issues affecting the community.

Our climate change responses have and continue to mainly focus on issues under our control

Council has shown a committed response to climate change from as far back as 2001. In 2011, we adopted a Blacktown Action and Adaptation Plan 2011-2015. The numerous mitigation and adaptation actions were completed.

Council now needs to establish its position in response to emerging technologies and changed global, Australian and NSW commitments to address climate change – as well as to the changing climate, outlined in Section 3. This will include stepping more into our spheres of influence and concern. For example, we will need to lobby NSW Government to improve urban planning policies and legislation to help our growing city adapt to a changing climate.

One option is to join the Global Covenant of Mayors to benchmark with peers

The Global Covenant of Mayors provides a three-year internationally consistent program of actions to assist councils to review, monitor and help manage their city’s greenhouse gas reductions and adaptation to climate change. The three years is counted from when a council joins the program.

In Australia, the International Council for Local Environmental Initiatives (ICLEI) Oceania manages the Global Covenant of Mayors. ICLEI is an association of local governments and local government organisations committed to sustainable development. ICLEI Oceania supports and advises council members that join the Global Covenant of Mayors. Council was a member of ICLEI while we undertook one of its previous programs, Cities for Climate Protection. This ran from 2001-2005, and we successfully achieved all milestones for that program.

3. Climate context

3.1 Our city is especially vulnerable to increased temperatures

While climate change is a global problem, we feel the impacts locally. We expect the number of hot summer days to increase for Western Sydney, and our community is increasingly likely to expect Council to take action to reduce greenhouse gas emissions and prepare ways to cope with climate change.

NSW Government research predicts more days with temperatures above 35°C

NSW Government runs a NSW Climate Change Impact Research Program. The program utilises a climate research partnership between the NSW and ACT Governments and the University of NSW. This partnership delivers NSW and ACT Regional Climate Modelling (NARClIM)^{xix}. NARClIM analysed historic temperature data (1910-2013). Sydney average temperatures have been increasing since about 1960, with higher temperatures occurring in recent decades.

Annually, Sydney averages fewer than 10 hot days (with a maximum temperature above 35°C), but western Sydney averages 10-20 hot days. NARClIM predicts further increases with western Sydney averaging an additional 5-10 hot days during 2020-2039, increasing to more than 10-20 additional hot days per year by 2070. This warming trend is large compared to natural temperature variability^{xx}.

Urban heat islands will be worse in new development areas

Urban heat islands occur where development alters the energy exchange. Fewer vegetated surfaces lead to a decrease in evaporative cooling. Development also changes water flow and absorption, with the increase in surface sealing leading to increases in stormwater runoff. Climate change will amplify these features.

Blacktown City's new growth areas are especially vulnerable to urban heat due to the vegetation clearing and development. NARClIM modelling shows that areas converted from forest and grasslands to new urban developments have the potential to double climate change temperature increases.

Increases in overnight temperatures will be higher in new development areas

Research has quantified the average temperature increases expected across Sydney because of further development. Due to the scale and type of development, the north-west area of our City is especially vulnerable to these increases.

From 1 am until 6 am, daily climate-change affected temperatures are expected to be similar across different land-use types. However, during the morning Sydney will experience increased temperatures due to land-use changes. The most pronounced temperature increases will be where urban land-use has replaced forest and/or grasslands, including at Marsden Park, Riverstone and Vineyard, which were specifically mentioned in the research report. [Development](#) areas are also more likely to retain heat from hot summer afternoons throughout the night^{xxi}.

Key information to plan resilience to the urban heat island effect include:

- land use/land cover changes, including changes in urban greening
- local wind circulation patterns
- choice of building materials including roof colour
- air temperature and land surface temperatures
- presence and strength of the urban heat island and heat waves^{xxii}.

3.2 Impacts of higher temperatures

Increased risks to human health

NARClIM research shows that urban development will affect local climates. The combined temperature increases from climate change and land-use change will affect our community through risks to health, air quality, infrastructure services, productivity and increased energy demand. In summer, higher maximum and minimum (overnight) temperatures affect human health through heat stress and increased numbers of heatwave events. [Prolonged hot days increase the incidence of illness and death – particularly among older people, and those with a pre-existing medical condition or disability.](#)

Increased bushfire danger and adverse impacts on biodiversity and agriculture

NARClIM also predicts considerable climate change effects regarding bushfire danger, infrastructure development and native species diversity. Shorter periods of cold weather and fewer frosts are expected to adversely affect some native plant species.

3.3 Adaptations can reduce the impacts of heat

There are guidelines that we can consider to plan our adaptation measures. The policy brief, *Managing heatwave impacts under climate change* includes actions that:

1. Reduce exposure through lowering the intensity of urban heat islands, e.g. consider heatwaves in urban planning, prioritise shading, plant street trees, utilise free airflow.
2. Increase the resilience of infrastructure, e.g. design infrastructure to operate under heatwave conditions, use fewer heat sensitive materials, upgrade engineering design standards, incorporate passive cooling in new-buildings.
3. Model electricity demand under more frequent heatwaves, then plan for meeting the expected demand.
4. Work with other organisations to help manage peak demand load on the electricity grid.
5. Enhance adaptive capacity to prepare for the impacts of more frequent heatwaves, e.g. develop an integrated, cross-agency heatwave response plan, coordinate with other agencies to support vulnerable members of the community during heatwaves, provide public cool amenities such as swimming pools and air conditioned libraries with extended hours^{xxiii}.

Reduce heat by building with materials that have cooling properties

Urban surfaces receive solar energy made up of 5% ultra-violet (UV) rays, 43% visible light and 52% infra-red radiation, which is felt as heat. The *Guide to Urban Cooling Strategies 2017* outlines the cooling characteristics of certain materials, as summarised in Table 6.

Table 7: Material characteristics that help with cooling

Property	Definition and how it reduces heat
High albedo	<p>Albedo is the proportion of light reflected from a material's surface. A higher albedo (reflectance of light) reduces heat storage.</p> <p>Advantages - Albedo strongly influences the maximum temperature that a material can reach. Adding a high reflectance coating to surfaces can be relatively easy and cost-effective. High albedo, light-coloured surfaces can reflect more than 75% of solar radiation.</p> <p>Disadvantages - design care must be taken to ensure that:</p> <ul style="list-style-type: none"> the reflected heat will escape the localised environment rather than be captured and stored in other materials and buildings the light being reflected does not create a glare hazard, e.g. for drivers or occupants of nearby buildings.
High emissivity or emittance	<p>Emissivity (or emittance) is the amount of heat radiated from a material at a given temperature, measured as a ratio of heat radiated from a theoretical standard 'black body'.</p> <p>Exposed to radiant energy, all materials heat up until they reach thermal balance with their surrounds. A high emittance material reaches that balance at a lower temperature, meaning that it gives away its heat more readily.</p>
Permeable pavements	<p>Conventional asphalt and concrete are almost impermeable, and do not facilitate water flow. Permeable (porous) surfaces enable water to drain into the soil underneath, where it is stored, and later provides evaporative cooling when the weather heats up. Evaporative cooling from permeable surfaces may decrease the surface temperature by up to 20°C.</p>

Use high albedo and high emissivity to achieve cool roofs and save energy

Typical roof surfaces can reach 50–90°C on a hot day, causing significant stress to occupants, roofing materials, urban microclimates, and air conditioning, and increasing energy demand. Using high albedo and high emittance roofing materials and white or light coloured roofs^{xxiv} can radiate away up to 75% of the visible light and infra-red solar energy (heat) received from the sun.

Cool roofs can be relatively cheap, fast and effective options but have drawbacks. They can save 18-34% energy for air conditioning in summer, but may need an additional 10% energy for winter heating. They are not suitable in all situations, as the reflected and emitted heat can get trapped in built environments – especially in dense urban settings with tall buildings.

There several effective strategies for cooling Blacktown City's built environment

The *Guide To Urban Cooling Strategies 2017* lists a range of cooling actions based on their effectiveness in Western Sydney, as shown below.

Table 8: Effective strategies for cooling

High effectiveness (in no particular order)
Cool paving <ul style="list-style-type: none">• high emittance paving• permeable paving.
Cool envelope – i.e. surface treatment or covering <ul style="list-style-type: none">• high albedo (including using the colour white) envelope - roof• high emittance envelope - roof and wall.
Green infrastructure - i.e. growing vegetation as a covering <ul style="list-style-type: none">• living walls.
Water sensitive urban design - i.e. effective stormwater management incorporating 'blue' (water) and 'green' (vegetation) into the landscape: <ul style="list-style-type: none">• green roofs and green walls• bio-retention systems (e.g. rain gardens, swales, street tree pits)• wetlands• stormwater harvesting.
Tree canopy
Evaporative cooling <ul style="list-style-type: none">• surface water and evaporative cooling• misting fan – which provides a mist of ultra-fine water droplets to cool a specific area in an outdoor setting.
Shading structures
Low effectiveness
<ul style="list-style-type: none">• high albedo paving• high albedo wall

Contextual considerations are important when choosing cooling options

Each situation is different and needs contextual analysis. Examples include:

- Green walls - the level and type of maintenance would need to be considered. If trucks are to be used for the maintenance, the transport emissions should be considered.
- Green roofs – the structural suitability of the particular building for holding the weight of the soil, plants and other additions for the green roof.

We need to increase vegetation and canopy cover

Plants, especially trees, provide shade and 'evapotranspiration' - the natural process of drawing water from soil and then losing some of that water as vapour into the atmosphere. In parks, combining tree canopy and natural turfs cuts radiant surface temperatures by 5°-10°C and reduces air temperature 1°-2°C.

The *Guide to Urban Cooling Strategies 2017* estimates that a 10% increase in urban tree coverage in Australian cities would give 15°C surface temperature reductions in relevant areas due to shading, and a 1.5°C urban heat island reduction at precinct scale.

The cooling effects of parks and reserves depend on vegetation type, coverage and availability of water. Parks with moderate tree coverage and reliance on natural precipitation are less effective because their highest cooling capacity occurs several hours after sunset, i.e. after the time when the heat island effect is strongest. Parks with dense tree canopies and/or significant water supply reach their maximum cooling capacity when most needed, during the afternoon^{xxv}.

Tree canopy cover in streets, parks, reserves and on privately owned land helps to reduce the urban heat island effect. Blacktown City has canopy coverage of just below 20 per cent. Along with Fairfield, Liverpool, Penrith and Camden, Blacktown has high proportions of grass-bare ground and lower proportions of hard surface compared with other Sydney areas^{xxvi}. This indicates further potential for planting.

Increase of blue-green landscapes through water sensitive urban design

Water is key for many of the cooling effects. Water sensitive urban design helps to efficiently use and re-use water, with less reliance on the potable (drinking quality) water supply.

Water sensitive urban design:

- includes green walls, green roofs, bio-retention systems, wetlands and stormwater harvesting
- effectively manages stormwater to improve the health of creeks and rivers
- often includes vegetation
- can help mitigate urban heat, as more 'blue' (water) and 'green' (vegetation) is introduced into our landscape. In the heat of the day, some water bodies can be 20°C cooler than urban surfaces.

While synthetic grass for sporting fields may reduce the need for irrigation, it is not permeable, is not recyclable at the end of its usable life and exacerbates heat, with researchers showing that it can reach up to 70°C on a hot, sunny day^{xxvii}. Stormwater harvesting to irrigate natural grass can be a better alternative.

Green star rating tools help emissions reduction and adaptation to climate change

The Green Building Council focuses on sustainability practice in the design, building and ongoing performance of new precinct developments and buildings. It has four rating systems, one each for: precinct developments (called 'Green Star – communities'), building performance, interiors, and new buildings (called the 'Design and As Built' rating). For all of these, a five Green Star rating indicates 'Australian excellence' and six stars indicate 'world leadership' in sustainability practice. Each of the four rating systems includes a range of assessment criteria. Example criteria for Design and As Built are 'implementation of a climate adaptation plan', 'ecological value', 'heat island effect reduction' and 'stormwater pollution targets'^{xxviii}.

The use of Green Star ratings for Council's new buildings and to incorporate cooling strategies, including increases in vegetation and canopy coverage, are factored into the implementation actions in Section 5.2.

3.4 Additional likely impacts from climate change

Planning for infrastructure design and maintenance needs to include elements to cope with a broad range of climate impacts.

More dry weather

In addition to warming, it is expected that there will be increased drying in southern areas of Australia, especially in winter, and in southern and eastern areas in spring. Decreased rainfall, and increases in drought conditions affect amenity, e.g. dry out sporting fields, stress vegetation and cause biodiversity changes. Stormwater harvesting and reuse schemes help combat drought and protect nature reserves and sporting fields.

When it does rain, it will be more intense, increasing flood risks

When it does rain, it is likely that the rainfall will be more intense^{xxix}, with increased frequency of thunderstorm days^{xxx}.

More intense rainfall increases the chances of property and infrastructure damage, displacement of residents, flash flooding, and overflow of contaminants. Increases in storms further raise the chances of disruptions to communications and power supplies.

Potential risks to insurance affordability

If increases in extreme weather combine with reduced confidence in the way climate change adaptation is being managed, insurance premiums will become more costly for Council, businesses and households^{xxxi}.

Increased risks for Council road assets and infrastructure

Blacktown City Council is responsible for 1,290 kilometres of local roads and hosts 87 kilometres of regional roads. One potential climate risk is increased flooding when intense rainfall causes stormwater and other infrastructure overload. This can lead to road damage, washouts and collapse. Additionally, higher temperatures cause more cracking in bitumen and asphalt road seals. Once water gets into the cracks, roads deteriorate rapidly, increasing maintenance costs and local disruption^{xxxii}.

4. Current situation - impacts and trends of Council operations

4.1 Council's greenhouse gas emissions

Council operations cause direct and indirect emissions

Since 2005, we have engaged consultant Planet Footprint to use our electricity and gas bills and fuel use data to calculate our carbon emissions. This gives us robust information on the levels of greenhouse gases emitted as a direct result of Council's energy use. However, it does not cover emissions from goods and services we procure that are not related to fuel, electricity and gas.

Accounting for our greenhouse gas emissions - boundary and scopes

Carbon accounting is an internationally and nationally recognised system of calculating greenhouse gas emissions. It requires a clear organisation boundary. In line with the National Carbon Offset

Standard, we use ‘operational control’ as our boundary. This is defined as including the areas over which we have ‘the full authority to introduce and implement operating policies’^{xxxiii}.

Carbon accounts are divided into three scopes to prevent double counting across the economy

Planet Footprint has been accounting for our emissions in the following way:

- Scope 1 includes emissions from fuel that we burn directly, e.g. mains gas and vehicle fuels.
- Scope 2 includes our grid-sourced electricity and street lighting.
- Scope 3 includes emissions related to the delivery of our energy and fuels. The main examples are emissions from transmission loss along the power lines to us, and from the fuel transport trucks delivering our fuel.

We also have other Scope 3 emissions, which are not monitored by Planet Footprint

These are the supply chain emissions from all other goods and services we purchase. We do not know these, and have little direct control over them, except through setting procurement requirements. Therefore, they are difficult to measure and to control.

Many of our Scope 3 emissions may be monitored and reported by others in the supply chain. This is because large organisations whose Scope 1 and 2 emissions annually exceed 25 kilo-tonnes (kt) of CO₂-e need to report their Scope 1 and Scope 2 emissions under Australia’s National Greenhouse and Energy Reporting Act 2007. We are not a liable entity under this Act.

There are ways to reduce our Scope 3 emissions

We can increase opportunities for reducing our Scope 3 emissions by considering them during procurement. Examples include:

- ensuring the durability of goods purchased, to reduce need for replacement with newly manufactured goods
- purchasing local goods and services, which reduces transport related emissions as well as supports the local economy
- supporting the ‘circular economy’ by purchasing goods produced from recycled materials, or that include recycled content. Recycling reduces emissions because it does not rely on the initial extraction of natural resources – which is often emissions-intensive.

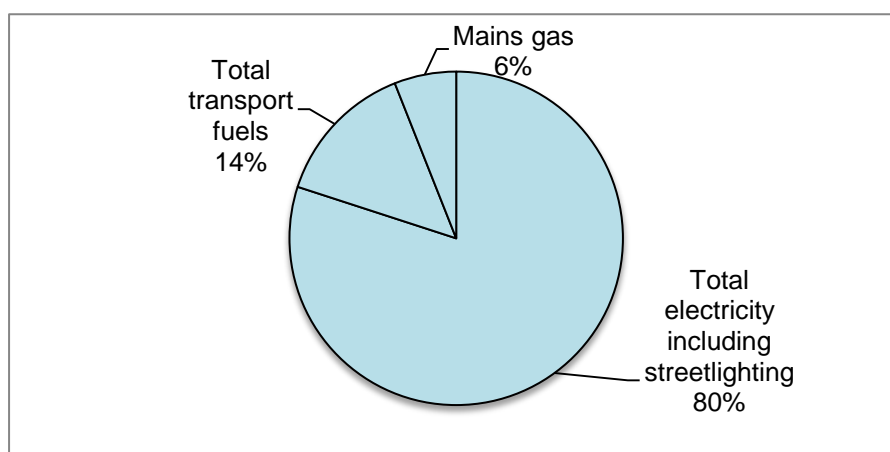
Scopes 1 and 2 Council’s known greenhouse gas emissions

In 2016/17, Council’s emissions from street lighting and operational electricity, fuels and mains gas totalled 36,642 tonnes of carbon dioxide equivalent (t/CO₂-e). This includes the supply chain emissions from delivering the energy to us, such as generating the electricity that was then lost during transmission to us, and emissions from the fuel used by tankers to deliver our fuels. If we do not make changes, these greenhouse gas emissions will increase with our growth.

As shown in Figure 1, of the 36,642 t/CO₂-e, just over 80% relates to electricity (including street lighting), almost 14% relates to fuel and nearly 6% is from mains gas.

Figure 1:

Council's 2016/17 known greenhouse gas emissions from electricity, fuels and mains gas



We can reduce these known greenhouse gas emissions as they are in our direct control

We control our procurement of electricity, fuels and gas, and we receive bills itemising the amounts consumed. This gives us the ability to make changes that will reduce or even eliminate these direct greenhouse gas emissions over time.

Council's best opportunity for reducing these known emissions: purchased electricity

Purchased electricity has long been Council's largest contributor to greenhouse gas emissions. Increasing energy efficiency, adding more on-site solar photovoltaic electricity generation and changing our way of sourcing electricity offers the greatest opportunity.

Improving energy efficiency and adding more on-site solar generation would reduce our reliance on purchased electricity, lowering costs and emissions. We engaged Ironbark Sustainability to provide a business case, *Energy Efficiency and Renewables Program Summary and Plan*.

Transitioning our electricity procurement to renewable energy would reduce our known greenhouse gas emissions by 80%. We engaged the University of Technology Sydney's Institute for Sustainable Futures to investigate the options for doing this. The Institute's investigation *Blacktown Council 100% Renewables Options* details the risks, opportunities and costs for a range of options. We wrote our policy and strategy at the same time to ensure that we could be realistic about our ability to reach any emission targets we set.

Our Council emissions target is cost-effective, realistic and achievable.

Policy commitment 1 is reaching net-zero emissions from the electricity, fuel and gas we use in our operations by 2030. Electricity, fuel and gas are the sources of greenhouse gas emissions over which we have the most direct control. The target takes account of the factors outlined below.

Electricity and gas

Moving to 100% renewable electricity would eliminate the 80% (29,314 t/CO₂-e) of our direct emissions from the electricity we purchase for operations and street lighting.

By adopting a transition to renewable electricity for the upcoming contracts we will meet this target quickly. The length of time needed would depend on which of the renewable electricity options Council adopted.

A quick transition could be financially beneficial. We understand that if we replaced our current large site and street lighting contracts with similar ones (using largely coal-powered electricity) the price would jump from 15 cents to 23 cents per kilowatt hour.

Moving from gas to heat pumps that use renewable electricity for our pools would eliminate most of the remaining 6% (a little over 2,000 t/CO₂-e) of our current direct emissions.

Fuel

Moving to electric and/or hydrogen vehicles would eliminate the 14% (a little over 5,000 t/CO₂-e) of our current direct emissions that relate to fuel. This relies on appropriate technology becoming available, so we plan a staged transition. We cannot be sure how long the transition will take. We may still have fuel emissions in 2030. We could purposely generate more electricity than we need – and use the excess generation to offset our fuel emissions. We could do this by ‘retiring’ (not selling) the Large Scale Energy Certificates created by the additional renewable energy.

Part 2: Implementation actions

5. Action plan

5.1 Policy commitments and implementation

This section outlines the actions we will take to meet the following commitments in Council's policy, *Responding to climate change*.

Policy commitment 1

Achieve net-zero emissions from the electricity, fuel and gas we use in our operations by 2030.

Policy commitment 2

Adopt best practice to:

- a. mitigate the impacts of urban heat in our operations, own new assets and buildings, and when undertaking major facility upgrades
- b. minimise potable water use in our operations and implement effective stormwater management through water sensitive urban design

Policy commitment 3

Assist our community to reduce greenhouse gas emissions and build resilience to climate change, including through:

- a. working with the NSW Government to achieve best practice reductions in greenhouse gas emissions, potable water use and urban heat impacts via our urban planning instruments
- b. increasing tree canopy cover and vegetation in streets and reserves
- c. providing appropriate public places and systems to create refuges from extreme heat for vulnerable residents.

Actions align with Delivery Program actions

The actions contribute toward the Community Strategic Plan *Our Blacktown 2036*, especially the following *Strategic Directions*:

1. A vibrant and inclusive community.
2. A clean, sustainable and healthy environment.
4. A growing city supported by accessible infrastructure.

The action tables to follow focus on the current Delivery Program, and the years 2018 – 2021. Some actions lay foundations for further work in the future.

Reporting aligns with Delivery Program and Annual reports

Many of this strategy's actions contribute to the Community Strategic Plan's focus area and goal actions, which are reported quarterly and then provided in the Annual and End of Term reports.

Actions requiring additional funds will be reported to Council with cost/benefit business cases for consideration.

To continue the corporate integration of this policy strategy, the Environment section will:

- review this policy and strategy in line with 4-yearly delivery programs
- report a summary of the progress of major actions to Council annually
- provide regular updates to EMC via the Major Council Environmental Initiatives Steering Group
- Part 2, implementation actions will be reviewed and updated annually in line with the Operational Plan.

A guide to the action tables

- Each of the three policy commitments has a list of required actions.
- While various sections across Council will be responsible for building resilience and reducing greenhouse gases, the table shows only the Manager or Director who will lead and report on each action.

Policy commitment 1

Achieve net-zero emissions from the electricity, fuel and gas we use in our operations by 2030.

<p>Links to Community Strategic Plan</p> <p>Strategic Direction 2: A clean, sustainable and healthy environment</p> <ul style="list-style-type: none"> 5.1.1 Monitor Council's energy usage 5.1.3 Source funding opportunities for energy and water efficiency programs 5.2.1 Assess building projects to identify and propose any economical and environmentally sustainable projects that could benefit new and existing facilities and assets <p>Strategic Direction 6: A leading city</p> <ul style="list-style-type: none"> 7.1.1 Incorporate the adopted Quadruple Bottom Line (QBL) framework in Council's reporting and decision-making <p>Key indicators:</p> <ul style="list-style-type: none"> Greenhouse gas emissions (Council operations) Total electricity consumption (Council operations) Fuel consumption (Council operations) 	
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No.	Action	Target/timeframe	Rationale	Manager Director	Funding, with estimates where additional funds are required
1a.i	Energy efficiency upgrades to Council assets and onsite solar PV installations.	2018 -2021	Improves efficiency, saves electricity, gas, costs and greenhouse gas emissions and reduces our reliance on procured electricity. Our electricity and gas contracts end in 2019, so we will need to decide on pathways forward in 2018.	Plant and Energy	i. and ii. Estimated total is \$9 million. Business cases for items 1a.i. 1a.ii., and 1a.iii. are being reported through a separate report to Council.
1a.ii	Energy efficiency upgrades to street lighting.	2018 -2021			

No.	Action	Target/timeframe	Rationale	Manager Director	Funding, with estimates where additional funds are required
1a.iii	Investigate the staged transition of Rooty Hill Depot operations to become net-zero emissions.	2018 -2021	<p>iii. Addresses emissions from our use of transport fuels. We will consider emerging technologies (e.g. hydrogen as a fuel source) and infrastructure (e.g. electric vehicle recharging stations powered by renewable electricity).</p> <p>We expect to take a staged approach, e.g. increasing our percentage of electric, hybrid and hydrogen vehicles.</p>		<p>1a.iii. Ongoing cost/benefit to be calculated as each technology change becomes available.</p>
1b	Source and use electricity exclusively from renewable sources.	2018-2025	<p>Replacing our current electricity purchasing contracts with contracts specifying renewable electricity would eliminate our emissions from electricity.</p> <p>Details in <i>Blacktown Council 100% Renewables Options</i> report (University of Technology's Institute for Sustainable Futures).</p>	Plant and Energy	<p>Depends on option selected from the <i>Renewables Options</i> report. Rather than needing additional capital, this action could be achieved through a new Power Purchasing Agreement.</p>
1c	Investigate software and options for optimising the routing of Council's heavy vehicles.	2018-2019	Findings from the Fleet Better Practice Review and route optimisation research undertaken in a partnership with Western Sydney University showed strong potential for savings in fuel and greenhouse gases.	Plant and Energy	<p>The initial investigation can be funded by existing operational budgets.</p> <p>Cost/benefit for each option to be considered as part of the investigation.</p>

No.	Action	Target/timeframe	Rationale	Manager Director	Funding, with estimates where additional funds are required
1d	Develop or purchase a quadruple bottom line (QBL) assessment method and interactive tool to compare and prioritise various energy projects.	2018-2019	Make decision-making more rigorous and transparent with a tool that can be modified for projects as required.	Plant and Energy	Energy and Water Reserve.
1e	Training for relevant managers of Council sites to use the Planet Footprint software to monitor electricity, gas and water usage.	2018-2019	Assist asset managers to be responsible and accountable for: <ul style="list-style-type: none"> • monitoring energy and water use at their sites • reporting anomalies. Increasing accountability will provide an incentive to reduce water and energy and help identify anomalies and problems (e.g. water leaks) much quicker.	Plant and Energy	Existing operational budgets.
1f	Update Planet Footprint database to include the relevant site managers, and support site managers to increase energy and water efficiency.	2018-19	To give asset managers and their staff the means to monitor their water and energy use and improve efficiency.	Environment	Existing operational budgets.
1g	Engage staff in an energy-efficiency drive through promotion of information and staff competitions.	2018-2019	Engage staff in ways to save energy and normalise energy saving actions, e.g. switching off computers at the end of each working day.	Environment Plant and Energy	Existing operational budgets.
1h	Require a minimum five-star Green Star rating for all new Council buildings (and aim for six stars where feasible).	2018-2019 and on-going	This will ensure that our new buildings minimise use of potable water and energy (and costs), and are competitive for future leasing or sale.	City Architect Plant and Energy	Existing operational budgets.

No.	Action	Target/timeframe	Rationale	Manager Director	Funding, with estimates where additional funds are required
1i	Investigate alignment of this strategy with the NSW Government Resource Efficiency Policy targets.	2018-2019	Identify improvements that we could make - in line with this NSW Government policy should it become mandatory for local government.	Environment	Existing operational budgets.
1j	Review and update procurement manual to incorporate ways to reduce greenhouse gas emissions.	2018-2019	Reduce our Scope 3 supply chain greenhouse gas emissions, demonstrate Council's commitment, show Council leadership in the market and help support the circular economy.	Environment	Review and update through existing operational budgets. Cost-benefit analysis to be calculated for individual projects.
1k	Explore options for reviewing the environmental considerations of Council purchases greater than \$100,000.	2018-2019 and ongoing	Projects with little or no environmental impact will be exempted.	Environment	Existing operational budgets.
1l	Where possible and feasible for building upgrades, use energy and water efficiency options above the standard required by the National Construction Code.	2018-19 and ongoing	Reduce long-term running and maintenance costs and improve adaptation to climate change.	Building Construction and Maintenance	As needed, from the relevant staff budgets or Energy and Water Reserve.
1m	Maintain membership with Green Building Council of Australia.	2018-2021	The Green Building Council of Australia provides ongoing information and training opportunities to members, and advice on meeting its Green Star ratings.	Environment	Energy and Water Reserve.
1n	Provide relevant staff training with the Green Building Council.	2018-on-going	Ongoing professional development will build continuous improvement in energy and water efficiency and sustainability.	Environment	Existing operational budgets.

No.	Action	Target/timeframe	Rationale	Manager Director	Funding, with estimates where additional funds are required
1o	Investigate pricing leaseback vehicles to reward staff choosing lower emission vehicles.	2018-2019	Reducing leaseback fleet emissions and enhancing sustainability culture among staff.	Environment	Energy and Water Reserve.
1p	Following outcomes of the Fleet Better Practice Review, improve fuel efficiency in the leaseback fleet, and support the transition of the fleet to run on renewable energy.	2018-2030	Assist in our transition to more fuel efficient technologies and options.	Environment	Existing operational budgets.
1q	Engage a consultant to undertake a comprehensive greenhouse gas emissions assessment.	2018-2019	As Planet Footprint provides our Scope 1 and 2 calculations, the main focus would be Scope 3. This assessment would help us understand our supply chain emissions 'exposure' and inform actions to reduce it.	Environment	Energy and Water Reserve.

Policy commitment 2

Adopt best practice to:

- a. mitigate the impacts of urban heat in our operations, own new assets and buildings, and when undertaking major facility upgrades
- b. minimise potable water use in our operations and implement effective stormwater management through water sensitive urban design.

Links to Community Strategic Plan	
Strategic Direction 2: A clean, sustainable and healthy environment	
<ul style="list-style-type: none"> 3.2.1 Promote innovation by Council in sustainable water management and best practice projects 4.2.1 Improve the urban forest 5.2.1 Assess building projects to identify and propose any economical and environmentally sustainable projects that could benefit new and existing facilities and assets 6.1.1 Deliver the Blacktown Climate Adaption Plan 	
Key indicators:	
<ul style="list-style-type: none"> Total potable water consumption (Council operations) Stormwater harvesting (Council operations) 	

No.	Action	Target/timeframe	Rationale	Manager Director	Funding, with estimates where additional funds are required
2a	Establish and follow best practice design requirements that use permeable surfaces, 'cool materials' and vegetation to mitigate the impacts of urban heat in new Council assets, and during major upgrades.	2018-2020	These strategies are effective in reducing local urban heat (pages 13-17).	City Architect	Cost benefit needs to be considered for each new project.
2bi	Develop an integrated water management strategy (IWMs) to include targets for: 1. Potable (drinking quality) water reductions	2018-2019	As weather becomes drier and temperatures rise, we will need increasing levels of water for urban heat mitigation actions. These include tree planting, maintenance, evapotranspiration and evaporative cooling (pages 13-17).	Asset Design	Development of the strategy from within existing operational budgets.

No.	Action	Target/timeframe	Rationale	Manager Director	Funding, with estimates where additional funds are required
	2. Effective stormwater management. Strategy to include water sensitive urban design and water reuse options, i.e. stormwater harvesting so that potable water reductions and stormwater targets can be met.		Introducing water savings targets – for both potable water and re-use schemes - will help us improve water use efficiency. The aim of an integrated plan is to minimise water usage for maximum effect. Reduced use of potable water will help decrease our Scope 3 (supply chain) emissions – as greenhouse gas emissions from pumping Sydney Water are counted in Scope 3.		Individual project cost benefit analysis to be included in the strategy.
2bii	Develop a maintenance and operation plan for all existing and new rainwater harvesting and reuse systems on Council buildings.	2019-2020	Assist us in achieving Objective 34 and Planning Priority C19 in the Greater Sydney Commission's <i>Our Greater Sydney 2056: Revised Draft Central City District Plan</i> (summarised on pages 8-9).	Building Construction and Maintenance	Existing operational budget.

Policy commitment 3

Assist our community to reduce greenhouse gas emissions and build resilience to climate change, including through:

- a. working with the NSW Government to achieve best practice reductions in greenhouse gas emissions, potable water use and urban heat impacts via our urban planning instruments
- b. increasing tree canopy cover and vegetation in streets and reserves
- c. providing appropriate public places and systems to create refuges from extreme heat for vulnerable residents.

Links to Community Strategic Plan
Strategic Direction 2 <ul style="list-style-type: none">1.1.3 Deliver environmental engagement activities that respond to community needs1.1.5 Encourage community participation in national environmental events4.2.1 Improve the urban forest by ensuring trees planted in streets and parks are greater than those removed4.2.3 Implement a City-wide approach to tree preservation6.1.1 Deliver the Blacktown Climate Adaption Plan6.1.2 Increase the community's involvement and understanding of the impacts of climate change
Strategic Direction 4 <ul style="list-style-type: none">1.1.3 Provide input to ongoing review of Council's Development Control Plan and propose improved design quality outcomes for future development1.4.1 Negotiate new and amend existing voluntary planning agreements1.5.1 Work with Department of Planning and Environment to prepare precinct plans for Marsden Park, North and West Schofields
Key indicators: <ul style="list-style-type: none">Total potable water consumption (Council operations)Stormwater harvesting (Council operations)Stormwater harvesting (Council operations)

No.	Action	Target/timeframe	Rationale	Manager Director	Funding, with estimates where additional funds are required
3a	Research and develop an urban planning strategy that helps to reduce urban heat and its impacts.	2018-2019	<p>Urban heat is our highest climate change risk and challenge. Evidence indicates that levels of urban heat will rise especially in new development areas (page 12).</p> <p>The proposed strategy will include working with the NSW Department of Planning and Environment, the Greater Sydney Commission and WSROC to identify and undertake planning policy and instrument changes to reduce urban heat. The aim is to come up with workable and practical solutions that can be easily implemented either by Council and/or developers.</p> <p>One of the barriers to improved energy efficiency and renewable energy is lack of independent, credible and practical information for consumers and businesses. This action aims to help provide this information.</p>	Environment collaborating with Strategic Planning, Development Policy and Development Assessment	Existing operational budget.
3b	Engage with and educate the community and local businesses on practical, low emissions energy options.	2018-2019 and ongoing		Environment	Existing operational budget.
3b.i.	<p>Join the Global Covenant of Mayors for Climate and Energy to:</p> <ul style="list-style-type: none"> Undertake a Blacktown City wide inventory of greenhouse gas emissions. Develop a Blacktown City-wide greenhouse gas reduction target and a plan for meeting the target. Commence implementing the plan in 2020. Undertake a detailed climate risk assessment for the City by 2020. 	2018-2021	<p>The inventory will:</p> <ul style="list-style-type: none"> help us to better understand our City's emissions, the main opportunities for reductions, and offer guidance for policy and planning comply with the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories. This will benchmark us over time and against comparable cities. <p>The program will:</p> <ul style="list-style-type: none"> provide a strong basis for engaging our community inform our Sustainable Living workshops provide more leverage to compete for possible future grants. 	Environment	Existing operational budget.

No.	Action	Target/timeframe	Rationale	Manager Director	Funding, with estimates where additional funds are required
	<ul style="list-style-type: none"> Develop a city-wide action plan for building resilience and adaptation to climate change. Commence implementing the resilience and adaptation action plan. 				
3b.ii	Continuing flood risk assessment for major catchments where this has not occurred, e.g. South Creek, Upper Parramatta River Catchments, Second Ponds Creek - to determine key hotspots and develop a strategy to reduce risks.	2018-2019	<p>We largely mitigate flood risk in the 'greenfield' areas through planning that takes account of topography and water flow. Planning processes for the older urban developments had lesser consideration for flooding risks.</p> <p>Older urban areas have stormwater systems that are likely to be undersized when considering the increased rainfall intensities linked to climate change. This may result in more localised overland flooding. Flood risk assessment informs our strategy for infrastructure upgrades to mitigate flood risk.</p> <p>Outcomes from this assessment will also inform the resilience and adaptation plan.</p>	Asset Design	Existing operational budget.
3b.iii	Purchase an online tool to estimate the potential for electricity generation from photovoltaic on building roofs – for use by residents, developers, businesses and Council.	2018-2019	The purchase includes the software developers integrating their unique tool with GIS mapping of Blacktown City.	Environment	<p>Initial mapping fee to launch the tool \$14,860.</p> <p>Ongoing annual hosting and maintenance fees \$5,000.</p>

No.	Action	Target/timeframe	Rationale	Manager Director	Funding, with estimates where additional funds are required
3c.i	Develop a City-wide tree strategy.	2019-2020	Staff have identified the need for an overarching approach to the City's trees to maximise the sustainability of our tree investments and create a legacy of green infrastructure to cool and beautify the City. The strategy will combine design, planning, planting and maintenance.	Open Space Maintenance	\$80,000.
3c.ii	Continue to increase tree canopy cover through the <i>Eyes on Blacktown</i> program.	2018-2019 ongoing	Trees provide cooling for their local environments (as summarised on page 12 in this document). Trees also offer biodiversity, air quality and aesthetic improvements and increases in property values for an area.	Recreation Planning and Design	Existing operational budget.
3c.iii	Continue with the street tree planting, maintenance and green screen programs.	2018-2019 ongoing		Open Space Maintenance	Existing operational budget.

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