# Sustainability

Gardens on the weekend as memories of children, St Ives by Anna Carter

# 4 - Sustainability

## **Open Space Network**

#### Ku-ring-gai Local Planning Priority

K27. Ensuring the provision of sufficient open space to meet the need of a growing and changing community

#### BACKGROUND

The Ku-ring-gai local government area has 3,356 hectares of open space, including the following:

- 1747 hectares of bushland within three local national parks;
- 1151 hectares of natural areas;
- 98 hectares of parkland and gardens;
- 116 hectares of sportsgrounds;
- 68 hectares of Council owned golf course; and
- 176 hectares of drainage reserve.

Planning for open space in Ku-ring-gai to date has been based on the following strategies and studies:

- Ku-ring-gai Open Space Strategy, 2005
- Ku-ring-gai Open Space Acquisition Strategy, 2006
- Ku-ring-gai Contributions Plan, 2010

The Open Space Strategy, 2005 found the following issues for open space planning:

- the LGA has a generous supply of environmentally significant open space; with national parks and Councilmanaged reserves constituting the majority of Ku-ringgai's greenspace. While these areas are a valuable resource, they do not fulfil all the open space needs of residents as they are not accessible to all members of the community and recreation potential is limited due to topography and environmental sensitivities;
- the provision of sportsgrounds is comparative to the traditional standards, however, sports club demands and levels of use indicate that there are insufficient facilities to meet present and anticipated future needs;
- the provision of local parkland across the LGA is low when compared to traditional standards;
- there are inequities in parkland provision across the LGA with particularly low per capita provision in Lindfield, Gordon and Roseville;

- about one third of parks are less than 0.2 hectares in size which limits the provision of a diversity of recreation opportunities;
- due to these distributional inequities and the limited size of many parks a significant proportion of the residences are not adequately serviced by high quality local parkland;
- about three-quarters of properties across the LGA are within walking distance of a park; this proportion varies across the LGA with Gordon and Roseville having the highest proportion of houses outside a park service area; and
- there are significant barriers to park access in Ku-ringgai; the most significant being the Pacific Highway, the rail corridor and the topography (valleys, bushland, creeks etc).

In response to the shortfall in the provision of local parkland identified in the Open Space Strategy, Council prepared two key documents:

- Ku-ring-gai Open Space Acquisition Strategy, 2006 (OSAS); and
- Ku-ring-gai Contributions Plan 2010.

The OSAS establishes a series of principles for acquisition of open space and identifies priority areas for acquisition based on existing quantum of open space and projected population growth. The Figure 4-1 shows the priority areas for land acquisition identified in the OSAS where red and orange represent priority 1-3 (highest priority) and other colours represent priority 4-6 (lowest priority). Figure 4-2 shows the current status of Council's acquisition program including new or proposed parks. Notable is the reduction in priority 1-3 ranked areas.

#### **BACKGROUND (CONT.)**

In 2010, Council adopted the Ku-ring-gai Contributions Plan 2010 which seeks to maintain baseline rates of provision of local open space parkland within the local government area. The plan establishes:

- causal nexus between new development and the demand for additional open space;
- causal nexus between new development and the demand for the embellishment of existing open space; and
- geographic and temporal nexus requirements that ensures provision of strategically located open space and civic spaces on a rolling program of acquisition.

The Ku-ring-gai Contributions Plan 2010 allows Council to acquire and deliver over 50,000sqm of new local parks and civic spaces within close proximity to high density residential areas in Ku-ring-gai over the next 20 years. Since 2010, Council has been actively acquiring land and converting the land to new parks. To date Council has created, or is in the process of creating, over 23,000sqm of new parks and civic spaces.

- New parklands that have been delivered and opened to the public so far include:
- Balcombe Park, Wahroonga (900m<sup>2</sup>);
- Curtilage Park, Warrawee (2,000m<sup>2</sup>);
- Greengate Park, Killara (2,600m<sup>2</sup>);
- Cameron Park extension, Turramurra (2,600m<sup>2</sup>); and
- Lapwing Reserve, St Ives (1,900m<sup>2</sup>).

#### New parks currently in the design or acquisition phase include:

- Allan Avenue Reserve, Turramurra (2,700m<sup>2</sup>);
- Lindfield Village Hub Park, Lindfield (3,500m<sup>2</sup>);
- Lindfield Village Green (3,000m<sup>2</sup>);
- Bedes Forest Reserve extension, St Ives (3,000m<sup>2</sup>); and
- Dumaresq Street Park, Gordon (3,500m<sup>2</sup>).

#### STRATEGIC RESPONSE

Significant progress has been made since 2010 in terms of creating new parks; at this point in time Council is just over halfway through the delivery program set out in the Ku-ring-gai Contributions Plan 2010. It is now timely to take stock and undertake a review of our baseline position. Council last prepared an Open Space Strategy in 2005 and considerable change has happened over that time particularly in relation to population growth, acquisitions and policy settings.

The revised Open Space Strategy will provide the overarching framework and strategic direction for public open space planning in Ku-ring-gai for the next 15-20 years. The Strategy will include consideration of the forecast population change and provide the strategic basis for amendments to Council's development contribution plans to fund ongoing land acquisition and upgrades to existing open space areas.

Supporting the Strategy will be technical research, definitions, analysis and recommendations including consideration of standards for provision of open space; assessment of the quantity and distribution of open space; and key drivers for open space planning in the future. Detailed analysis of areas and precincts with identified gaps in open space provision will also be undertaken to identify potential locations for new parks.

The Strategy will also integrate planning for future open space and recreation needs with Council's existing state government policies and council policies including the Open Space Acquisition Strategy, draft Recreation in Natural Areas Strategy, draft Playground Strategy, and Ku-ring-gai Bicycle Plan among others.

Figure 4-3 Open Space Network outlines where new urban parks and civic spaces are proposed, where new sportsfields are located and areas where there is a gap in the provision of open space based on current housing supply.



Figure 4-1 Ku-ring-gai Open Space Acquisition Program – 2006 Priority Acquisition Areas



Figure 4-2 Ku-ring-gai Open Space Acquisition Program – Implementation Status – May 2018

# **Open Space Network - Ku-ring-gai Local Planning Priority and Actions**

	Ku-ring-gai Local Planning Priority K27. Ensuring the provision of sufficient open space to meet the need of a growing and changing community
	Actions
Ku-ring-gai Council	<ul> <li>Prepare a revised Open Space Strategy that will provide the overarching framework and strategic direction for public open space planning in Ku-ring- gai for the next 15-20 years. This strategy will be integrated with sport and recreation needs studies (refer K17 - K20) (medium term).</li> </ul>
	Undertake detailed analysis of areas and precincts with identified gaps in open space provision for potential locations for new parks (short term).
	<ul> <li>Integrate the new Open Space Strategy with current state government and council policies (medium term).</li> </ul>
	<ul> <li>Increase proportion of homes in urban areas within 10min walk of quality green, open and public open space by 10% within 10 years (long term).</li> </ul>
	Planning Priority N20
North District Plan	Delivering high quality open space
Greater Sydney Region Plan	<b>Objective 31</b> Public open space is accessible, protected and enhanced



Figure 4-3 Open Space Network

## **Bushland and Biodiversity**

**Ku-ring-gai Local Planning Priorities** 

K28. Improving the condition of Ku-ring-gai's bushland and protecting native terrestrial and aquatic flora and fauna and their habitats

K29. Enhancing the biodiversity values and ecosystem function services of Ku-ring-gai's natural assets

#### BACKGROUND

The Ku-ring-gai Local Government Area (LGA) contains significant bushland and a unique combination of soils, topography, vegetation and fauna habitats which support high biodiversity. The unique vegetation provides critical habitat for many species with highly restricted distributions.

Many threatened plants, mammals, birds, reptiles, amphibians and invertebrates have been recorded within the LGA and the adjoining national parks. A number of significant vegetation associations are also present in the area, including many that are commensurate with threatened listed ecological communities under the NSW Biodiversity Conservation Act 2016 and Environment Protection and Biodiversity Conservation Act 1999. Ku-ring-gai also contains a nationally significant camp of Grey-Headed Flying-Fox.

Extensive logging in colonial years and, more recently, the intensification and sprawl of urban development (to cope with increased population), has impacted the environment of Ku-ring-gai. Planning and land use activities has resulted in a massive decline in the extent of ecological communities, particularly those associated with the more fertile shale derived soils, such as Blue Gum High Forest and Sydney Turpentine Ironbark Forest. In the case of Blue Gum High Forest, less than 1% of the original extent remains today.

Despite the above mentioned reduction of vegetative cover, the LGA has an important and diverse urban forest incorporating intact and significant bushland areas, a mosaic of tree canopy and vegetation within private and public property which provides stepping stone habitat, forming linkages to and within the LGA, including connection to national parks. The urban forest is a defining and valued character of the LGA and supports its biodiversity and amenity.

Wildlife corridors within Ku-ring-gai, which facilitate movement and gene flow across the landscape, connecting otherwise fragmented remnants and ecosystems, is central to conservation management. Corridors are generally linear connections between areas of similar habitat which enable the spread and movement of, and maintenance of biological diversity. Wildlife corridor is a general term and the function of a corridor to provide benefit is determined partly by the corridor's characteristics (size, structure and location) and partly by the ecological needs of target species. What may constitute a good corridor for one species does not necessarily meet the needs of another species.

There are 119 bushland reserves and 1,151 hectares of natural areas in the Ku-ring-gai LGA. These are managed in accordance with the Bushland Plan of Management 2013. Ku-ring-gai has an engaged community who highly value the area's biodiversity. Ku-ring-gai's volunteer programs, including Bushcare, have very high participation rates with 700+ members working with Council to enhance and protect the ecological systems which are still present. Council local environmental plans and development control plans have strong biodiversity and riparian controls and mapping; including riparian lands and Greenweb (biodiversity) mapping, which highlight environmentally sensitive landscapes and waterways. Figure 4-4 Ecological Grid highlights some of the key elements that contribute to the bushland and biodiversity in Ku-ring-gai.

Bushland and biodiversity impacts are managed in accordance with a number of policies which seek to enhance and protect biodiversity. These include the Biodiversity Policy (2016), Fauna Management Policy (2016) and Dumping and Encroachment in Bushland Policy (2016). Increased population and further urban development, as well as the associated introduction of weeds, pests, increased erosion, nutrients and loss of habitat and connectivity, compounded by climate change, continue to threaten the biodiversity values of Ku-ring-gai.

#### STRATEGIC RESPONSE

The biodiversity value of Ku-ring-gai includes both biotic and abiotic components, ecological communities, seedbanks and soils, animals, plants, their habitat and interactions on both private and public land. To prevent a decline in biodiversity, Council will continue to strengthen its local planning controls and seek strategic alignment with NSW government initiatives and guidelines. Management of bushland will continue to be guided by the Bushland Plan of Management which will be reviewed in 2020. Additionally, specific site management plans will be developed for complex or significant sites throughout the LGA.

Council will seek to ensure no net loss is achieved within the LGA via strengthening planning documents and operating under the mitigation hierarchy of avoid, minimise and mitigate, with residual impacts offset in accordance with the NSW Biodiversity Assessment Methodology or the Ku-ring-gai Biodiversity Offsetting Code of Practice (for Council works).

A large component of biodiversity management will be addressed through the Urban Forest Policy and Strategy and the improvement to Ku-ring-gai's Green Grid network, which are addressed in the Urban Forest (Planning Priorities K30 and K31), Green Grid (Planning Priorities K32, K33 and K34) and Water Sensitive City (Planning Priorities K35, K36 and K37). To inform opportunities and complement delivery of the Green Grid Strategy and Urban Forest Strategy as addressed within Planning Priorities identified above; Council will undertake further investigation and implementation of biodiversity corridor improvements including, opportunities for urban forest replenishment, habitat creation and fauna road crossing priority projects.

Biodiversity management will be incorporated into further reviews, or the development of, relevant policies, including the development of the Natural Areas Plan of Management, the Urban Forest Policy and Strategy, the Recreation in Natural Areas Strategy and the Water Sensitive City Strategy and biodiversity corridors will be protected and enhanced through Greenweb in Council's Development Control Plan. The biodiversity provisions within Council's Local Environmental Plan (LEP) and Development Control Plan (DCP) will address legislative changes and controls relating to the no net loss of significant vegetation or habitat. In order to ensure the relevance of Council's biodiversity provisions, in the LEP and DCP, Council will seek to update their existing vegetation and canopy mapping.



# Bushland and Biodiversity - Ku-ring-gai Local Planning Priorities and Actions

	Ku-ring-gai Local Planning Priority
	K28. Improving the condition of Ku-ring-gai's bushland and protecting native terrestrial and aquatic flora and fauna and their habitats
	K29. Enhancing the biodiversity values and ecosystem function services of Ku-ring- gai's natural assets
	Actions
	Develop and implement the Natural Areas Plan of Management (short term).
	Review and implement the Biodiversity Policy (short-medium term).
Ku-ring-gai Council	Review and implement the Fauna Management Policy (short-medium term).
	<ul> <li>Undertake further investigation and implementation of biodiversity corridor improvements including Urban Forest replenishment, habitat creation and fauna road crossing priority projects (short-medium term).</li> </ul>
	<ul> <li>Review biodiversity provisions within Council's LEP and DCP to address legislative changes and consider controls relating to no net loss of significant vegetation or habitat (short term).</li> </ul>
	<ul> <li>Review Greenweb mapping (within Council's DCP) and lands identified as 'Biodiversity' on the Terrestrial Biodiversity Map (within the LEP), to reflect changes to legislation, land use, vegetation and results of biodiversity corridors and fauna road crossing investigations (short term).</li> </ul>
	Planning Priority N16
North District Plan	Protecting and enhancing bushland and biodiversity
	Objective 27
Greater Sydney Region Plan	Biodiversity is protected and urban bushland and remnant vegetation is enhanced



## **Urban Forest**

**Ku-ring-gai Local Planning Priorities** 

K30. Improving the quality and diversity of Ku-ring-gai's urban forest

K31. Increasing, managing and protecting Ku-ring-gai's urban tree canopy

#### BACKGROUND

Ku-ring-gai's urban forest comprises of all trees, other vegetation and the soil and water that support these. It includes the network of vegetation within both public and private ownership, encompassing the spectrum of vegetation growing within:

- natural soils that exist independent of human involvement
- altered soils, including gardens, bioretention basins, raingardens
- engineered structures such as tree cells / vaults, vertical and roof top gardens.

Like many cities around the world, Ku-ring-gai recognises our urban forest as a significant asset that is a fundamental part of a liveable, economically and ecologically sound community. Unlike traditional infrastructure such as roads and storm water systems, a well-managed urban forest accrues value and provides a greater variety of benefits including<sup>21</sup>:

- increased public and private amenity
- contribution to an areas current and desired future character
- enabling reduction of energy consumption
- increased land and property values
- increased social and health wellbeing
- recreational opportunities
- provision of shade and reduction of Urban Heat Island Effects
- reduced air pollution
- carbon sequestration
- · provision and support of biodiversity
- increased ground water infiltration (improving drought tolerance and reducing storm water runoff)

The shift from Council's traditional (and in some cases current) management approach - management of 'trees and vegetation' to 'urban forest' management - is an important step in improving the quality and diversity of Ku-ringgai's urban forest. This transition enables consideration of interrelated issues such as:

- biodiversity and ecosystem services;
- open space and public recreation needs;
- water sensitive design;
- urban heat island;
- climate change and extreme weather events (bush fire, storm, drought);
- development pressures from urbanisation and projected population growth (housing needs).

Known as the 'Green Heart' of Sydney, Ku-ring-gai contains diverse natural habitats and rich biodiversity. Ku-ring-gai has long recognised the benefits and importance of its urban forest, with resident surveys from 1998 identifying "greening and tree preservation" as an issue of high importance to the community<sup>22</sup>. This has continued to be a relevant issue in the 21st Century, with continued emphasis on preservation of the natural environment including the tree canopy, as identified in community strategic plans adopted by Council in 2013 and 2018. Residents of all ages continue to support preserving the leafy character, bushland and green spaces of Ku-ring-gai and protecting the future of its urban forest<sup>23</sup>.

Pressure from development, bush fire risk mitigation, severe weather events and in recent years significant legislative changes (including 10/50 Vegetation Clearing Code of Practice for New South Wales<sup>24</sup>); have impacted upon the extent and density of Ku-ring-gai's urban forest (particularly large trees).

Canopy mapping within Ku-ring-gai was undertaken biennially between 1990 and 2002 (as shown in Figure 4-5). Since this time canopy extents have been mapped through vegetation mapping; including LGA wide mapping using 2005 aerial imagery, and localised mapping using aerial imagery from 2006 – 2017 as needed.

In 2014, a joint study of tree cover, between the NSW University of Technology and 202020 Vision [Jacobs, 2014], indicated that Ku-ring-gai had 52.1% tree coverage. At the

<sup>&</sup>lt;sup>21</sup>North Sydney Council, 2019. North Sydney Urban Forest Strategy

<sup>&</sup>lt;sup>22</sup>Hunter Valley Research Foundation, 1998

 <sup>&</sup>lt;sup>23</sup>Ku-ring-gai Council, 2008. Sustainability Vision Report 2008-2033
 <sup>24</sup>NSW Rural Fire Service. 2015

time, this was the fourth highest amongst the 39 NSW local government areas studied. Recently the Office of Environment and Heritage commissioned mapping of urban vegetation cover from 2016 for the Greater Sydney Region, providing percentage canopy for property boundaries, see Figure 4-6, Urban Vegetation Cover – Tree Canopy.

Council has a long history of supporting canopy replenishment. Council's commitment to canopy replenishment increased in the late nineties, in response to an identified canopy decline. The program focused on increasing canopy and development of a more sustainable mixed aged tree population on open space land and road reserves. This initiative resulted in planting of over 15,000 trees in all streets and parks within the LGA between 2000 and 2009 (with a 48% mortality rate). This canopy replenishment program is ongoing with a reduced operational budget since 2009.

Canopy has been protected within Council's LEP and DCP planning controls via; deep soil and landscape/planting provisions, a Tree Preservation Order (and more recently a Tree and Vegetation Preservation clause), and riparian land and biodiversity provisions.





#### STRATEGIC RESPONSE

To support Ku-ring-gai's transition to urban forest management, Council is developing an Urban Forest Policy and Strategy. Through these documents Council seeks to:

- improve the quality and diversity of Ku-ring-gai's urban forest; and
- increase, manage and protect Ku-ring-gai's urban tree canopy (as supported by the Greater Sydney Region Plan (Objective 30) and North District Plan (Planning Priority N19).

It will be important for Council to ensure that future urban forest management address limitations imposed by the LGA's existing canopy cover, bush fire prone nature and future planned development.

These documents will set canopy coverage targets for the LGA and inform the transition of Council's Canopy Replenishment Program to an Urban Forest Replenishment Program. It will also inform investigations regarding the creation and maintenance of a public land and street tree inventory and relevant tree management guidelines.

Further work is required to update Council's existing Street Tree Master Plan. This will inform composition and species selection of Council's street trees; directing tree management and planting within Heritage Conservation Areas, biodiversity corridors and the public domain areas.

Council recognise that the urban forest is a continuous resource regardless of ownership boundaries and seek to collaborate with other agencies and councils to improve urban forest management and strengthen partnerships. This will include advocating for Basix to be updated and strengthened to incorporate green infrastructure.

Council will review relevant LEP and DCP provisions in order to support the Urban Forest Policy and Strategy implementation including addressing canopy and urban forest targets, and legislative changes including the NSW Biodiversity Conversation Act 2016, 10/50 Vegetation Clearing Code of Practice for New South Wales<sup>25</sup> and State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017. Council will investigate creation and implementation of an Urban Forest Monitoring Program, which will:

- improve understanding of Ku-ring-gai's existing and future urban forest extent, condition and composition;
- assess canopy, shrub and ground cover;
- provide periodic mapping and evaluation against a current baseline, informed by historic changes, enabling integration of future technology and on ground outcomes;
- address constraints of history mapping, resultant from continued improvements in mapping technology (improving scale and detail);
- align with relevant regional/state/national mapping and monitoring;
- investigate the integration of Urban Heat Mapping;
- integrate and inform existing vegetation and biodiversity mapping and monitoring programs (as directed by Kuring-gai's Biodiversity Policy);
- facilitate assessment of relevant provisions within Kuring-gai's LEP and DCP (including biodiversity and tree and vegetation controls);
- inform future Ku-ring-gai bush fire prone land mapping; and
- facilitate monitoring and implementation of green infrastructure and Green Grid within the LGA.

Other actions and issues that relate to urban forests within Ku-ring-gai are addressed within the following sections of this report, Green Grid Planning Priorities K32, K33 and K34, Bushland and Biodiversity Planning Priorities K28 and K29, Climate Change Resilience and Adaptation Planning Priorities K39 and K40, Water Sensitive City Planning Priorities K35, K36, and K37 and Energy and Greenhouse Gas Emissions Planning Priority K38.

# **Urban Forest - Ku-ring-gai Local Planning Priorities and Actions**

	Ku-ring-gai Local Planning Priorities	
	K30. Improving the quality and diversity of Ku-ring-gai's urban forest	
	K31. Increasing, managing and protecting Ku-ring-gai's urban tree canopy	
	Actions	
	Implement the Urban Forest Replenishment Program (ongoing).	
Ku-ring-gai Council	<ul> <li>Develop and commence implementation of an Urban Forest Policy and develop an Urban Forest Strategy, which set canopy coverage targets for the LGA (short term).</li> </ul>	
	<ul> <li>Investigate creation and implementation of an Urban Forest Monitoring Program (short term).</li> </ul>	
	<ul> <li>Investigate review of landscape and street tree planting strategies and guidelines. Including Council's current Street Tree Master Plan to inform species selection and composition (medium term).</li> </ul>	
	<ul> <li>Investigate the creation and maintenance of a public land and street tree inventory to improve Council programs and identify new opportunities (medium term).</li> </ul>	
	<ul> <li>Investigate and refine LEP and DCP controls to support Council to meet its Canopy and Urban Forest targets set within the Urban Forest Strategy, including canopy protection, planting and deep soil requirements, and provision of shade (short term).</li> </ul>	
	<ul> <li>Review DCP Tree and Vegetation Preservation provisions and associated Council guidelines to align with State Environmental Planning Policy - Vegetation in Non-Rural Areas, 2017 (short term).</li> </ul>	
	<ul> <li>Investigate options for increasing pervious surfaces within sites and green infrastructure (roofs, walls and WSUD) to be included within built infrastructure (including buildings), and guidelines and LEP and DCP provisions (medium term).</li> </ul>	
	<ul> <li>Support enhancements to the Urban Forest (including canopy cover) through public domain planting (ongoing).</li> </ul>	
	Collaborate with other agencies to build and strengthen partnerships (ongoing).	
	<ul> <li>Advocate for Basix to be updated and strengthened to incorporate green infrastructure (ongoing).</li> </ul>	
	<ul> <li>Support priority actions in the Biodiversity Policy (ongoing).</li> </ul>	
	Planning Priority N19	
North District Plan	Increasing urban tree canopy cover and delivering Green Grid connections	
	Objective 30	
	Urban tree canopy cover is increased	
Greater Sydney Region Plan	Objective 32	
	The Green Grid links parks, open spaces, bushland and walking and cycling paths	



Figure 4-6 Urban Vegetation Cover - Tree Canopy

## **Green Grid**

**Ku-ring-gai Local Planning Priorities** 

K32. Protecting and improving Green Grid connections

K33. Providing a network of walking and cycling links for leisure and recreation

K34. Improving connections with natural areas including river and creek corridors, bushland reserves and National Parks

#### BACKGROUND

Ku-ring-gai's liveability and sustainability rely on maintaining, managing and planning for green infrastructure. Green infrastructure is the network of green spaces and water systems within both public and private ownership, that deliver multiple environmental, economic and social values and benefits to urban communities. It extends beyond physical vegetative structures (such as the urban forest) and includes natural and semi-natural systems as well as the management and integration of various components of urban environments

Greener Places (the draft green infrastructure policy by Government Architect NSW, 2017) and the Greater Sydney Region Plan and North District Plan highlight the importance of planning for, protecting, creating and maintaining green infrastructure within Greater Sydney. This planning framework has sought to protect and improve Sydney's network of water related systems (our Hydrological Grid), biodiversity and urban forest (our Ecological Grid) and passive and active recreation and transport (our Recreational Grid).

The Greater Sydney Region Plan's vision for the Eastern Harbour City (including Ku-ring-gai) is for improved access to foreshores, waterways and the coast for passive and active recreation, tourism, cultural events and waterbased transport. This vision is to be achieved through implementation of the Sydney Green Grid, providing a network of water related systems (our Hydrological Grid) and green spaces (our Ecological Grid), that will connect communities (through our Recreational Grid) to green infrastructure.

Improved access and connections from Ku-ring-gai's Local Centres to nature and green infrastructure is increasingly important, as the number of people living in high density dwellings increases. There is significant opportunity for local residents and visitors to walk or cycle via a network of streets and parks to bushland areas given that all centres, with the exception of Wahroonga and Pymble, are within a 1km walk of a natural area. The Ku-ring-gai LGA provides extensive walking trails traversing bushland reserves and connecting with the adjoining national park trails. Iconic walks within the LGA are shown in Figure 4-8 Green Grid – Walking.

While extensive planning has been undertaken for recreation in natural areas there is a gap in the provision of marked recreational trails leading from the Local Centres and rail stations to the bushland reserves via local streets and parks. Currently Council only has one marked track from Lindfield Station to the Two Creeks Track which starts in Seven Little Australians Park.

#### STRATEGIC RESPONSE

To inform assessment, prioritisation and implementation of these Sydney Green Grid and Local Green Grid connections, Council will investigate the creation of a Green Grid Strategy. This Strategy will consider bikeways, pedestrian facilities, walking tracks, fire trails and footpath network improvements having regard for the access, transport, health and recreational needs of the community.

The Strategy will include an analysis of opportunities, constraints and required actions, regarding implementation of the:

- Sydney Green Grid, including the following key projects:
  - Sydney Green Grid Project 16 Pacific Highway Urban Transformation. This includes Council's projects within the Local Centres along the Pacific Highway:
    - the Lindfield Village Green project which comprises turning an at grade public carpark into a public park, and providing basement car parking beneath;
    - Lindfield Community Hub and Turramurra Community Hub projects which include the provision of new public parks, as well as;
    - iii. tree planting and greening within the Local Centres and other areas along the highway and rail corridor.

A walk in the bush, Cowan Catchment by Pauline Jensen

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#### STRATEGIC RESPONSE (CONT.)

- Sydney Green Grid Project 33 Pacific Highway Centres – Open Spaces and Green Links which seeks to provide a connection through urban areas (including town centres) to open space and bushland on either side of the Pacific Highway.
- Sydney Green Grid Project 4 Lane Cove River and Lane Cover National Park - Priority Corridor 1 - which includes open spaces along the Lane Cove River foreshores to create unique recreational experiences, linking the Lane Cove National Park to Macguarie Park, Macquarie University, Chatswood and Epping. Further work on this project is required to inform feasibility and create design options to improve track accessibility under wet conditions along the Browns Waterhole walking and cycling track, North Epping and South Turramurra. Preliminary investigation has been undertaken regarding improved flood mitigation and accessibility options over a heavily used crossing point of the Lane Cove River, linking Ku-ring-gai and Rvde local government areas and connecting the Great North Walk.
- Ku-ring-gai Local Green Grid connections shown in Figure 4-7 Green Grid.

These Green Grid connections have sought to address connectivity shortcomings, identified within the Ku-ring-gai Biodiversity & Riparian Lands Study 2016<sup>26</sup>; including that:

- There is no continuous, good condition vegetation/ habitat crossing the urban area of Ku-ring-gai in either a north-south or east-west direction.
- Middle Harbour Valley (including Garigal National Park) is considered to be poorly connected to surrounding bushland; including Ku-ring-gai Chase National Park to the north (connectivity is highly compromised by Mona Vale Road).
- The Lane Cove Valley bushland (including Lane Cove National Park) is not connected to adjacent protected areas or reserves, including bushland in the Berowra Valley in the Hornsby and Ryde local government areas.

The Green Grid Strategy will include further consideration of:

- The need to minimise fragmentation and impact upon bushland areas.
- Walking track connections between Richmond Park and Governor Phillip Reserve. This link is designed to replace the Sydney Green Grid, crossing through the Ku-ring-gai Flying Fox Reserve. This Reserve is subject to a longterm Conservation Agreement and home to an important maternal colony of grey-headed flying-fox. As Council does not support public recreation within this reserve,

further development of this Section of the Sydney Green Grid is also not supported. Refer to Figure 4-7 Green Grid.

- The rarity, significance and the special conservation agreements associated with Dalrymple Hay Nature Reserve / Browns Forest and Sheldon Forest, which need to be fully recognized. The nature of these reserves and their protection needs to be promoted. It is envisaged the current ongoing restricted access and usage will continue to ensure their preservation for future generations. To discourage any unintended future use as general transit ways, Green Grid track linkages will not rely on passage through these reserves, but will employ neighbouring or adjoining routes.
- Walking track links to improve connections between Local Centres and rail stations via a network of streets, private bushland and other agency lands and parks to bushland areas connecting with the Great North Walk and broader trail network along Lane Cove River, Middle Harbour and Cowan Creek – Refer Figure 4-8 Green Grid – Walking
- Walking track connections from the St Ives Showground Precinct with Brooklyn, Bobbin Head and West Head, linking with existing national park's infrastructure and walking trails as identified within the Ku-ring-gai Destination Management Plan 2017 -2020.
- Opportunities to combine recreation and transport with biodiversity corridors (as identified within Council's DCP Greenweb Map and LEP Terrestrial Biodiversity Map) – Refer to Figure 4-7 Green Grid.
- Opportunities to improve biodiversity and recreational disconnect caused by main roads (in particular Ryde Road, The Comenarra Parkway and Mona Vale Road).
   Refer to Bushland and Biodiversity Planning Priorities K28 and K29 for more information.
- Opportunities and priorities to enhance a variety of open spaces; improve streetscapes; connect with local European heritage and Aboriginal cultural heritage, and undertake street tree planting.
- Access to waterways, water based recreation and creation/inclusion of Water Sensitive City features.

The Green Grid Strategy, planning and implementation will be integrated with other Ecological Grid and Hydrological Grid projects within Ku-ring-gai, and the broader North District, and will inform and be informed by priority actions identified within Urban Forest (Planning Priorities K30 and K31), Bushland and Biodiversity (Planning Priorities K28 and K29), Climate Change Resilience and Adaptation (Planning Priorities K39 and K40) and Water Sensitive City (Planning Priorities K35, K36, and K37).

 $<sup>^{26}</sup>$ www.kmc.nsw.gov.au/Plans\_regulation/Building\_and\_development/Town\_Planning\_documents/Supporting\_documents

# Green Grid - Ku-ring-gai Local Planning Priorities and Actions

	Ku-ring-gai Local Planning Priorities
	K32. Protecting and improving Green Grid connections
	K33. Providing a network of walking and cycling links for leisure and recreation
	K34. Improve connections with natural areas including river and creek corridors, bushland reserves and National Parks
	Actions
Ku-ring-gai Council	<ul> <li>Investigate and deliver the Sydney Green Grid and Ku-ring-gai Local Green Grid, including collaboration with other agencies, councils and private landholders (medium term).</li> </ul>
	Investigate the creation of a Green Grid Strategy that:
	<ul> <li>Refines Sydney Green Grid and Ku-ring-gai Local Green Grid opportunities, constraints and required actions.</li> </ul>
	<ul> <li>Identifies walking and cycling routes from connecting Local Centres with nearby parks and natural areas, walking track connections from the St lves Precinct with existing national park walking trails, including improved biodiversity connections and green infrastructure (medium term).</li> </ul>
	<ul> <li>Update Ku-ring-gai Bicycle Plan to include outcomes from the Green Grid Strategy (medium term).</li> </ul>
	Planning Priority N19
North District Plan	Increasing urban tree canopy cover and delivering Green Grid connections
	Objective 32
Greater Sydney Region Plan	The Green Grid links parks, open spaces, bushland and walking and cycling paths



Figure 4-7 Green Grid



## Water Sensitive City

#### **Ku-ring-gai Local Planning Priorities**

K35. Protecting and improving the health of waterways and riparian areas

K36. Enhancing the liveability of Ku-ring-gai's urban environment through integrated water infrastructure and landscaping solutions

K37. Enabling water resource recovery through the capture, storage and reuse of water; alternative water supplies; and increased water efficiency

#### BACKGROUND

The management of water in Sydney is separated by various legislative and administrative arrangements. Having traditionally focused on the management of stormwater to control flooding, Council's water management program has evolved over time into the coordinated management of all components of the water cycle, including water consumption, rainwater, stormwater, wastewater and groundwater, to secure a range of benefits for the wider community and our catchments.

Ku-ring-gai has been at the forefront of urban water management in a local government context. Ku-ring-gai was one of the first councils to incorporate controls for On Site Detention (OSD) into a water management development control plan, to manage flash flooding from increased development and connectivity to the drainage system and adopted a Riparian Policy in 2004, which guided the management of waterways and riparian areas, including providing development controls for riparian setbacks.

In 2008, Council adopted an Integrated Water Cycle Strategy to guide the implementation of integrated urban water management within the Ku-ring-gai Local Government Area. The Strategy recognised the need for holistic management of all sources of water and the consideration of traditionally compartmentalised sectors (potable water, sewerage and stormwater) in an integrated manner, by managing local and regional water catchments through appropriate land use planning, including the use of water sensitive urban design (WSUD) and water harvesting and reuse to mitigate the impacts of urbanisation and improve the condition of our natural waterways. Figure 4-11 Water Sensitive Urban Design (WSUD) outlines the key installed and operating Water Sensitive Urban Design devices and systems within Ku-ringgai. Climate change is leading to disruptions of the water cycle and Ku-ring-gai's increasing population and the associated intensification of development continues to place further pressure on our water resources, as well as alter flow regimes caused by increased hard impervious surfaces and piped systems from development, impacting urban streams.

Ku-ring-gai's network of water related systems (our Hydrological Grid) includes 220km of creeks with a large proportion remaining in semi-natural to natural condition, in private easements and public open space. This includes natural banks, intact riparian vegetation and minimal hard engineering. The condition of our creeks has a significant impact on water quality, riparian ecosystems and the receiving environments of Sydney Harbour and the Hawkesbury Estuary, to which all creeks within the Ku-ring-gai LGA flow. These water systems support a range of aquatic plants and animals, as well as providing the community with opportunities for recreation, tourism and water-based transport. The key elements of the Hydrological Grid are outlined in Figure 4-10 Hydrological Grid – Catchment and Riparian Corridors and Figure 4-12 Hydrological Grid.

To improve community connection and access to green infrastructure (including our water related systems) and to support the creation and maintenance of open spaces that supports recreation, waterway health and biodiversity; the Greater Sydney Region and District Plans have identified a Sydney Green Grid (further addressed within the Green Grid Planning Priorities K32, K33 and K34).

Council's 2016 Water Sensitive City Policy adopts the management principles of a Water Sensitive City by responding to the issues of water conservation and water security, flooding risks, degradation of urban waterways and rising temperatures in a way that enhances the liveability of Ku-ring-gai. Detached residential and multi-unit residential were the highest water users by sector in the Ku-ring-gai LGA for 2016/17, collectively representing 86.5% of total energy use. Non-residential – health, non-residential – retail and residential – attached represented the next largest water users.See Figure 4-9 All Water Use by Sector in the Ku-ringgai Local Government Area for 2016/17

Hence, interventions affecting detached residential and multiunit residential represent the greatest opportunity to achieve Ku-ring-gai's water management objectives.

To support Ku-ring-gai's Water Sensitive City Policy, Council is developing a Water Sensitive City Strategy. This Strategy will highlight the value of all forms of water as a resource and will implement a series of management actions to meet Kuring-gai's Water Sensitive City objectives, namely to:

- protect, conserve and improve the condition of our waterways and riparian corridors, including native biodiversity;
- manage the quantity, frequency and quality of stormwater runoff to improve ecological stream health;
- reduce Council and the community's potable water use by diversifying water sources at different scales in fit-forpurpose applications and increasing water efficiency;
- deliver programs and interventions that support and enable a continued shift in the community to more water sensitive practices; and

• integrate water infrastructure within the urban landscape to enhance the liveability of Ku-ring-gai, including stormwater treatment, flood protection, heat mitigation, ecological health, microclimate and landscape amenity.

Interventions will focus on water sensitive approaches to strategic land use planning and urban design; the restoration of ecosystems; the use of alternative water sources for effective irrigation of public open spaces to support public amenity and urban cooling and improvements in the resilience of local infrastructure; connecting people to local waterways and the celebration of cultural heritage as it relates to water; the engagement of Aboriginal leaders in the planning, design and implementation of actions designed to activate waterways and their surrounds; an increase in green infrastructure on public and private land; planning and developing high performing net zero energy, water and waste buildings; and the retainment of water in the landscape though permeable surfaces and an irrigated tree canopy.

Council's existing LEP and DCP includes riparian mapping and detailed provisions relating to the management of riparian land and watercourses. This includes specific provision on the maintenance, rehabilitation and re-creation of highly modified or degraded watercourses. The Strategy will continue to protect our hydrological grid through their controls. Council will seek to create cool, green links to waterways, open space and bushland for recreation through the realisation of Sydney's and Ku-ring-gai's Green Grid.

Ku-ring-gai's Water Sensitive City is further addressed in the Climate Change Resilience and Adaptation Planning Priorities K39 and K40, Urban Forest Planning Priorities K30 and K31 and Green Grid Planning Priorities K32, K33 and K34.



Source: Resilient Sydney Platform - www.resilientsydney.com.au

Figure 4-9 All Water Use by Sector in the Ku-ring-gai Local Government Area for 2016/17

# Water Sensitive City - Ku-ring-gai Local Planning Priorities and Actions

	Ku-ring-gai Local Planning Priorities
	K35. Protecting and improving the health of waterways and riparian areas
	K36. Enhancing the liveability of Ku-ring-gai's urban environment through integrated water infrastructure and landscaping solutions
	K37. Enabling water resource recovery through the capture, storage and reuse of water; alternative water supplies; and increased water efficiency
	Actions
Ku-ring-gai Council	<ul> <li>Develop and implement a Water Sensitive City Strategy (short term).</li> </ul>
	<ul> <li>Utilise the Water Sensitive City Strategy to inform future LEP and DCP controls (short term).</li> </ul>
	• Prepare design guidelines for best practice urban water management (medium term).
	<ul> <li>Participate in regional and national urban water management collaborations and research opportunities to inform future LEP/DCP controls and guidelines (ongoing).</li> </ul>
	Review Riparian Lands Mapping to inform improvements to LEP/DCP riparian controls (short term).
	Planning Priority N15
North District Blog	Protecting and improving the health and enjoyment of Sydney Harbour and the District's waterways
	Planning Priority N21
	Reducing carbon emissions and managing energy, water and waste efficiently
	Objective 25
	The coast and waterways are protected and healthier
	Objective 34
Cuestas Cuda en Destas Disa	
Greater Sydney Region Plan	Energy and water flows are captured, used and re-used
Greater Sydney Region Plan	Energy and water flows are captured, used and re-used Objective 38



Figure 4-10 Hydrological Grid - Catchment and Riparian Corridors







## **Energy and Greenhouse Gas Emissions**

#### **Ku-ring-gai Local Planning Priorities**

K38. Reducing greenhouse gas emissions by Council and the Ku-ring-gai community to achieve net zero emissions by 2045 or earlier

#### BACKGROUND

Climate change ranks amongst the most pressing issues facing our world and the way we live and addressing climate change is a top management priority for Council. It requires action and innovation from community, business and all levels of government. The warming of our climate system is unequivocal and since the 1950s many of the observed changes are unprecedented. Anthropogenic greenhouse gas (GHG) emissions are rising and are the dominant cause of warming, particularly from the burning of fossil fuels such as coal, oil and gas, for energy use. The impacts of climate change are accompanied by far-ranging economic, environmental and social costs that will increase over time with higher levels of warming. The rate of increase in GHG emissions is proportionate to the rate of increase in the risk of climate related impacts; the higher the concentration of GHGs in the atmosphere the greater the likelihood and magnitude of impact.

Council has a responsibility to the Ku-ring-gai community to undertake activities that:

- effectively reduce the degree of climate change that occurs (through mitigation); and
- reduce the vulnerability, and increase the resilience, of the built and natural environment, the community and the economy to the risks of climate change (through adaptation).

Council's most recent Climate Change Policy has been in place since 2015, providing a management framework to respond to the observed and projected implications of climate change on Ku-ring-gai's natural and built environment, community and economy. Council has adopted emission reduction targets that align to the Paris Agreement to limit global temperature increases to below 2°C and pursue efforts to keep warming below 1.5°C above preindustrial levels, namely a reduction in Council's greenhouse gas emissions (GHG) from fixed assets, street lighting and vehicles of 20% by 2020, 50% by 2030 and 100% by 2045, based on 2000 levels. Council's 2015 Greenhouse Gas (GHG) Reduction Action Plan supports the 2015 Climate Change Policy by providing a mitigation response to climate change and recommending abatement activities to enable Council to achieve its 2020 emission reduction target. Key activities delivered to date to achieve Council's 2020 target are: lighting, plant and equipment and air conditioning upgrades and energy management systems to improve the energy efficiency of Council's buildings and facilities; the installation of solar panels and solar hot water systems on Council's buildings and facilities; energy efficient street lighting upgrades; and the procurement of renewable energy from the grid.

In addition, Council offers a number of community rebates for the implementation of home energy solutions; including the installation of energy efficient pool pumps; solar panels and batteries; solar hot water systems; insulation; and window retrofits, which contribute to reducing the Ku-ring-gai community's carbon footprint.

At present the LEP provides a relatively weak framework to support the delivery of green buildings. The extent of the LEP reference to this issue is one 'aim' which looks for development "to facilitate adaptation to climate change". In an effort to address large-scale development having the highest carbon footprint, Council's DCP mandates that all non-residential development is to incorporate Ecologically Sustainable Design (ESD) measures and achieve accredited Green Star ratings.

To ensure the delivery of buildings with actual reductions in resource use, carbon emissions and building running costs, the DCP requires all non-residential buildings with a total gross floor area above 2,000sqm to obtain a baseline 4 Star Green Star certification and all non-residential buildings with a total gross housing above 5,000sqm to obtain a 5 Star Green Star certification under the Green Building Council of Australia's (GBCA's) Green Star-Design & As Built rating tool. Council is not able to apply the same standards to large scale residential development, also recognised as having a significant carbon footprint, due to the operation of SEPP (Building Sustainability Index: BASIX) 2004 which prevents standards above BASIX being mandated for residential development.

#### STRATEGIC RESPONSE

A report by Kinesis<sup>27</sup> prepared for the Greater Sydney Commission, provides technical evidence on how land use, transport and infrastructure planning can help reduce greenhouse gas emissions to support the NSW Government's aspirational long-term objective of achieving net-zero emissions by 2050.

The study highlights the impact of future housing distribution on Greater Sydney's greenhouse gas emissions and demonstrates the importance of place-based emission saving interventions in enabling Greater Sydney to support the NSW Government's aspirational long-term objective of achieving net zero emissions by 2050. Key findings from the study were:

- Interventions in land use, transport and infrastructure planning can enable Greater Sydney to reduce its overall emissions from energy, residential transport and waste by 50% by 2036. These interventions include both government and market-led strategies across building standards, renewable energy, transport infrastructure and increased waste diversion.
- Placed-based interventions are needed that respond to local land use, infrastructure and transport patterns.
- Greater Sydney is not a monoculture of density, and both high density renewal areas and low density suburbs need to be part of the solution, with linkages between infrastructure delivery and housing and transport.

Electricity and transport represented the two greatest sources of emissions for the Ku-ring-gai LGA in 2016/17 as shown in Figure 4-13.

Detached residential and multi-unit residential were the highest energy users by sector in the Ku-ring-gai LGA for 2016/17, collectively representing 68.5% of total energy use. Non-residential – commercial, non-residential – health and non-residential – industrial represented the next largest energy users. See Figure 4-14.

Hence, interventions affecting the electricity used in detached residential and multi-unit residential represent the greatest opportunity to achieve Ku-ring-gai's energy and greenhouse gas management objectives, as well as interventions that reduce transport emissions.



Source: Resilient Sydney Platform - www.resilientsydney.com.au

Figure 4-13 Ku-ring-gai Local Government Area: All Emissions by Source for 2016/17 (scopes 1+2+3)



Source: Resilient Sydney Platform - www.resilientsydney.com.au

Figure 4-14 All Energy Use by Sector in the Ku-ring-gai LGA for 2016/17

#### STRATEGIC RESPONSE (CONT.)

An emissions reduction pathway, developed for Ku-ring-gai Council, showed the greenhouse gas emission reduction potential from a series of interventions relating to land use, transport and infrastructure. Cumulatively, the interventions can achieve a 37% reduction in Ku-ring-gai's emissions by 2036 as shown in Figure 4.15.

Overall, more than half of the potential emission reductions are attributable to land use, transport and infrastructure planning interventions, including BASIX, new building standards, renewable energy, waste diversion, and transport and parking.

Transport demand management initiatives including working from home, improved walking and cycling, improved access to car sharing, carpooling and on-demand transport will also be considered in helping achieve net-zero greenhouse gas emissions.

The biggest drivers of the reduction are installing building renewables, the impact of the 2020 Renewable Energy Target (RET), implementing residential retrofits and higher waste diversion.

These interventions fall short of the action required for Council to meet its current and any future net zero emissions target. Building on the interventions outlined in Ku-ring-gai's emission reduction pathway to 2036, Council will soon be reviewing its Climate Change Policy and revising its GHG emission reduction targets, as well as developing a Towards Net Zero Emissions Plan 2020-2030, in order for Council to achieve its revised 2030 GHG emission reduction target and work towards achieving its net zero emissions target.

To improve the delivery of large-scale buildings whose design, construction and operation deliver measurable and reduced carbon footprints, amendments to the LEP will seek to include further LEP clauses to strengthen the delivery of the current DCP requirements for certified Green Star nonresidential buildings and enable the incorporation and delivery of requirements for measurable sustainability outcomes for large scale mixed-use and residential flat buildings.

Local government, including Ku-ring-gai Council, will have an important advocacy role to play if Ku-ring-gai is to meet its GHG emission reduction targets, as many of the interventions on the pathway to net zero emissions are influenced by other levels of government. For example, higher BASIX targets and progressive improvements to the emissions intensity of the electricity grid beyond the existing Renewable Energy Target can play a significant role in delivering low emissions electricity to Greater Sydney and Ku-ring-gai.



Source: Resilient Sydney Platform - www.resilientsydney.com.au

Figure 4-15 Emission Reduction Pathway to 2036 for Ku-ring-gai Local Government Area

# Energy and Greenhouse Gas Emissions - Ku-ring-gai Local Planning Priority and Actions

	Ku-ring-gai Local Planning Priority	
	K38 Reducing greenhouse gas emissions by Council and the Ku-ring-gai community to achieve net zero emissions by 2045 or earlier	
	Actions	
Ku-ring-gai Council	<ul> <li>Develop and implement Council's revised Climate Change Policy and Towards Net Zero Emissions Plan 2020-2030 (short term).</li> </ul>	
	<ul> <li>Revise Council's 2030 GHG emissions reduction target and net zero emissions reduction target (short term).</li> </ul>	
	• Develop community greenhouse gas reduction targets and design interventions that enable a continued reduction in community energy use and greenhouse gas emissions in line with these targets (short term).	
	<ul> <li>Seek to include new clauses in the LEP to reinforce the DCP requirements for green non-residential, mixed-use and large scale residential flat buildings, and to support the use of sustainable materials, finishes and landscape features across all high density built forms (short term).</li> </ul>	
	• Seek to include and incentivise Design Excellence Mechanisms in the LEP and DCP to deliver sustainable dwellings, mixed use and non-residential buildings (short term).	
	<ul> <li>Facilitate the uptake of electric vehicles, car sharing, carpooling and cycling through provisions in the LEP/DCP and Public Domain Plan (short term).</li> </ul>	
	<ul> <li>Integrate sustainability measures, incorporating minimum performance standards, into Council's asset management program (ongoing).</li> </ul>	
	• Continue to review Council's and the community's greenhouse gas emission reduction targets and trajectories, emissions budget and climate change mitigation activities based on the latest climate science and modelling (ongoing).	
	Planning Priority N21	
North District Plan	Reducing carbon emissions and managing energy, water and waste efficiently	
	Objective 33	
Greater Sydney Region Plan	A low-carbon city contributes to net-zero emissions by 2050 and mitigates climate change	
	Objective 34	
	Energy and water flows are captured, used and re-used	

Solar Panels at 31 Bridge Street, Pymble by Alex Lyle

## **Climate Resilience and Adaptation to the Impacts of Urban and Natural Hazards**

**Ku-ring-gai Local Planning Priorities** 

K39. Reducing the vulnerability, and increasing resilience, to the impacts of climate change on Council, the community and the natural and built environment

K40. Increasing urban tree canopy and water in the landscape to mitigate the urban heat island effect and create greener, cooler places

K43. Mitigating the impacts of urban and natural hazards

#### BACKGROUND

Recent climate-related extremes, such as heat waves, droughts, floods and bush fire, reveal that some ecosystems and many human systems are significantly exposed and vulnerable to current climate variability. The impacts of such events include altered ecosystems and terrestrial and freshwater species risk, disrupted food production and critical services, including power and water supply, damage to infrastructure and settlements and escalating costs of disaster recovery, and negative mental health and human wellbeing consequences, including morbidity and mortality.

The impact of rapidly warming conditions on biodiversity is a common problem for land managers across the world. Conserving biodiversity is critical for the health and wellbeing of a community, with carbon storage, forage production, enhanced water supply and quality, pollinator support and outdoor recreation as just a few of the ecosystem services that may be impacted with a decline in biodiversity.

Ku-ring-gai has particular geographical and societal vulnerabilities to extreme weather events, including extensive bush fire and flood prone land; and susceptible sectors of the community, including aged care institutions; seniors, particularly those living alone; childcare and day care groups; people with disabilities; and residents for whom English is a second language.

To complement Council's climate change mitigation program, discussed in the Energy and Greenhouse Gas Emissions Planning Priority K38. Council also undertakes a climate change adaptation program. Council's 2016 Climate Change Adaptation Strategy supports the 2015 Climate Change Policy by providing an adaptation response to climate change, through a series of prioritised adaptation controls to reduce Council's, the community's and the natural and built environment's vulnerability and increase its resilience to the impacts of more frequent and extreme weather events as a result of changing climate.

An integral part of the Strategy is the continuation of Council's Climate Wise Communities program, which aims to reduce community vulnerability and increase community resilience to the impacts of extreme weather events at a personal, property and neighbourhood level. The Strategy adopts a shared responsibility framework, with Council adopting a leadership role in building climate resilience into its operations, service delivery and that of the Ku-ring-



Figure 4-16 Floodplain Risk Management Process

gai community; and implementing adaptive management responses to address the impacts of climate change on Kuring-gai's biodiversity.

#### FLOODPLAIN RISK MANAGEMENT

To ensure Council staff, state emergency services and the community have a thorough understanding of local flood issues and potential solutions; Council is following the NSW Government's Flood Prone Land Policy and Floodplain Development Manual (2005). This is done through a floodplain risk management process (as shown in Figure 4-16) which involves the development of floodplain risk management studies and plans covering all three catchments and twenty eight sub catchments.

#### EXTREME HEAT AND URBAN HEAT ISLAND (UHI)

It is predicted that the average maximum temperature, frequency and duration of heatwaves within Ku-ring-gai will increase<sup>28</sup>. Heatwaves already have significant impacts on our people and city, including increasing energy use and peak demand, grid reliability and power failures, and increasing morbidity and mortality rates.

In addressing Ku-ring-gai's future urban growth, it is important to address current and predicted increase in heat, as urban development continues and temperatures increase with climate change.

Urban areas create their own microclimates through influencing the surrounding atmosphere and interacting with climate processes. This is known as the Urban Heat Island (UHI) effect, which results in higher air temperatures in urban areas than those in surrounding non-urban areas.

The UHI effect is worsened by development activities that reduce canopy and green space; increase hard surfaces that absorb heat, and where medium to high density development adds to the creation of street canyons that trap heat and increase night and day time temperatures. Increased urban densities and human activities such as traffic, industry and electricity usage, particularly air conditioning usage, generate additional heat, further exacerbating the UHI effect.

Figure 4-17 Urban Heat Island (UHI) Summer 2015-2016 provides a picture of urban heat variations in 2016<sup>29</sup>. From this mapping it is clear that Ku-ring-gai's riparian corridors, urban forest and green space areas such as golf courses

contribute significantly to mapped heat patterns. These areas have a cooling effect. Areas of increased urban densification, roads and less vegetated areas also contribute to the heat patterns, having a warming effect.

Within the LGA, areas of increased vulnerability to heat have higher concentrations of populations who are more sensitive, less adaptive and more exposed to the adverse effects of heat (such as very old, the very young and those with existing health conditions). Council will consider vulnerability to heat within future Council programs and planning controls.

#### **BUSH FIRE**

Climate change will exacerbate a range of risks to urban, catchment and biodiversity values, including:

- increases in fire weather conditions;
- local fire activity (incidence and area burned) are predicted to increase substantially; and
- management of a changing ecosystem, including weather and carbon dioxide concentrations, influencing factors such as plant (fuel) growth and moisture (flammability).

Whilst prescribed burning provides a degree of reduced risk to life and property; a large increase in management effort (prescribed fire) may be required, to maintain the current level of bush fire risk, in light of the increased risk due to climate change<sup>30</sup>. This increase in management effort is both costly and resource intensive (eg. water) and may increase pressures upon an already stressed environment; including air pollution, catchment health (such as erosion), biodiversity values sensitive to fire (such as hollows) and species and communities sensitive to fire intensity and severity.

As such, it is important that other risk mitigation measures aimed at enhancing 'defensible space' and reducing vulnerability are considered; such as future town planning, building design and urban forest management (including private gardens and public open spaces).

Management of bush fire is a shared responsibility. Ku-ringgai is part of the Hornsby Ku-ring-gai Bush Fire Management Committee, responsible for coordinating bush fire planning in the local area. To help reduce bush fire threat, Council undertakes manual works including fire trails, walking tracks and fire break maintenance and conducts strategic hazard

<sup>&</sup>lt;sup>28</sup> Office of Environment and Heritage, NSW 2015a NARCliM http://www.climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/About-NARCliM accessed02/06/15

<sup>&</sup>lt;sup>29</sup> Office of Environment and Heritage, 2016

<sup>&</sup>lt;sup>30</sup> Ross Bradstock, Ian Davies, Owen Price and Geoff Cary, 2008. Effects of Climate Change on Bushfire Threats to Biodiversity, Ecosystem Processes and People in the Sydney Region.

Bushfire aftermath, South Turramurra by J Moldovan

#### **BUSH FIRE (CONT.)**

reduction burns and ecological burning. Ku-ring-gai Council maintains its own fire team enabling Council to support the Ku-ring-gai Bush Fire Brigade and Ku-ring-gai State Emergency Service.

Council has sought to incorporate bush fire risk planning within planning controls. This has included:

- Mapping of bush fire prone land within the LGA Kuring-gai's Bush Fire Prone Land Mapping 2017. First mapped in 2007 this mapping is required to be updated every five years.
- Identification of high bush fire evacuation risk areas (areas where future growth should be limited), including
  - Ku-ring-gai Bush Fire Evacuation Risk Map (2008), this map is identified areas as SEPP Seniors Exclusion areas, due to being susceptible to evacuation difficulties in the event of bush fire due to limited egress and access, and limits development in accordance with the SEPP (Housing for Seniors and People with a Disability) 2004.
  - Use of E4 Environmental Living zones to properties located within the Ku-ring-gai Bush Fire Evacuation Risk Map (2008) and that did not meet Council's evacuation capacity criteria (refer to the Planning Proposal for the Deferred Areas<sup>31</sup>).

#### CONTAMINATION

Historical land uses and activities undertaken within the Ku-ring-gai Local Government Area, including intensive agriculture purposes such as market garden activities and orchards where metal based pesticides were applied, as well as uncontrolled demolition and fill on many sites, means that there is potential for soil and groundwater to be contaminated. Contaminated land is an urban hazard that poses health and environmental risks.

Council has a Contaminated Land Policy which forms the basis for the management of contaminated land within Ku-ring-gai through the Planning Proposal (rezoning) and development application processes. The aim of the policy is to ensure that changes of land use will not increase health or environmental risks.

#### STRATEGIC RESPONSE

Council will continue to implement and review the Climate Change Adaptation Strategy. Further interventions to address climate change resilience and to maintain and improve Ku-ring-gai's liveability are incorporated within Urban Forest Planning Priorities K30 and K31, Green Grid Planning Priorities K32, K33 and K34, Water Sensitive City Planning Priorities K35, K36, and K37 and Energy and Greenhouse Gas Emissions Planning Priority K38.

#### ► Floodplain Risk Management

Council is continuing to undertake Flood Studies and Risk Management Plans within all sub catchments of the LGA as per the floodplain risk management process (Figure 4-16). Refer to Figure 4-18 Flood Risk Management for current and planned studies. All floodplain studies and risk assessments are undertaken in consultation with the Office of Environment and Heritage and the Flood Risk Management Committee to ensure significant community consultation throughout the process.

Council is working towards having all current flood mapping and flood planning controls in the LEP and DCP. This will be informed by the completed flood studies and flood risk management plans, with additional flood information for other sub catchments being added as it becomes available.

Council will seek to address identified flood risks, through the investigation and where appropriate implementation of priority management actions identified within flood risk management studies.

#### Extreme Heat and Urban Heat Island (UHI)

Adaptation to increasing urban heat means building communities that are adapted and resilient to hot temperatures: buildings and precincts that utilise sustainable design principles; use less energy, water and waste; and utilising cool materials, greenery and water to help reduce local temperatures.

#### Extreme Heat and Urban Heat Island (UHI) (CONT.)

This will be further advanced through Council's programs, public domain and open space management, which seeks to include:

- a review of council-owned assets across the local government area for thermal comfort, climate adaptiveness and opportunities;
- consideration of heat, in the design and development of Council parks, sports fields (including synthetic fields), open space, and facilities and for long term asset management considerations;
- investigation of the increased use and replacement of impervious surfaces where practically feasible (for example in low traffic areas and through building setbacks); and
- investigation of verge plantings (green infrastructure) in priority heat areas to provide water retention opportunities, habitat, shade and cooling.

Council will investigate the use of development controls within the LEP and DCP to address urban heating, including:

- selection of built materials (including reflectivity of building roofs, paved and soft fall surfaces, podiums and facades);
- encouraging suitable wind flows and circulation through urban areas;
- reducing the impacts of heat rejection sources of heating and cooling systems;
- increasing use and protection of green infrastructure in the urban environment (including appropriate canopy species);
- increasing shade to hard surfaced areas;
- increasing the use of WSUD principles and pervious surfaces to assist in the use and reuse of water for cooling in the urban environment; and
- collaboration with other agencies to build and strengthen partnerships and advocate for BASIX to be updated and strengthened to incorporate urban heat and green infrastructure.

#### ► Bush fire:

- Provide a best practice adaptive management approach to resilience management, including the integration of current legislation, guidelines and standards with scientific and on ground knowledge.
- Work with the NSW Rural Fire Service on the evaluation of bush fire evacuation risk, monitor changes to the urban forest, land use type, densities and road networks to further inform future bush fire planning controls such as zoning, bush fire LEP and DCP controls and Ku-ringgai Bush Fire Prone Land and Bush Fire Evacuation Risk Mapping.

#### Contamination

Council does not hold a 'register' of contaminated sites. Council has conducted a review of readily available information on land use history and potentially contaminated sites. Councils records regarding contamination issues are dynamic and will change over time as land is investigated, remediated and validated, and as new sites of potential contamination are identified.

Council must consider the possibility of former land contaminating activity and the implications that these activities may have for any proposed or permissible future land use. The intensification of land uses is discouraged on land which is identified as contaminated, unless the site can be made suitable through remediation.

# Climate Resilience and Adaptation to the Impacts of Urban and Natural Hazards - Ku-ring-gai Local Planning Priorities and Actions

	Ku-ring-gai Local Planning Priorities
	K39. Reducing the vulnerability, and increasing resilience, to the impacts of climate change on Council, the community and the natural and built environment
	K40. Increasing urban tree canopy and water in the landscape to mitigate the urban heat island effect and create greener, cooler places
	K43. Mitigating the impacts of urban and natural hazards
	Actions
	Review and implement a revised Climate Change Adaptation Strategy (medium term).
	<ul> <li>Integrate climate resilience measures, incorporating minimum performance standards, into Council's asset management program (ongoing).</li> </ul>
	• Complete flood studies and flood risk management plans for all catchments within the LGA (ongoing).
	<ul> <li>Investigate, and where appropriate implement, priority management actions identified within flood risk management studies (ongoing).</li> </ul>
Ku-ring-gai Council	Include flood mapping and flood planning controls in the LEP and DCP (short term).
	Investigate the inclusions of urban heat provisions in LEP and DCP (short term).
	<ul> <li>Investigate design guidelines for best practice urban heat management (including appropriate materials and surface treatments and urban cooling mechanisms (medium term).</li> </ul>
	<ul> <li>Collaborate with other agencies to build and strengthen partnerships and advocate for BASIX to be updated and strengthened to incorporate urban heat and green infrastructure (ongoing).</li> </ul>
	<ul> <li>Update the Ku-ring-gai Bush Fire Prone Land Mapping - reviewed every five years from 2017 (ongoing).</li> </ul>
	<ul> <li>Review LEP and DCP planning controls related to Bushfire and Bush Fire Evacuation Risk. To ensure alignment with current bushfire planning, continued best practice and feedback from consultation with the NSW Rural Fire Service (medium term).</li> </ul>
	<ul> <li>Avoid locating new development in areas exposed to natural and urban hazards and consider options to limit the intensification of development in existing urban areas most exposed to hazards' (ongoing).</li> </ul>
	Planning Priority N22
North District Plan	Adapting to the impacts of urban and natural hazards and climate change



Figure 4-17 Urban Heat Island (UHI) - Summer 2015-2016



Figure 4-18 Flood Risk Management



Figure 4-19 Bushfire Prone Land

## Waste

#### **Ku-ring-gai Local Planning Priorities**

K41. Reducing the generation of waste

K42. Managing waste outcomes that are safe, efficient, cost effective, maximise recycling, and that contribute to the built form and liveability of the community

#### BACKGROUND

The North District Plan acknowledges the diminishing capacity for land filling in Greater Sydney. It identifies planning priorities, objectives and actions, focused on managing waste efficiently, highlighting the need for innovative solutions to reduce the volume of waste and reduce waste transport requirements, as well as protecting and identifying new locations for waste recycling and management. The need to reduce waste and minimise the amount of waste sent to landfill have taken on even greater importance as state and federal governments address the future of recycling in Australia, given the reduction in recycling materials that can be exported.

There are no landfills or resource recovery facilities within the Ku-ring-gai council area to manage waste and recycling locally. Ku-ring-gai currently sends the majority of its waste to Woodlawn Bioreactor Landfill, with kerbside greenwaste being sent to an organics processing facility.

In 2018-2019, Ku-ring-gai produced 55,608 tonnes of domestic waste of which 59.2% was recovered through kerbside collections for recyclable containers, paper and cardboard and green waste as well as Council's e-waste and chemical recycling programs.

Data shows that, even though Ku-ring-gai has experienced a period of population increase over the past decade the total overall amount of waste generated has been relatively stable.

However, waste to landfill has, in fact, slowly but steadily increased since 2008-2009. This is most likely due to the increases in population as the per person garbage generation rates have remained steady at approximately 200 kg per person per year since 2011-2012. Recycling generation per person per year was 140.3 kg in 2008-2009. This has fallen to 88.8 kg in 2018-2019. The per person per year generation rate for greenwaste was 167.2 kg in 2008-2009. This has fallen to 152.1 kg in 2018-2019.

The reasons for the downward trends in recyclables and greenwaste generation are likely to be due to a number of factors, including the increase in the number of multi-unit developments in Ku-ring-gai, decreases in the paper stream and the effects in changes to weather in the greenwaste stream.

Waste management in multi-unit developments is a major issue for Ku-ring-gai due to a range of waste-related problems that are more prevalent than in single dwellings. Recycling streams tend to be more highly contaminated than those in single dwellings. Council has also experienced issues with dumped waste and the size of bulky waste collections outside large unit blocks. Increases in the number of multiunit developments will amplify these problems.

#### STRATEGIC RESPONSE

Similar to other environmental and sustainability priorities, the management of waste will require Council, residents and business working together to develop practical and sustainable responses to the issue. Council's Community Plan places a focus on improved waste reduction, reuse and recycling. Council has two waste performance indicators in its 2018-2021 Delivery Program. These are:

- Kilograms of waste generated per resident
- Percentage of household waste diverted from landfill.

Council has commenced the preparation of a Waste Management Strategy to guide future waste services and outcomes. The Waste Management Strategy is driven by the NSW Waste Avoidance and Resource Recovery Strategy 2014–2021, the Waste Management Hierarchy, Northern Sydney Regional Organisation of Councils' (NSROC) Regional Waste Strategy and Council's community's vision.

Council's approach in the Waste Management Strategy will be to continue to improve its provision of services in the following key areas:

- Core waste management services
- Litter and illegal dumping management
- Contracts and tenders
- Recovery of additional materials
- Research and investigate expanding recovery options through CRCs (Community Recycling Centres), the NSW container deposit scheme, soft plastics, food and organics, e-waste and metals
- Engagement with our community.

Council will continue to engage in education programs and initiatives to assist the local community in improved waste reduction, reuse and recycling outcomes. Council will also continue to investigate markets for recovery of additional material such as soft plastics. Where some materials are not currently economically viable or processes are not available for recycling and reuse, Council will continue to stay informed and actively pursue future markets for these materials.

Future development and growth in Ku-ring-gai needs to be supported by well-planned waste infrastructure that is responsive to future needs, and provides equitable access to waste, reuse and recycling services. The current Ku-ringgai DCP contains a comprehensive set of controls for waste management in all building forms. The objectives of the waste controls in the DCP are focused on efficient, effective and sustainable waste management practices that do not affect the amenity of residents with regard to odour, visual appearance or noise disturbance and the protection of public health. The expected future increase in higher density residential development will require further refinement the DCP, with the view to implement innovative controls that facilitate the reduction of the amount of waste going to landfill and to maximise re-use and recycling. The review of the DCP controls should also address any other relevant issues identified in the waste management strategy.

The importance of waste considerations in Council's planning controls could be further escalated through the inclusion of specific waste provisions within the LEP. As such, the review of the DCP waste provisions should also include an investigation of an appropriate Waste and Recycling clause for inclusion within the Ku-ring-gai Local Environmental Plan.

# Waste - Ku-ring-gai Local Planning Priorities and Actions

	Ku-ring-gai Local Planning Priority
Ku-ring-gai Council	K41. Reducing the generation of waste
	K42. Managing waste outcomes that are safe, efficient, cost effective, maximise recycling, and that contribute to the built form and liveability of the community
	Actions
	<ul> <li>Finalise and commence implementation of the Ku-ring-gai Council Waste Management Strategy (short term).</li> </ul>
	<ul> <li>Review the DCP waste management controls for multi-unit residential buildings to facilitate the reduction of the amount of waste going to landfill and to maximise re-use and recycling (short term).</li> </ul>
	<ul> <li>Investigate the inclusion of a Waste and Recycling clause within the Ku-ring-gai Local Environmental Plan (short term).</li> </ul>
North District Plan	Planning Priority N21
	Reducing carbon emissions and managing energy, water and waste efficiently
Greater Sydney Region Plan	Objective 35
	More Waste is re-used and recycled to support the development of a circular economy