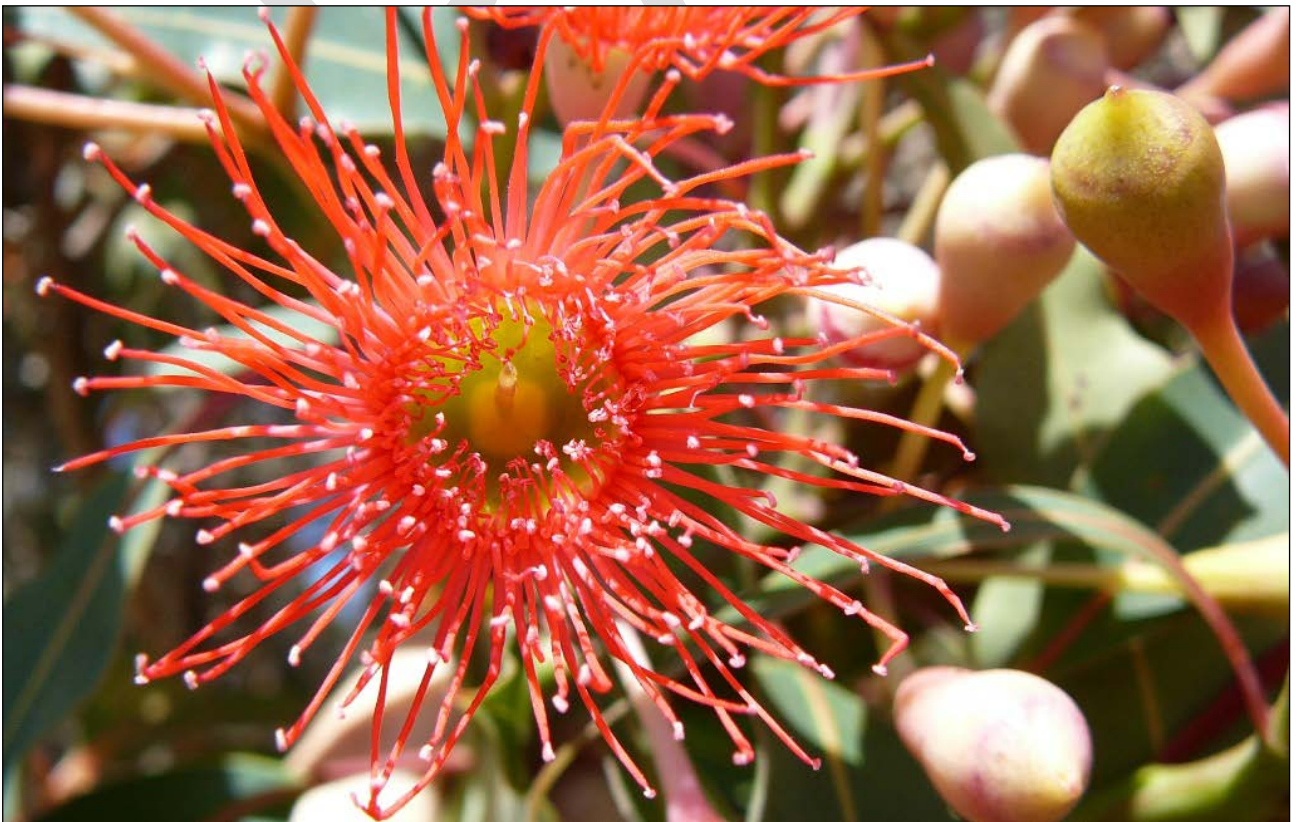


Environment Plan

2014–2019



Contents

Introduction	5
Background	5
Sustainability Policy	6
Purpose of the Plan	6
Strategic planning context	6
Joondalup 2022 Strategic Community Plan 2012 – 2022	7
Structure of the Environment Plan 2014–2019	8
The Pressure–State–Response model	8
Themes and pressures	8
City of Joondalup Environmental Framework	10
Environmental profile	11
Background	11
Climate	11
Future Climates	11
Landform	12
Water resources	12
City of Joondalup natural environment	14
Wetland Zone	14
Coastal Zone	14
Bushland Zone	15
Theme 1 — Biodiversity Management	16
Objective	16
Biodiversity Management Pressures	16
Pressure - Invasive species	16
Pressure – Altered Fire Regimes	17
Pressure – Pathogens	19
Pressure – Fragmentation and Degradation	19
Pressure – Introduced Animals	20
Pressure – Climate Change	21
State of Biodiversity Management within the City of Joondalup	22
Biodiversity Management Responses	24
Biodiversity Management Indicators	26
Theme 2 — Water Management	27
Objective	27
Water Management Pressures	28
Pressure – Reduced water availability	28
Pressure – Water Regulation	29

Pressure – Pollutants	29
State of Water Management within the City of Joondalup	29
State – Corporate Scheme Water Consumption	30
State – Community Scheme Water Consumption	31
State – Groundwater Consumption	31
State – Water Quality	32
Water Management Responses.....	33
Water Management Indicators.....	34
Theme 3 — Climate Change Mitigation	35
Objective.....	35
Climate Change Mitigation Pressures.....	35
Pressure – Increased provision of services and facilities	35
Pressure – Increased provision of services and facilities	36
Pressure – Available technologies	36
Pressure – Capacity for change	37
Pressure – Changing Behaviour	37
State of Climate Change Mitigation within the City of Joondalup	38
State – Corporate Energy Use	38
State – Community Energy Use	39
Climate Change Mitigation Responses.....	40
Climate Change Mitigation Indicators.....	42
Theme 4 — Waste Management.....	43
Objective.....	43
Waste Management Pressures.....	43
Pressure – Increasing Waste Generation.....	43
Pressure – Recycling behaviour	44
State of Waste Management within the City of Joondalup.....	46
Waste Management Responses	47
Waste Management Indicators	48
Theme 5 — Community Involvement.....	49
Objective.....	49
Pressures on Community involvement.....	49
Pressure – Level of Community awareness and participation	49
Pressure – Capacity (City and Community)	50
State of Community involvement within the City of Joondalup.....	51
Community Involvement Responses	52
Community involvement Indicators	53

Implementation54
 Environment Plan Responses54
 Summary of Environment Plan Indicators.....61
Appendix 165
 Federal policies, plans and strategies65
 State policies, plans and strategies67
References70

DRAFT

Introduction

Background

The City of Joondalup is committed to conserving, enhancing and rehabilitating the City's natural assets to ensure the long term protection of the environment for future generations.

Environmental management is a key role of local government. Whilst the responsibility is shared with other spheres of government the City of Joondalup implements programs, strategies and policies, in partnership with stakeholders and the community, to ensure the sustainable use of natural resources, biodiversity conservation, energy and water efficiency and awareness raising of environmental issues within the City.

As the second largest local government in Western Australia, by population, the City of Joondalup is responsible for the management of a diverse number of natural and built environments and the delivery of numerous services to the community. The City of Joondalup has an important role in environmental management and is actively involved in:

- Working with the community to raise awareness of environmental issues
- Providing opportunities for community education
- Developing sustainable waste management options
- Supporting efficient use of water, energy and other resources
- Conserving local biodiversity and natural areas
- Developing partnerships to achieve better environmental outcomes
- Consideration of environmental outcomes in purchasing decisions
- Enhancing the natural environment of the City through effective land use planning and development control process
- Including environmental objectives in long term planning decisions

The City's innovative approach to environmental management has been recognised locally, nationally and internationally as best practice with the following achievements:

2011 International Awards for Liveable Communities

Winner of the World's Most Liveable City Award – Whole of City Award for population 150,001 to 400,000

2011 Western Australian Heritage Awards

Winner of the Outstanding Interpretation Project That Enhances a Place Category

2011 Western Australia Water Awards

Winner of the Waterwise Council Category

2012 United Nations of Australia Association's Environment Day Awards

Winner of the Local Government – Excellence in Overall Environmental Management Category

2010 Keep Australia Beautiful Sustainable Cities Award

Winner of the Young Legends Category - Adopt a Coastline Program

Department of Transport's Local Government TravelSmart Awards 2010

Winner of the TravelSmart Workplace Category - Green Transport Plan

Sustainability Policy

The City's Sustainability Policy states that in carrying out its functions as a local government, the City of Joondalup will use its best endeavours to meet the needs of current and future generations through the integration of environmental protection, social advancement and economic prosperity within a sound framework of governance. The Policy also recognises the Precautionary Principle which states that avoidance of the risk of serious or irreversible environmental damage should not be postponed due to a lack of full, scientific knowledge. The City recognises that while not all the information regarding specific environmental threats and pressures is currently available it is still necessary for the City to plan, and implement measures to effectively manage the local environment.

Purpose of the Plan

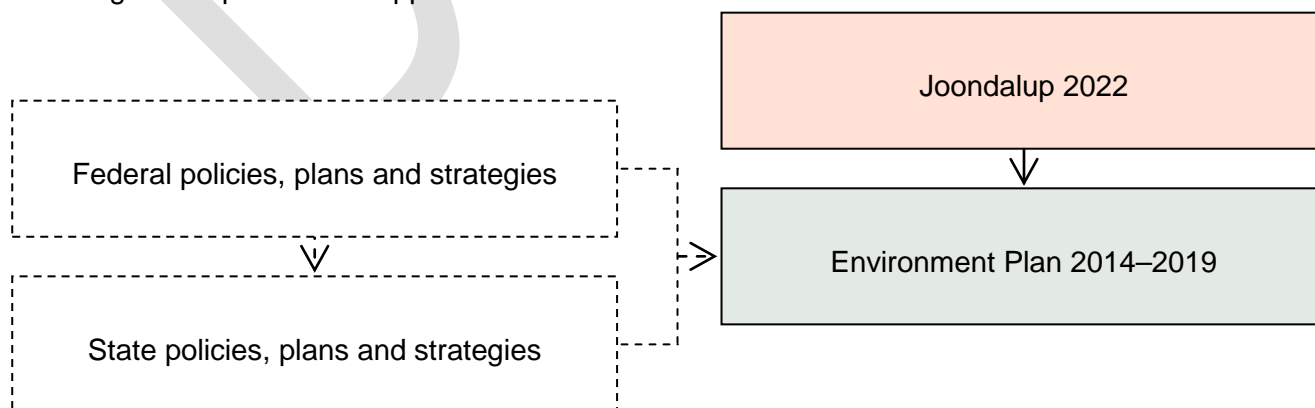
The City of Joondalup *Environment Plan 2014–2019* guides the City's strategic response to local environmental pressures. The purpose of the Plan is to ensure that the City's operations are delivered in an environmentally sustainable manner and that the City takes measures to effectively influence positive environmental behaviours within the community.

The overarching objective of the *Environment Plan 2014–2019* is:

To provide ongoing leadership in adaptive environmental management to ensure the sustainable use of natural resources and the conservation and enhancement of the City's natural assets for future generations.

Strategic planning context

The *Environment Plan 2014–2019* sits below the City of Joondalup Strategic Community Plan *Joondalup 2022* and is informed by the key themes and objectives of the Plan. In addition to the City's internal planning framework, the design and content of the *Environment Plan 2014–2019* also aligns to relevant State and Federal policies, plans and strategies that address issues under Urban Planning and Sustainability, Biodiversity Conservation, Water Management, Climate Mitigation and Waste Management. Details of the relevant State and Federal policies, plans and strategies are provided in Appendix 1.



The strategic planning context of the *Environment Plan 2014–2019*

Joondalup 2022 Strategic Community Plan 2012 – 2022

Joondalup 2022 is the City of Joondalup's long-term strategic planning document that outlines the City's commitment to achieving the vision and aspirations of the community and regional stakeholders. The Plan is divided into six themes, one of which is the Natural Environment. *Joondalup 2022* has established the following aspirational outcome for the management of the local environment:

The City is a global leader in adaptive environmental management. It works closely with the community to protect and enhance the natural environment, while celebrating and showcasing its natural assets to the world.

Within the Natural Environment section, *Joondalup 2022* also includes a series of objectives to guide the management of the City's local environment into the future, these are:

Environmental resilience: *To continually adapt to changing local environmental conditions.*

Community involvement: *To build a community that takes ownership of its natural assets and supports their ongoing preservation and conservation.*

Accessible environments: *To develop an appreciation for local natural assets by providing appropriate access to natural areas.*

Environmental leadership: *To embrace learning opportunities on an international scale and continuously lead by example in our application of new knowledge.*

The City of Joondalup's *Environment Plan 2014–2019* is the key mechanism for achieving outcomes and objectives within the City's Strategic Community Plan.

Structure of the Environment Plan 2014–2019

The City's *Environment Plan 2014–2019* will further enhance the City's management of the local environment and provide a greater emphasis on key environmental challenges including climate change, biodiversity protection and water conservation.

The Pressure–State–Response model

The *Environment Plan 2014–2019* utilises the Pressure–State–Response model developed by the Organisation for Economic Cooperation and Development (OECD). The model is based on the concept of *causality*, which is described as human activities exerting pressures on the environment which alter the state or condition of the environment. The theory behind the Pressure–State–Response model is that these pressures can, in principle, be controlled or modified to reduce negative impacts on the environment. Under the model, the “state” of the environment is its condition at a particular time, and “responses” are the organised actions people take to either reduce environmental pressures, or directly improve environmental conditions.

The *Environment Plan 2014–2019* identifies the key pressures and provides the strategic response to the major environmental issues affecting the City of Joondalup. The Plan includes a number of environmental indicators that will be reported against on an annual basis in order to track the progress and effectiveness of the Plan. These performance measures will be included within the City's *Annual Report*.

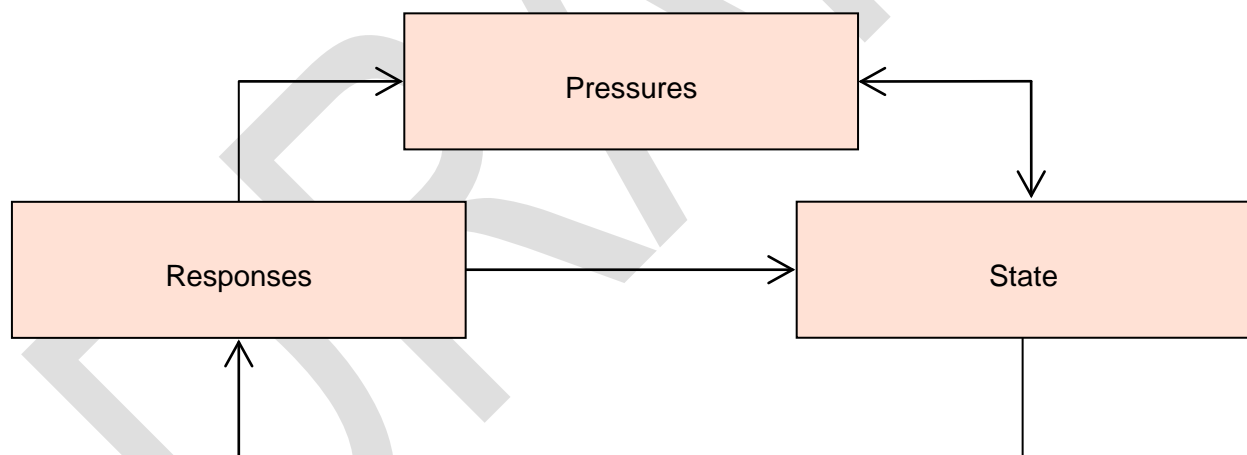


Figure 1- The Pressure–State–Response model of environmental change

Themes and pressures

The *Environment Plan 2014–2019* addresses the key environmental pressures for the City of Joondalup under five Themes. Sitting below each theme are the key pressures to be addressed by the City over the life of the Plan.

For each of the themes the current state is outlined with recommended responses for environmental improvement being provided, in the form of a Plan/Strategy, an Overarching Program or a Policy.

Whilst separate themes have been included in the Plan it is acknowledged that there are interactions and inter-relationships between several of themes discussed within the *Environment Plan 2014–2019*. For example there are strong links between the Biodiversity and Water Management themes with the availability of water in wetland ecosystems impacting on the biodiversity values of these areas.

Indicators that will inform ongoing monitoring and reporting of the progress of the *Environment Plan 2014–2019* are included under each theme.

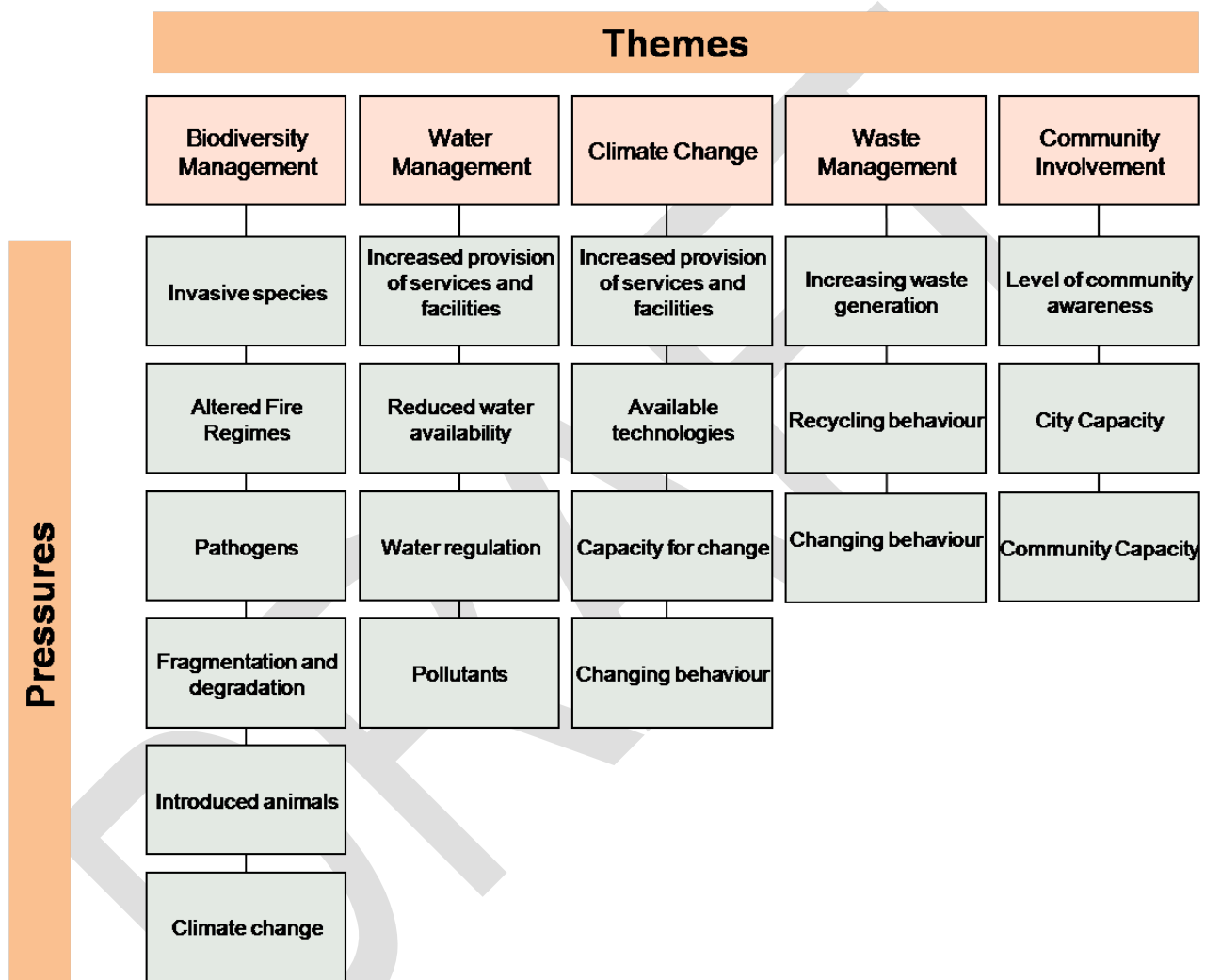


Figure 2- Themes and pressures addressed in the *Environment Plan 2014-2019*

City of Joondalup Environmental Framework

Achievement of the objectives within the *Environment Plan 2014-2019* will be supported through the City's Environmental Framework, shown in Figure 3. The City's Environmental Framework provides high level guidance to the management of the local environment. The Environment Plan sets the strategic direction for the City's environmental management activities.

Sitting below the Environment Plan are a series of issue specific plans which address key environmental issues such as water conservation, climate change and adaptation and biodiversity conservation.

These issue specific plans contain detailed information on the activities that the City will take in addressing the key environmental issues affecting the local environment, which includes implementation of issue specific plans that address key environmental issues within the City of Joondalup.



Figure 3- City of Joondalup Environmental Framework

Environmental profile

Background

The City of Joondalup is situated along the Swan Coastal Plain, 30 kilometres from the Perth Central Business District. The City covers an area of 96 square kilometres which encompasses a diverse range of natural areas including 17 kilometres of coastal foreshore, a chain of wetlands and a variety of bushland ecosystems.

The City's southern boundary is located approximately 16 kilometres from the Perth Central Business District, and is bounded by the City of Wanneroo to the east and north, the City of Stirling to the south, and the Indian Ocean to the west.

There are a number of regionally, nationally and internationally significant natural areas located within or adjacent to the City including the Yellagonga Regional Park, the Marmion Marine Park, the Neerabup National Park and a number of Bush Forever sites which contain species of high conservation value.

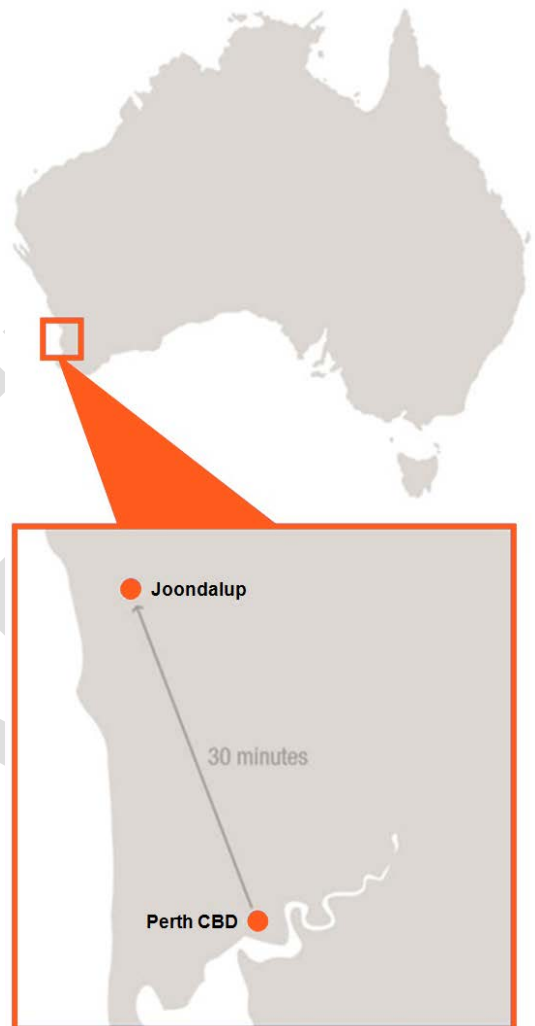
Climate

The City of Joondalup has a Mediterranean type climate characterised by hot, dry summers and mild, wet winters. Approximately 80 percent of rainfall occurs between the months of May and September.

Wind conditions during the summer depend on anti-cyclonic conditions. During the average summer's day the eastern wind is predominant, modified by sea/land breezes. During the winter, wind conditions are variable; however, cyclonic conditions with the possibility of storms bring mostly north-west to south-west prevailing winds.

Future Climates

The effects of climate change will vary in scale and nature across the globe but will impact on temperature, rainfall, intensity and frequency of extreme weather events, wind strength and patterns, and ocean temperatures and currents.



The City has identified a climate change scenario (based on the best available scientific research) to provide a picture of what the climate will be like in the City of Joondalup in 2070 compared to 1990.

In 2070, it is expected that the City of Joondalup will have hotter, drier and windier summers with the number of days over 35°C nearly doubling. Winters will be drier, warmer and less windy as a result of fewer low pressure systems¹.

Landform

The City of Joondalup occupies part of the Swan Coastal Plain and has an undulating landscape formed by depositional material of Aeolian origin. The area consists of two geomorphic systems situated parallel to the present coastline. These are the Spearwood Dunes, consisting of three sub-systems known as Karrakatta, Cottesloe and the newer Quindalup Dunes along the present coastline.

The Spearwood Dunes System consists of a core of massive Tamala Limestone overlain by yellow to brown sand mainly consisting of quartz. The System has two distinctly different landscapes. On the western side, the Cottesloe Unit consists of shallow sands and exposed limestone in many places, while on the eastern side the Karrakatta Unit has deep sand features.

The Quindalup Dune System consists of calcareous sand and occurs in both linear beach ridges and parabolic dune formations, arranged parallel to the coastline. The core of this system is also composed of Tamala Limestone, which is out-cropping in a number of places particularly along the shoreline at Marmion, Ocean Reef and Burns Beach. Soil developed on this system is relatively poor quality and the vegetation type consists mainly of scrub or heath formations.

Water resources

The City relies on both scheme and groundwater resources. Scheme water is used within community buildings and facilities and administrative buildings. Groundwater is used to irrigate the City's parks and open spaces. Both scheme and groundwater resources are under pressure from a drying climate and are both sourced from the Gnangara Groundwater System.

Scheme Water

All scheme water used in the City is sourced from the superficial aquifer of the Gnangara Groundwater System. A significant area of the City is defined as a Priority 3 Drinking Water Source Area as groundwater extracted from this area is used to supply public drinking water through the Integrated Water Supply Scheme (IWSS). The IWSS consists of three sources: dams (surface water), groundwater (Gnangara and Jandakot aquifers) and desalination (sea water). Currently, 35 – 50 per cent of water sourced for the IWSS is from groundwater.

¹ CSIRO (2007)

Groundwater

The City of Joondalup's water supply is largely dependent on groundwater resources. There are three groundwater formations within the City of Joondalup. These are the Leederville Formation, the Yarragadee Formation and the superficial formation known as the Gnangara Mound. An important groundwater resource for the Perth Metropolitan Region, the Gnangara Mound is a large source of water used for public and private supply. This good quality groundwater is generally unconfined, fresh and easily accessible, usually at depths up to 50 metres below the surface.

The City of Joondalup contains part of a distinct linear wetland system. It extends from Lake Goollelal and Lake Joondalup in the south within the City of Joondalup, north through Lakes Neerabup, Nowergup and Carabooda to Loch McNess in the Yanchep Regional Park, within the City of Wanneroo. Lakes Goollelal and Joondalup form part of Yellagonga Regional Park.

City of Joondalup natural environment

The range of environmental areas within the City are characterised into zones according to the specific landform and vegetation types which exists within each area. The three main biodiversity zones within the City are the Wetland Zone, Coastal Zone and Bushland Zone.

Wetland Zone

The Wetland Zone comprises of a chain of conservation-category wetlands alongside the City's eastern boundary. The wetlands consist of Lake Goollelal, Lake Joondalup and Wallaburnup and Beenyup Swamps. The Wetland Zone is located within the Yellagonga Regional Park and contains some of the oldest and last remaining freshwater wetland systems along the Swan Coastal Plain

The Wetland Zone provides habitat for several fish, frog and reptile species and a number of indigenous bird species and mammals have also been identified within the area. The vegetation within the Wetland Zone has been fragmented due to development and weed invasion, however a number of significant plant species have been recorded within the Yellagonga Regional Park.

The dominant species include flooded gum (*Eucalyptus rudis*), freshwater paperbark (*Melaleuca raphiophylla*) and red eyed wattle (*Acacia cyclops*). The aquatic vegetation predominantly consists of rushes and reeds. The fringing upland vegetation consists of species typical of the Spearwood Dune System including open jarrah and marri forest with scattered tuarts. The fringing wetland vegetation has been identified as having a high conservation value, despite weed invasion and altered water regimes.



A slender tree frog (*Litoria adelaidensis*) in the Wetland Zone

Coastal Zone

The City's Coastal Zone extends from Marmion in the City's south to Burns Beach in the north and includes 17 kilometres of coastal foreshore, limestone cliffs, rocks and reefs, white sand dunes and beaches. The Coastal Zone is one of the City's most valuable assets and has been recognised for its conservation significance with areas being protected under Bush Forever. This area is also greatly utilised by the local community, visitors and tourists for its recreational and aesthetic opportunities.

The shore and offshore islands of the Coastal Zone provide resting and breeding sites for a variety of species of seabirds, including several migratory species which are protected under international

treaties including the Japan Australia Migratory Birds Agreement and the China Australia Migratory Birds Agreement. The coastal area has also been identified as an important habitat for a variety of reptile species.



Grey saltbush (*Atriplex cinerea*) in the Coastal Zone

Bushland Zone

The City's Bushland Zone comprises of protected open space areas east of Padbury and Craigie including Craigie Open Space, Pinnaroo Valley, Hepburn Heights and Lilburne Reserve. Together these areas represent approximately 4 square kilometres of adjoining bushland reserves. In addition, the City manages over 500 hectares of natural areas in 108 reserves containing significant flora and fauna species and ecological communities.



Various flora species in the City's Bushland Zone

Theme 1 — Biodiversity Management

Objective

To provide long-term protection and enhancement of the City's biodiversity through adaptive management and the delivery of targeted projects and programs.

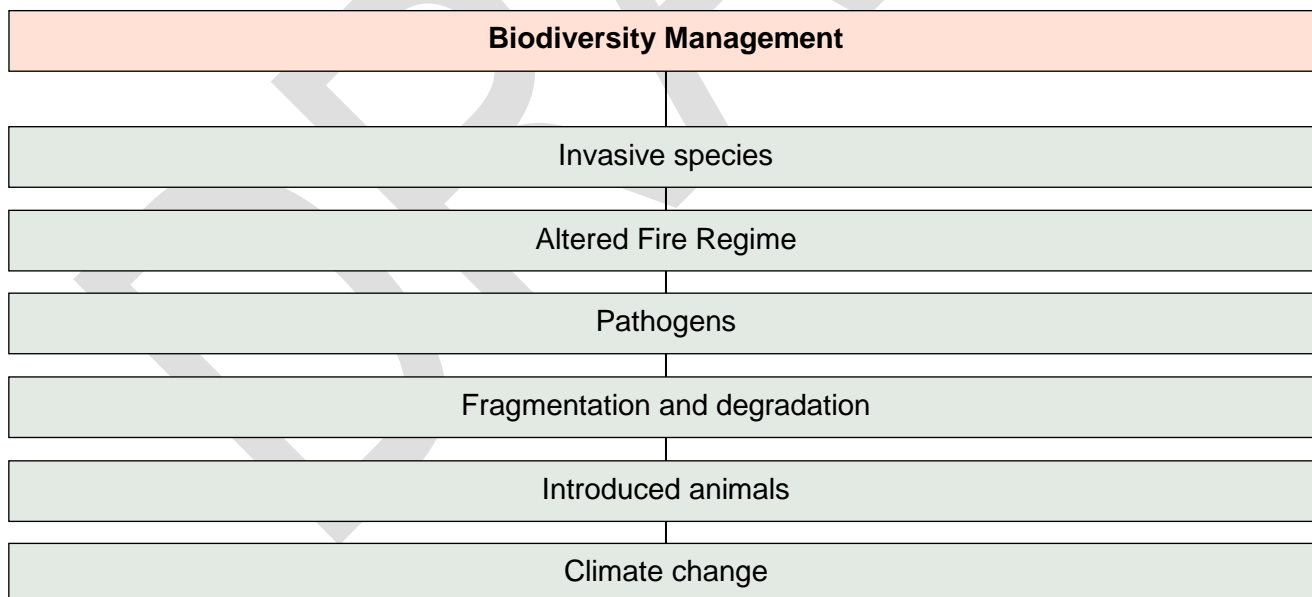
The diverse range of natural areas located within the City of Joondalup support an abundance of plant and animals species. The long-term protection of biodiversity values within the City is critical to ensuring the conservation of unique habitat which supports iconic local species such as the Long-necked Tortoise, Carnaby's Cockatoo and Graceful Sunmoth.

The protection and enhancement of biodiversity within the City also benefits the community through the provision of ecological services such as the capture of carbon dioxide, cooling of urban environments and a number of recreational and cultural experiences.

Biodiversity Management Pressures

There are a number of pressures that pose a risk to the City's biodiversity. Development and other human activities threaten to affect the long-term protection and conservation of biodiversity values within the City.

The main pressures that threaten biodiversity within the City of Joondalup include the following:



Pressure - Invasive species

The City of Joondalup boasts large areas of bushland, many of which are recognised as having local and regional significance; however the invasion of weeds threatens the diversity of these natural areas. Weeds are a key management issue for the City's natural areas and threaten the biodiversity values they contain. Weeds can displace native plant species, harbour pests and

diseases and create fuel loads for fire. Weeds also alter the structure and distribution of plant communities which has a negative impact on native flora and fauna.²

Weeds are commonly introduced and distributed within bushland areas through the dispersal of seed by wind and animals and birds, through dumping of garden refuse and through the use of machinery in natural areas. The Commonwealth Scientific and Industrial Research Organisation (CSIRO) estimates that an average of 10 weed species are established in Australia each year, 70 per cent of which are likely to have escaped from private or public (botanic) gardens.³

Weeds can also become established wherever the environment is disturbed or altered, through unauthorised access by people, vehicles and animals and through frequent fire events.



Common weed species in the City of Joondalup — One-leaf Cape Tulip (*Moraea flaccida*)

Weeds are one of the key environmental threats to natural areas in the City of Joondalup. The City of Joondalup contains 234 identified weed species, including 18 declared pest plants and six Weeds of National Significance. Effective weed management is required to ensure that measures are taken to prevent, monitor and control the spread of weeds within the City.

The City has undertaken monitoring of the density of environmental weeds within reserves since 2004/05. At this time, the average density of environmental weeds within natural areas was 33%. Since monitoring commenced, a number of weed control measures have been put in place which has led to a significant reduction in the density of weeds within the City. In 2012/13 surveys demonstrated that average weed density within City reserves was 11%.

Pressure – Altered Fire Regimes

Fire is an important natural feature of the Western Australian landscape. Fire helps to shape the diversity of plant communities with many native plants having developed fire-related adaptations over time, for example many species require fire to enable flowering or seed germination.

² DSEWPC (2012)

³ Natural Resource Management Ministerial Council (2007)

Human activity such as accidents and arson has resulted in increased incidences of fire within many urban bushland reserves. Increased frequent burning has devastating effects on biodiversity in urban bushland reserves as altered fire regimes affect the floristic composition and structure of vegetation and fauna of bushland reserves. Frequent burning also encourages growth of highly flammable and invasive weeds.

Natural regeneration is also prevented due to increased frequency of fire regimes. Seeding species of plants do not have enough time to flower and set seed whilst re-sprouting species do not have time to build up enough food stores to allow re-sprouting of buds.

Following the event of a fire, natural areas are vulnerable to invasive weed species. Therefore active management of these areas is vital following a fire in order to ensure native species are not competing with weeds for nutrients, space and water⁴.

Many of the natural areas within the City of Joondalup are affected by seasonal fires, with the majority being small spot fires. However a number of natural areas have been affected by major fires in recent years. Reserves that have experienced one or more major fire event within recent years including Warwick Open Space, Central Park, Joondalup and Yellagonga Regional Park, Joondalup.



Central Park, Joondalup after a fire in January 2011

Fire management is a key responsibility for local government. Planning for fire management and the implementation of prevention, preparedness and recovery strategies ensure that the risk to property and life and the natural values of bushland is reduced.

The City's aims in regard to Fire Management are to:

- protect life, property and environment;
- fulfil obligations under the fire related legislation;
- maintain and enhance biodiversity values within natural areas;

⁴ Western Australia Local Government Association (2009)

- ensure long term survival of native wildlife populations; and
- minimise adverse impacts on regional air quality.

Pressure – Pathogens

Organisms such as fungi, bacteria and viruses that cause plant diseases are known as pathogens. Whilst some pathogens are naturally occurring within soil populations, others have been introduced to the environment through the movement of plant materials and soils.

The presence of pathogens such as *Phytophthora sp* (dieback) and *Armillaria* (honey fungus) within the City poses a serious risk to the biodiversity values within natural areas.



Dieback-affected trees in the City of Joondalup

Vegetated areas within the City are at risk from pathogens which poses a serious threat to the biodiversity values within the City's parks and bushland areas. Effective pathogen management is required to ensure that measures are taken to mitigate the effects and limit the spread of pathogens within the City.

Whilst the City has had some known or suspected outbreaks of pathogens in recent years, the actual extent of pathogens within the City's vegetated areas is unknown. The City has however developed a Pathogen Management Plan which establishes the level of risk of pathogen infestation within City parks and natural areas. The Plan provides guidance on management procedures and staff training that should be employed to reduce the spread of pathogens and strategies to engage the community in order to raise the awareness of pathogens within the City. A key component of the Plan is the Pathogen Mapping and Sampling Program which aims to establish the actual extent of pathogens within the City by undertaking ground truthing and soil sampling within parks and natural areas.

Pressure – Fragmentation and Degradation

Removal of native vegetation, both historic and current, is a major threatening process affecting biodiversity in Western Australia. Removal of large areas of native vegetation fragments the landscape, leaving behind small and unconnected remnants of native vegetation resulting in many flora and fauna communities becoming threatened; often resulting in a loss of biodiversity.

Clearing in the Greater Perth Metropolitan Region has resulted in a number of environmental issues including enhanced spread of weed species and exacerbated soil erosion, reduced

biological diversity, fragmentation and has also contributed to reduced carbon stores of greenhouse gases⁵

The City of Joondalup manages more than 500 hectares of bushland with many areas being recognised for their regional significance. The continual protection of areas of native vegetation through the use of planning mechanisms as well as on ground management is vital to conserving and enhancing biodiversity within the City.



Coastal development in the City of Joondalup

Pressure – Introduced Animals

The presence of pest animals within natural areas can lead to major environmental impacts. Many pest animals cause significant damage to ecosystems such as severe land degradation, soil erosion, poor water quality and the spread of weeds. Competition, habitat destruction and predation by pest animals threaten the survival of many of Australia's native plants and animals.

Introduced animals such as cats, foxes, rabbits, birds and bees inhabit the City's bushland, wetland and coastal areas. Foxes within the Yellagonga Regional Park pose a significant threat to the population of Oblong long-necked tortoise that is native to the area with eggs being taken during breeding months.

The European Rabbit is common within the City's coastal and bushland areas and has the potential to damage large areas of native vegetation. Rabbits also reduce the effectiveness of bushland rehabilitation activities by feeding on newly planted seedlings.

Domestic animals such as dogs can also cause damage to the City's natural environment, particularly when exercised unleashed within natural areas. Dogs can chase and harass native fauna often resulting in stress and harm to the animals.

⁵ Environmental Protection Authority (2007)

Domestic cats have the potential to cause significant environmental harm when enabled to roam within natural areas. Predation of wildlife by domestic cats is known to have serious impacts on the population of native mammals, reptiles and birds within bushland areas along the Swan Coastal Plain.



Predation of tortoise eggs within Yellagonga Regional Park

Pressure – Climate Change

Australia's unique biodiversity, already under threat from a wide range of stressors, will face further impacts into the future as a result of a changing climate.

Biodiversity is one of the most vulnerable sectors to climate change and many of Australia's most valued and iconic natural areas and the rich biodiversity they support will be subject to the impacts associated with climate change.

The south-west region of Western Australia has been identified as one area which is significantly vulnerable to the impacts of climate change. Increased temperatures, reduced rainfall, sea level rise and increased frequency and severity of storm events are likely to be experienced within the City of Joondalup.

A number of threats associated with the effects of climate change are likely to impact the City's biodiversity. The key impacts include⁶:

- Increased potential and frequency for bush fires.
- Reduced water available for wetland ecosystems.
- Loss of species.
- Disruption to breeding patterns and distribution of certain species.
- Water quality issues.
- Less recharge to groundwater systems.
- Increased competition between agricultural, urban and environmental needs.
- Loss of foreshore and dune area.

⁶ Climate Commission (2011)

- Disruption in the breeding patterns and distribution of certain species.
- Damage and loss of vegetation.
- Increased erosion.



Coastal erosion along the City of Joondalup coastline

State of Biodiversity Management within the City of Joondalup

There are a variety of regionally, nationally and internationally significant natural areas located within the City including the Yellagonga Regional Park and a number of Bush Forever sites which contain species of high conservation value.

The City of Joondalup encompasses approximately 9600 hectares of land in the northern corridor of Perth. Around 1390 hectares is vegetated with native flora across natural bushland areas, 17 kilometres of coastal foreshore, and a chain of linear wetlands, as shown in Figure 4. Of the total vegetated area approximately 1240 hectares or >85% is protected under the City's District Planning Scheme and/or the State Government's Bush Forever Strategy.

The City of Joondalup actively manages over 500 hectares of natural areas, the remainder is managed by state government and private land owners.

Increasing protection of ecological communities within the City of Joondalup will ensure that the City's ecosystems and biological diversity, as well as the numerous benefits deriving from biodiversity are conserved for future generations.

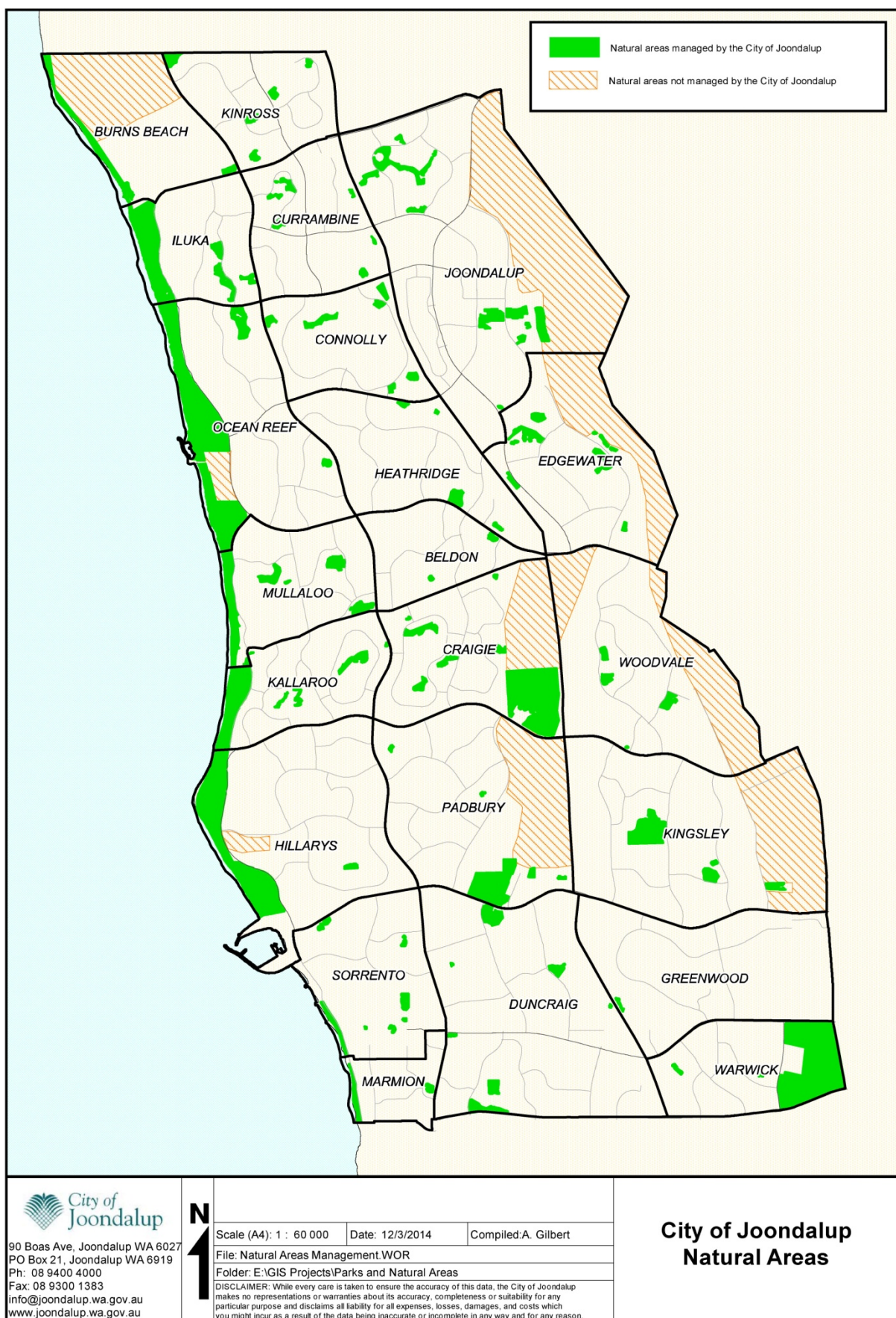


Figure 4- Natural Areas within the City of Joondalup

Biodiversity Management Responses

In order to address the threats to biodiversity within the City's natural environment and to achieve the objectives within the *Environment Plan 2014-2019* the following strategic environmental initiatives will be undertaken over the life of the Plan.

Response	Description	Response Type	Threat Addressed
Natural Area Management Plans	Continue to develop Natural Areas Management Plans to improve the strategic management of the City's native vegetation and ecosystems.	Plan/ Strategy	All
Yellagonga Integrated Catchment Management Plan 2014 -2018	Implement the new Yellagonga Catchment Management Plan to ensure the long term protection of the Yellagonga Wetlands with a focus on addressing the current and future impacts of climate change.	Plan/ Strategy	All
Coastal Foreshore Natural Areas Management Plan	Implement the City's Coastal Foreshore Natural Areas Management Plan to protect and enhance the native vegetation within the City's coastal foreshore areas.	Plan/ Strategy	All
Think Green Environmental Education Program	Through the Think Green Environmental Education Program continue to raise the awareness of threats to biodiversity within the community and inform the community on actions that can be taken to reduce these threats.	Overarching Program	All
Weed Management Plan 2014-2019	Implement the City's Weed Management Plan to provide guidance on weed surveying and monitoring, priority weeds species control and seasonal weed control measures.	Plan/ Strategy	Invasive Species
Fire Management Plan 2015-2020	Develop and implement an overarching City of Joondalup Fire Management Plan to provide a coordinated approach to minimising the risk of fire within Natural Areas.	Plan/ Strategy	Altered Fire Regimes
Pathogen Management Plan 2013-2016	Implement the City's Pathogen Management Plan to provide guidance on pathogen management, control measures, staff training and to inform the development of community education strategies regarding pathogens. Undertake a major review of the Pathogen Management Plan in 2015-16.	Plan/ Strategy	Pathogens
Local Planning Strategy	The City's Local Planning Strategy can provide mechanisms to protect and enhance the City's natural environment through a number of policy instruments that aim to encourage environmental protection through land use planning decisions.	Plan/ Strategy	Fragmentation and Degradation

Response	Description	Response Type	Threat Addressed
Schedule 5 of the City's District Planning Scheme	Undertake a review of Schedule 5 of the City's <i>District Planning Scheme</i> in order to include additional priority reserves for protection, as determined by bushland condition assessments.	Policy	Fragmentation and Degradation
Vegetation Retention Policy	Develop and implement a <i>Vegetation Retention Policy</i> to encourage the retention of natural landforms and native vegetation within the City of Joondalup.	Policy	Fragmentation and Degradation
Feral Animal Management Program	Continue to implement management actions to address the environmental impacts of domestic and pest animals within the City's natural areas.	Overarching Program	Introduced Animals
Coastal Adaptation Planning and Implementation Project	Implement the Coastal Adaptation Planning and Implementation Project to ensure that the outcomes of the City's Coastal Vulnerability Studies are integrated into City policies, planning and maintenance schedules and Capital Works Programs where relevant.	Overarching Program	Climate Change
Climate Change Strategy 2014 - 2019	The Climate Change Strategy provides guidance on the City's climate change management activities over the next five years. It addresses climate change mitigation and adaptation and has both a corporate and community focus. One of the key focus areas is the Natural Environment.	Plan/ Strategy	Climate Change
Implementation of State Coastal Planning Policy 2.6	Implement the State Coastal Planning Policy 2.6 when approving developments under the City's Local Planning Scheme. SCPP 2.6 provides guidance for decision making within the coastal zone including managing development and land use change; establishment of foreshore reserves; and protection, conservation and enhancement of coastal values.	Policy	Climate Change
Strategic Partnerships	Investigate opportunities to partner with stakeholders, industry groups and research institutions to enable the City to build capacity and gain information relating to best practice approaches to environmental management	Overarching Program	All

Biodiversity Management Indicators

Biodiversity indicators are used to assess the condition of the City's natural environment and to track the progress and effectiveness of implemented projects and initiatives. Indicators are monitored on an annual basis and this information is included within the City's *Annual Report*.

Indicator 1 Annual density of environmental weeds (%) within City of Joondalup Natural Areas	Source Measured on three transects (a line along which environmental data is collected). Ten of the City's reserves are assessed on an annual basis.	Aspirational Trend Decrease	Reportable Period 2014 -2019
Indicator 2 Percentage of natural areas protected within City reserves (ha)	Source Areas included in the City's District Planning Scheme Schedule 5 and City of Joondalup Bush Forever sites.	Aspirational Trend Increase	Reportable Period 2014 -2019
Indicator 3 Vegetation Condition of City of Joondalup Major Conservation Areas. (% of area in pristine, excellent, very good, good, degraded or completely degraded condition)	Source Assessed through floristic surveys undertaken within City of Joondalup Major Conservation Areas utilising the Keighery Scale, a tool used to rate the condition of vegetation from pristine to completely degraded.	Aspirational Trend Not Applicable (Floristic surveys are undertaken once every five years which does not allow for annual comparison of condition)	Reportable Period 2018-19

Theme 2 — Water Management

Objective

To manage the City's water resources in a sustainable manner in order to decrease water consumption, increase efficiency and improve water quality.

As a local government, the City relies heavily on both scheme and groundwater resources. Scheme water is used within the City's buildings and facilities whilst groundwater is used for the irrigation of parks and reserves managed by the City. Groundwater is sourced from the superficial (shallow) aquifers in the Gnangara Groundwater System.

The City has demonstrated its ongoing commitment to balancing its own use of water resources and encouraging water efficiency within the community. The *City Water Plan 2012-2015* outlines a coordinated approach for the City to sustainably manage water resources within City operations and the community including the setting of targets. As a water user, facility manager, land-use planning authority and community educator, the City is well placed to demonstrate leadership and contribute to sustainable water management.

Water resources are an integral component of the natural environment. Water provides the basis for all forms of life; supports biodiversity and provides important habitats. Ecosystem health is dependent upon sufficient water within the environment to support its biodiversity and habitats.

Water available to the environment has reduced in many areas due to extraction of water for human consumption and also impacts of a drying climate. As water becomes less readily available it is important that water resources are managed responsibly to maintain sufficient water within the environment to ensure ecosystem viability. Both the City's bushland areas and wetland areas are currently and are likely to continue to be under pressure due to reduced water availability.

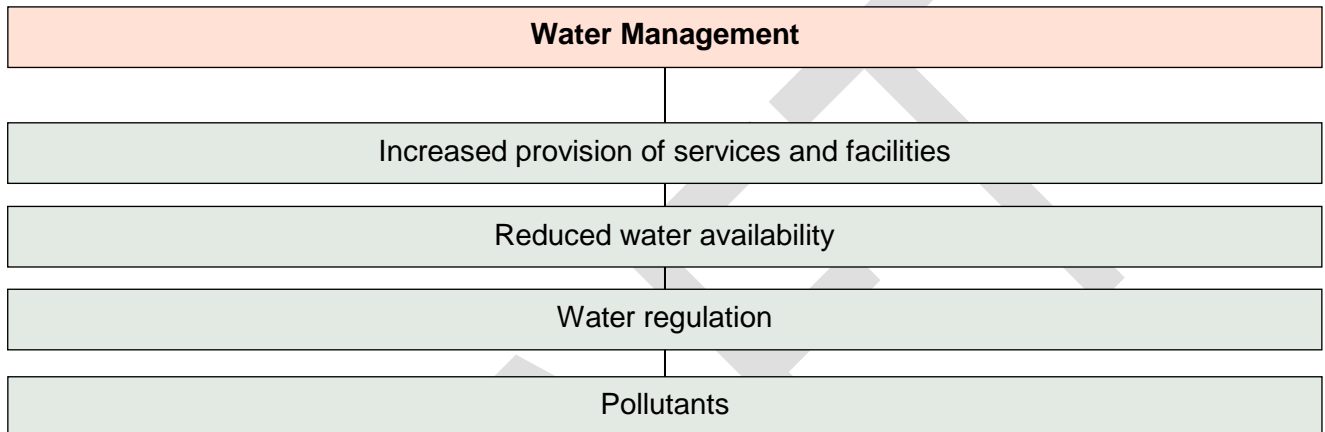
Water quality is also important for ecosystem health particularly in the City's wetland areas. Poor water quality can affect biodiversity health and can cause algal blooms, reduced reproduction rates and flora and fauna death.

As such, the City of Joondalup recognises the importance of the sustainable and responsible use of water within its operations and facilities, and the need to promote water conservation, water efficiency and water quality within the community.

Water Management Pressures

The City undertakes its water management activities in the context of a number of pressures including requirements to reduce water consumption, a drying climate, increased provision of services and facilities and the impact of pollutants on receiving water bodies from the urban environment.

The main pressures that threaten water resources within the City of Joondalup are shown in the diagram below.



Increased provision of services and facilities

The City's population has increased by almost 5% in the past ten years. The growing population has increased demand for services and facilities within the City. With an expected increase in population across the Perth-Peel Region from 1.65 million to 2.2 million by 2031⁷, demand for water resources is set to increase considerably. As water availability decreases and demand increases it is essential that the City takes steps to use water resources in a responsible manner while maintaining the delivery of high quality services and facilities for the community. To achieve this, the City aims to improve both water conservation and efficiency.

Pressure – Reduced water availability

The south-west of Western Australia has experienced a 15% reduction in rainfall since the mid-1970s.⁸ Reduced rainfall has resulted in a significant decrease in the annual stream flow into Perth dams. Between 1911 and 1974 average annual stream inflow into Perth's dams was 338 Gigalitres (GL); between 2006 and 2012 it was only 65.8GL, representing approximately an 80% decrease.

⁷ Department of Planning & Western Australian Planning Commission. (2010)

⁸ IOCI (2010)

Reduced stream flow has also impacted on recharge to groundwater aquifers with water levels in the Gnangara Groundwater System declining. This system supports some of the City's key environmental assets including the Yellagonga Wetlands.

Future climate change will lead to a hotter drier climate with less rainfall and increased evaporation rates further reducing water availability. This will put pressure on both environmental water requirements, which may impact on biodiversity management, and water resource management.

Pressure – Water Regulation

Reduced stream inflow has affected water availability for the Perth Metropolitan Area and has led to increased pressure on groundwater resources. The region's reliance on groundwater has resulted in more stringent management and monitoring of groundwater use by the State Government which has meant large users such as the local government sector have had to adapt and significantly reduce groundwater use.

The Department of Water is facilitating reform of water resources legislation to ensure a more equitable, transparent and sustainable approach to groundwater allocations and management. Local governments will need to prepare for the possibility of changes to the amount of groundwater that is available for use for irrigation purposes as well as possible changes to management and monitoring processes.

Pressure – Pollutants

The interface between surface water, including wetlands, coastal waters and groundwater in the City means that water quality management is an important issue. Water quality can be negatively impacted through drainage operations, maintenance works (including street sweeping) and management of waterways and public open space. Within the community the application of fertilisers, waste management, vehicle use and interaction with waterways can also lead to a reduction in the quality of water of receiving environments.

The City has shared management responsibility for conservation category wetlands within Yellagonga Regional Park and also manages a number of constructed (artificial) wetlands located within City parks and public open space.

Poor water quality can significantly affect the health of wetland and aquatic systems with increased levels of metals and nutrients within the water bodies leading to algal blooms, disease and the loss of fauna and vegetation communities.

State of Water Management within the City of Joondalup

The City relies on both scheme and groundwater resources. Scheme water is used within community buildings and facilities and administrative buildings. Groundwater is used to irrigate the City's parks and open spaces. Both scheme and groundwater resources are under pressure from a drying climate and are both sourced from the Gnangara Groundwater System. The use of alternative water sources, to substitute scheme and groundwater, will be investigated by the City as it adapts to a drying climate. Maintaining water quality is also important as wetlands provide important local amenity and ecological values.



City of Joondalup Craigie Leisure Centre

State – Corporate Scheme Water Consumption

Corporate scheme water refers to water sourced from the Integrated Water Supply Scheme (IWSS) that is used within City buildings and facilities. In 2012/13 the City used 72,815kL of scheme water which was equivalent to 44kL per capita.

Over the past few years this consumption has increased slightly. See Figure 5.

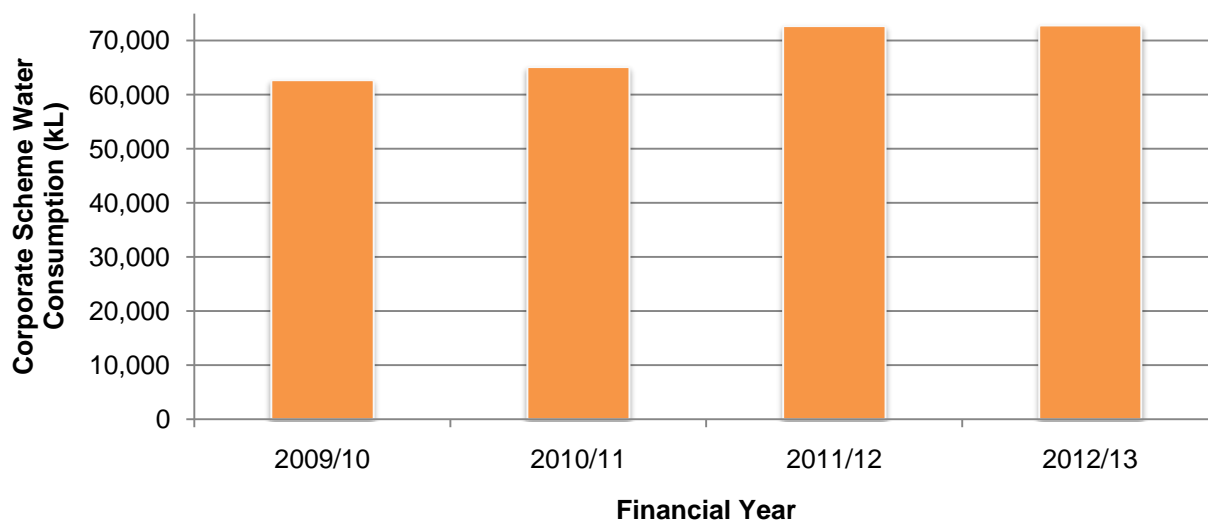


Figure 5- Annual Corporate Scheme water consumption (kL)

State – Community Scheme Water Consumption

Community Scheme water is residential water use sourced from the Integrated Water Supply Scheme (IWSS). Consumption data is sourced from the Water Corporation. Community Scheme water use for 2012/13 was 18,847,810kL which is equivalent to 115kL per capita.

At the residential level the average water consumption per household was 314.62 kL in 2011/12. Consumption decreased to 303.86 kL in 2012/13; however still remained higher than the Perth Average of 277 kL. Iluka had the highest annual consumption per unit of 370.11 kL, followed by Connolly and Woodvale, whilst the suburbs of Beldon, Craigie, Heathridge, and Padbury were below the Perth Average in 2012/13. See Figure 6.

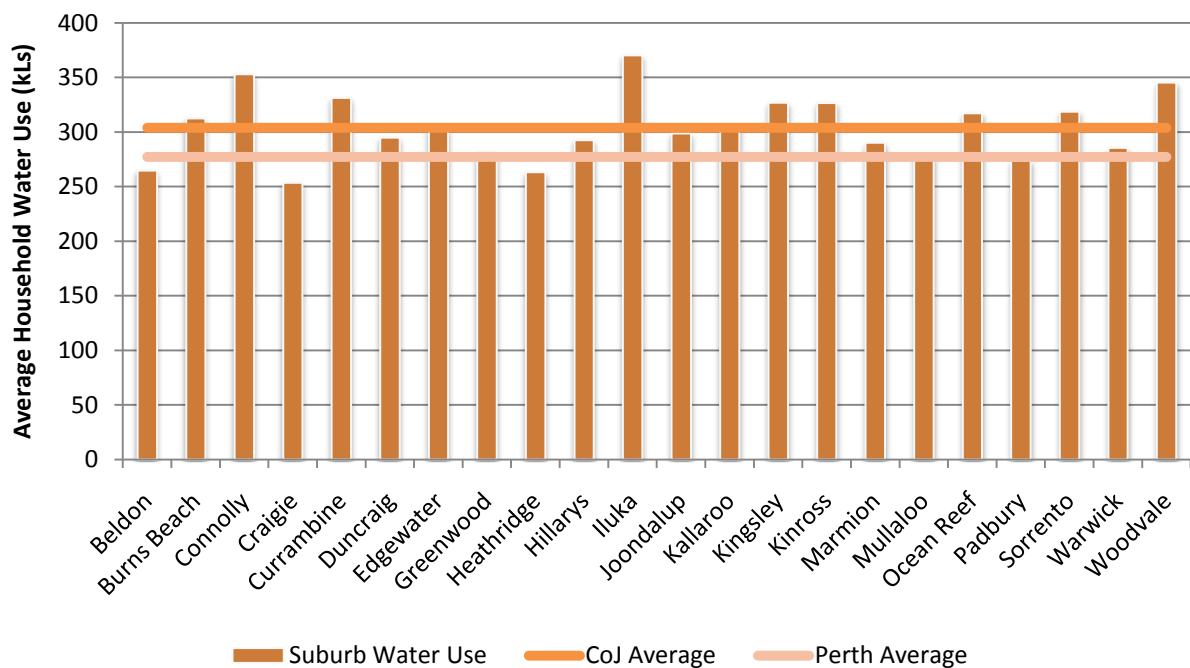


Figure 6- City of Joondalup Average Water Use by Suburb (2012/13)

Suburbs with a greater number of high density residential dwellings recorded less water use per unit. Analysis of residential water consumption by suburb assists the City to run targeted campaigns for water conservation.

State – Groundwater Consumption

The City utilises groundwater for irrigation of parks and public opens spaces. The City has been monitoring its groundwater use since 2007. Through the implementation of water efficiency measures such as ecozoning, hydrozoning and the use of water reducing technologies groundwater consumption has reduced by 37% since 2008/09 with usage remaining within the City's groundwater allocation limits, as shown in Figure 7. Groundwater use for 2012/13 was 3,319,673kL which equates to 20.21L per capita.

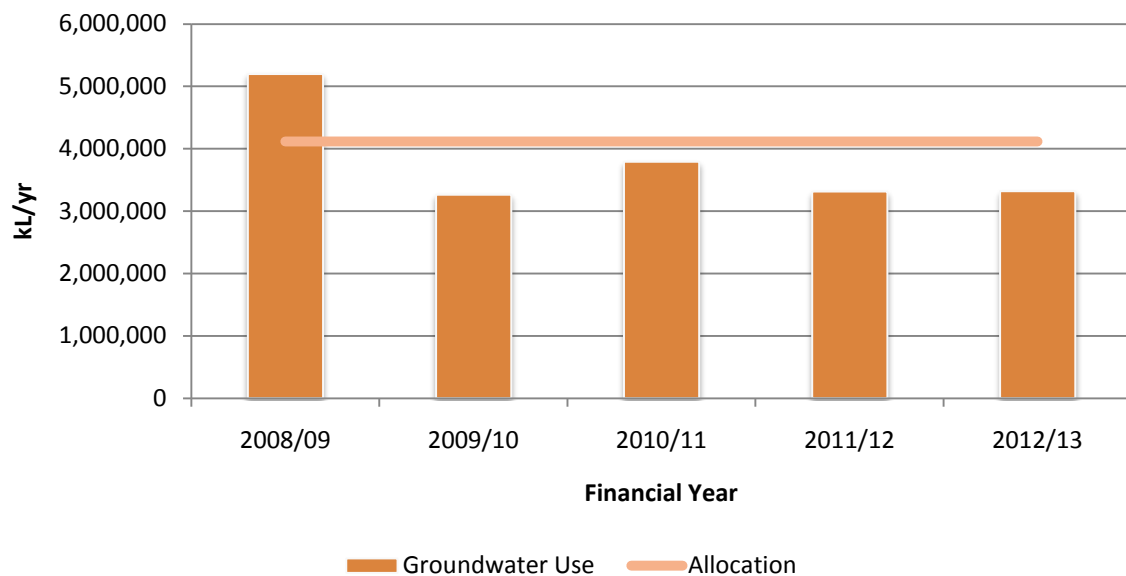


Figure 7- Annual groundwater consumption and City's annual water allocation

State – Water Quality

The City in partnership with the City of Wanneroo undertakes regular water quality monitoring of the Yellagonga Wetlands as part of the implementation of the Yellagonga Integrated Catchment Management Plan. Testing and analysis has identified water quality issues associated with current and historical land use of the area including increased levels of nutrients and pollutants within the system.

Monitoring of the area will be undertaken on an ongoing basis and management strategies will be implemented to improve the water quality of the Catchment Area.



Yellagonga Wetlands

Water Management Responses

In order to address the pressures, improve the state of the City's water resources and achieve the objectives of the *Environment Plan 2014-2019* the following strategic environmental initiatives will be undertaken over the life of the Plan.

Response	Description	Response Type	Threat Addressed
City Water Plan 2012 -2015	<p>Implement the City Water Plan to provide a coordinated approach to the management of water resources within City.</p> <p>The City Water Plan identifies the main water related issues impacting the City (including climate change) and sets objectives for scheme and groundwater conservation, water quality and quantity improvement.</p> <p>Undertake a major review in 2015/2016.</p>	Plan/ Strategy	All
Think Green Environmental Education Program	Through the Think Green Environmental Education Program continue to raise awareness of water conservation and quality issues within the community and inform the community on actions that can be taken to reduce water use and improve water quality.	Overarching Program	Reduced Water Availability
Think Green – Office Program	Continue to implement the Think Green – Office Program, a cultural change program targeting City staff to promote more sustainable behaviours and attitudes within their everyday work life.	Overarching Program	All
Climate Change Strategy 2014 - 2019	Implement the Climate Change Strategy to provide guidance for the City on climate change management activities over the next five years.	Plan/ Strategy	Reduced Water Availability
Yellagonga Integrated Catchment Management Plan 2014 -2018	Implement the new Yellagonga Catchment Management Plan to ensure the long term protection of the Yellagonga Wetlands with a focus on addressing the current and future impacts of climate change.	Plan/ Strategy	Reduced Water Availability / Pollutants
Stormwater Management Policy	<p>Implement the Stormwater Management Policy to provide guidance on matters relating to stormwater planning and maintenance including the protection of environmental, social and economic values, and the integration of water sensitive design principles into planning and development within the City.</p> <p>The Stormwater Management Policy will be reviewed in 2014/15.</p>	Policy	Reduced Water Availability / Pollutants
Strategic Partnerships	Investigate opportunities to partner with stakeholders, industry groups and research institutions to enable the City to build capacity and gain information relating to best practice approaches to environmental management.	Overarching Program	All

Water Management Indicators

The following indicators will be monitored annually to determine the continued state of the City's water resources and the effectiveness of the City's responses.

Indicator 1 Total Corporate Scheme Water Consumption (kL/yr)	Source Consumption data provided through Planet Footprint Reporting utilising Water Corporation billing information.	Aspirational Trend Decrease	Reportable Period 2014-2019
Indicator 2 Corporate Scheme Water Consumption per capita (kL/yr)	Source Consumption data provided through Planet Footprint Reporting utilising Water Corporation billing information. Population data provided by i.d community profile.	Aspirational Trend Decrease	Reportable Period 2014-2019
Indicator 3 Average Community Scheme Water Consumption by Suburb (kL/household/yr)	Source Data provided annually by the Water Corporation.	Aspirational Trend Decrease	Reportable Period 2014-2019
Indicator 4 Total Corporate Groundwater Consumption (kL/yr) (This indicator measures water used by the City for irrigation purposes and does not include private groundwater use)	Source Data collected through monthly monitoring of City groundwater bores.	Aspirational Trend Decrease	Reportable Period 2014-2019

Theme 3 — Climate Change Mitigation

Objective

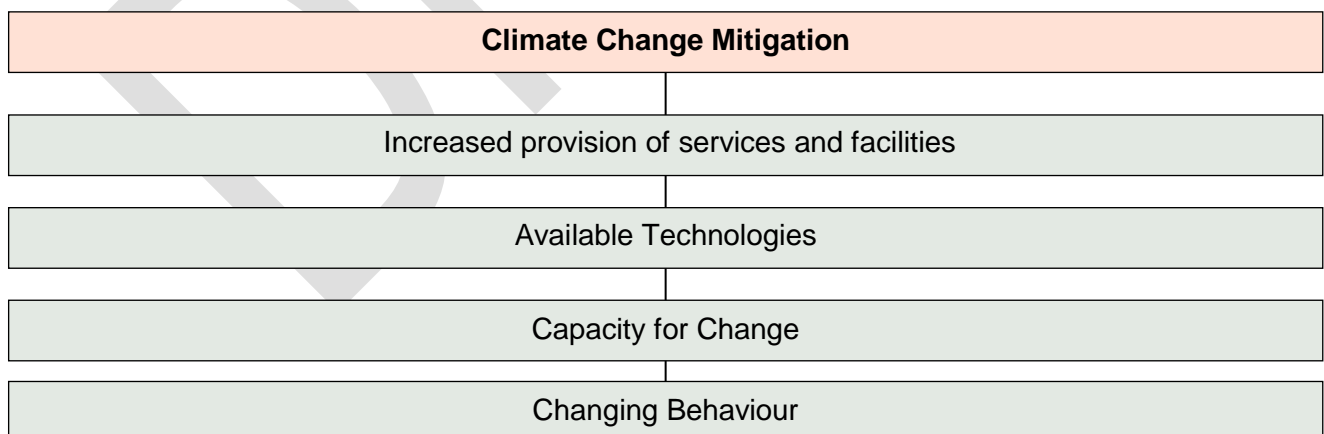
To reduce energy consumption and greenhouse gas emissions by the City and the community to mitigate the effects of climate change.

The burning of fossil fuels (such as coal, oil and natural gas) that creates the energy needed to run buildings, homes, cars, business, and industry also creates greenhouse gas emissions. The concentration of greenhouse gases in the atmosphere has increased and has resulted in a warming of the atmosphere which has and will continue to have a wide ranging effect on weather patterns and climate systems⁹.

The City of Joondalup has been working with the community to reduce energy and greenhouse gas emissions for over a decade and has implemented a number of projects and programs with a focus on energy efficiency and greenhouse gas reduction. Since 2007 the City's net emissions have decreased by 20% through the implementation of energy and greenhouse saving actions. The City of Joondalup is committed to continuing to work in partnership with stakeholders and the community to reduce greenhouse gas emissions to mitigate the effects of climate change.

Climate Change Mitigation Pressures

There are four key pressures that impact on the City's ability to mitigate climate change: increased provision of services and facilities, available technologies and the City's capacity to implement change.



⁹ CSIRO (2011)

Pressure – Increased provision of services and facilities

The City uses energy to power its buildings, community facilities, street lights, public open space lighting, and light and heavy fleet vehicles.

Between 2001 and 2012 the City's population has increased by over 5%¹⁰ increasing demand for services and facilities within the City. With some increased population expected it is essential that the City takes steps to manage and reduce its energy consumption while maintaining community facilities and service delivery. To achieve this, the City needs to improve both energy conservation and efficiency.

Pressure – Available technologies

Advancements in energy research and development have led to greater availability of technologies that either utilise renewable energy sources and produce no greenhouse emissions or are more efficient and produce less greenhouse emissions.



Photo-voltaic cells on the roof of the Craigie Leisure Centre

The City uses a range of renewable energy sources including (photovoltaic cells, solar hot water systems and geothermal heating) which produce no greenhouse emissions.

The City also uses traditional energy sources such as electricity, natural gas, petrol, liquefied petroleum gas (LPG) and diesel which produce greenhouse emissions.

The availability of energy efficient technologies means that the City's use of energy and production of greenhouse gas emissions can be reduced, however in some instances emerging technologies are more expensive and may not have been thoroughly tested in the field. As these emerging technologies become more widely used and available, they become more cost effective and have

¹⁰ Australian Bureau of Statistics (2012)

improved reliability, at this time the purchase and use of these technologies becomes a more viable option.

Pressure – Capacity for change

Whilst there are many technologies available (both renewable energy and energy efficiency improvements) for reducing the City's energy consumption and greenhouse gas emissions these technologies can be significantly more costly to implement particularly at a large scale. Retrofitting some of these technologies into existing buildings can also be impractical and have logistical and technical challenges.

The City has been undertaking energy reduction and efficiency improvements for some time and has made significant progress in reducing corporate energy consumption and greenhouse gas emissions. This means that many of the 'easier' low-cost energy management options have already been implemented. In some instances the City has obtained grant funding to assist with implementation of the initiative, such as the installation of Photovoltaic (PV) Systems.

The City's capacity to change is limited by both the cost of implementing these technologies and the practicality of implementation. For example the replacement of all of the City's public open space lighting would result in a significant reduction in the energy used for lighting. However to replace the entirety of the public open space lighting infrastructure at once is cost-prohibitive.

As such it is important that the City continues to make ongoing changes as opportunities arise. This is likely to take the form of incremental change or demonstration projects, as funding becomes available, when new infrastructure is being installed or as the technologies become cost effective.

Where there is limited capacity to change technologies or improve efficiencies the purchase of carbon offsets can be considered an effective mitigation strategy. Carbon offsets are credits for reductions in greenhouse gas emissions made at another location either through carbon sequestration or renewable energy projects. Using offsets does not mean the City is reducing its total emissions as those emissions are still being produced; however it does reduce the City's net emissions as it mitigates the effect of the emissions that are unavoidable by reducing emissions elsewhere.

The City currently purchases offsets for 100% of its vehicle fleet emissions and for 75% of the electricity consumed at Craigie Leisure Centre and the Joondalup Library, Administration and Civic Centre.

Pressure – Changing Behaviour

Encouraging positive behaviour change is an important way to influence a reduction in energy use and greenhouse gas emissions. The City undertakes a number of behavioural change initiatives within the community, however influencing positive change can be challenging.

In order to facilitate positive behavioural change the City needs to provide appropriate information, motivation and opportunities for the community which aim to raise the awareness of energy efficiency, renewable energy and climate change. Community awareness initiatives can have differing levels of effectiveness and participation rates can vary. Despite these challenges the City has had considerable success in recent years with the implementation of its Think Green –Energy Program. Continuation of this Program will provide opportunities for greater dissemination of information and opportunities for the City to engage with the community on issues relating to energy efficiency and climate change mitigation.

State of Climate Change Mitigation within the City of Joondalup

State – Corporate Energy Use

The City has achieved a greater than 20% reduction in greenhouse gas emissions since 2002. Through the development of the City's *Climate Change Strategy 2014-2019* a new benchmark year of 2012-13 has been established. This will be the baseline for measuring progress made in mitigating greenhouse gases and therefore climate change.

The City's total annual corporate energy use (not including renewable energy) in 2012/13 was 101,571GJ. This energy was used across four main sectors: Electricity (Facilities), Electricity (Street lights), Natural Gas and Fuel (Fleet). This equated to total GHG emissions of 21,852 t CO₂-e (equivalent) which equates to 133.1 kg CO₂-e per capita.

The City produced 4,147GJ of renewable energy through geothermal heating, photovoltaic cells and solar hot water.

The City also offset in 2012/13 5,333 t CO₂-e - nearly a quarter of the City's emissions. As a result the City's net corporate emissions equates to 16,519 t CO₂-e or 100.6 kg CO₂-e per capita, as shown in Figure 8.

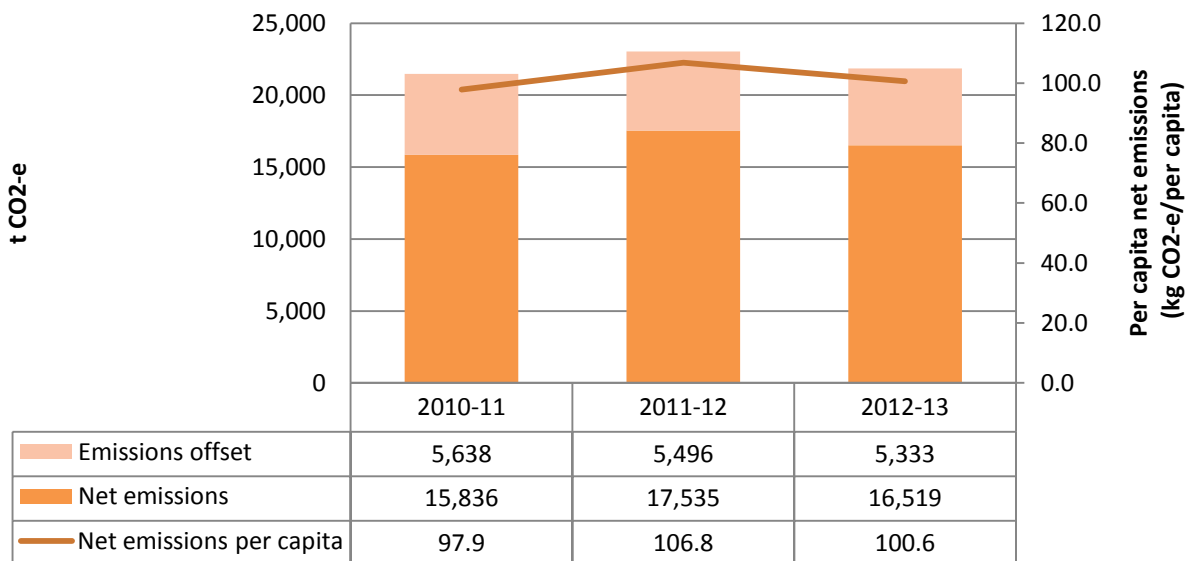


Figure 8- Corporate greenhouse gas emissions

State – Community Energy Use

Average residential energy (electricity) use within the City of Joondalup suburbs during 2011 was 20.2 units (kWh/house/day) this was higher than the Perth Average of 17.04 units (kWh/house/day). Residential consumption decreased in 2012 with an average of 17.95 units (kWh/house/day) being used, however as shown in Figure 9, for the majority of suburbs consumption remained above the Perth Average. The highest consuming suburbs were Iluka, Hillarys and Burns Beach, whilst Beldon, Craigie and Heathridge were below the Perth Average of 15.63 units (kWh/house/day). Awareness of high energy consuming suburbs allows the City to target community education programs to encourage energy efficiency and energy conservation within these areas.

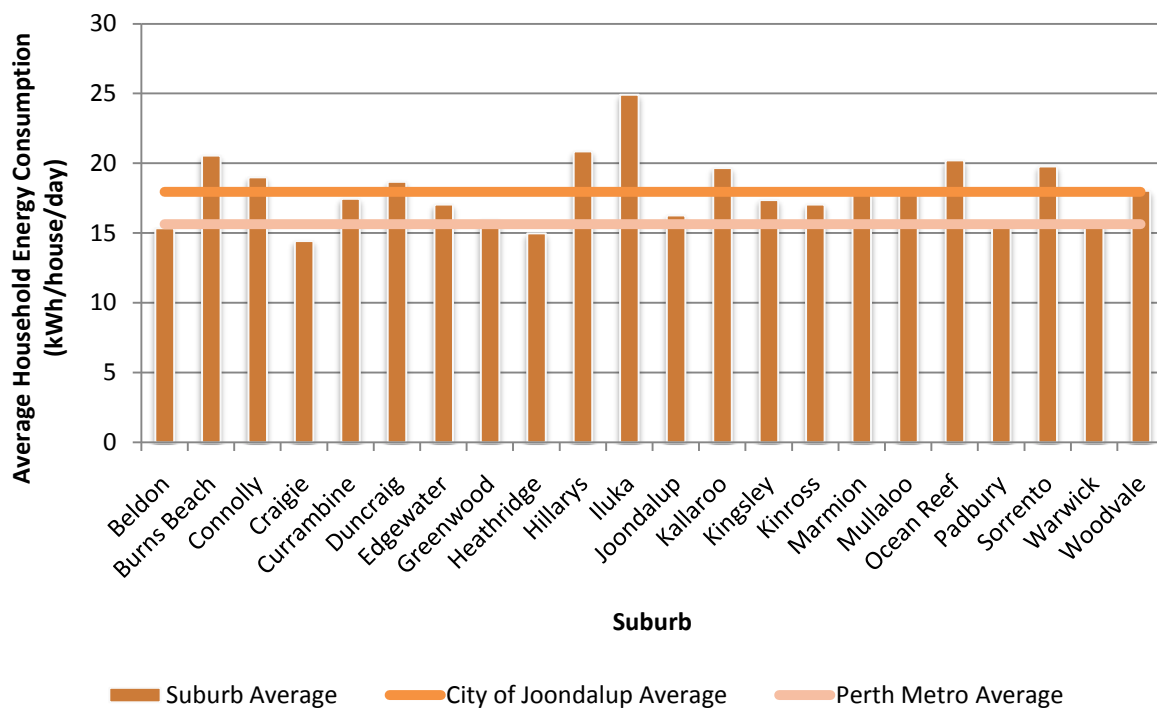


Figure 9: Average daily energy consumption by City of Joondalup suburb (2012/13)



Portable power meters available in City Libraries as part of the Think Green Energy Program

Climate Change Mitigation Responses

The City has been undertaking corporate and community climate change mitigation action for many years and recognises the important role that local government has in reducing its energy use and greenhouse gas emissions and supporting the community to become more energy efficient.

In order to address the pressures, improve the state of the City's climate change mitigation and achieve the objectives of the *Environment Plan 2014-2019* the following strategic environmental initiatives will be undertaken over the life of the Plan.

Response	Description	Response Type	Threat Addressed
Climate Change Strategy 2014 - 2019	Implement the Climate Change Strategy to provide guidance on the City's energy and greenhouse gas reduction activities over the next five years.	Plan/ Strategy	All
Environmentally Sustainable Design for City Buildings Policy	Continue to implement the Environmentally Sustainable Design for City Buildings Policy to facilitate the integration of environmentally sustainable design principles into the siting, design and construction of new City-owned or City-managed buildings, renovation projects and retro-fitting.	Policy	All
Think Green – Office Program	Continue to implement the Think Green – Office Program, a cultural change program targeting City staff to promote more sustainable behaviours and attitudes within their everyday work life.	Overarching Program	Changing Behaviour
Bike Plan 2009	Continue to implement the Bike Plan to increase cycling infrastructure such as pathways, bike parking and signage within the City and undertake initiatives to raise the awareness of cycling and its benefits within the community. Undertake a major review of the Bike Plan in 2015-16.	Plan/ Strategy	All
Walkability Plan 2013 - 2018	Continue to implement the Walkability Plan 2013 – 2018. The Plan provides a strategic guide to investing in and managing walking and cycling infrastructure to ensure usability, appropriate signage and efficient and effective linkages. The Plan also identifies opportunities for enhanced community education and awareness of active recreational opportunities in the region. Undertake a major review of the Walkability Plan in 2017-18.	Plan/ Strategy	All

Response	Description	Response Type	Threat Addressed
Think Green - Community Energy Program	Continue to implement the Think Green Energy Program to promote energy conservation and climate change awareness to the community.	Overarching Program	Changing Behaviour
Strategic Partnerships	Investigate opportunities to partner with stakeholders, industry groups and research institutions to enable the City to build capacity and gain information relating to best practice approaches to environmental management.	Overarching Program	All
Integrated Transport Management Plan	Develop and implement an Integrated Transport Management Plan to inform future transport planning at the City.	Plan/ Strategy	All

Climate Change Mitigation Indicators

The following indicators will be monitored annually to determine the continued state of the City's energy use and the effectiveness of the City's responses.

Indicator 1 Total Corporate energy use (GJ/yr)	Source Consumption data provided through Planet Footprint Reporting utilising electricity and gas billing information.	Aspirational Trend Decrease	Reportable Period 2014-2019
Indicator 2 Net Corporate greenhouse gas emissions (t CO ₂ -e/yr)	Source Emissions data provided through Planet Footprint Reporting utilising billing information.	Aspirational Trend Decrease	Reportable Period 2014-2019
Indicator 3 Renewable energy produced by the City of Joondalup (GJ/yr)	Source Data sourced from the Greensense monitoring of photovoltaic systems installed on City buildings.	Aspirational Trend Increase	Reportable Period 2014-2019
Indicator 4 Average community electricity use per suburb (GJ household/yr)	Source Data provided annually by utility providers (eg- Synergy). (Data is only provided on average consumption per suburb per household)	Aspirational Trend Decrease	Reportable Period 2014-2019

Theme 4 — Waste Management

Objective

To minimise waste to landfill through sustainable waste management practices which incorporate reduce, re-use, recovery and recycling principles.

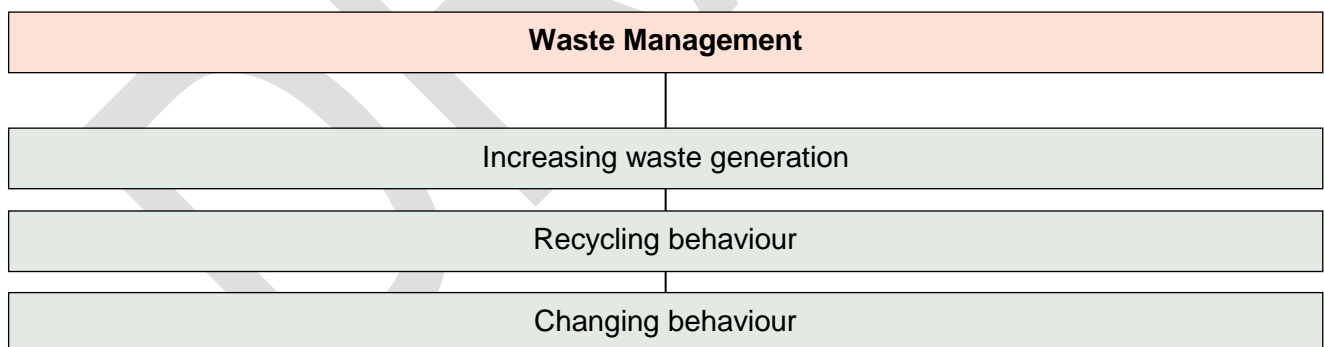
Waste generation and the disposal of waste can have serious direct and indirect environmental impacts including the production of greenhouse gas emissions associated with the collection, transportation and disposal of solid waste and recycling of materials.

As the level of government closest to the community, local government plays an increasingly important role in providing information, infrastructure and incentives to encourage behaviour change in the community.

The City is responsible for managing waste created by households and provides separate rubbish, recycling and verge collection services. The City of Joondalup is a member of the Mandurah Regional Council (MRC) which services seven local governments. The MRC operates waste processing facilities including the Tamala Park Landfill Facility. Methane gas is extracted from the landfill at this facility which is converted into clean, renewable electricity by the MRC's joint venture partner, Landfill Gas and Power Pty Ltd.

Waste Management Pressures

The main pressures that threaten waste management within the City of Joondalup include the following: increasing waste generation, recycling behaviour and changing behaviour.



Pressure – Increasing Waste Generation

Increased demand for goods within the community can be linked to an increase in waste generation. Increasing consumption per capita places greater pressure on resources, and

produces greater levels of waste through production, packaging, and final disposal of goods. National waste data for the year 2009/10 shows that Western Australia had the highest rate of waste generation in the country at approximately 3.5 tonnes per capita.¹¹ The amount of waste being generated by the community within the City of Joondalup is also increasing. Between 2010/11 and 2012/13 the amount of waste collected by the City increased by 5.5%. This is likely to be a combination of increasing amounts waste through greater consumption and packaging and the reduced lifespan of products such as electrical appliances.

Pressure – Recycling behaviour

With growing consumption and population size, the need to recycle products to reduce the use of natural resources and greenhouse emissions is an important waste minimisation strategy. Furthermore, recycling materials reduces the need to dispose to waste to landfill sites, providing greater space for other land uses and our natural ecosystems.

Waste reduction and recycling have major positive impacts on climate change. Recycling one tonne of steel uses only 5% of the energy required to produce a tonne of steel from 'virgin' material, therefore saving large amounts of carbon dioxide.

Recycling rates within the City have been steadily increasing since 2010/11; however in order to further reduce the amount of waste going to landfill, greater utilisation of the City's recycling service is required. Increasing reuse and recycling within the community requires a commitment from residents and for the City to provide adequate services as well as appropriate information to enable the community to effectively recycle waste on an ongoing basis.



Sorted recycling at the City's Materials Recovery Facility, Wangara

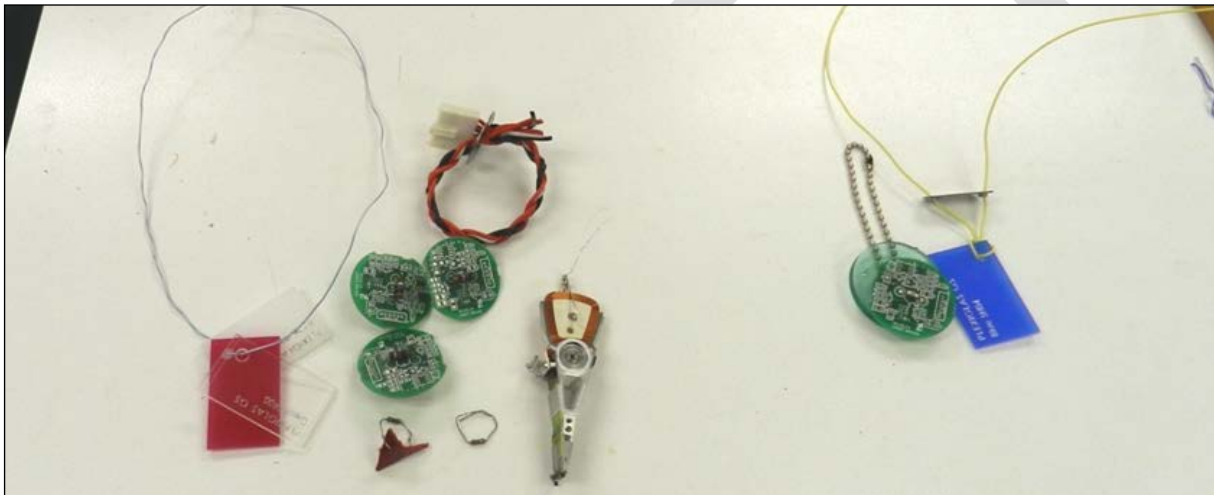
¹¹ Western Australian Waste Authority (2012)

Pressure – Changing behaviour

In order to successfully implement effective waste management strategies, it is essential for the City to liaise with residents and provide information and educational opportunities in efficient waste management techniques.

The dissemination of information regarding the waste management services that the City of Joondalup provide as well as the environmental benefits of waste reuse, recovery and recycling influences the amount of waste that is diverted from landfill.

Providing increased community information regarding recycling and opportunities for the community to learn about the sustainable use of natural resources will also assist the City in reaching the State Government's *Western Australian Waste Strategy* target of 50% diversion from landfill of material presented for collection in the Metropolitan Region by 30 June 2015.



Participant creations from a City of Joondalup Recycled Jewellery-Making Workshop

State of Waste Management within the City of Joondalup

The total waste collected by the City from households has been steadily increasing since 2010/11 and in 2012/13 was 93,291 tonnes or 0.55 tonnes per capita. See Figure 10.

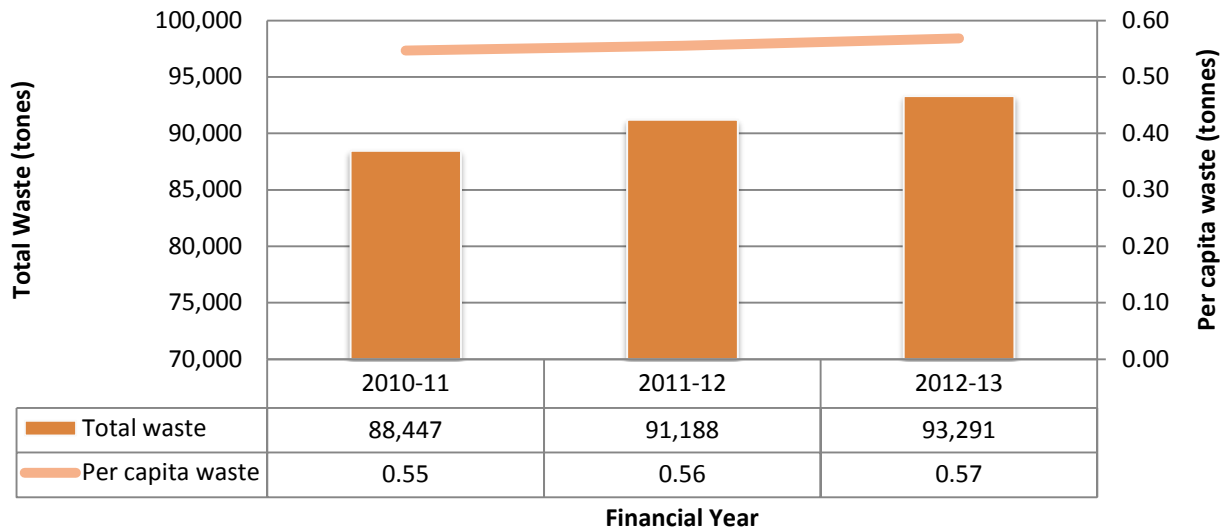


Figure 10- Total Waste and Per Capita Waste from 2010/11 to 2012/13

Over half (57%) of the waste collected by the City from residents is general household waste (green lid bin) while recyclables (yellow lid bin) account for 18%. The remaining waste is disposed through bulk rubbish collections.

The City has increased the amount of waste being diverted from landfill over recent years. Between 2010/11 and 2012/13, the amount of waste diverted increased by 3.86%, see Figure 11.

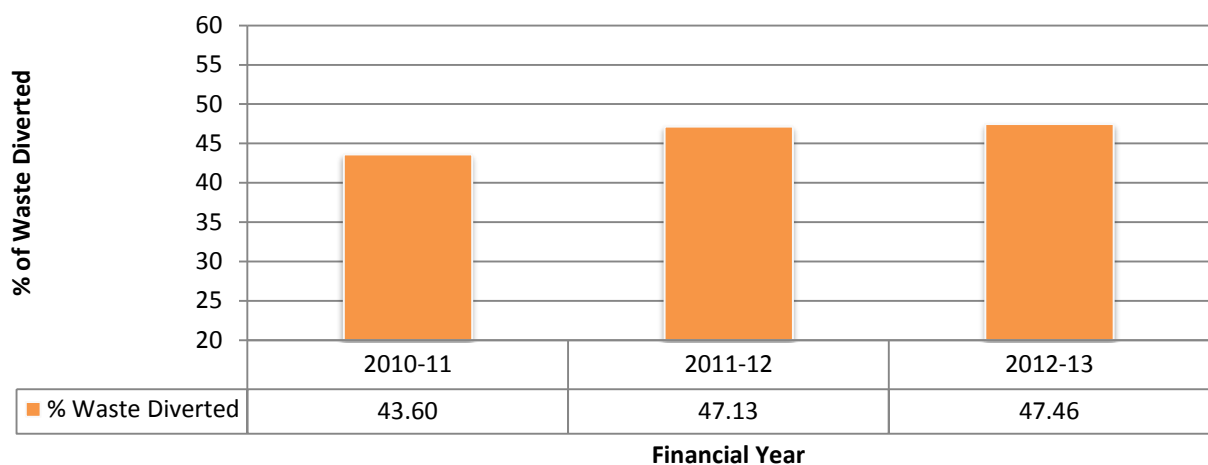


Figure 11- Percentage of waste diverted from landfill annually since 2010/11

Waste Management Responses

In order to address the pressures, improve the state of the City's strategic waste management activities and achieve the objectives of the *Environment Plan 2014-2019* the following strategic environmental initiatives will be undertaken over the life of the Plan.

Response	Description	Response Type	Threat Addressed
Waste Management Plan 2014 - 2017	Develop and implement a Waste Management Plan to provide guidance on the City's waste management operations over the next 3 years. Undertake a major review of the Waste Management Plan in 2016/17	Plan/ Strategy	All
Waste Management Policy review	Continue to implement and review the City's Waste Management Policy which outlines the key components of providing comprehensive waste disposal services to the community.	Policy	All
Think Green - Waste Education Program	Develop community waste education initiatives under the City's Think Green Environmental Education Program including a range of brochures, recycling calendars and website information to inform the community of appropriate waste management practices.	Overarching Program	All
Strategic Waste Management	Continue to liaise with key stakeholders including the Mindarie Regional Council, the Western Australian Waste Authority and the Western Australian Local Government Association in order to increase access to waste management information and funding opportunities.	Overarching Program	All

Waste Management Indicators

The following indicators will be monitored annually to determine the continued state of the City's waste generation and the effectiveness of the City's responses.

Indicator 1 Total residential waste generated (tonnes/yr)	Source Tonnage data provided through measurement of individual waste streams.	Aspirational Trend Decrease	Reportable Period 2014-2019
Indicator 2 Residential waste generated per capita (tonnes/capita/yr)	Source Tonnage data provided through measurement of individual waste streams. Population data provided by i.d community profile.	Aspirational Trend Decrease	Reportable Period 2014-2019
Indicator 3 Residential waste diverted from landfill (%) (tonnes/yr)	Source Tonnage data provided through measurement of individual waste streams. Population data provided by i.d community profile.	Aspirational Trend Increase	Reportable Period 2014-2019
Indicator 4 Amount of residential waste recycled as a percentage of total waste generated. (tonnes/yr)	Source Tonnage data provided through measurement of individual waste streams.	Aspirational Trend Increase	Reportable Period 2014-2019

Theme 5 — Community Involvement

Objective

To enhance community participation in environmental education initiatives and encourage community appreciation and ownership of the natural environment.

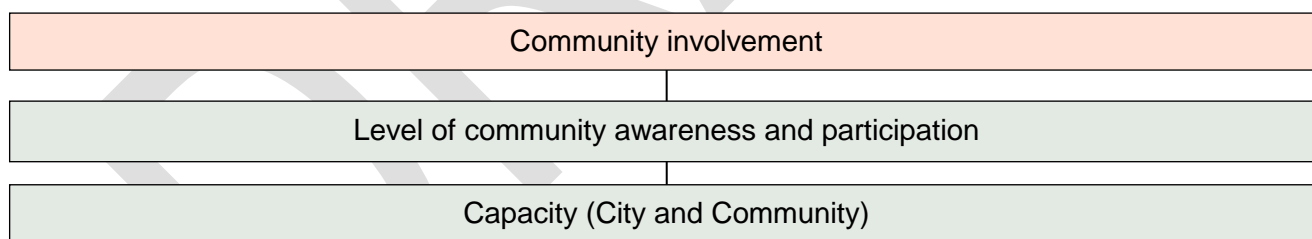
Environmental objectives cannot be achieved through the actions of the City alone; the community can also affect the local environment in both positive and negative ways. Environmental outcomes require the support of an engaged community that has ownership of the natural environment and participates in environmental activities.

The community also provides significant input into the protection and enhancement of the City's natural areas through participation in environmental volunteer groups known as Friends Groups. The City of Joondalup also actively encourages public participation within its community to raise awareness of key environmental issues within the City.

The City also aims to develop an appreciation within the community for local environmental assets by providing appropriate access to the City's natural areas.

Pressures on Community involvement

There are a number of factors that influence the level of involvement in environmental activities and awareness of key issues within the Joondalup community. The main pressures that influence the level of community involvement within the City of Joondalup include the level of community awareness and participation and capacity both in regard to the City and community.



Pressure – Level of Community awareness and participation

In order to successfully implement effective environmental management strategies, it is essential for the City to engage and liaise with residents to provide information and environmental education opportunities. However creating community ownership of the environment, responsible behaviour and encouraging the community to participate in environmental initiatives can be challenging.

A number of considerations may influence the City's ability to engage the community in environmental initiatives and environmental decision making, these include:

- Demographic features of the community
- Community preferences for engagement

- The community's previous experience with local government programs or initiatives
- Availability of the community
- Level of experience or understanding of environmental issues
- Level of support/assistance provided to the community.

It is important that the City of Joondalup continues to provide appropriate access to natural areas, relevant information, tools and opportunities to enable community participation in environmental initiatives and decision making processes. Additionally it is critical that the City continues to support existing volunteers and enable new volunteers to become involved in the active management of the City's natural environment.

Pressure – Capacity (City and Community)

City Capacity

Providing opportunities for the community to become engaged in environmental management is dependent on the availability of resources both financial and human. Local government is often reliant on grant funding in order to develop and implement community education initiatives. Access to State and Federal grants is competitive and often requires an equal financial contribution from the City. The City of Joondalup works in partnership with a number of government agencies and not for profit groups in delivering community environmental initiatives. Continued liaison with key stakeholders to support the delivery of community environmental education initiatives within the City of Joondalup is crucial to improving the community's awareness of and participation in environmental management.

Community Capacity

The capacity of local governments to improve environmental outcomes can be built through community involvement and the awareness of key environmental issues within the community. However effective engagement with residents is dependent on the community's capacity to be involved in environmental initiatives. Capacity may relate to the community's time, willingness, motivation and the perceived level of support.

It is therefore important that the City provides ongoing support and encouragement for community involvement in environmental management. The City of Joondalup actively engages with its community and environment groups to provide support and assistance to volunteers working within the City's natural areas. Maintaining this support and addressing barriers to community participation is critical to ensuring the community remains engaged in environmental management and continues to assist the City in achieving positive environmental outcomes.

State of Community involvement within the City of Joondalup

Despite the challenges associated with the development and delivery of environmental education initiatives, the City has been successful in implementing the Think Green Environmental Education Program. This ongoing Program aims to raise the awareness of key environmental issues within the City with initiatives covering a range of themes including biodiversity, energy, water, waste and transport. Projects are implemented throughout the year to a wide range of community members including schools, community groups and businesses. The City also partners with key stakeholders in the delivery of the Program.

The City's Community Consultation and Engagement Policy provides a clear statement of the City's intention to seek community opinion in order to inform decision-making. The Policy seeks to ensure that all groups in the community have the opportunity to engage with the City on matters that affect them including the City's strategic environmental management activities such as the development of Natural Area Management Plans.

The City works closely with stakeholders and community groups in managing the local environment including 16 Friends Groups who work within the City's natural areas to conserve and enhance the biodiversity of the local natural environment.

Friends Groups make a valuable contribution towards the conservation of biodiversity for present and future generations. The Groups undertake a variety of activities with the City's natural areas and provide a significant number of volunteer hours to the City each year. The City provides support to Friends Groups through the provision of training, information and financial assistance.



Participants at Clean Up Australia Day event

Community Involvement Responses

Response	Description	Response Type	Threat Addressed
Support for Friends Groups	Continue to provide support to the City of Joondalup Friends Group through the implementation of the City's Friends Group Manual.	Policy	All
Environmental Development Community Funding	Continue to provide funding opportunities to schools and community groups through the delivery of the City's Environment Development Community Funding Program.	Overarching Program	All
Think Green Environmental Education Program	Continue to implement the Think Green Environmental Education Program to raise the awareness of environmental issues within the community and provide opportunities for the community to interact with the local environment.	Overarching Program	All
Walkability Plan	As part of the implementation of the City's Walkability Plan develop appropriate access to natural areas through the installation of trails and signage within the City's bushland, wetland and coastal zones.	Plan/Strategy	All
City of Joondalup Community Consultation and Engagement Policy	In accordance with the City's City of Joondalup Community Consultation and Engagement Policy seek community opinion and provide information on the City's strategic environmental management initiatives.	Policy	All

Community involvement Indicators

The following indicators will be monitored annually to determine the continued state of community involvement in environmental management and the effectiveness of the City's responses.

<p>Indicator 1</p> <p>Waste present in City reserves (items/per ha/yr)</p> <p>(The amount of waste disposed of in City reserves is a measure of community ownership of natural areas)</p>	<p>Source</p> <p>Data is collected using transects to measure waste present within ten of the City's reserves.</p>	<p>Aspirational Trend</p> <p>Decrease</p>	<p>Reportable Period</p> <p>2014-2019</p>
<p>Indicator 2</p> <p>Number of natural area Friends Groups operating within City of Joondalup (number/yr)</p> <p>(Includes a list of current groups)</p>	<p>Source</p> <p>Number of registered City of Joondalup Friends Groups.</p>	<p>Aspirational Trend</p> <p>Increase</p>	<p>Reportable Period</p> <p>2014-2019</p>
<p>Indicator 3</p> <p>Area managed by City of Joondalup Friends Groups(ha/yr)</p>	<p>Source</p> <p>Data provided through City of Joondalup Friends Groups Annual Reports.</p>	<p>Aspirational Trend</p> <p>Increase</p>	<p>Reportable Period</p> <p>2014-2019</p>
<p>Indicator 4</p> <p>Community satisfaction with City of Joondalup environmental events/initiatives (%)</p>	<p>Source</p> <p>Data collected through feedback from participants regarding individual initiatives rated from not satisfied to very satisfied.</p>	<p>Aspirational Trend</p> <p>Increase</p>	<p>Reportable Period</p> <p>2014-2019</p>
<p>Indicator 5</p> <p>Community perception regarding environmental issues and environmental management within the City of Joondalup.</p>	<p>Source</p> <p>Data collected through City's Community Perceptions Survey</p>	<p>Aspirational Trend</p> <p>Increase</p>	<p>Reportable Period</p> <p>2015-2019</p>

Implementation

Environment Plan Responses

The following responses will be implemented over the life of the *Environment Plan 2014-2019* in order to improve the state of the City's local environment and to achieve the objectives within the Plan.

Responses		Themes Addressed				
Overarching Program/Plan/Strategy/Policy	Description	Biodiversity Management	Water Management	Climate Change Mitigation	Waste Management	Community involvement
Natural Area Management Plans	Continue to develop Natural Areas Management Plans to improve the strategic management of the City's native vegetation and ecosystems.	✓				
Yellagonga Integrated Catchment Management Plan 2014 -2018	Implement the new Yellagonga Catchment Management Plan to ensure the long term protection of the Yellagonga Wetlands with a focus on addressing the current and future impacts of climate change.	✓	✓			
Coastal Foreshore Natural Areas Management Plan	Implement the City's Coastal Foreshore Natural Areas Management Plan to protect and enhance the native vegetation within the City's coastal foreshore areas.	✓				
Think Green Environmental Education Program	Through the Think Green Environmental Education Program continue to raise the awareness the environment within the community.	✓	✓	✓	✓	✓
Weed Management Plan 2014-2019	Implement the City's Weed Management Plan to provide guidance on weed surveying and monitoring, priority weeds species control and seasonal weed control measures.	✓				

Responses		Themes Addressed				
Overarching Program/Plan/Strategy/Policy	Description	Biodiversity Management	Water Management	Climate Change Mitigation	Waste Management	Community involvement
Fire Management Plan 2015-2020	Develop and implement an overarching City of Joondalup Fire Management Plan to provide a coordinated approach to minimising the risk of fire within Natural Areas.	✓				
Pathogen Management Plan 2013-2016	Implement the City's Pathogen Management Plan to provide guidance on pathogen management, control measures, staff training and to inform the development of community education strategies regarding pathogens. Undertake a major review of the Pathogen Management Plan in 2015-16.	✓				
Local Planning Strategy	The City's Local Planning Strategy can provide mechanisms to protect and enhance the City's natural environment through a number of policy instruments that aim to encourage environmental protection through land use planning decisions.	✓				
Schedule 5 of the City's District Planning Scheme	Undertake a review of Schedule 5 of the City's <i>District Planning Scheme</i> in order to include additional priority reserves for protection, as determined by bushland condition assessments.	✓				
Vegetation Retention Policy	Develop and implement a City's <i>Vegetation Retention Policy</i> to encourage the retention of natural landforms and native vegetation within the City of Joondalup	✓				
Feral Animal Management Program	Continue to implement management actions to address the environmental impacts of domestic and pest animals within the City's natural areas.	✓				

Responses		Themes Addressed				
Overarching Program/Plan/Strategy/Policy	Description	Biodiversity Management	Water Management	Climate Change Mitigation	Waste Management	Community involvement
Coastal Adaptation Planning and Implementation Project	Implement the Coastal Adaptation Planning and Implementation Project to ensure that the outcomes of the City's Coastal Vulnerability Studies are integrated into City policies, planning and maintenance schedules and Capital Works Programs where relevant.	✓				
Climate Change Strategy 2014 - 2019	Implement the Climate Change Strategy to provide guidance the City's climate change management activities over the next five years. It addresses climate change mitigation and adaptation and has both a corporate and community focus.	✓	✓	✓		
Implementation of State Coastal Planning Policy 2.6	Implement the State Coastal Planning Policy 2.6 when approving developments under the City's Local Planning Scheme. SCPP 2.6 provides guidance for decision making within the coastal zone including managing development and land use change; establishment of foreshore reserves; and to protect, conserve and enhance coastal values.	✓				
Strategic Partnerships	Investigate opportunities to partner with stakeholders, industry groups and research institutions to enable the City to build capacity and gain information relating to best practice approaches to environmental management	✓	✓	✓	✓	
City Water Plan 2012 -2015	Implement the City Water Plan to provide a coordinated approach to the management of water resources within City. The City Water Plan identifies the main water		✓			

Responses		Themes Addressed				
Overarching Program/Plan/Strategy/Policy	Description	Biodiversity Management	Water Management	Climate Change Mitigation	Waste Management	Community involvement
	related issues impacting the City (including climate change) and sets objectives for scheme and groundwater conservation, water quality and quantity improvement. Undertake a major review in 2015/2016.					
Think Green – Green Office Program	Continue to implement the Think Green – Green Office Program, a cultural change program targeting City staff to promote more sustainable behaviours and attitudes within their everyday work life.		✓	✓		
Stormwater Management Policy	Implement and review the Stormwater Management Policy to provide guidance on matters relating to stormwater planning and maintenance including the protection of environmental, social and economic values, and the integration of water sensitive design principles into planning and development within the City.		✓			
Environmentally Sustainable Design for City Buildings Policy	Continue to implement the Environmentally Sustainable Design for City Buildings Policy to facilitate the integration of environmentally sustainable design principles into the siting, design and construction of new City-owned or City-managed buildings, renovation projects and retro-fitting.		✓	✓		

Responses		Themes Addressed				
Overarching Program/Plan/Strategy/Policy	Description	Biodiversity Management	Water Management	Climate Change Mitigation	Waste Management	Community involvement
Bike Plan 2009	Continue to implement the Bike Plan to increase cycling infrastructure such as pathways, bike parking and signage within the City and undertake initiatives to raise the awareness of cycling and its benefits within the community. Undertake a major review of the Bike Plan in 2015-16.			✓		
Walkability Plan 2013 - 2018	Continue to implement the Walkability Plan 2013 – 2018. The Plan provides a strategic guide to investing in and managing walking and cycling infrastructure to ensure usability, appropriate signage and efficient and effective linkages. The Plan also identifies opportunities for enhanced community education and awareness of active recreational opportunities in the region. Undertake a major review of the Walkability Plan in 2017-18.			✓		✓
Think Green -Community Energy Program	Continue to implement the Think Green Energy Program to promote energy conservation and climate change awareness to the community.			✓		
Integrated Transport Management Plan	Develop and implement an Integrated Transport Management Plan to inform future transport planning at the City.			✓		

Responses		Themes Addressed				
Overarching Program/Plan/Strategy/Policy	Description	Biodiversity Management	Water Management	Climate Change Mitigation	Waste Management	Community involvement
Waste Management Plan 2014 - 2017	Develop and implement a Waste Management Plan to provide guidance on the City's waste management operations over the next 3 years. Undertake a major review of the Waste Management Plan in 2016/17				✓	
Waste Management Policy	Continue to implement the City's Waste Management Policy which outlines the key components of providing comprehensive waste disposal services to the community.				✓	
Think Green- Waste Education Program	Develop community waste education initiatives under the City's Think Green Environmental Education Program including a range of brochures, recycling calendars and website information to inform the community of appropriate waste management practices.				✓	✓
Strategic Waste Management	Continue to liaise with key stakeholders including the Mandurah Regional Council, the Western Australian Waste Authority and the Western Australian Local Government Association in order to increase access to waste management information and funding opportunities.				✓	
Support for Friends Groups	Continue to provide support to the City of Joondalup Friends Group through the implementation of the City's Friends Group Manual.					✓

Responses		Themes Addressed				
Overarching Program/Plan/Strategy/Policy	Description	Biodiversity Management	Water Management	Climate Change Mitigation	Waste Management	Community involvement
Environmental Development Community Funding	Continue to provide funding opportunities to schools and community groups through the delivery of the City's Environment Development Community Funding Program.					✓
City of Joondalup Community Engagement Policy	In accordance with the City's Community Consultation and Engagement Policy seek community opinion and provide information on the City's strategic environmental management initiatives.					✓

Summary of Environment Plan Indicators

The following indicators will be reported on an annual basis to monitor the progress of the implementation of the *Environment Plan 2014-2019*.

Biodiversity Management Indicators			
Indicator 1 Annual density of environmental weeds (%) within City of Joondalup Natural Areas	Source Measured on three transects (a line along which environmental data is collected). Ten of the City's reserves are assessed on an annual basis.	Aspirational Trend Decrease	Reportable Period 2014 -2019
Indicator 2 Percentage of natural areas protected within City reserves (ha)	Source Areas included in the City's District Planning Scheme Schedule 5 and City of Joondalup Bush Forever sites.	Aspirational Trend Increase	Reportable Period 2014 -2019
Indicator 3 Vegetation Condition of City of Joondalup Major Conservation Areas. (% of area in pristine, excellent, very good, good, degraded or completely degraded condition)	Source Assessed through floristic surveys undertaken within City of Joondalup Major Conservation Areas utilising the Keighery Scale, a tool used to rate the condition of vegetation from pristine to completely degraded.	Aspirational Trend Not Applicable	Reportable Period 2018-19
Water Management Indicators			
Indicator 1 Total Corporate Scheme Water Consumption (kL/yr)	Source Consumption data provided through Planet Footprint Reporting utilising Water Corporation billing information.	Aspirational Trend Decrease	Reportable Period 2014-2019
Indicator 2 Corporate Scheme Water Consumption per capita (kL/yr)	Source Consumption data provided through Planet Footprint Reporting utilising Water Corporation billing information. Population data provided by i.d community profile.	Aspirational Trend Decrease	Reportable Period 2014-2019

Water Management Indicators			
Indicator 3 Average Community Scheme Water Consumption by Suburb (kL/household/yr)	Source Data provided annually by the Water Corporation.	Aspirational Trend Decrease	Reportable Period 2014-2019
Indicator 4 Total Corporate Groundwater Consumption (kL/yr) (This indicator measures water used by the City for irrigation purposes and does not include private groundwater use)	Source Data collected through monthly monitoring of City groundwater bores.	Aspirational Trend Decrease	Reportable Period 2014-2019
Climate Change Mitigation Indicators			
Indicator 1 Total Corporate energy use (GJ/yr)	Source Consumption data provided through Planet Footprint Reporting utilising electricity and gas billing information.	Aspirational Trend Decrease	Reportable Period 2014-2019
Indicator 2 Net Corporate greenhouse gas emissions (t CO ₂ -e/yr)	Source Emissions data provided through Planet Footprint Reporting utilising billing information.	Aspirational Trend Decrease	Reportable Period 2014-2019
Indicator 3 Renewable energy produced by the City of Joondalup (GJ/yr)	Source Data sourced from the Greensense monitoring of photovoltaic systems installed on City buildings.	Aspirational Trend Increase	Reportable Period 2014-2019
Indicator 4 Average community electricity use per suburb (GJ household/yr)	Source Data provided annually by utility providers (eg- Synergy). (Data is only provided on average consumption per suburb per household)	Aspirational Trend Decrease	Reportable Period 2014-2019

Waste Management Indicators			
Indicator 1 Total residential waste generated (tonnes/yr)	Source Tonnage data provided through measurement of individual waste streams.	Aspirational Trend Decrease	Reportable Period 2014-2019
Indicator 2 Residential waste generated per capita (tonnes/capita/yr)	Source Tonnage data provided through measurement of individual waste streams. Population data provided by i.d community profile.	Aspirational Trend Decrease	Reportable Period 2014-2019
Indicator 3 Residential waste diverted from landfill (%) (tonnes/yr)	Source Tonnage data provided through measurement of individual waste streams. Population data provided by i.d community profile.	Aspirational Trend Increase	Reportable Period 2014-2019
Indicator 4 Amount of waste recycled as a percentage of total waste generated. (tonnes/yr)	Source Tonnage data provided through measurement of individual waste streams.	Aspirational Trend Increase	Reportable Period 2014-2019
Community Involvement Indicators			
Indicator 1 Waste present in City reserves (items/per ha/yr) (The amount of waste disposed of in City reserves is a measure of community ownership of natural areas)	Source Data is collected using transects to measure waste present within ten of the City's reserves.	Aspirational Trend Decrease	Reportable Period 2014-2019

Community Involvement Indicators			
Indicator 2 Number of natural area Friends Groups operating within City of Joondalup (number/yr)	Source Number of registered City of Joondalup Friends Groups.	Aspirational Trend Increase	Reportable Period 2014-2019
Indicator 3 Area managed by City of Joondalup Friends Groups(ha/yr)	Source Data provided through City of Joondalup Friends Groups Annual Reports.	Aspirational Trend Increase	Reportable Period 2014-2019
Indicator 4 Community satisfaction with City of Joondalup environmental events/initiatives (%)	Source Data collected through feedback from participants regarding individual initiatives rated from not satisfied to very satisfied.	Aspirational Trend Increase	Reportable Period 2014-2019
Indicator 5 Community perception regarding environmental issues and environmental management within the City of Joondalup.	Source Data collected through City's Community Perceptions Survey	Aspirational Trend Increase	Reportable Period 2015-2019

Appendix 1

Federal policies, plans and strategies

The City of Joondalup *Environment Plan 2014–2019* has been developed to align with the Local, State and Federal Government planning context.

Federal policies, plans and strategies
Urban Planning and Sustainability
<i>Australia to 2050: Future Challenges</i> , the 2010 Intergenerational Report Produced by the Federal Treasury and details the challenges facing Australia regarding its ageing population and outlines the Federal Government's proposed agenda in response to these challenges.
<i>COAG National Objective and Criteria for Future Strategic Planning of Capital Cities</i> Following the 2010 <i>Intergenerational Report</i> , the Council of Australian Governments (COAG) agreed to a national objective and nine criteria to ensure Australian cities are globally competitive, productive, sustainable, liveable, socially inclusive and are well-placed to meet future challenges and growth.
<i>Our Cities, Our Future: A National Urban Policy for a Productive, Sustainable and Liveable Future</i> Developed under the COAG cities reform agenda the Policy establishes a long-term National framework to guide policy development and public and private investment in cities and to improve the productivity, sustainability and liveability of Australia's major urban centres.
<i>Sustainable Australia — Sustainable Communities: A Sustainable Population Strategy for Australia 2011</i> Developed by the Federal Department of Sustainability, Environment, Water, Population and Communities. And supports and complements the <i>National Urban Policy</i> under the COAG reform agenda. <i>Sustainable Australia — Sustainable Communities</i> outlines the Federal Government's framework for a sustainable Australia. The Strategy is intended to help to ensure that future population change is compatible with the economic, environmental and social wellbeing of the country.
Biodiversity Conservation
<i>Environment Protection and Biodiversity Conservation Act 1999</i> The Act provides for the protection of the environment and the conservation of biodiversity, and for related purposes.
<i>Australia's Biodiversity Conservation Strategy 2010–2030</i> An overarching Strategy from the Department of Sustainability, Environment, Water, Population and Communities aimed at helping to stop the decline in Australia's biodiversity. The Strategy identifies Priorities for Action which indicates where change is needed in the way Australians view, understand and approach biodiversity issues.
<i>National Weed Strategy 1997</i> Provides a strategic framework for managing weeds at a national level. As part of the implementation of the National Weeds Strategy, 32 Weeds of National Significance are identified as nationally agreed priority plant species for control and management based on the criteria of invasiveness and impact characteristics, potential and current area of spread and economic, environmental and social impacts.

Water Management
<p><i>The National Water Initiative (NWI) 2004</i></p> <p>A shared government commitment to increase water efficiency for the benefit of the Australian people, economy and the environment. The NWI has contributed to the water reform agenda in Western Australia through the following:</p> <ul style="list-style-type: none"> • Intergovernmental Agreement on a National Water Initiative - signed by COAG 25 June 2004. • Western Australia became a signatory in April 2006. • Western Australia NWI Implementation Plan developed in 2007 and includes: <ul style="list-style-type: none"> • Improved water management planning; • Review of water access processes; and • Legislative water reform.
Climate Mitigation
<p><i>Direct Action Plan 2013</i></p> <p>The Federal Government currently has a target of reducing Australia's greenhouse emissions by five per cent below 2000 levels by 2020. The central element to the <i>Direct Action Plan</i> is an Emissions Reduction Fund to source low-cost emissions reductions and provide incentives for emission reduction activities across the Australian economy. The Emissions Reduction Fund is currently in development.</p>
Waste Management
<p><i>National Waste Policy 2009</i></p> <p>The National Waste Policy provides an efficient and environmentally responsible approach to waste management in Australia. The policy, agreed by all State environment ministers in November 2009, and endorsed by the Council of Australian Governments, sets Australia's waste management and resource recovery direction to 2020.</p>

State policies, plans and strategies

State policies, plans and strategies
Urban Planning and Sustainability
<p><i>Directions 2031 (2010)</i>¹²</p> <p>Provides a high level spatial framework and strategic plan that establishes a vision for future growth of the metropolitan Perth and Peel region; and guides the detailed planning and delivery of housing, infrastructure and services necessary to accommodate a range of growth scenarios.</p>
<p><i>Draft State Planning Strategy 2012</i></p> <p>The Strategy presents a vision for Western Australia to 2050 and beyond based on a framework of planning principles, strategic goals and State strategic directions. The Strategy is the Government's proposed response to the opportunities and challenges Western Australia is likely to face in the future.</p>
Urban Planning and Sustainability
<p><i>State Coastal Planning Policy 2.6</i></p> <p>Provides for the long term sustainability of WA's coast through guiding land use and development decision-making within the coastal zone including managing development and land use change; establishment of coastal foreshore reserves; and to protect, conserve and enhance coastal values.</p>
Biodiversity Conservation
<p><i>Environmental Protection Act 1986</i></p> <p><i>The Act provides authority to the Environmental Protection Authority (EPA) for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment in Western Australia.</i></p>
<p><i>Government of Western Australia "Bush Forever" Strategy 2000</i></p> <p>The Strategy identifies regionally significant bushland in the Perth Metropolitan Region to be retained, managed and protected forever.</p>

¹² Department of Planning (2010)

Biodiversity Conservation
<p><i>State Planning Policy 2.8 — Bushland Policy for the Perth Metropolitan Region</i></p> <p>Provides a framework to ensure bushland protection and management issues in the Perth Metropolitan Region are appropriately addressed and integrated with broader land use planning and decision-making. The long-term aim of the Policy is to secure protection of biodiversity and associated environmental values. The Policy recognises the protection and management of significant bushland areas as a fundamental consideration in the planning process, whilst also seeking to integrate and balance wider environmental, social and economic considerations.</p>
<p><i>A 100-year Biodiversity Conservation Strategy for Western Australia: Blueprint to the Bicentenary in 2029 (draft)</i></p> <p>Developed in response to the problem of continuing decline in indigenous biodiversity, and outlines opportunities to protect and restore biodiversity in the State. Overall, the goal of the Strategy is to recover and conserve the State's biodiversity within 100 years.</p>
<p><i>Environmental Weed Strategy for Western Australia 1999</i></p> <p>The Department of Conservation and Land Management (CALM) (now Department of Parks and Wildlife (DPaW)) developed an Environmental Weed Strategy for Western Australia (WA) (1999). The Strategy prioritises 1,350 weed species using the criteria of invasiveness, distribution and environmental impacts to rate weeds as high, moderate, mild or low priority.</p>
<p><i>Swan Natural Resource Management Region Environmental Weed Census and Prioritisation 2008</i></p> <p>The Swan Catchment Council (SCC) and the Department of Parks and Wildlife (formerly the Department of Environment and Conservation) conducted an environmental weed assessment of over 900 weeds in the Swan Natural Resource Management (NRM) Region to identify the most threatening species, in order to prioritise works programs and effectively allocate resources. The assessment prioritises weed species using ratings of ecological impact, invasiveness, current and potential distribution in the region and recognised importance (existing classifications or its recognised weed potential elsewhere) as very high, high, medium, low, unknown and further assessment required.</p>
<p><i>Adapting to our Changing Climate 2012</i></p> <p>Outlines the key climate change challenges the State will face and provides a strategic approach to address them. The Strategy identifies the following areas where adaptation will be needed.</p>
Water Management
<p><i>Draft Perth- Peel Regional Water Plan 2010-2030¹³</i></p> <p>Sets the strategic directions for the sustainable management of the region's water resources to the year 2030. It provides a blueprint for the next 20 years for the management, conservation and development of water resources in the region.</p>
<p><i>Better Urban Water Management Framework (WAPC)</i></p> <p>Provides guidance on the implementation of <i>State Planning Policy 2.9 — Water Resources</i>. The Framework is designed to facilitate better management and use of urban water resources by ensuring an appropriate level of consideration is given to the total water cycle at each stage of the planning system.</p>

¹³ Department of Water (2009)

Water Management
<p><i>Securing Western Australia's Water Future – A Position Paper (2013)</i>¹⁴</p> <p>Outlines policies which provide increased certainty to water users including key industry sectors such as mining, horticulture and agriculture, and local government, and drives new ways of effectively and efficiently managing water resources.</p>
<p><i>Draft Gnamara Sustainability Strategy(2009)</i>¹⁵</p> <p>A cross-government initiative working on an action plan that will ensure the sustainable use of water for drinking and commercial purposes and to protect the environment.</p>
<p><i>State Water Plan 2007</i> (Department of Water)</p> <p>Provides a framework to plan and manage Western Australia's water resources. The Plan sets out broad strategic directions and policies including an overview of water availability and use in Western Australia, current and projected trends in water demand and options available to meet these demands.</p>
<p><i>Adapting to our Changing Climate (2012)</i></p> <p>Outlines the key climate change challenges the State will face and provides a strategic approach to address them. The Strategy identifies the following areas where adaptation will be needed.</p>
Climate Mitigation
<p><i>Public Transport Plan for Perth in 2031: Mapping out the Future for Perth's Public Transport Network (draft)</i></p> <p>Currently still in draft form, the Western Australian Department of Transport's <i>Public Transport Plan for Perth in 2031</i> outlines the State Government's vision for improved and expanded public transport in Perth. The Plan addresses congestion and accessibility issues associated with Perth's growth to an expected population of 2.5 million by 2031.</p>
<p><i>Draft WA Bicycle Network Plan 2012 - 2021</i>¹⁶</p> <p>Provides a blueprint for metropolitan and regional cycle facilities to encourage and support bicycle trips. It identifies appropriate routes and supporting facilities that protect existing routes.</p>
<p><i>Energy 2031 (2012)</i>¹⁷</p> <p>Outlines a vision and long-term plan for WA's energy sector, providing industry and the community with clarity about the sector's direction and its context for decision-making.</p>
Waste Management
<p><i>Western Australian Waste Strategy: Creating the right environment (2012)</i>¹⁸</p> <p>Sets the long-term strategic directions and priorities for the way in which waste issues are managed in WA.</p>

¹⁴ Department of Water (2013)

¹⁵ Gnamara Coordinating Committee (2009)

¹⁶ Department of Transport (2012)

¹⁷ Department of Finance – Public Utilities Office (2012)

¹⁸ Waste Authority (2012)

References

- Australian Bureau of Statistics (2012) *Regional Population Growth, Australia (3218.0)*. Compiled and presented in profile.id by .id The population experts
- Australian Government, Department of Climate Change (2009) *Australia's Biodiversity and Climate Change- Summary for Policy Makers*, Canberra
- Balla, S (1994) *Wetlands of the Swan Coastal Plain: Their Nature and Management*. Water Authority of WA and the Western Australian Department of Environmental Protection, Perth Western Australia.
- Climate Commission (2011) *The Critical Decade: Western Australia climate change impacts*. Climate Commission
- CSIRO (2007) *Climate Change in Australia – Technical Report*. CSIRO
- CSIRO (2011) *Climate Change: Science and Solutions for Australia*. CSIRO
- Department of Conservation and Land Management (1992) *Marmion Marine Park Management Plan 1992-2002*, Government of Western Australia, Perth.
- Department of Conservation and Land Management (2003) *Yellagonga Regional Park Management Plan 2003-2013*, Perth Western Australia.
- Department of Environment and Conservation (2007) *Environmental Weed Strategy for Western Australia*, Government of Western Australia, Perth.
- Department of Planning & Western Australian Planning Commission. (2010) *Directions 2031*
- Department of Sustainability, Environment, Water, Population and Communities (DSEWPC), 2012, viewed on 31 January 2014, <http://www.environment.gov.au/biodiversity/index.html>.
- Department of Water (2008) *Gnangara Groundwater Areas Water Management Plan – Draft for Public Comment*. Government of Western Australia, Perth.
- Dieback Working Group (2000) *Managing Dieback- Guidelines for Local Governments*, Perth Western Australia.
- Dieback Working Group (2008) *Managing Dieback- Guidelines for Landholders and Community Conservation Groups*, Edition 4, Perth Western Australia.
- Dixon K and Barnett R (2003) *Defining the Role of Fire in South West Western Australian Plants*, Perth, Western Australia.
- Environmental Protection Authority (2007) *State of the Environment Report: Western Australia 2007*, Government of Western Australia, Perth.

Forest Science Centre (2003) Ian W. Smith & David I. Smith, *Armillaria Root Rot: A Disease of Native and Introduced Trees*, Victoria Australia.

IOCI (2010) *WA Rainfall – What the past can tell us, and what the future may hold*. IOCI

IPCC (2013) *Climate Change 2013: The Physical Science Basis. Summary for Policymakers*. IPCC Fifth Assessment Report. IPCC

Natural Resource Management Ministerial Committee (2007) Australian Pest Animal Strategy- A national strategy for the management of vertebrate pest animals in Australia, Commonwealth Government, Canberra.

Natural Resource Management Ministerial Council, (2007) *The Australian Weed Strategy- A national strategy for weed management in Australia*, Commonwealth Government, Canberra.

Newport, M.L. and Lund, M.A. (2013) *Yellagonga Regional Park wetlands water quality monitoring 2012 report*. Mine, Water and Environment Research/ Centre for Ecosystem Management Report No. 2013 -11, Edith Cowan University, Perth, Australia. Unpublished report to the Cities of Joondalup and Wanneroo.

Western Australia Local Government Association (2009) Local Government Guidelines for Bushland Management, Western Australian Local Government Association, Perth.

Western Australian Waste Authority (2012) *Western Australian Waste Strategy – Creating the Right Environment*.