



**Dungog Shire
State of the Environment
Report 2021**













Acknowledgement of traditional owners

The Dungog State of the Environment (SoE) Report 2021 has been prepared for lands that are the traditional country of the Gringai and Worimi people.

Dungog Shire Council acknowledges the Gringai and Worimi people as the traditional owners and custodians of this country and pays respect to the generations of Gringai and Worimi people who, for thousands of years, have lived and derived their physical and spiritual needs from the landscape which we all now share.

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Disclaimer

The Dungog SoE Report 2021 has been compiled in good faith, exercising all due care and attention. The Dungog SoE Report 2021 has been developed with reference to technical data released by Dungog Shire Council, various NSW State and Federal Government agencies, non-government organisations and private research institutes. The technical data is licensed under the Creative Commons Attribution 4.0 International (CC BY 4.0), subject to the exemptions contained in the licence. Tracks Environment and Planning does not accept responsibility for inaccurate or incomplete data or information provided by government departments or research institutions.

Acknowledgements

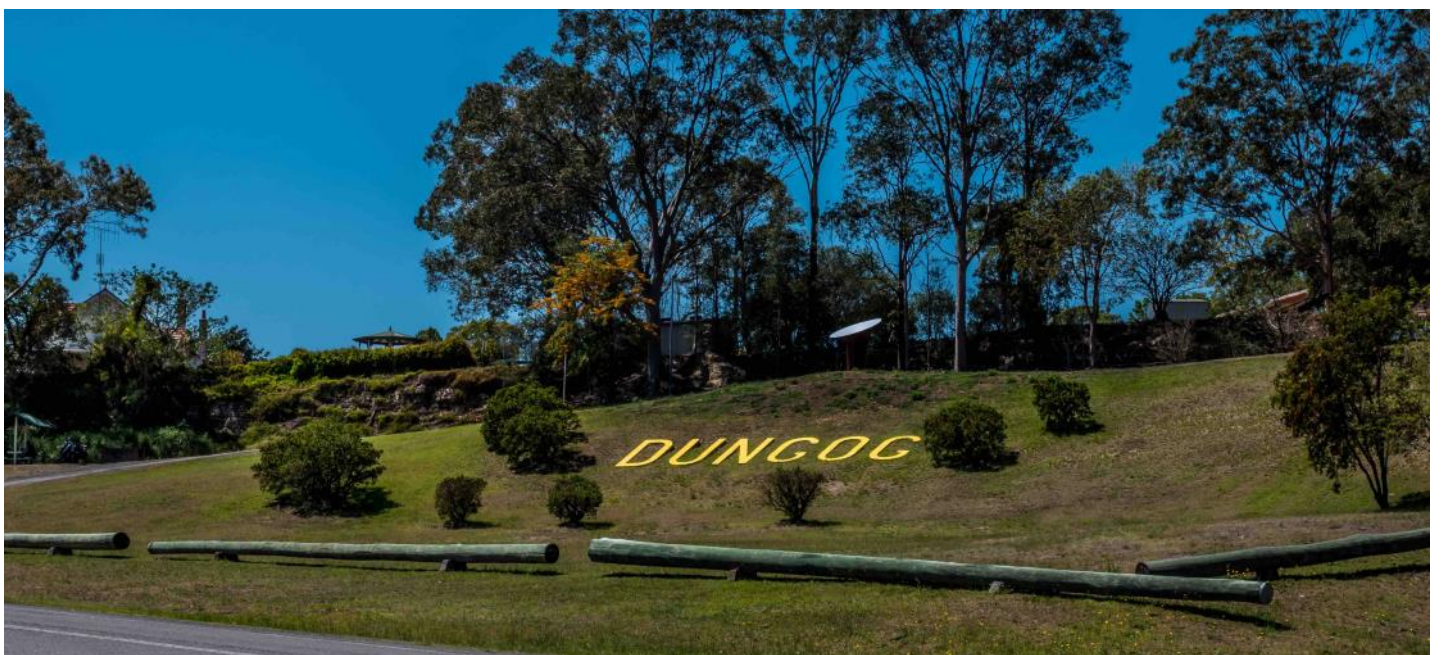
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Abbreviations

Abbreviation	Full name
ABS	Australian Bureau of Statistics
BASIX	Building Sustainability Index
BC Act 2016	<i>Biodiversity Conservation Act 2016 (NSW)</i>
CSP	Community Strategic Plan
EPA	Environment Protection Authority
EP&A Act 1979	<i>Environmental Planning and Assessment Act 1979 (NSW)</i>
EPBC Act 1999	<i>Environment protection and Biodiversity Conservation Act 1999 (Cwlth)</i>
GRP	Gross Regional Product
HWC	Hunter Water Corporation
IP&R	Integrated Planning and Reporting
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
LG Act 1993	<i>Local Government Act 1993 (NSW)</i>
LLS	Local Land Services
LSPS	Local Strategic Planning Statement
NPWS	National Parks and Wildlife Service
NSW	New South Wales
SEPP	State Environmental Planning Policy
SES	State Emergency Services
SoE	State of the Environment
UPSS	Underground petroleum storage system



1. Introduction

1.1 Why is a State of the Environment Report needed?

Local Councils in New South Wales (NSW) are governed through the provisions of *the Local Government Act 1993* (LG Act 1993). Councils are required to undertake strategic planning and reporting under Chapter 13 of the LGA Act 1993. Strategic planning under Chapter 13 is commonly referred to as the Integrated Planning and Reporting framework (IP&R). The planning and reporting documents required through IP&R are shown in **Figure 1.1**.



Figure 1.1 : Integrated Planning and Reporting framework under Chapter 13 of the *Local Government Act 1993*.

Councils are overseen by a governing body of elected representatives called Councillors. The election of Councillors is typically held every four years (Section 287 LG Act 1993). IP&R requires Councils to complete an annual report, but during the year when elections are held the annual report must include a State of the Environment (SoE) Report (Section 428A LG Act 1993). The SoE Report is to outline the environment context for each Local Government Area (LGA) and include environmental issues and objectives established by the Council under an adopted Community Strategic Plan (CSP).

A SoE Report is required to:

- Establish relevant indicators for each environmental objective outlined in the adopted CSP
- Report and update trends for relevant indicators
- Identify major environmental impacts, including events and activities that impact upon the adopted environmental objectives.

1.2 What are Dungog Shire Council's environmental goals?

Dungog Shire Council adopted the Dungog Shire Council CSP 2030 in June 2012 with subsequent amendments in 2018. The Dungog Shire Council CSP 2030 is divided into seven themes containing the goals and priorities for Dungog Shire LGA over the next 10-15 years. **Figure 1.2** provides an overview of the relevant goals and objectives from the Dungog Shire Council CSP 2030 that support the information contained within this SoE Report.

The natural environment

Goal: The health of our natural environment and biodiversity is preserved and enhanced

- Potential impacts of climate change on our natural environment need to be monitored and addressed
- Weeds and pest animals need to be effectively managed and their impacts on our local area minimised
- Natural assets in our Shire need careful management to protect them from degradation arising from human activity
- Appropriate access to our local national parks, forests and waterways needs to be maintained
- Communities and households across the Shire need to reduce their carbon footprint and water and energy use

Community and culture

Goal: We enjoy a safe and supportive community characterised by vibrant cultural life and a strong sense of local heritage

- Public involvement in community activities including volunteering needs to be maintained and encouraged
- There needs to be greater community awareness of local Aboriginal heritage and culture
- Build community resilience and enhance preparedness for natural disasters and rapid onset events within the Shire
- Local European and Indigenous heritage and history need to be preserved and promoted

Rural and urban development

Goal: Growth is achieved through a balanced mix of development which acknowledges our unique scenic qualities, rural amenity and country lifestyle

- Local land use planning needs to ensure the retention of the character of the area whilst encouraging ecologically sustainable development

Recreation and open space

Goal: Access to a range of places, activities and facilities which cater for diverse sporting and recreational interests

- Planning and management of local parklands and recreational facilities needs to reflect community growth and change across the Shire
- Access to and within areas of our local national parks and forests needs to be appropriately managed and expanded.

Public infrastructure and services

Goal: Our community is supported by safe, functional, accessible and well-maintained infrastructure and effective local and regional transport networks.

- The long-term retention and enhancement of local services provided by Governments at all levels needs to be ensured e.g.) public transport
- Appropriate public transport options are needed to connect us locally and regionally

Figure 1.2 Themes, goals and objectives in the Dungog Shire Council CSP 2030 relevant to the SoE Report.

1.3 What are the objectives of this Report?

While the Dungog Shire SoE Report 2021 is a legislative requirement for Dungog Shire Council, the impacts and pressures acting upon the condition of the environment in the LGA go beyond the operations of Council alone. As such, the Dungog Shire SoE Report 2021 has sought to provide a more comprehensive review of the condition of the local environment, bringing together the combined response of Council, State Government Departments and the community alike to key environmental impacts in the LGA.

The objectives of the Dungog Shire SoE Report 2021 include:

- Provide a common and representative set of environmental themes and indicators.
- Report on meaningful environmental trends and indicators with a focus on natural resource and heritage condition.
- Enhance data gathering, sharing and assessment of environmental issues within Dungog Shire LGA
- Develop a broader, more inclusive reporting framework that captures new and additional natural resource and heritage management programs and stakeholders
- Provide an accessible report for the community and decision-makers on the condition of the local environment and where resources might be best placed to respond to environmental issues and community expectations.

1.4 What will the Report include?

The Dungog Shire SoE Report 2021 has been structured into eight themes for reporting purposes.

- The **People and Development theme** explores the effects human settlement has on the environment in the LGA and management issues from human habitation. This theme includes population, economy, energy, transport, water use, waste, contaminated sites and food safety.
- The **Climate and Air theme** contains an overview of the climate in Dungog Shire LGA and the impacts of human produced emissions on the airshed. This theme includes air quality, greenhouse gases and climate change.
- The **Heritage theme** explores both Aboriginal and European heritage within Dungog Shire LGA and the pressures or impacts on these cultural and historic areas.
- The **Biodiversity theme** includes an overview of biological richness in Dungog Shire LGA and the pressures on species and ecological communities. The theme includes details about threatened species and ecological communities and invasive species
- The **Land management theme** looks at how land is used in Dungog Shire LGA, pressures of land management on the environment and how land is protected. This theme includes native vegetation and protected conservation areas
- The **Water catchment management theme** explores the river and estuarine system within Dungog Shire LGA and management of the catchment. This theme includes river health, the Hunter River estuary and wetlands within the LGA.
- The **Emergency management theme** explores natural hazard threats in Dungog Shire LGA such as flooding and bushfires fire and how they are managed.
- The **Community environmental participation theme** explores environmental projects that are being undertaken in Dungog Shire LGA that are community driven or undertaken by interest groups.

These themes combine to provide an overall view of the current status of the environment in Dungog Shire LGA.

2. Dungog Shire Local Government Area

Nestled within the Hunter Region of NSW, Dungog Shire LGA encompasses a land area of 2250km² (ABS 2020). Crowned by the majestic Barrington Tops escarpment, at an altitude of over 1500m in the north, the LGA is characterised by undulating hilly countryside before transitioning into alluvial river flats in the south. The western border of the LGA is defined by the Mount Royal Range, which runs south from the Barrington Tops to the Moonabung Range while the eastern border includes the Black Bulga Range

Three river valleys contribute to the landform with the LGA. The Paterson and Allyn Rivers originate in the Barrington Tops and course through the north-west and western part of the LGA before converging near the township of Vacy. The Paterson River continues south and joins the Hunter River downstream of Morpeth, outside of the LGA. The Williams River also originates in the Barrington Tops and meets the Chichester River south of Bandon Grove. The Williams River flows south through the eastern part of the LGA passing the townships of Dungog and Clarence Town before continuing south and joining the Hunter River upstream of Raymond Terrace, outside of the LGA (See **Figure 2.1**).



Figure 2.1: Dungog Shire LGA river systems

Forming part of the NSW North Coast bioregion (DAWE 2020) and containing four bio-subregions Dungog Shire LGA's environment is highlighted by the Barrington Tops National Park, a listed UNESCO world heritage site as part of the Gondwana Rainforest of Australia. The Barrington Tops National Park stretches across a number of adjoining LGAs including Upper Hunter Shire Council to the north-west of Dungog Shire LGA and Mid-Coast Council to the north and north-east. Mid-Coast Council LGA adjoins the entire eastern boundary of Dungog Shire LGA with Port Stephens Council LGA to the south/South-west. Singleton Council LGA shares the western boundary of Dungog Shire LGA while Maitland City Council LGA adjoins part of the southern boundary of the LGA below the township of Paterson (Figure 2.2).

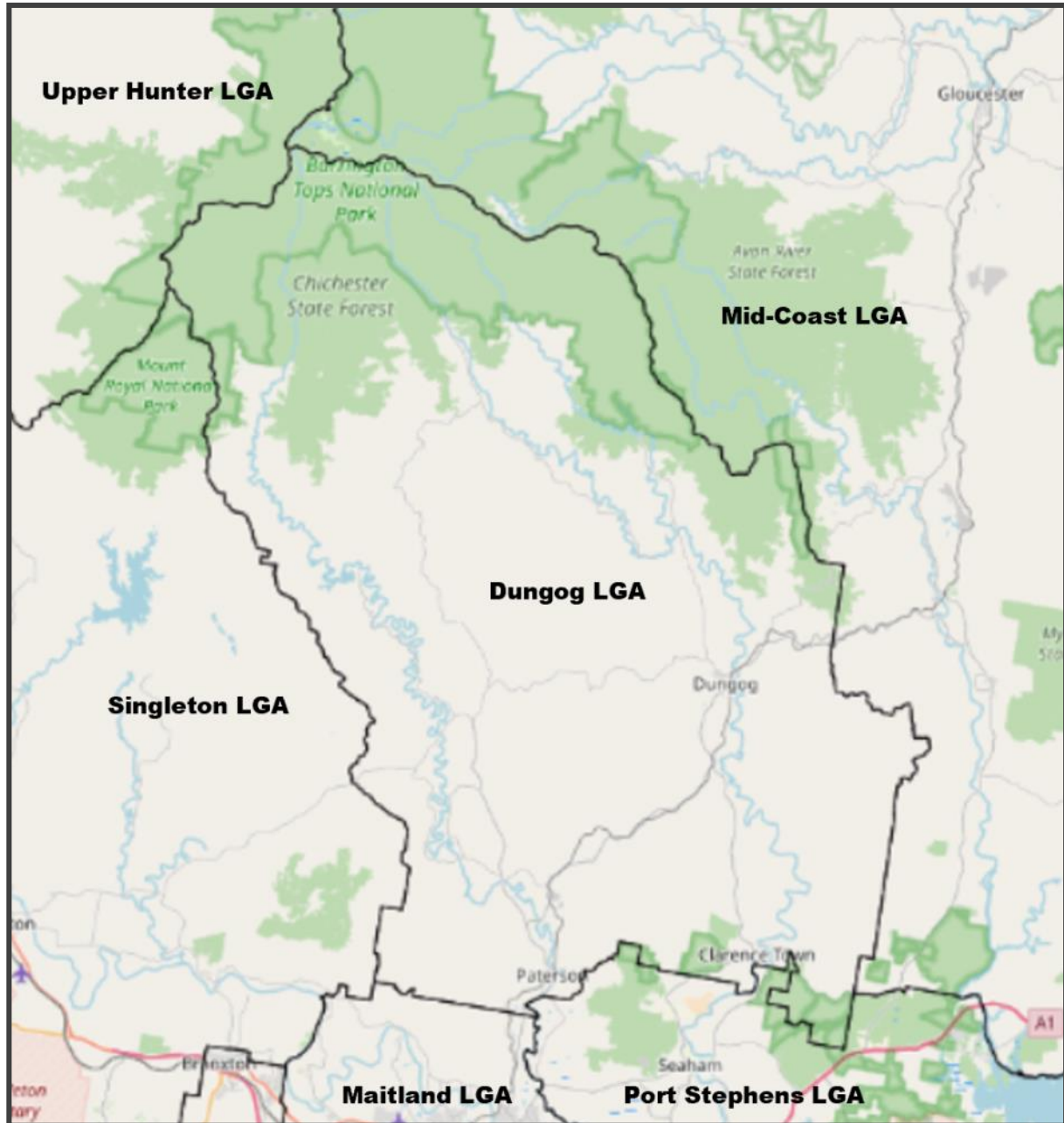










Figure 2.2: Dungog Shire Local Government Area and surrounding Local Government Areas.



People and Development

People and Development

13		Population
16		Economy
21		Energy
28		Transport
34		Water Use
39		Waste
45		Contaminated Sites
48		Food safety



3. Population

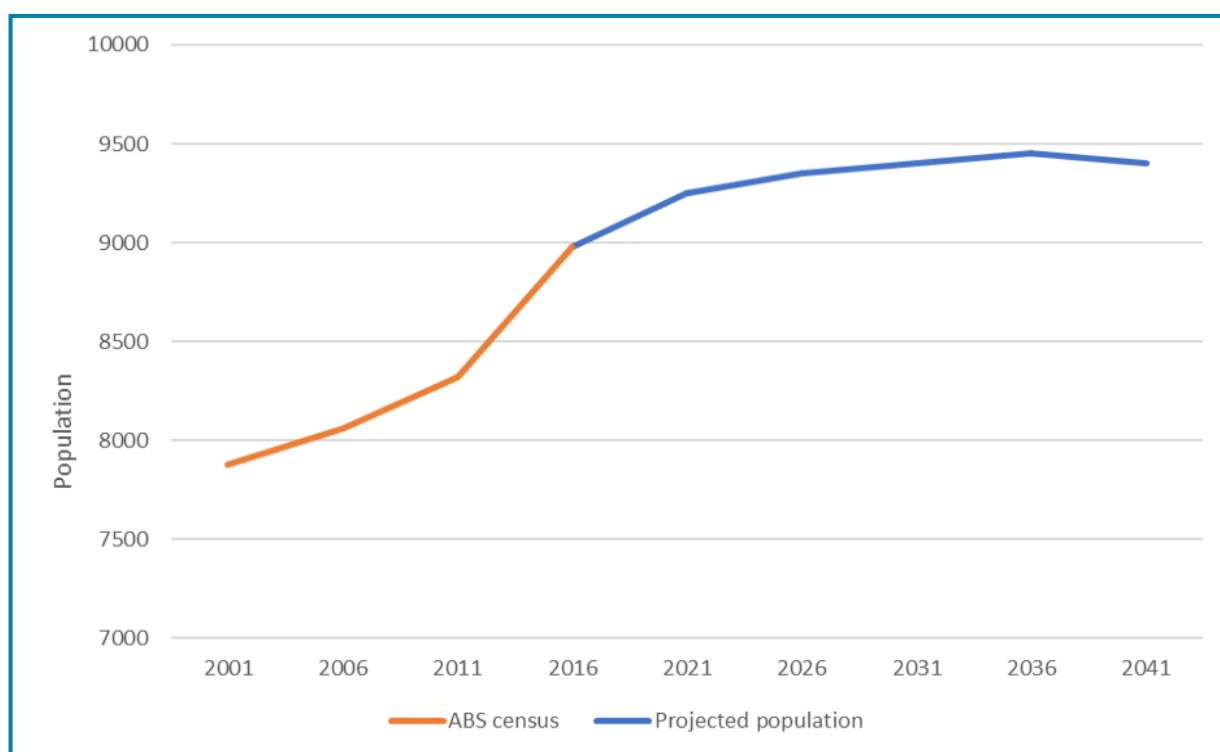


Human habitation in Dungog Shire LGA has resulted in a significant change to the natural environment. In 2017 over 80% of the Dungog Shire LGA has been modified or cleared for agricultural use including modified grazing pastures (DPIE 2017). Human habitation and use of the land can place significant pressure on the environment and this section of the SoE Report details how the population in Dungog Shire LGA is progressing and changing.

3.1 Population change in Dungog Shire

3.1.1 Local Government Area population growth

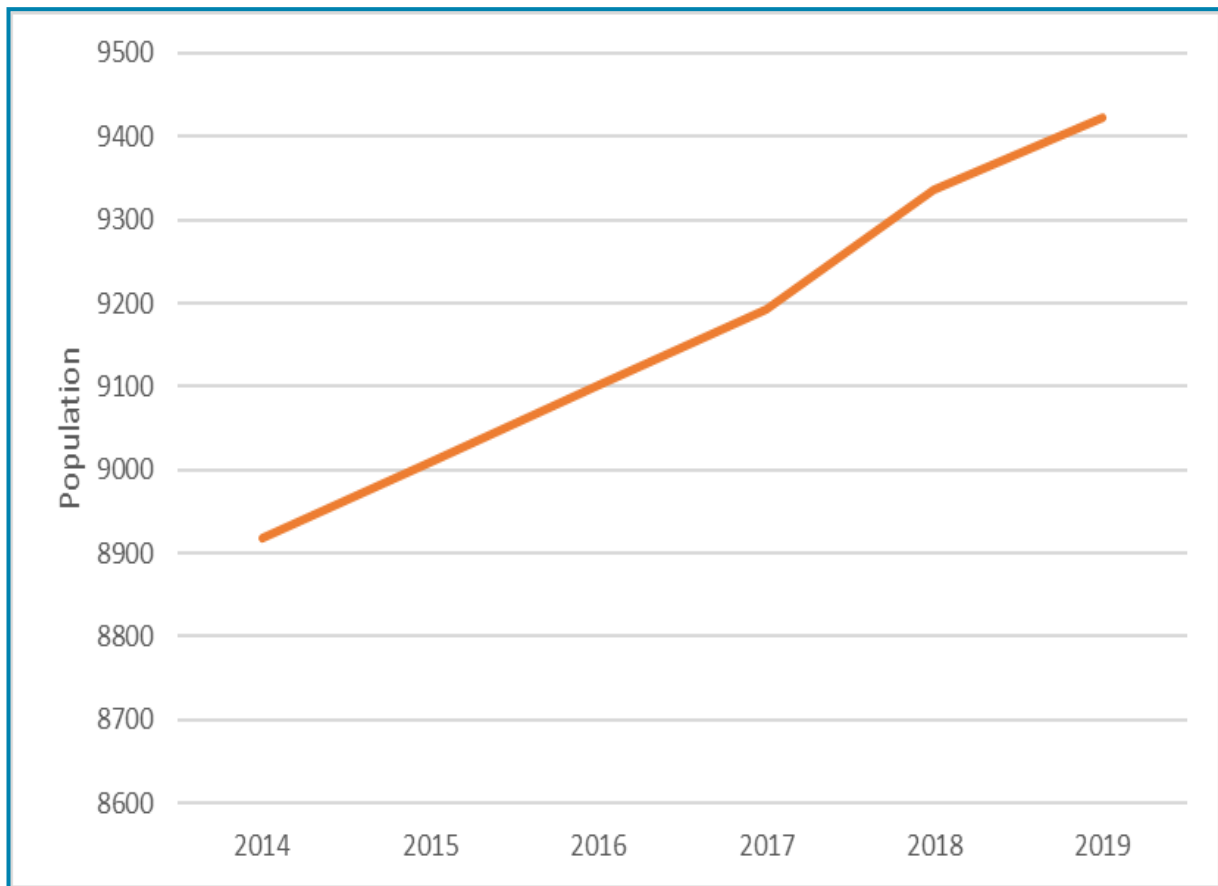
Dungog Shire LGA has experienced continuing population growth since the start of the century (**Figure 3.1**). From 2001-2016 an additional 1100 people (14% population increase) resided in Dungog Shire LGA based on collected Australian Bureau of Statistics (ABS) census data. **Figure 3.1** also shows the population of Dungog Shire LGA is projected to increase to 9400 people by 2041, a population increase of 4.73% compared to 2016.



Source: 2001-2016 enumerated population from ABS census (ABS 2020)
2021 – 2041 projected population from NSW Projections Explorer (DPIE 2020)
Figure 3.1: Historical and projected population growth in Dungog Shire LGA.

The methods for modelling population growth can vary. While **Figure 3.1** has used the NSW Projections Explorer (DPIE 2020) to predict population growth to 2041 **Figure 3.2** includes the estimated residential population statistics from the ABS (ABS 2021).

Figure 3.2 shows the estimated residential population in Dungog Shire LGA in 2019 (population of 9423) exceeds the NSW Projections Explorer predicted population for 2041. The estimated residential population from 2014-2019 shows a 5.67% population increase in the five-year period and suggests population growth in Dungog Shire LGA is higher than NSW State Government projections.



Source: *Estimated residential population (ABS 2021)*

Figure 3.2: Estimated residential population in Dungog Shire Local Government Area 2014-2019.

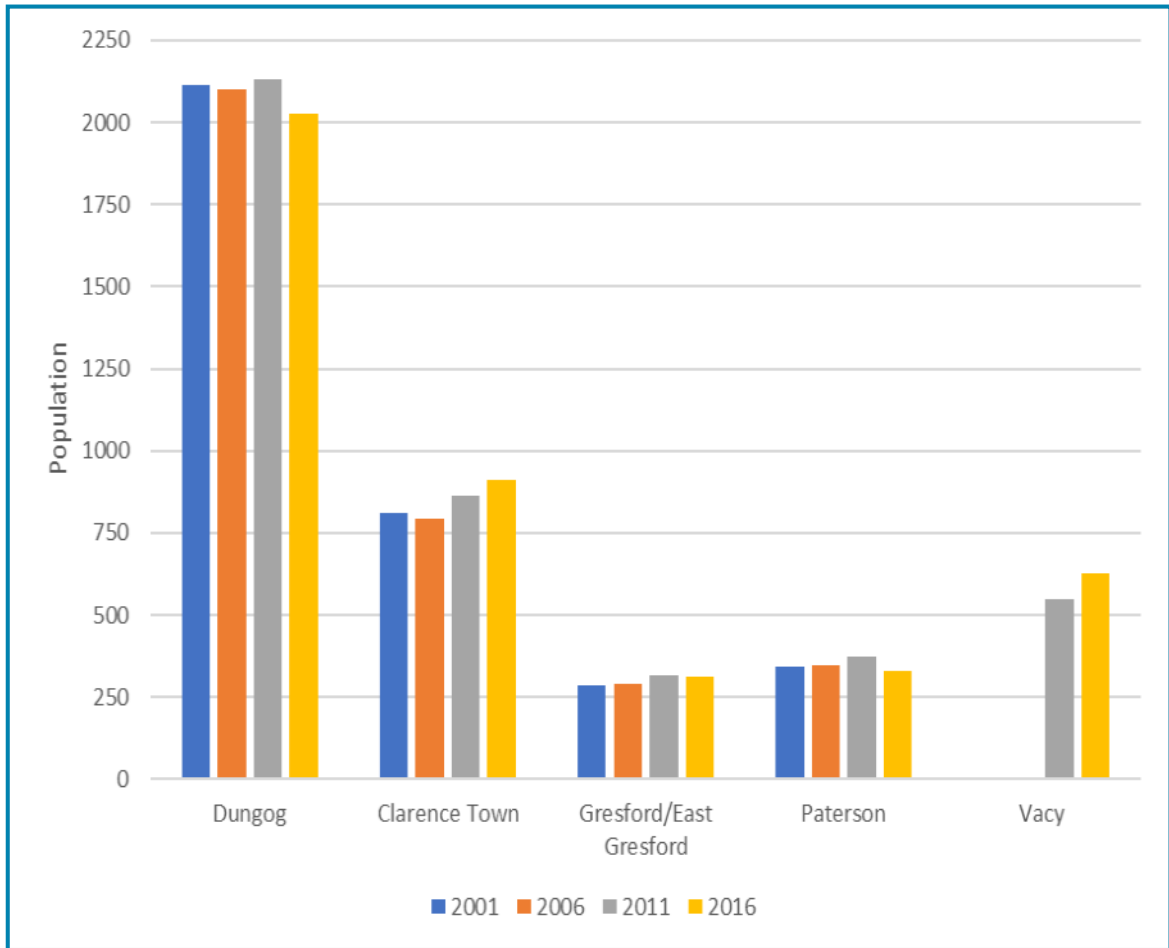
It must be noted that the ABS estimated residential population statistics do not include the 2020/21 period. NSW in recent years has experienced a significant increase in internal migration from the Sydney Metropolitan Area to regional areas (DPIE 2020b). Therefore, additional potential migration may have occurred into Dungog Shire LGA in the last two years resulting in an increased population size. The next national census will be held in 2021 and may provide additional insight into population growth within Dungog Shire LGA.

3.1.2 Population change in Dungog Shire townships

In 2016 47% of the Dungog Shire LGA population resided within the five main township areas of Dungog, Clarence Town, Gresford/East Gresford, Vacy and Paterson

Since 2001 population growth has varied in each of the townships (**Figure 3.3**). From 2011-2016 the townships of Vacy (14.3% increase) and Clarence Town (5.8% increase) have experienced population growth while Dungog and Gresford/East Gresford have seen modest (<5%) population decrease. Paterson has experienced a larger population decline (11.3% decrease) from 2011-2016. However, as noted above, the 2021 census will provide additional insight into population size in each of the townships.

From 2011-2016 an additional 523 people, or 80% of the Dungog Shire LGA population growth during the five year period, are located within the five main townships of Dungog Shire LGA. This population growth pattern shows a consolidation of the population in the more urban townships and places pressure or demand on existing services in these townships.



Note: Vacy population data only available for 2011-2016 due to change in census boundary

Source: ABS 2020

Figure 3.3: Population change in Dungog Shire Local Government Area townships 2001-2016.



4. Economy



Over the past 30 years the NSW economy has been shifting from a more resource intensive industrial base to a service-based economy. However, the economies of local government areas in NSW vary based on geographical location, access to natural resources and local employment sectors. The interaction of different sectors of the economy with the environment is complex with varying levels and types of environmental impacts (NSW EPA 2019).

4.1 Economy in Dungog Shire

4.1.1 Business sectors

The Gross Regional Product (GRP) of Dungog Shire LGA has risen from \$317 million in 2014 to \$401.7 million in 2019, or a 27% increase in GRP (REMPAN 2021). The increase in GRP shows economic growth within the LGA in the last five years.

Industry and employment sectors can vary in regions over time based on market forces and resource availability. In Dungog Shire primary industries, such as agriculture, account for a significant proportion of total businesses within the LGA from 2015-2019 (38.64% of businesses in 2019) with construction accounting for nearly 16% of businesses in 2019 (**Table 4.1**). These two sectors account for approximately 34.3% of economic output within Dungog Shire LGA in 2019 (REMPAN 2021).

While primary industries continue to provide a significant proportion of businesses in the LGA service-based industries have continued to grow in Dungog Shire. These services include professional, scientific and technical services and rental, hiring and real estate. The number of manufacturing businesses have declined over the same period along with the number of food and accommodation services.

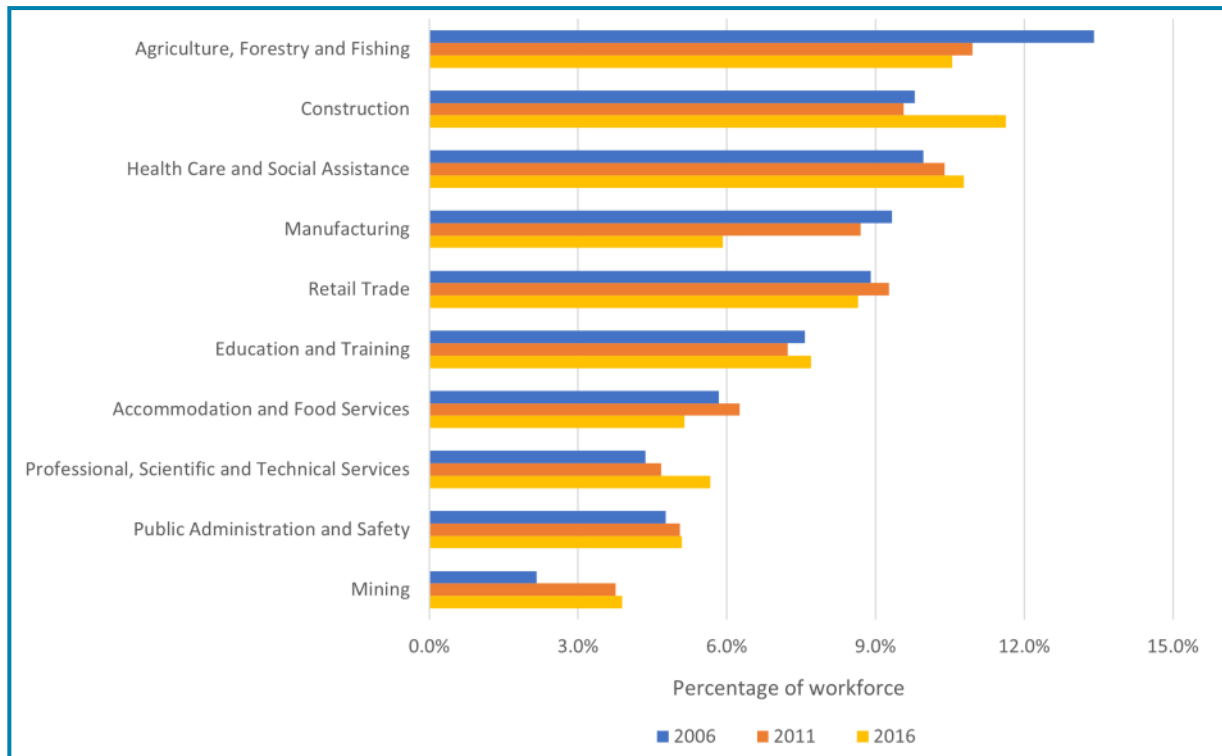
Table 4.1: Number of businesses operating in Dungog Shire Local Government Area 2015-2019

Business type	2015	2016	2017	2018	2019	% change 2015-2019
Agricultural, forestry and fishing	388	396	398	410	410	5.67
Manufacturing	30	30	28	18	25	-16.67
Construction	147	153	160	171	169	14.97
Wholesale trade	27	24	28	24	25	-7.41
Retail trade	50	48	48	55	55	10
Accommodation and food services	40	39	39	34	35	-12.5
Transport, postal and warehousing	37	39	45	40	45	21.62
Financial and insurance	32	32	36	32	35	9.38
Rental, hiring and real estate	56	58	68	66	75	33.93
Professional, scientific and technical services	50	55	62	65	71	42
Administrative and support services	27	26	26	24	29	7.41
Education and training	12	12	14	15	15	25
Health care and social assistance	22	25	24	28	27	22.73
Other	55	49	57	78	45	-18.18
Total	973	986	1033	1060	1061	9.04%

Source: ABS 2020

4.1.2 Employment in Dungog Shire

While the number of businesses operating within the LGA can provide insight into types of industries operating locally the economic and social factors of these industries in the LGA require consideration. While **Table 4.1** shows the number of businesses in the primary industries sector have increased in Dungog Shire LGA, the percentage of the local workforce employed in this sector has decreased from 2006-2016 (**Figure 4.1**). A significant decrease in the local workforce employed in the manufacturing sector has also occurred from 2006-2016. A significant increase in employees (almost 2% increase) has occurred in the construction sector from 2006-2016 while employees in the mining sector (1.7% increase) have also risen. Employees in service-based industries including professional, scientific and technical services (1.3% increase) and health care and social services (0.8% increase) have also increased from 2006-2016.



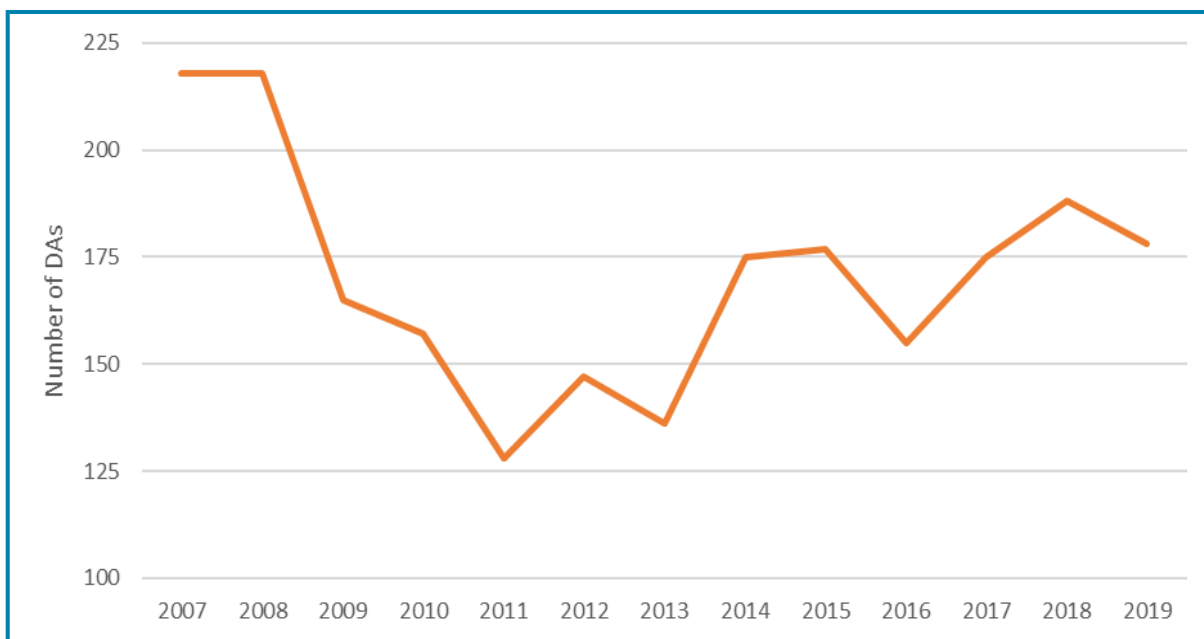
Source: ABS 2020

Figure 4.1: Dungog Shire Local Government Area workforce employment sectors 2006-2016



4.2 Development in Dungog Shire

Increasing development within a area or region can relate to economic growth. A key indicator for development in NSW is the number of applications submitted for development approval under the *Environmental Planning and Assessment (EP&A) Act 1979*. The number and type of development applications submitted has been impacted by changes to the planning system in NSW in the last decade, but **Figure 4.2** shows the number of approved development applications in Dungog Shire from 2007-2019. **Figure 4.2** shows a significant decrease from the 2007 baseline in the number of development applications approved in Dungog Shire LGA from 2008-2013. This decrease is likely to be a result of the 2008 global financial crisis and subsequent worldwide economic impacts flowing down to a local scale. However, the number of approved development applications have steadily increased from 2013-2018 (DPIE 2020) with an average of 170 development applications approved each year from 2013-2019.

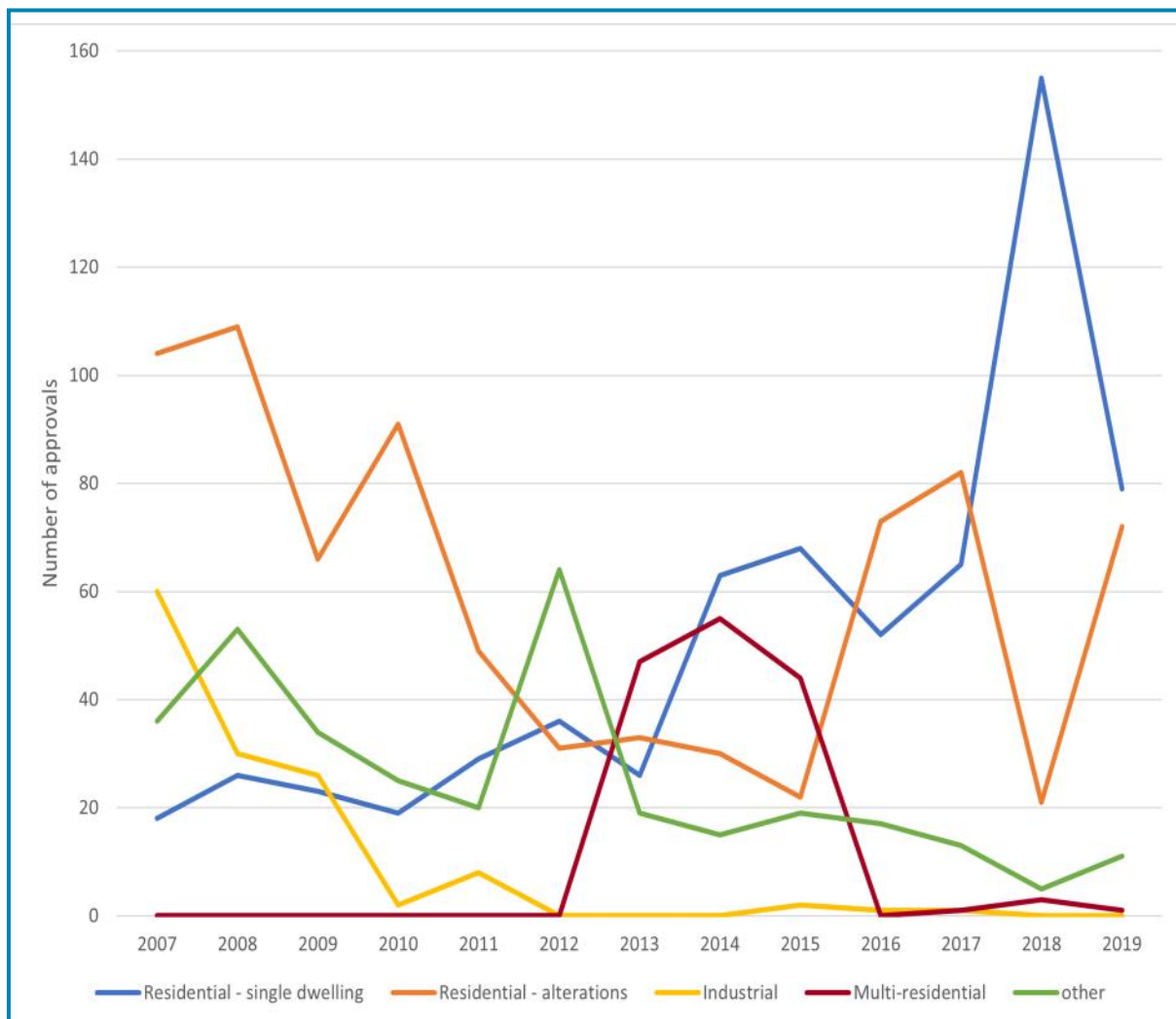


Source: DPIE 2020

Figure 4.2: Number of approved development applications in Dungog Shire LGA 2007-2019

The types of development approved within an LGA can provide insight into the potential environmental impacts from continuing development in the area. Types of development can fluctuate over time in response to market forces and demand, but in Dungog Shire LGA residential development accounts for a significant proportion of approved development applications each year (**Figure 4.3**). This coincides with the population growth shown in **Section 3.1** and business and employment growth in the construction sector in **Section 4.1**. **Figure 4.3** shows the following trends

- Single dwelling residential development has significantly increased since 2013 with a strong increase from 2017.
- Alterations to existing residential properties declined from 2007-2015 but has increased from 2016-2019.
- Multi-residential developments significantly increased from 2012-2016 but have declined to almost zero since 2017.
- Industrial approvals have steadily declined from 2007-2010 (to no approvals) with minimal approvals from 2010-2019
- Other development, including commercial development peaked in 2012, but has remained steadily under 20 approvals annually from 2013-2019.



Source: DPIE 2020

Figure 4.3: Types of development approvals in Dungog Shire Local Government Area 2007-2019

4.3 Population and economic growth pressure on the environment in Dungog Shire

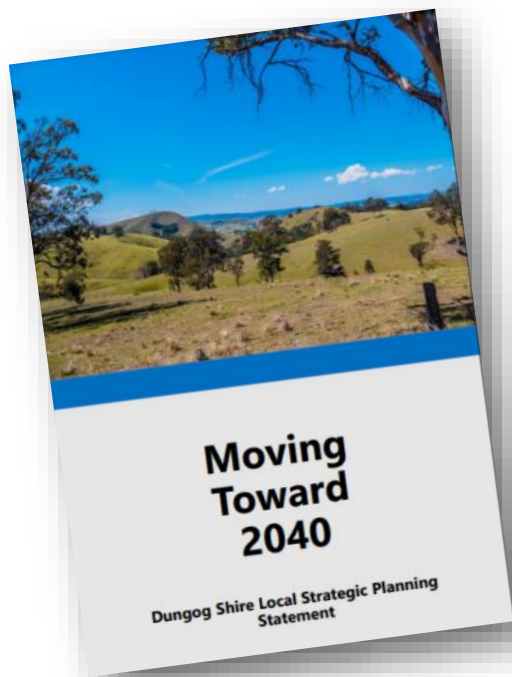
Human population growth and economic growth is a significant factor when considering impacts on the natural environment. Increasing population and urbanisation of areas can result in a higher demand for land area and resultant clearing of vegetation and native habitat. This demand is driven by the requirement for additional housing and employment areas along with the construction or enhancement of infrastructure, utilities and other facilities to meet a desired standard of living.

Continued population and economic growth can result in increasing demand for energy, water and consumer products which places pressure on natural resources, generates emissions into the environment and potentially increasing generation of waste.

4.4 Population and economic growth response in Dungog Shire

4.4.1 Hunter Regional Plan

The Hunter Regional Plan 2036 (DoP 2016) was released in October 2016 and includes strategic planning for growth in the wider Hunter Region. While the Hunter Regional Plan 2036 provides some planning context for population and economic growth in Dungog Shire LGA the strategic planning principles are primarily restricted to growth and diversification of the agricultural sector and changing housing needs. The population growth in Dungog Shire LGA (see **Section 3.1**) already exceeds the projected growth in the Hunter Regional Plan 2036 and further planning for the LGA is required. The Hunter Regional Plan 2036 is proposed for review in the next twelve months.



4.4.2 Dungog Shire Local Strategic Planning Statement

Reforms to the EP&A Act 1979 by the NSW State Government require Councils to prepare Local Strategic Planning Statements (LSPS) to guide development within their LGAs. The Dungog Shire Local Strategic Planning Statement (DSC 2020) provides overarching themes and actions that will inform development within the LGA and facilitate future review of key development planning instruments such as the Dungog Local Environmental (LEP) Plan 2014.

4.4.3 Programs

A range of Government initiatives, including Commonwealth, State and Council, along with community programs have been implemented in Dungog Shire LGA to reduce the impacts from human settlement on the environment. These programs will be discussed in other sections of the SoE Report and include Energy (**Section 5**), Transport (**Section 6**), Water Use (**Section 7**), Waste (**Section 8**) and Air and Climate (**Sections 12-14**).



In 2018/19 consumption of energy in Australia increased by over 1% compared to the previous reporting year (DISER 2020). The transport, electricity supply and manufacturing sectors accounted for nearly three quarters of Australia’s energy consumption. Over 94% of energy in Australia is supplied by non-renewable fossil fuels including oil, coal and natural gas.

While energy consumption in NSW declined in 2018/19 the State still remains the highest energy consumer, 24.9% of Australia’s total energy consumption, of any Australian State or territory.

The impacts of the COVID-19 pandemic in 2020/21 on energy consumption within Australia are not yet reported, but preliminary indicators show large industrial energy consumption remained steady while commercial consumption reduced by 10-20% (DISER 2020). However, commercial or workplace energy consumption decline appears to have been largely offset by residential energy consumption growth. The largest decline in energy consumption in 2020 is related to the transport sector, with sales of petrol and aviation fuel significantly reduced.

5.1 Energy consumption in Dungog Shire

Energy supplied to an end user is known as ‘final energy’. Advanced data regarding ‘final energy’ consumption in Dungog Shire is not available, but primary energy use sectors within the LGA can be indicatively determined from emissions data.

In Dungog Shire LGA the agricultural sector was the highest energy consumer from 2016-2019. However, the agricultural sector in the LGA has seen a decline in emissions from 41% of total LGA emissions in 2016 to 34% in 2019 (**Table 5.1**). Transport related emissions have risen from 31% of total LGA emissions in 2016 to 34% in 2019.

Table 5.1: Emission and energy use sectors within Dungog Shire LGA 2016-2019

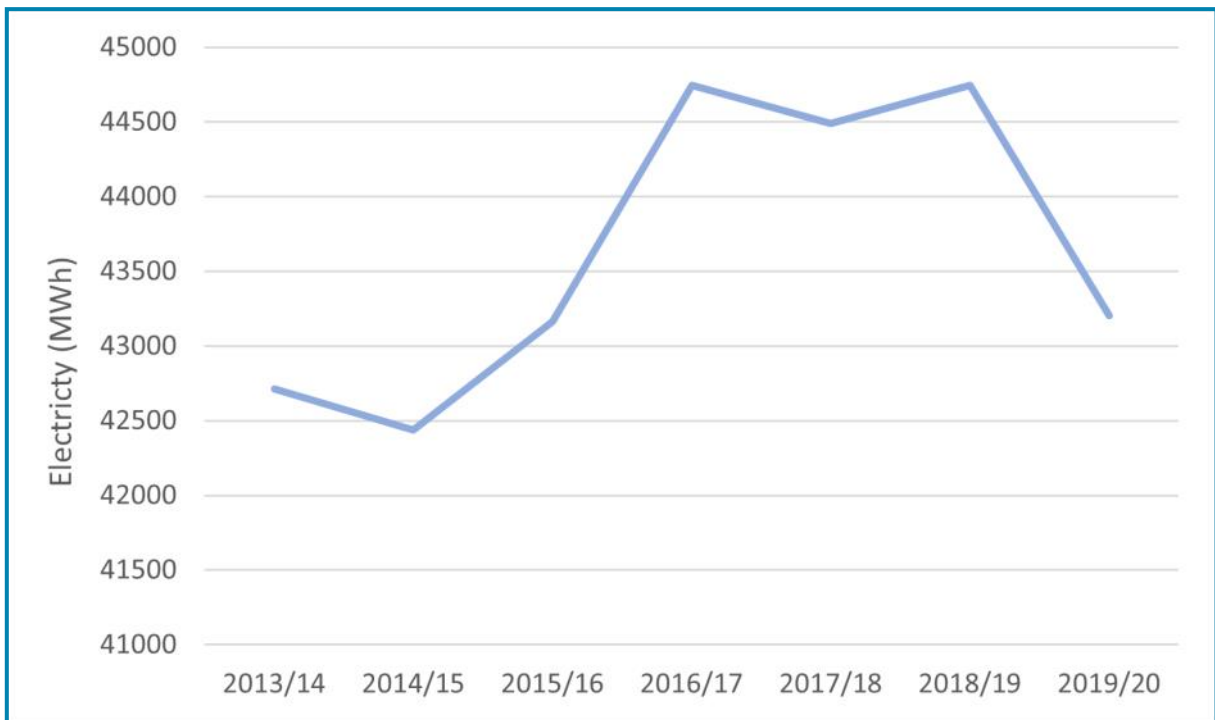
Percentage of use/emissions in LGA					
Energy use sector		2016	2017	2018	2019
Agricultural		41	40	34	34
Transport		31	31	34	34
Electricity	Residential	11	12	13	12
	Commercial	5	5	6	6
	Industrial	7	7	7	8
	Electricity total	23	24	26	26
Gas		4	4	5	5
Waste		1	1	1	1

Source: Ironbark Sustainability 2019

5.2 Electricity consumption In Dungog Shire

5.2.1 Local Government Area consumption

The third highest energy use sector in Dungog Shire LGA is electricity. Electricity consumption has increased from 23% of emissions in 2016 to 26% in 2019 (see **Table 5.1**). Essential Energy, the electricity provider in Dungog Shire LGA, has provided advanced data on electricity use within the LGA. Total electricity use in Dungog Shire LGA has increased by 1.14% from 2013/14 to 2019/20 (**Figure 5.1**). Electricity consumption within the LGA steadily increased by 4.75% from 2013/14 to 2016/17, but subsequently decreased since, particularly between 2018/19 and 2019/20.



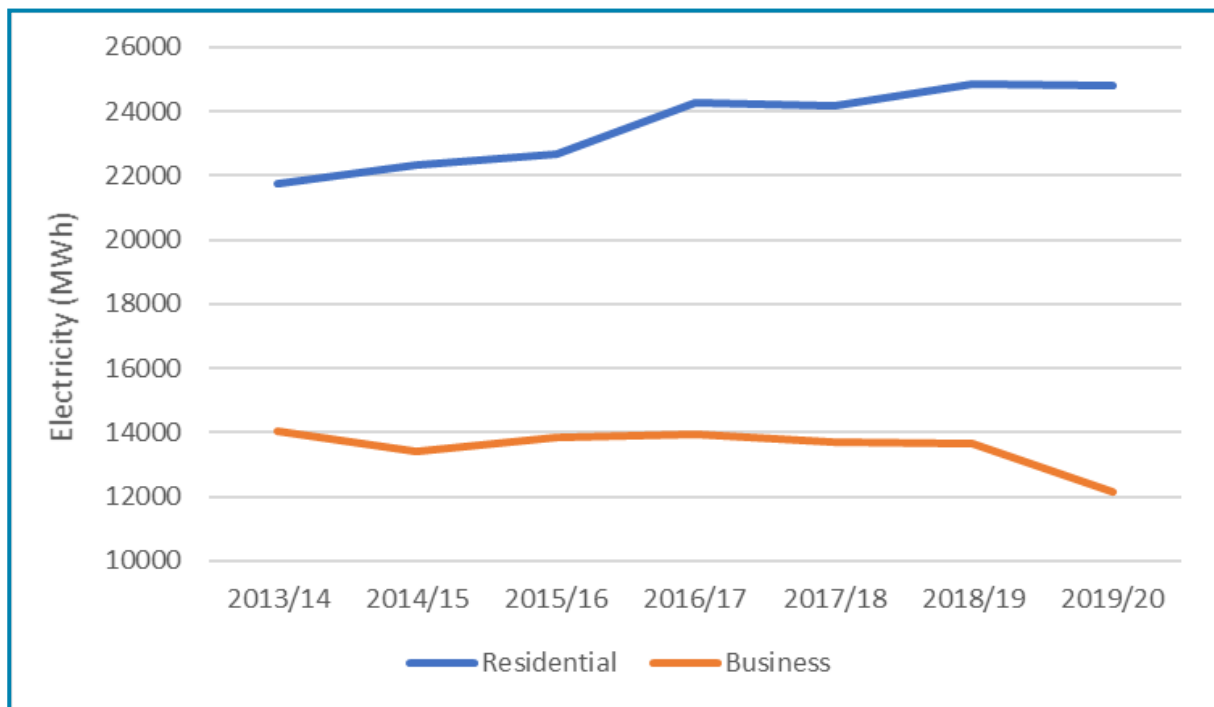
Source: Essential Energy 2020

Figure 5.1: Total annual electricity consumption in Dungog Shire LGA 2013/14 to 2019/20



5.2.2 Residential and business consumption

Electricity consumption data within the LGA can be divided into business and residential end users. Residential electricity consumption accounts for a greater proportion of total electricity use within Dungog Shire LGA with use increasing by 14% from 2013/14 to 2019/20 (**Figure 5.2**).



Source: Essential Energy 2020

Figure 5.2: Total annual residential and business electricity consumption in Dungog Shire LGA 2013/14 to 2019/20.

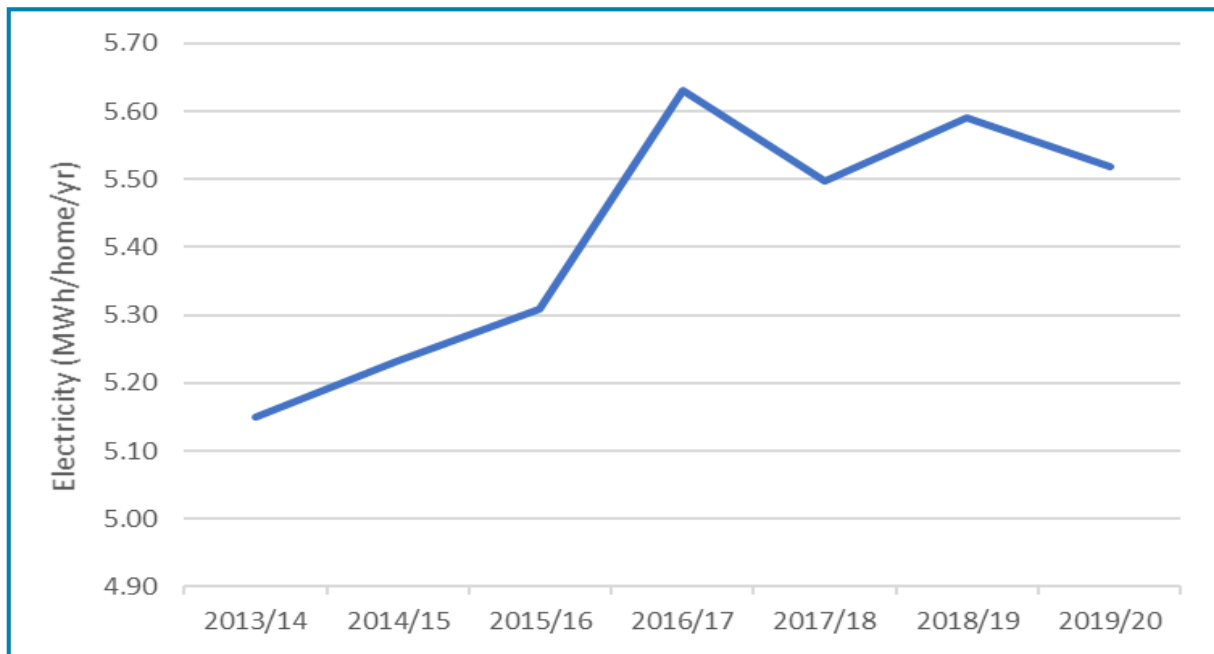
Residential electricity customers increased by 273 dwellings in Dungog Shire LGA from 2013/14 to 2019/20. While household numbers have increased the average annual residential electricity use has also increased from 5.15 MWh/year in 2013/14 to 5.52MWh/year in 2019/20, a 7.13% increase per household (**Figure 5.3**).

Adjusting residential electricity consumption to average annual use/person, based on estimated residential population (ABS 2020), shows use has increased from 2.47 MWh/year in 2013/14 to 2.63 MWh/year in 2019/20, or a 6.5% increase in electricity use per person.

Electricity consumption by business premises in Dungog Shire LGA has decreased by 13.75% from 2013/14 to 2019/20 (See **Figure 5.2**). A significant portion of the decrease in electricity use by businesses occurred from 2018/19 to 2019/20 (an annual decrease of 1523MWh). This decrease in electricity use is equivalent to a reduction of 1079t of CO₂ emissions. However, the reduction in business electricity consumption in 2019/20 may potentially be a result of reduced operation of business and commercial premises due to the COVID-19 pandemic.

Essential Energy's data does not distinguish between industrial and commercial operations and reports these as a combined 'business' category. Businesses, whether commercial or industrial, have varying electricity requirements based on the type of operations conducted. This makes a comparative analysis of business electricity usage difficult.

The number of business customers in Dungog Shire LGA increased by 5 premises from 2013/14 to 2019/20 and based on a simple average electricity use/business premises consumption has decreased from 31.38MWh/business in 2013/14 to 26.77MWh/business in 2019/20, a 14.7% decrease per business.



Source: *Essential Energy 2020*

Figure 5.3: Average annual residential household electricity consumption in Dungog Shire Local Government Area 2013/14 to 2019/20.

5.3 Energy pressure in Dungog Shire

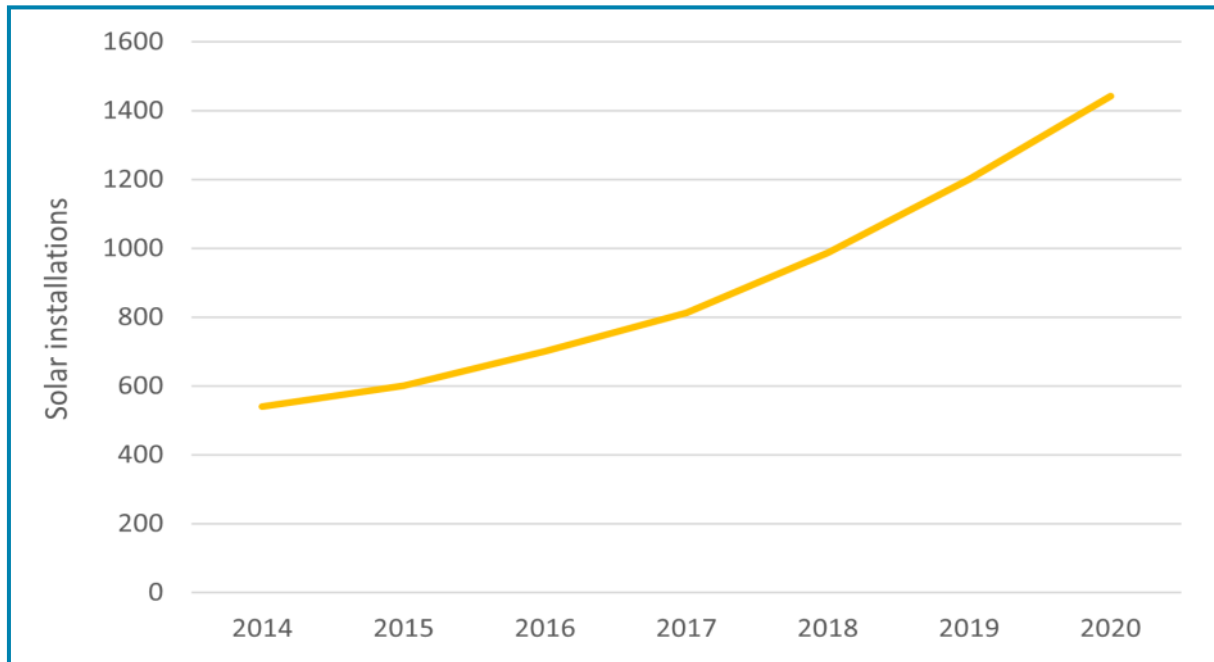
Pressure on energy use in Dungog Shire LGA includes:

- The transport sector accounts for the second highest level of emissions in Dungog Shire LGA (**Table 5.1**). Dungog Shire LGA has increasing levels of private transport, including increasing number of private vehicle registrations (**See Section 6 Transport**). Increased private vehicle use, or single person vehicle occupancy during trips, can result in increasing greenhouse gas emissions.
- Population increase (**See Section 3.1**). Population growth can result in increased levels of energy demand and consumption.
- Economic growth (**See Section 4.1**). Primary industry growth can result in increased greenhouse gas emissions while energy and resource intensive growth in industries such as construction can increase energy demand.
- Climate change (**See Section 14 Climate Change**). Climate change is projected to result in increasing number of hot days (>35°C) and extended heatwave conditions in the Hunter Region (AdaptNSW 2021). These projected conditions may result in increased energy demand for air conditioning and cooling.

5.4 Energy response in Dungog Shire

5.4.1 Solar energy

Renewable energy source capacity, such as solar energy, has significantly increased in Dungog Shire LGA since 2014. The number of solar installations has increased from 541 in 2014 to 1445 by the end of 2020, a 166% increase in the number of installations (**Figure 5.4**). The uptake of low-scale solar energy systems is likely to be a result of NSW State Government energy efficiency incentive programs.

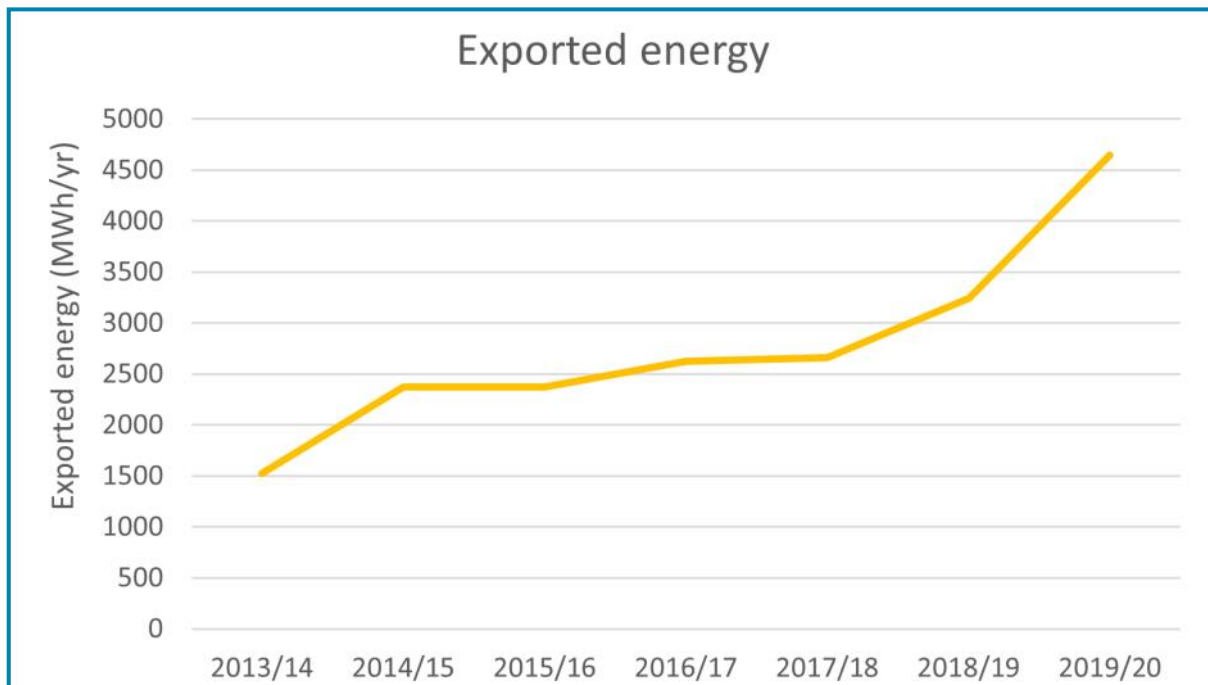


Source: 2014-2018 (ABS 2020), 2019-2020 (Australian PV Institute 2021)

Figure 5.4: Solar installations in Dungog Shire LGA 2014-2020.



The Australian PV Institute estimates solar installations in Dungog Shire LGA in 2020 have a generation capacity of 8240kW (Australian PV Institute 2021). The installed generation capacity has resulted in increasing export of energy from systems in Dungog Shire LGA into the energy network grid. The annual energy export to the Essential Energy network has increased from 1524MWh in 2013/14 to 4650MWh in 2019/20, a 205% increase in exported energy (Figure 5.5). The energy exported to the grid has resulted in the equivalent reduction of 3295t of CO₂ emissions in 2019/20 and 13899t of CO₂ emissions since 2013/14.



Source: Essential Energy 2020

Figure 5.5: Energy exported from Dungog Shire Local Government Area to Essential Energy grid 2013/14 to 2019/20.

Installation of solar panel systems has been undertaken at several Council owned/operated buildings, including the Council Administration Centre in Dungog and the Works Depot. However, advanced energy data is not currently available for these installations but will be reviewed in future reports.



5.4.2 Cities Power Partnership

The Cities Power Partnership is a collaborative local government climate network with 140 Council members sharing resources and expert knowledge. Dungog Shire Council, through collaboration with the Hunter Joint Organisation, became a member of the Cities Power Partnership in June 2021. As part of the membership pledge for the Cities Power Partnership Council has resolved to replace 481 streetlights with more energy efficient LED lighting. This energy efficiency program will be undertaken in partnership with Essential Energy.



Energy opportunities in Dungog Shire

Future energy efficiency opportunities for Council and the community may include:

- Council to consider the **development of a sustainability strategy and action plan** for both Council operations and the LGA. The sustainability strategy and action plan may include targets for energy consumption to guide future energy efficiency initiatives.
- Council may consider a **membership with the NSW State Government Sustainability Advantage program**. This program may assist with Council furthering operational sustainability practices or implementing new practices.
- Council undertaking **energy efficiency audits** at its facilities to assess current operations. The audits may assist Council in implementing energy efficiency programs across its facilities.
- Sustainability and energy saving engagement activities to assist the community in achieving effective and energy efficient outcomes. This may include information support for **renewable energy installations or community renewable energy programs** such as the NSW Government Regional Community Energy Fund.
- Continued collaboration with the **Cities Power Partnership** and implementation of membership pledges.
- Investigation of implementation of **environmental upgrade agreements for non-residential buildings** in the LGA under the *Local Government Act 1993*.
- Investigation of **electric vehicle infrastructure (See Section 6 Transport)**.



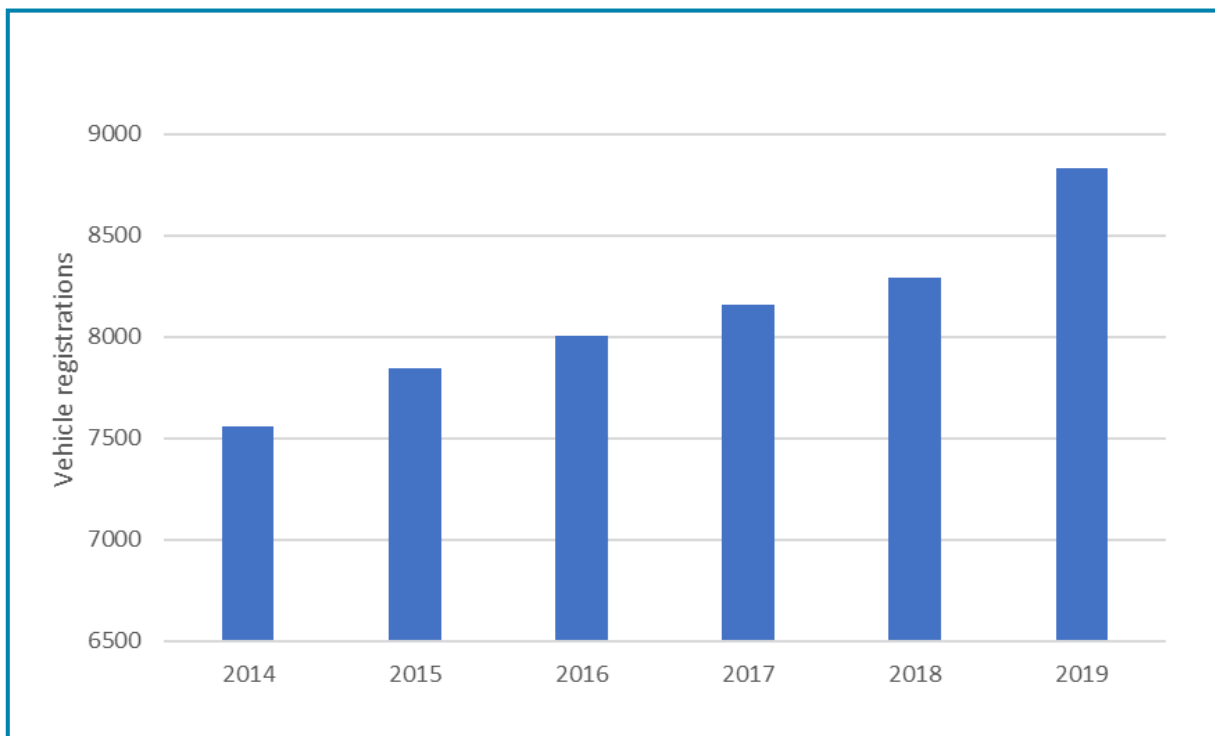


6.1 Transport in Dungog Shire

Transport within Dungog Shire LGA is heavily car dependent. The NSW State Government Household Travel Survey estimates in 2016/17 87.3% of average weekday travel within the LGA was undertaken in a private vehicle (TfNSW 2021). In 2018/19 estimated private vehicle trips increased to 96.1% of all weekday travel within the LGA with the average car trip being 24.2km. The remainder of weekday travel from 2016/17 to 2018/19 was primarily through walking, with an average trip distance of 800m. Public transport accounted for a minor percentage of weekday travel in the LGA.

6.1.1 Motor vehicle ownership

Due to the high and increasing dependence on private vehicle travel within Dungog Shire the number of registered motor vehicles within the LGA has increased by 16.83% from 2014 to 2019 (**Figure 6.1**).



Source: ABS 2020

Figure 6.1: Number of registered motor vehicles in Dungog Shire Local Government Area 2014-2019

In 2019 passenger vehicles accounted for over 60% of all registered motor vehicles within Dungog Shire LGA (**Table 6.1**). While passenger vehicle numbers have continued to grow from 2014-2019 there has been a significant change in the number of registered campervans (66.67% increase), light rigid trucks (59.38% increase) and light commercial vehicles (25.54% increase) within the LGA.

Table 6.1: Registered motor vehicle types within Dungog Shire LGA 2014-2019

Vehicle type	2014	2015	2016	2017	2018	2019	% change 2014-2019
Passenger vehicle	5060	5204	5280	5379	5158	5324	5.22
Campervans	24	26	31	41	42	40	66.67
Light commercial	1962	2087	2158	2224	2185	2463	25.54
Light rigid trucks	64	82	81	81	91	102	59.38
Heavy rigid trucks	225	227	241	249	238	272	20.89
Articulated trucks	29	30	32	33	21	27	-6.9
Non-freight carrying trucks	4	7	4	7	3	unavailable	
Buses	68	59	63	60	61	62	-8.82
Motorcycles	465	496	526	515	499	530	13.98

Source: ABS 2020

6.1.2 Motor vehicle fuel type

Emissions from motor vehicles can vary depending on fuel type. In 2018/19 petrol vehicles accounted for almost 60% of registered motor vehicles within the Dungog Shire LGA while diesel fueled vehicles represented 38.8% of registrations. Alternative fuel vehicles, such as LPG or electric, accounted for only 1.34% of registered vehicles in the LGA (**Table 6.2**).

Table 6.2: Vehicle fuel types for registered motor vehicles in Dungog Shire Local Government Area 2014-2019

Fuel type	2014	2015	2016	2017	2018	2019	% change 2014-2019
Petrol	5177	5278	5261	5242	5171	5276	1.9
Diesel	2207	2418	2617	2816	3007	3427	55.28
LPG/Dual/Other	171	151	127	108	117	118	-31

While petrol motor vehicles have seen a small increase in number in the LGA (1.9% increase) from 2014-2019 diesel fuel vehicles have increased by 1220 vehicles in the five-year period (55.28% increase). It must be noted that the number of alternative fuel or powered vehicles, such as LPG or electric, have decreased in the LGA in the same period. This decrease may be a result of low uptake of these type of vehicles idue to market or economic forces or potentially due to minimal supporting infrastructure, such as electric charging stations, within the region.

6.1.3 Active transport

Walking

The Household Travel survey estimates the number of weekday walking trips in Dungog Shire LGA has decreased from 2016/17 to 2018/19 (TfNSW 2021). Distance is a barrier for walking trips between the townships within the LGA, but walkable trips within the townships could possibly be undertaken.

Walkscore provides an overview of walkability of an area, including footpath availability and other infrastructure to facilitate people to walk rather than use another mode of transport.

Table 6.3: Walkscore value for townships within Dungog Shire Local Government Area

Township	Walkscore
Dungog (Town centre)	66 – average walkability
Dungog (Outside town centre)	28 – car dependent
Clarence Town	6 – car dependent
Paterson	30 – car dependent
Vacy	19 – car dependent
Gresford/East Gresford	27 – car dependent

Source: Walkscore 2021

Table 6.3 shows the walkability rating for each of the townships within the LGA is minimal and highlights the private vehicle dependency of the townships. However, Dungog Town Centre has an average walkability rating with potential for improvement for walking trips within the township.

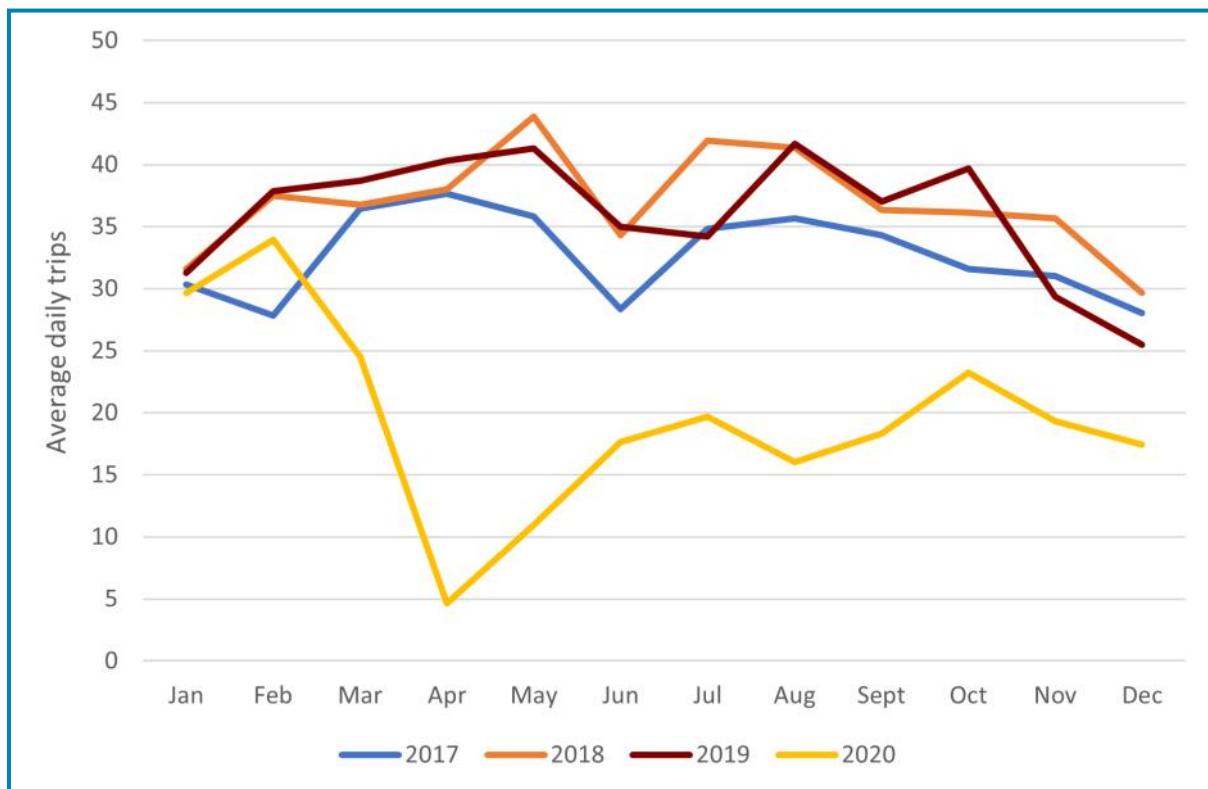
Cycling

Data relating to cycling as a mode of transport within Dungog Shire LGA is minimal. However, anecdotal evidence suggests cycling, or recreational cycling, has increased in the past few years and may be an option for active transport within townships and the wider LGA.

6.1.4 Public transport

The North Coast rail line passes through Dungog Shire LGA with stations at Dungog, Wirragulla, Wallarobba, Hilldale, Martins Creek and Paterson (map?) Trip data (entry and exit to station) shows regular use of the stations at Dungog, Martins Creek and Paterson, but minimal public use of the stations at Wirragulla, Wallarobba, and Hilldale station (TfNSW 2021a).

From 2017-2020 Dungog Station had the highest trip use with an average of 31.3 trips/day. However, this average may be low as average daily and monthly trips were significantly reduced in 2020 due to public transport restrictions associated with the COVID-19 pandemic (**Figure 6.2**).



Source: TfNSW 2020a.

Figure 6.2: Average daily trips/month at Dungog train station 2017-2020.

Average daily trips at Paterson (9.26 trips/day) and Martins Creek (5.95 trips/day) were significantly lower than Dungog Station from 2017-2020.

6.2 Pressure from transport on the environment in Dungog Shire

Pressure from transport in Dungog Shire LGA includes:

- Limited public transport options between townships within the LGA and surrounding areas. Limited options result in higher rate of private vehicle usage with increased pressure on the road network and higher greenhouse gas emissions.
- Population increase (See **Section 3.1**). Population growth can result in increased transport demands and use of private transport vehicles.
- Higher levels of fuel consumption from increasing use of private motor vehicles with increased pressure on non-renewable resources.
- Increased air pollution from private vehicle use

6.3 Transport response in Dungog Shire

Transport within Dungog Shire LGA is administered by various NSW State Government agencies and Council. Responses include:

- Transport for NSW released the NSW Future Transport 2056 strategy in March 2018 accompanied by the Regional NSW Services and Infrastructure Plan which includes Dungog Shire LGA. However, these plans contain minimal information in relation to transport improvements within Dungog Shire LGA.
- Council's Roads and Transport Asset Management Plan includes an analysis of cycleways and footpaths within the LGA and opportunities for extension or replacements works. However, advanced data on footpath and cycleway renewal or extensions is not complete at this stage.



Transport opportunities in Dungog Shire

Future transport opportunities for Council and the community may include:

- Advocate for funding of transport initiatives** within the LGA through inclusion in the Regional NSW Services and Infrastructure Plan and the NSW Walking and Cycling Program.
- Review of Council's Roads Management Strategy 2011 to consider **inclusion of cycle ways to increase active transport.**
- Review of Council's Roads and Transport Asset Management Plan to consider **provision of footpaths and cycleways to improve active transport** within townships in the LGA. This is supported by the Dungog Shire Local Strategic Planning Statement.
- Advocate to Transport for NSW for **improvement to rail timetable** to increase public transport participation within and through the LGA.
- Council to investigate **alternative fuel or electric vehicles within the Council operational fleet** as part of Cities Power Partnership.
- Collaborate with Hunter Joint Organisation on **electric vehicle infrastructure** strategy for the Hunter Region. Increasing electric vehicle infrastructure may facilitate the uptake of alternative fuel vehicles in Dungog Shire LGA and the wider region.
- Advocate for **transport surveying** to be conducted within the LGA like surveys conducted in the Lower Hunter and Sydney Metropolitan Area. This surveying may inform any future transport strategy for the LGA.



7. Water use



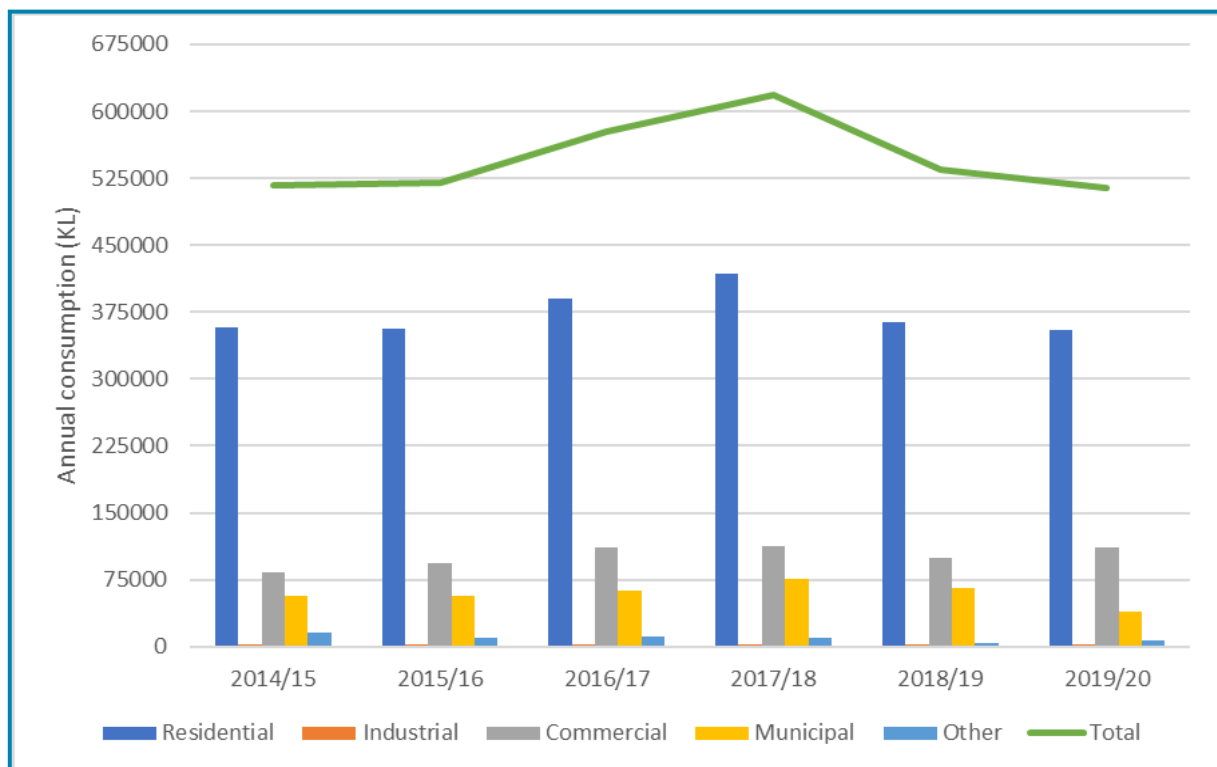
Due to decreasing water storage from reduced rainfall in the past few years (See **Section 11 Climate**) Level 1 water restrictions were introduced in September 2019 by Hunter Water Corporation (HWC). These were the first water restrictions in the region in over twenty years. Water storage levels continued to decrease resulting in the introduction of Level 2 water restrictions in January 2020.

In 2019/20 Hunter Water Corporation supplied almost 57.5GL of water to LGA's within their service region (HWC 2021). This was a reduction of over 3.9GL compared to 2018/19 and was likely to be a result of both water restrictions and change in customer use of water. However, the extended decrease in rainfall highlights the variable nature of the climate and how it can determine access to water in the region. The decrease in rainfall also shows the need for strong water supply planning to account for variable conditions and the efficient use of water by end users.

7.1 Water consumption in Dungog Shire

7.1.1 Local Government Area water use

In 2019/20 total water consumption in Dungog Shire LGA was 514839kL. Total water consumption in Dungog Shire LGA increased from 2014/15 to 2017/18 by nearly 20% (**Figure 7.1**). However, LGA-wide water consumption has decreased since 2017/18 to a level that is 0.4% less than the 2014/15 consumption level. **Figure 7.1** shows residential water use accounts for a large proportion of water consumption in Dungog Shire (69% of water used in 2019/20) with commercial premises accounting for 21.5% of water use in 2019/20. Industrial water use is a minor percentage of total water consumption in the LGA.



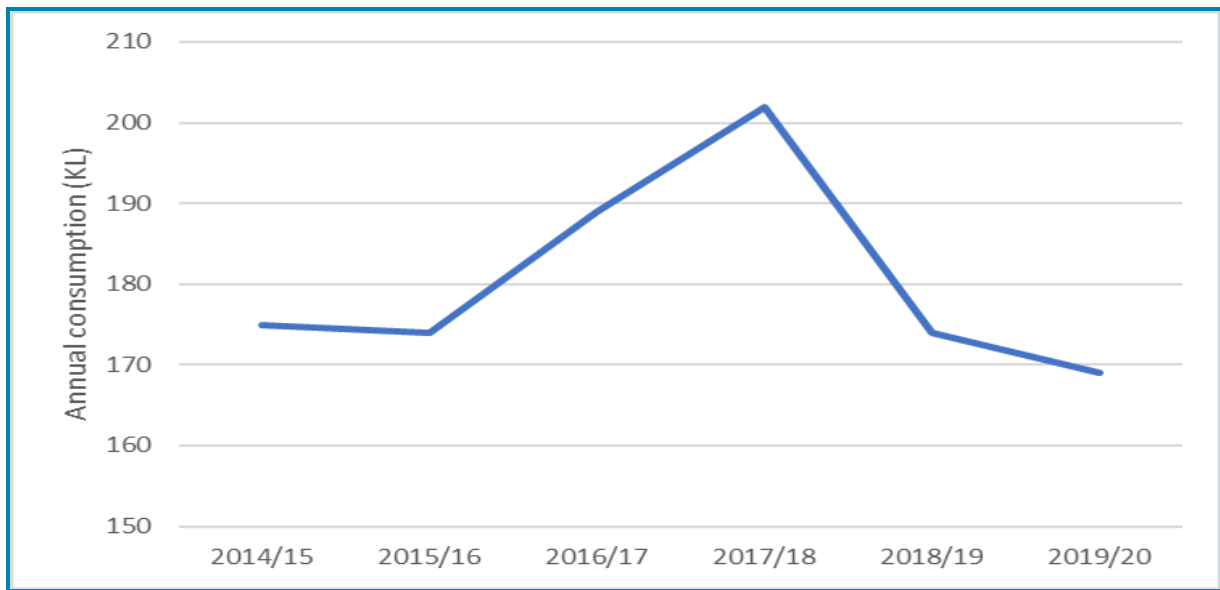
Source: HWC 2021

Figure 7.1: Water consumption in Dungog Shire Local Government Area 2014/15 to 2019/20.

It must be noted that due to total lower rainfall within the region in 2016/17 and 2017/18 that potable water consumption is likely to have increased due to reduced capacity of tank or other water storage methods at customer properties.

7.1.2 Residential water use

Average annual water consumption/residential dwelling in Dungog Shire LGA increased from 175kL/dwelling in 2014/15 to 202kL/dwelling in 2017/18 (Figure 7.2). However, residential water consumption has decreased since 2017/18 to an average of 169kL/dwelling in 2019/20. This decrease in recent years has resulted in an overall decrease in water consumption of 3.43% per dwelling from 2014/15 to 2019/20.



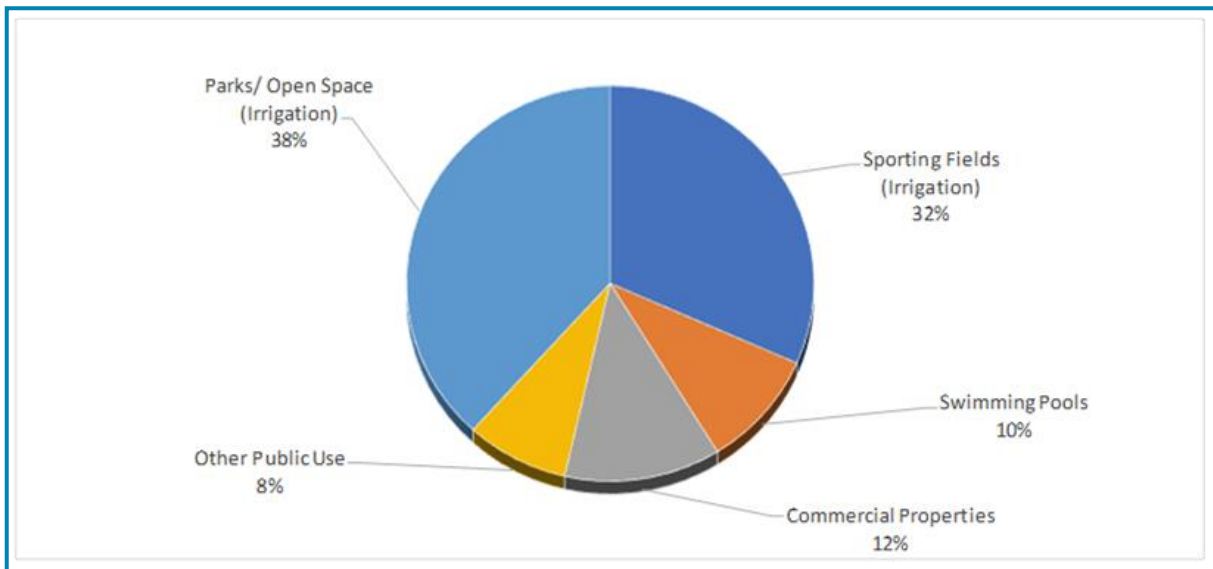
Source: HWC 2021

Figure 7.2: Average annual residential water consumption in Dungog Shire Local Government Area 2014/15 to 2019/20.



7.1.3 Municipal water use

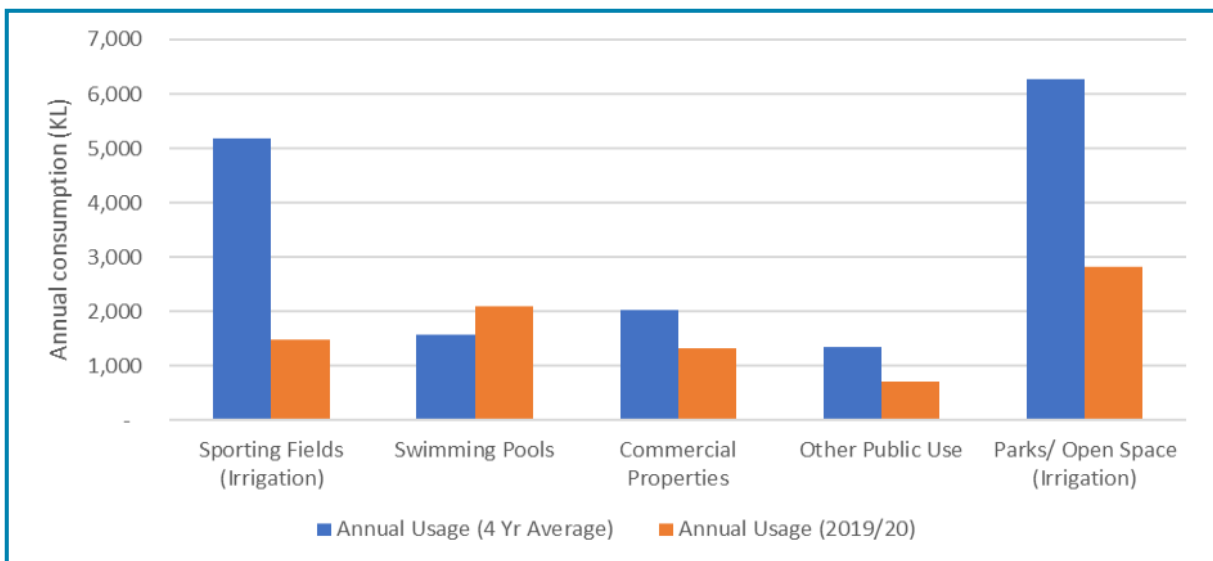
Dungog Shire Council is the third highest water consumer sector within the LGA (**Figure 7.1**). Water consumption by Council is primarily through irrigation of public space such as parks and sporting fields. Irrigation accounted for approximately 70% of municipal water use from 2015/16 to 2018/19 (**Figure 7.3**).



Source: HWC 2020

Figure 7.3: Proportion of municipal water consumption by Dungog Shire Council operational areas from 2015/16 to 2018/19.

Due to drought conditions and in response to the introduction of water restrictions by HWC Dungog Shire Council reduced municipal water consumption by 49% compared to the previous 4-year water consumption average (**Figure 7.4**). The reduction in municipal water consumption was achieved across most Council operational areas with irrigation significantly reduced in response to water restrictions. However, water use from the operation of Council swimming pools increased in 2019/20.



Source: HWC 2020

Figure 7.4: Annual average water use by Dungog Shire Council operational areas – 4 year average compared to 2019/20.

7.2 Pressure on water use in Dungog Shire

Pressure on water use in Dungog LGA includes:

- Population increase (See **Section 3.1**). Population growth can result in increased demand for water and total water consumption.
- Economic growth (See **Section 4**). Primary industry growth can result in increased potable water use demands while other economic sectors may have increased water consumption requirements.
- Climate change (See **Section 14 Climate change**). Increasing number of hot days (>35^oC) and heatwaves (AdaptNSW 2021) may result in increased water demand.
- Human behaviour towards water use. Varying attitudes towards water management including water use behaviour, appliance and water fitting choices and rainwater use can impact on water supply and storage
- Water use at public facilities. Sporting grounds and place spaces require a certain standard of amenity to be fit for purpose and irrigation may be required to supplement rainfall.

7.3 Water use response in Dungog Shire

7.3.1 Smarter Water Choices

HWC have implemented the Smarter Water Choices program to inform and embed water saving practices among water users in the region. The Smarter Water Choices program extends to both residential properties and businesses (HWC 2021).



7.3.2 Building Sustainability Index (BASIX)

The Building Sustainability Index (BASIX) was introduced in NSW in 2004 to ensure residential dwellings are designed to use up to 40% less water than pre-2004 levels. BASIX is implemented through the planning system for residential development under State Environmental Planning Policy (SEPP) BASIX 2004. The implementation of SEPP BASIX 2004 is supported by the Dungog DCP.

7.3.3 Council Water Efficiency Management Plan

Section 7.1.3 outlines the water reduction volumes achieved by Council during 2019/20. Council is collaborating with HWC to develop a water efficiency management plan for the public swimming pools at Dungog and Clarence Town. The water efficiency management plan will identify measures to reduce water use at these facilities.



Water use opportunities in Dungog Shire

Future water efficiency opportunities for Council and the community may include:

- Council to consider the development of a sustainability strategy and action plan for both Council operations and the LGA. The sustainability strategy and action plan may include **targets for water consumption** to guide future water saving initiatives.
- Council may consider a **membership with the NSW State Government Sustainability Advantage program**. This program may assist with Council furthering operational sustainability practices for water use or implementing new water use practices.
- Council to **audit water use at its facilities** to assesses current operations. The audit may include leak detection and investigation of current water fixtures to assess current water efficiency capabilities and recommend management options such as installation of smart meters.
- Sustainability and **water saving engagement activities** to assist the community in understanding current water saving options and technology. This may be supported by HWC's Smarter Water Choices or appointment of a sustainability advisor.
- Promotion of **water efficiency labelling and standards (WELS) scheme** for both residential and commercial development.
- Promotion of **National Australian Built Environment Rating System (NABERS)** for new development.
- Promotion of **water rebates schemes** to facilitate uptake of water saving technologies on existing residential housing stock.
- Review of **Section C18- Water efficiency of the Dungog DCP**.



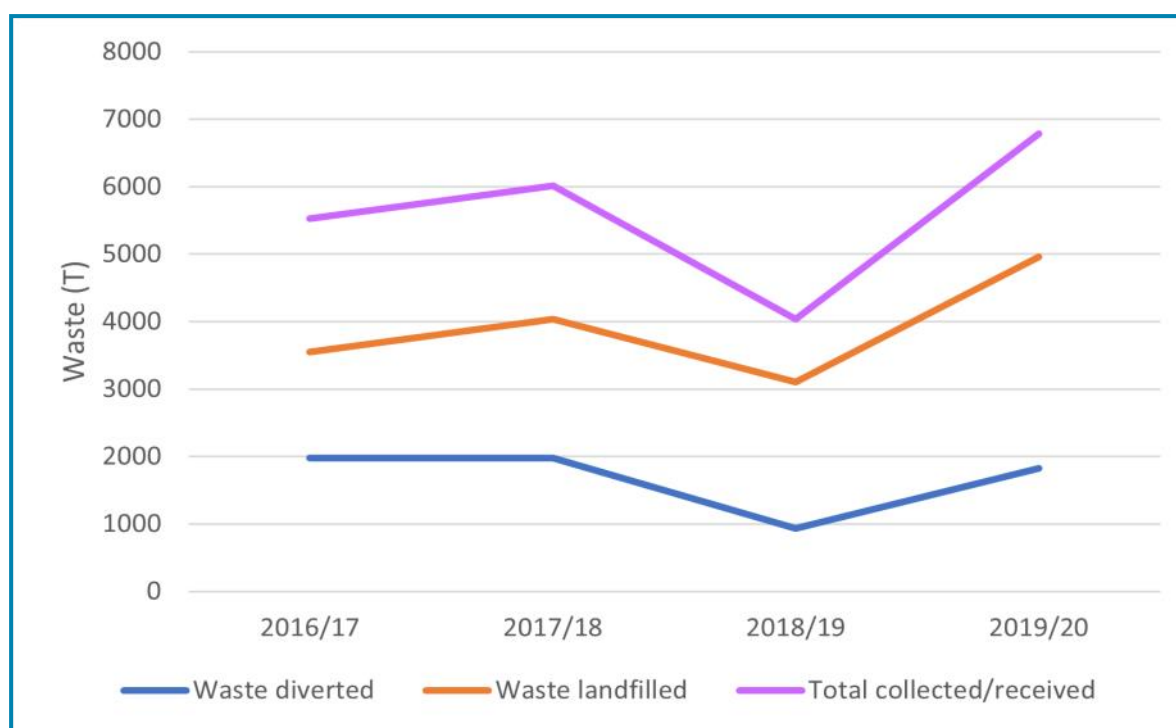
Human use of resources can result in the generation of waste products. In 2018/19 more than 22 million tonnes of waste was generated in NSW alone. From 2015/16 to 2018/19 the total waste generated per person in NSW rose from 2.42 tonnes to 2.75 tonnes with the majority of waste originating from the construction and demolition industries (NSW EPA 2021). However, 65% of waste generated in NSW was diverted from landfill (14.6 million tonnes in 2018/19) with the construction industry achieving a strong recycling rate of 77%. Municipal solid waste has remained at 42-43% recycling rate since 2015/16.

8.1 Waste in Dungog Shire

8.1.1 Waste to landfill

In Dungog Shire LGA the total amount of waste collected or received by Council annually has increased by 22.8% from 2016/17 to 2019/20 (Figure 8.1). In 2019/20 over 6700 tonnes of waste was collected by Council with almost 5000 tonnes (73% of total waste) landfilled.

The annual total amount of waste landfilled in Dungog Shire LGA has increased by almost 40% from 2016/17 to 2019/20. This increase in landfilled waste has also resulted in the annual tonnage of waste recycled or diverted from landfill decreasing by 7.57% from 2016/17 to 2019/20



Source: DSC 2021

Figure 8.1: Annual waste collected, landfilled and diverted by Council in Dungog Shire Local Government 2016/17 to 2019/20.

Total volume of waste in a region can increase due to population growth. Utilising the estimated residential population from ABS (ABS 2021) the annual waste generation per person in the LGA can be calculated. Waste generated per person in Dungog LGA has increased by 18.6% from 2016/17 to 2019/20 (Figure 8.2). Waste landfilled per person in Dungog Shire LGA has also increased by 34.9% over the same time period.

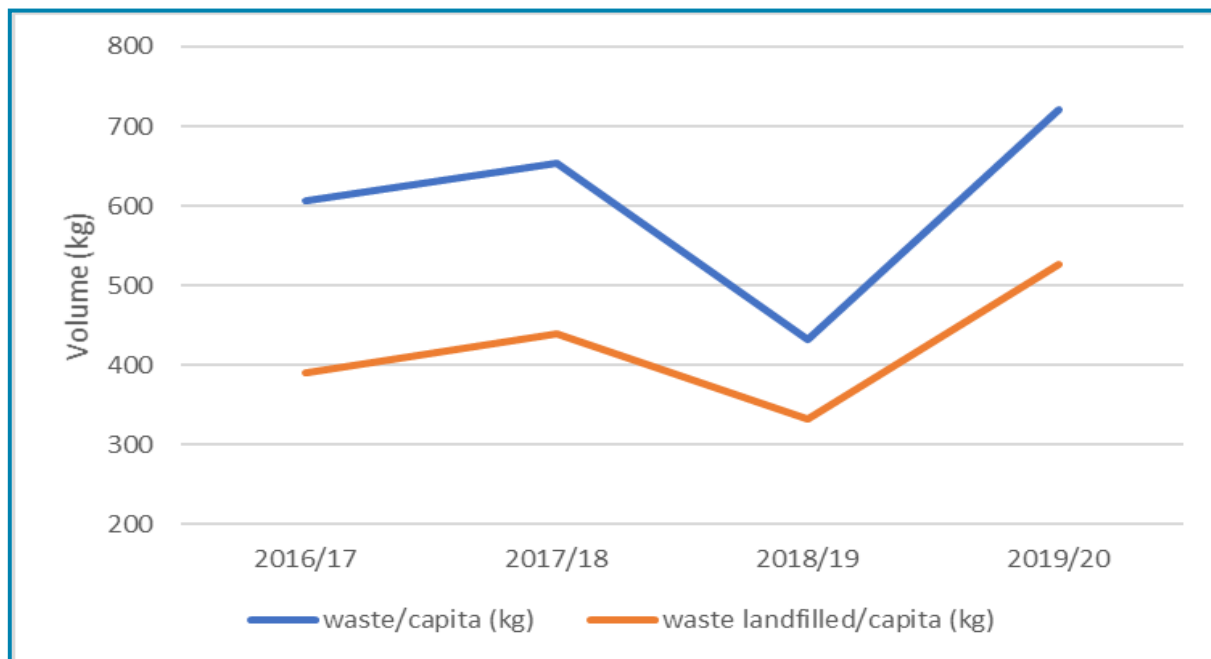


Figure 8.2: Waste generation per person in Dungog Shire Local Government Area 2016/17 to 2019/20.

It must be noted that landfilled waste may have increased in 2019/20 in response to landfill operational capping requirements and from waste generated as a result of bushfires in the summer of 2019/20.

8.1.2 Waste diversion from landfill

The total tonnage of waste diverted from landfill in Dungog Shire LGA has decreased from 1979t in 2016/17 to 1829t in 2019/20 (**Figure 8.1**). In terms of the percentage of the overall waste stream diverted from landfill the annual percentage has decreased from 36% in 2016/17 to 27% in 2019/20. The various types of waste have been diverted from landfill within the LGA and are outlined in **Table 8.1**.

Table 8.1: Waste types diverted from landfill in Dungog Shire Local Government Area 2016/17 to 2019/20.

Diverted waste type (t)	2016/17	2017/18	2018/19	2019/20
Co-mingled recycling (yellow bin and waste management centre)	885.06	812.66	752.92	717
Garden organics	225.57	172.51	172.5	234
Paper	62.92	43.92	36.96	20
Plastics (soft)	0.52	1.96	3.81	15
Mattresses	7.17	9.85	5.48	23
Metals	789	929.4	721.82	787
Batteries (vehicle)	2.4	3.39	8.65	13
Gas bottles	1.97	1.68	2.94	11.15
Agricultural drums	0.34	1.13	1.44	3.44
Oil	4.78	4.35	3.92	5.03

Source: DSC 2021



8.2 Pressure on waste management in Dungog Shire

Pressure on waste management in Dungog LGA includes:

- Population increase (See **Section 3.1**). Population growth can result in increased levels of waste generation.
- Economic growth (See **Section 4 Economy**). Economic growth can result in increased use of resources and resultant waste generation. Waste generation is dependent on the type of sector growth and requirements for resource use eg) construction can result in higher levels of waste generation.
- Problem wastes such as unwanted paint, chemicals, treated timber, gas bottles, tyres and e-waste can be hazardous to human health or the environment.
- Human behaviour. Recycling and avoidance of waste generation is strongly influenced by human behaviour or knowledge of waste practices required to facilitate recycling.
- Cross-jurisdiction waste legislation and practices. Waste legislation or policy, both within Australia and internationally, can impact on the ability to manage waste streams within the LGA and wider Australia.
- Illegal waste dumping

8.3 Waste response in Dungog Shire

8.3.1 Waste diversion management

Multiple programs and initiatives have contributed to ensuring recycling and diversion of waste in Dungog Shire LGA including:

- Garden organics received at the Dungog Waste Management Facility are processed for mulch. This processing has resulted in over 800t of garden organics being diverted from landfill from 2016/17 to 2019/20.
- Council has partnered with community groups (See **Section 23 Community environmental participation**) to facilitate the collection of soft plastics and divert this waste stream from landfill. This has included the installation of soft plastic drop-off points at the Council administration building in Dungog, Dungog library and the waste management facility. Council has installed a soft plastic and paper baler at the Dungog Waste Management Facility to facilitate the processing of these materials.
- Annual bulk waste collections conducted by Council and drop-off points at the Waste Management Facility have resulted in over 45t of waste mattresses being diverted from landfill
- Collection of agricultural drums through the Drum Muster program has resulted in 6.35t of agricultural drums being diverted from landfill.

8.3.2 Return and Earn container deposit scheme

The NSW State Government introduced the Return and Earn container deposit scheme in December 2017 to reduce drink container litter and facilitate recycling of these containers. Council facilitated the establishment of a TOMRA Return and Earn reverse vending machine at the State Emergency Services (SES) facility at Clarence Town Road, Dungog in April 2020. 1.75 million containers have been returned for processing and recycling since the establishment of the Return and Earn site (April 2020-March 2021) (TOMRA 2021).



Return and Earn collection point



Soft Plastics Baler

8.3.3 Regulation of illegal waste dumping

Dungog Shire Council has partnered with the Hunter/Central Coast Regional Illegal Dumping (RID) squad to investigate and regulate illegal dumping in the LGA. The number of illegal dumping incidents in Dungog Shire LGA have remained relatively low since 2017. However, regulatory action under the Protection of the Environment Operations Act 1997 is undertaken by Council with penalties and clean-up notices issued (**Table 8.2**).

Table 8.2: Illegal dumping incidents in Dungog Shire Local Government Area, 2017 to April 2021.

Year	Incidents	Waste dumped (t)	Clean-up (Council or land owner)	Clean-up (Offender)	Penalties
2017	13	6.81	8	3	0
2018	8	0.39	5	2	2
2019	8	7.13	5	1	0
2020	15	18.64	8	2	1
2021 (Jan-April)	7	74.56	2	1	1

Source: RID Squad 2021

8.3.4 Waste education

Education regarding waste is a significant component to changing people’s behaviour towards recycling and reuse of materials. Between 2017 and 2020 Council has conducted 12 waste education workshops with schools and the community. The education programs have ranged from waste behaviour, use of bees wax wraps to reduce single use plastics and eco-cleaning workshops.



Waste opportunities in Dungog Shire

Future waste opportunities for Council and the community may include:

- Council to consider review of the Dungog Shire Council Waste Strategy 2014-2024 with consideration of the points below.
- Investigation of the feasibility of organics collection, food organics and garden organics, and processing at the Dungog Waste Management facility to reduce landfilled waste.
- Investigation for collection points for e-waste materials and processing providers
- Investigation of sorting of construction and demolition materials at Dungog Waste Management Facility to reduce landfilled waste.
- Audit of other materials for diversion at Dungog Waste Management Facility. These may include concrete and expanded polystyrene.
- Council to consider waste management and reuse plan for civil operations. The plan may consider assessment of reuse/recycling of road pavement materials and concrete reuse.
- Council to consider additional waste programs with funding through the State Government Waste Less, Recycle More program.
- Council to continue collaboration with the Hunter Joint Organisation Circular Economy Program and promote the Hunter Central Coast Circular Economy Eco-system website.
- Additional community waste education programs and promotion.

9. Contaminated Sites



Contamination of an area is where a substance, or multiple substances, occur at a concentration above the normal level. Historic use of sites are a source of land contamination and substances can remain in soils for long periods and continue to be toxic or migrate from sites through transport pathways such as groundwater. Exposure to contaminated substances can affect the health of people, fauna and plants and make land unsuitable for its existing or future intended land use.

9.1 Contaminated sites in Dungog Shire

9.1.1 Identified sites

The *Contaminated Lands Management Act 1997* requires sites that are a significant risk of contamination to be notified to the NSW Environment Protection Authority (EPA). A search of the NSW EPA contaminated land record shows no sites are currently identified within Dungog Shire LGA (NSW EPA 2021). However, two sites within Dungog Shire LGA were previously notified to the NSW EPA but are no longer regulated under the *Contaminated Lands Management Act 1997*.

Council maintains a Contaminated Land Information System which identifies contaminated or potentially contaminated sites, based on historical land use. In June 2021 92 contaminated sites are identified within the Contaminated Land Information System. Historical or existing fuel storage accounts for 63% of sites identified on the Contaminated Land Information System (**Table 9.1**).

Table 9.1: Types of contaminated sites identified in Dungog Shire Local Government Area in 2021

Type of contaminated site	Number of sites
Fuel storage	58
Auto-wreckers	10
Timber treatment	8
Landfill or waste disposal site	4
Sewerage or water treatment	3
Other	9
Total	92

Source: Dungog Shire Council 2021

9.1.2 Underground fuel storage systems

Due to the number of identified sites and contamination risk from fuel storage facilities across the State the NSW Government introduced the *Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008*. This regulation required sites with underground fuel storage systems (UPSS) to implement and meet prescribed requirements.

In Dungog Shire LGA there are 11 active UPSS sites with a combined 63 underground storage tanks. 44 of these underground storage tanks are located on private land with a further 19 tanks extending onto the adjacent Council road reserve. 46 of these underground storage tanks remain active or hold fuel while 17 are non-active or decommissioned.

9.2 Pressure from contaminated sites in Dungog Shire

Pressure on the environment from contaminated sites located in Dungog Shire LGA includes:

- Land redevelopment. Development of contaminated sites can potentially result in additional pollution if remediation is not undertaken appropriately.
- Contaminated sites without remediation can result in on-going pollution or public health impacts. Pollution can include contamination of groundwater and water catchments.
- Remediation methods, such as land farming, can result in emissions of large quantities of greenhouse gases.

9.3 Contaminated sites response in Dungog Shire

9.3.1 Contaminated Lands Policy

In September 2018 Council adopted a new Contaminated Lands Policy that provides a framework to appropriately manage contaminated sites within the LGA. The Contaminated Lands Policy provides guidance regarding contamination site assessment and aligns with the development application process under the EP&A Act 1979 through Section C.15 of the Dungog DCP. Through the development assessment process contaminated sites are appropriately identified, assessed, and remediated for the proposed land use.

The Contaminated Lands Policy requires the on-going use and updating of the Contaminated Lands Information System which has seen an increasing number of contaminated sites identified within the LGA.

9.3.2 Underground petroleum storage systems

In September 2019 regulatory responsibility for the *Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008* was transferred from the NSW EPA to local councils. Significant work was undertaken by the NSW EPA to audit and assess compliance of sites with UPSS prior to the transfer of responsibilities to local Councils. Dungog Shire Council is continuing to educate and inform the 11 sites in the LGA with UPSS regarding requirements under the regulation.



Contaminated site opportunities in Dungog Shire

Future opportunities for contaminated sites for Council and the community may include:

- ❑ Recording of remediation action plans and validation reports in the Council Contaminated Lands Information Management System to understand the number of potentially contaminated sites that have undergone remediation within the LGA.
- ❑ Inclusion of validation and category 2 remediation works notifications under State Environmental Planning Policy 55 – Remediation of Land within the Contaminated Lands Information Management System.
- ❑ Annual compliance program for UPSS sites within the LGA.



10. Food safety



The preparation, sale and storage of food can result in risk of transfer of food-borne illness. Safe food handling practices are required to minimise the risk of bacteria or biological illness from the consumption of food and to protect the health of the public. In NSW these food handling practices, and design of food premises are regulated under the Food Act 2003.

10.1 Food premises in Dungog Shire

In Dungog Shire LGA the number of premises undertaking food preparation and handling has remained steady from 2016/17 to 2017/18 with just over 50 premises in the LGA. However, in 2019/20 the number of premises decreased to 45 premises. This may potentially be a result of reduced operations of premises due to the COVID-19 pandemic.

10.2 Pressures on food safety in Dungog Shire

Pressure on food safety practices in Dungog Shire include:

- Inappropriate food handling and storage practices by food premises
- Lack of knowledge or understanding of appropriate food handling and storage practices by staff.

10.3 Food safety response in Dungog Shire

Dungog Shire Council is authorised under the Food Act 2003 to undertake annual inspections of food premises within the LGA. The inspection program can also undertake regulatory action in the event of non-compliant food handling practices or non-compliance with the Australian and New Zealand Food Standards Code. **Table 10.1** provides an overview of Council's food inspection program and regulatory action from 2016/17 to 2019/20.

Table 10.1: Dungog Shire Council food inspection program 2016/17 to 2019/20

Year	Food premises	Inspections	Inspection completion	Food premises complaints	Notices or infringements
2016/17	51	51	100%	9	0
2017/18	52	46	88.5%	5	0
2018/19	52	31	59.6%	1	0
2019/20	45	18	40%	3	0

Source : DSC 2021a

Council receives a minor number of food premises each year and compliance with the Food Act 2003 is high. This is demonstrated by stronger regulatory action (notice or infringements) has not been required within the LGA. It must be noted that the annual inspection rate for the program in 2019/20 has been severely impacted by the restrictions required during the COVID-19.



Food safety opportunities in Dungog Shire

Future opportunities for food safety in Dungog Shire may include:

- Increasing promotion of food safety requirements for food premises owners/staff through Council website
- Increasing promotion of food safety supervisor training
- Increasing access to food safety advice and guidelines.





Air and Climate

Air and Climate

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Climate

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Air quality

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Greenhouse gases

62



Climate change





Weather and climate elements, such as rainfall, are a key factor in the health and state of the environment for many other subjects covered in the SoE Report.

11.1 Weather conditions in NSW

While climate can be variable across a range of time periods weather conditions in NSW from 2017-2020 included:

2017

- 2017 was the average warmest year (mean average) on meteorological record for NSW.
- Heatwave conditions (>35^oC) occurred during January, February and December with the number of heatwave days the highest on record.
- NSW statewide average rainfall for the year was 18% below the long-term rainfall average.
- NSW experienced the driest September on record (BOM 2018).

2018

- Recorded the second highest warm year (mean average) on meteorological record in NSW
- NSW experienced heatwave conditions during January, February and December with the second highest number of heatwave days on record
- Localised heavy rainfall events across the State, but rainfall was 40% below the long-term rainfall average resulting in continuing drought conditions. Autumn and winter recorded low rainfall levels (BOM 2019).

2019

- 2019 recorded the average warmest year (mean average) on meteorological record for NSW surpassing 2017. The mean temperature in 2019 was 1.95^oC above average.
- The five warmest years on record (as of 2019) in NSW are in the last decade(2019, 2017, 2018, 2014 and 2009)
- Widespread heatwave conditions across the State with extended heatwave conditions during December
- Total rainfall was lowest on record for NSW. Total rainfall was 55% below average, the lowest since 1944.
- March was only month with above average rainfall with most rain falling in 3 days (BOM 2020).

2020

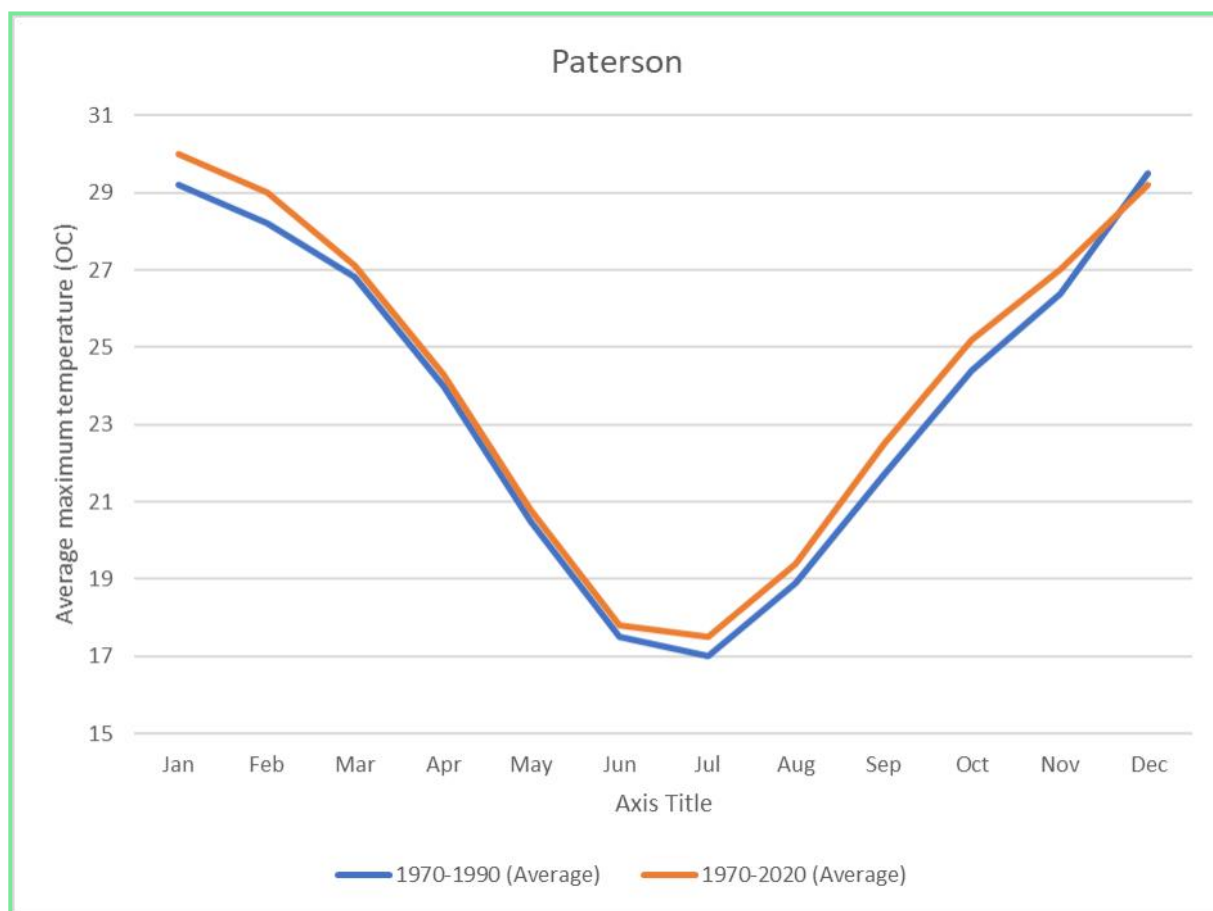
- NSW temperature was generally above average but reduced compared to previous years.
- January experienced periods of extreme heat with significantly increased bushfire activity with poor air quality as a result.
- Total rainfall was above average by 14% with total rainfall almost reaching combined level of 2018 and 2019.
- Succession of complex lows in the Tasman Sea in July, August and Oct brought heavy rain and some flooding.
- Rainfall in November was 54% below average, driest November for State since 2002 (BOM 2021).

11.2 Climate in Dungog Shire

Due to the range of topography within Dungog Shire an average climate data set cannot be accurately produced for the LGA itself. However, two weather station sites within the LGA with the most complete meteorological data (Lostock Dam and Paterson (Tocal)) have been selected to provide an overview of the climate for Dungog Shire.

11.2.1 Temperature

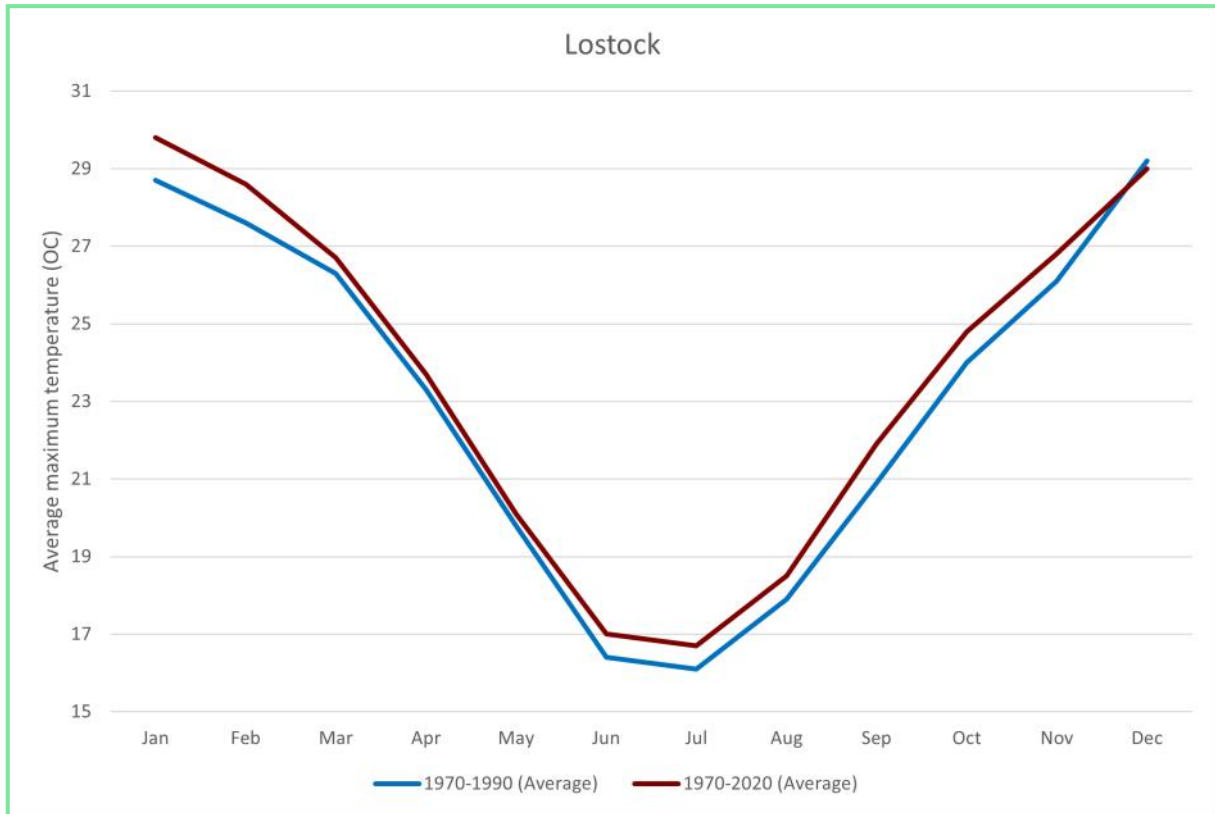
The average maximum monthly temperature at Paterson (Tocal) is highest in the summer months, over 29°C (December-January), with a lowest maximum of around 17°C in June-July. However, over the last fifty years the average maximum monthly temperature has increased by 0.5- 1°C in most months compared to the monthly temperatures from 1970-1990 (**Figure 11.1**).



Source: BOM 2021a

Figure 11.1: Average monthly maximum temperature at Paterson (Tocal) weather station from 1970-2020 and average maximum monthly temperature from 1970-1990.

The average maximum monthly temperature at Lostock Dam is highest in the summer months, 29-30°C (December -January) with a lowest maximum of around 16°C in June-July. Similar to Paterson (Tocal) the average maximum monthly temperature over the last fifty years has increased by 0.5- 1°C in most months compared to the monthly temperatures from 1970-1990 (**Figure 11.2**).



Source: BOM 2021b

Figure 11.2: Average monthly maximum temperature at Lostock Dam weather station from 1970-2020 and average maximum monthly temperature from 1970-1990.

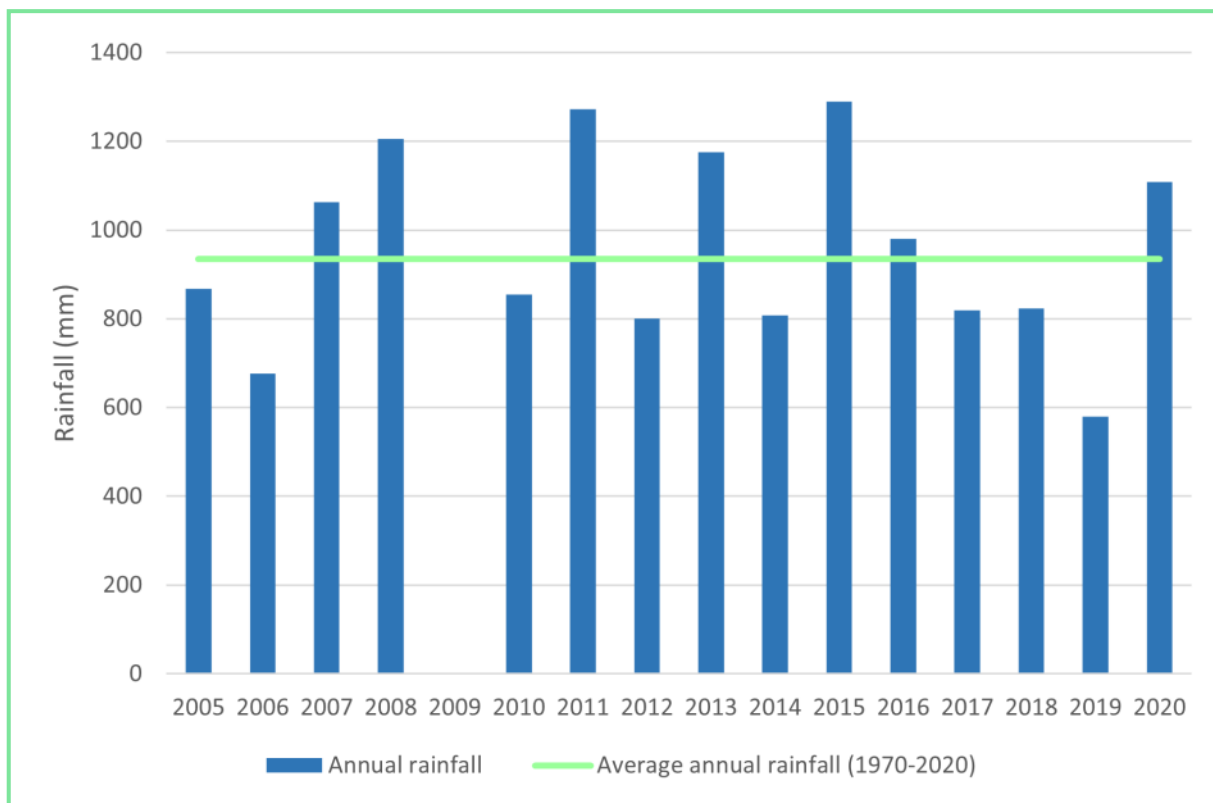
11.2.2 Rainfall

Average rainfall is location specific and can be hard to define for a land space such as a local government area, particularly in Dungog Shire that has varying topography. Rainfall data has been collected from the two weather stations at Paterson (Tocal) and Lostock Dam to provide an overview of rainfall within Dungog Shire LGA.

At Paterson (Tocal) the average annual rainfall from 1968-2020 was 934mm (**Figure 11.3**). From 2005 to 2020 seven years exceeded the average rainfall level with the highest rainfall of 1290mm in 2015. However, rainfall from 2017-2019 was significantly below average resulting in drought conditions and water use restrictions by HWC in 2019/20 (See **Section 7**).



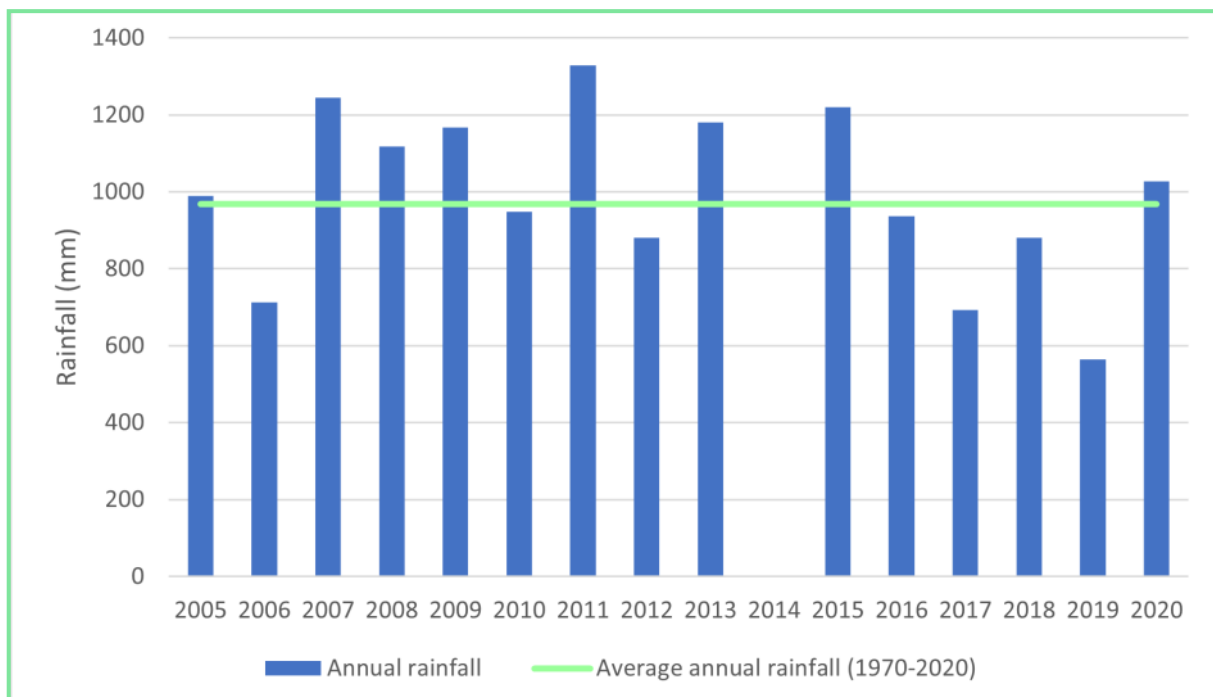
Town view flooded over Hooke Street, Dungog



Note: Rainfall data was unavailable for 2009 and excluded from average rainfall data

Figure 11.3: Annual rainfall at Paterson(Tocal) weather station 2005-2020.

At Lostock Dam the average annual rainfall from 1968-2020 was slightly higher than Paterson at 968mm (**Figure 11.4**). From 2005 to 2020 the average rainfall level was exceeded in 8 separate years with the highest rainfall recorded in 2011 (1329mm). Similar to Paterson, below average rainfall was recorded at Lostock Dam from 2016-2019.



Note: Rainfall data was unavailable for 2014 and excluded from average rainfall data

Figure 11.3: Annual rainfall at Lostock Dam weather station 2005-2020.



12.1 Air Quality in Dungog Shire

Air quality in NSW is monitored by DPIE through an air quality network (DPIE 2021). The air quality network includes monitoring stations in the Lower Hunter region (primarily around the Port of Newcastle) and the Upper Hunter Region. Monitoring stations in the Upper Hunter region are mainly located in the neighbouring area of Singleton LGA with a focus on mining operations. There are no current monitoring stations within Dungog Shire LGA with detailed air quality data.

Emissions, both human and naturally produced, contribute to air quality within an airshed or region. The National Pollutant Inventory provides information regarding emissions within an airshed and can be utilised to determine the main air emissions within Dungog Shire LGA (DAWE 2021). The highest emissions generated in Dungog Shire LGA in 2019/20 include carbon monoxide, oxides of nitrogen, particulates (PM10 and PM2.5), volatile organic compounds and sulfur dioxide (**Table 12.1**). **Table 12.1** shows the main sources for each of the primary air quality emissions within Dungog Shire LGA.

12.2 Pressure on air quality in Dungog Shire

Pressure on air quality in Dungog Shire includes:

- Increasing level of private transport including increasing number of private vehicle registrations (See **Section 6 Transport**). Increased private vehicle use, or single person vehicle occupancy during trips, can result in increasing air quality emissions.
- Wood smoke from residential woodheaters can contribute to increased emissions of particulates. The number of woodheaters in Dungog Shire LGA is not currently known.
- Agricultural burning and bushfires can lead to increased air quality emissions.
- Population increase (See **Section 3.1**). Population growth can result in increased levels of energy demand and consumption with resultant air quality emissions.

12.3 Air quality response in Dungog Shire

12.3.1 Open burning regulation

Council adopted the Control of Open Burning Policy in October 2018 to regulate burning under the Protection of the Environment (Clean Air) Regulation 2010. The Control of Open Burning Policy provides guidance on locations and times when burning may be conducted, but also requires a permit to be obtained for burning in specific locations or times to reduce impacts on air quality.

12.3.2 Woodsmoke education

Council receives a small number of complaints regarding woodsmoke impacts each year. Owners of the woodheater are provided educational materials regarding appropriate use of the woodheater to reduce emissions and the impacts from woodsmoke.

Table 12.1: Air quality emissions and sources in Dungog Shire Local Government Area 2019/20.

Emission	Source	Source contribution to emission (%)
Carbon monoxide	Motor vehicles	68
	Burning (agriculture or bushfire)	18
	Lawn mowing	5.1
	Solid fuel burning(including woodheaters)	4.6
	Lawn mowing	2.7
Oxides of nitrogen (NoX)	Motor vehicles	64
	Railways	31.3
	Non-metallic mineral mining and quarrying	2.27
	Burning (agriculture or bushfire)	2.13
	Fuel consumption (industry)	1.07
Particulates - PM10 (particles < 10 micronmetres)	Windblown dust	69.1
	Burning (agriculture or bushfire)	17.27
	Solid fuel burning(including woodheaters)	6.9
	Non-metallic mineral mining and quarrying	5.1
	Motor vehicles	2.1
Particulates - PM2.5 (particles < 2.5 micronmetres)	Non-metallic mineral mining and quarrying	98.2
Volatile organic compounds (VOC)	Motor vehicles	30.4
	Domestic/commercial solvents and aerosols	16.4
	Service stations	12.8
	Surface coatings	12.8
	Solid fuel burning(including woodheaters)	6.4
Sulfur dioxide	Railways	77.65
	Motor vehicles	15.3
	Burning (agriculture or bushfire)	3.76
	Solid fuel burning(including woodheaters)	1.41



Air quality opportunities in Dungog Shire

Future opportunities for air quality initiatives for Council and the community may include:

- ❑ Advocate for **NSW air quality network to be expanded to Dungog Shire LGA**. While not heavily developed Dungog Shire LGA may provide a reference or baseline air quality location for the network.
- ❑ Council to consider additional **educational program and materials for woodsmoke emissions**. The educational program may be undertaken with existing resources from the NSW EPA.
- ❑ Council to consider **approval system for installation of woodheaters** through the Local Government Act 1993 or EP&A Act 1979. This approval system may consider implementation of the national emission standards for woodheaters as a condition of installation.
- ❑ Advocate for the **extension of vapour recovery capture systems at service stations** within Dungog Shire LGA through the Protection of the Environment (Clean Air) Regulation 2010.
- ❑ Council to **promote the NSW EPA Air Emissions** in My Community web tool to increase community knowledge of air quality emissions.

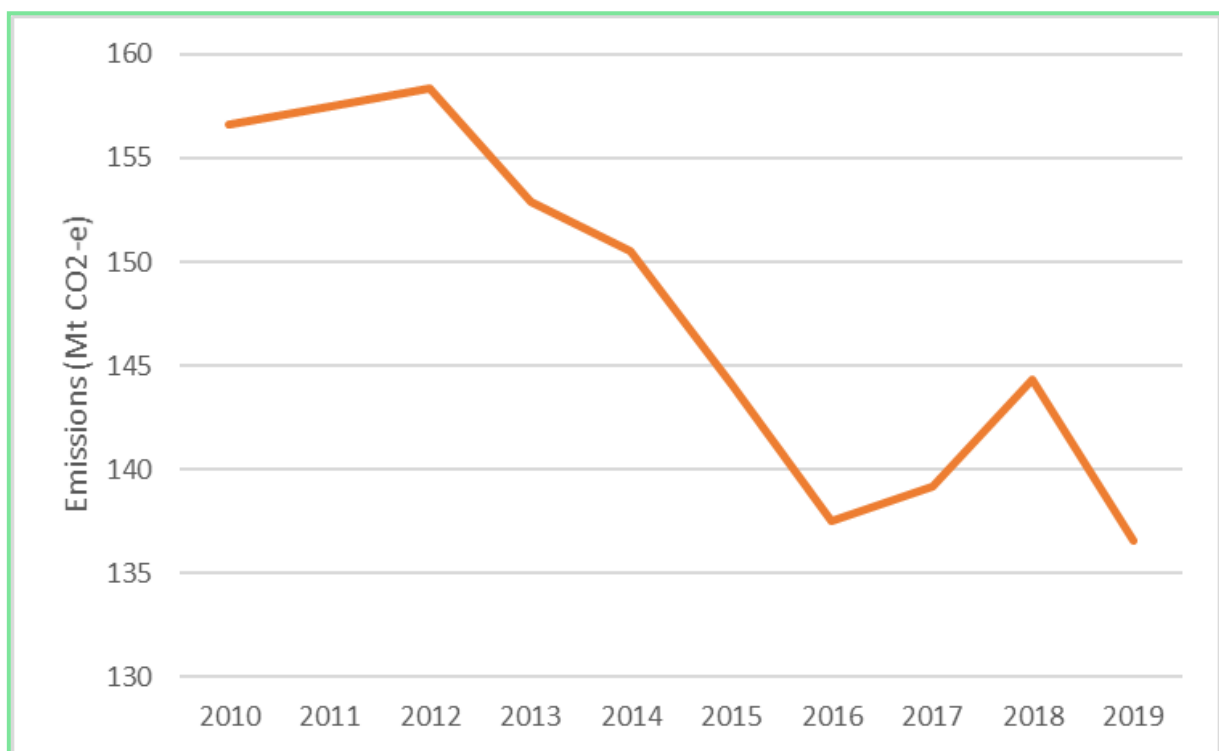


13. Greenhouse gases



Greenhouse gases occur naturally within the atmosphere and act, along with other processes such as solar absorption, to maintain and regulate a global surface temperature in which the natural environment and biodiversity can be sustained. However, since the mid-18th century there has been an increased build-up of greenhouse gases, including carbon dioxide and oxides of nitrogen, in the atmosphere (IPCC 2018). The increased levels of greenhouse gases have been from human-induced emissions and do not appear to be a result of natural climate variability (CSIRO and BOM 2020).

While population and economic growth have increased in NSW from 2010-2019 the annual levels of greenhouse gas emissions have decreased (**Figure 13.1**). While the annual level of greenhouse gas emissions increased from 2010-2012 in NSW there has been an overall 12.8% decrease in annual emissions between 2010-2019.



Source: DISER 2021

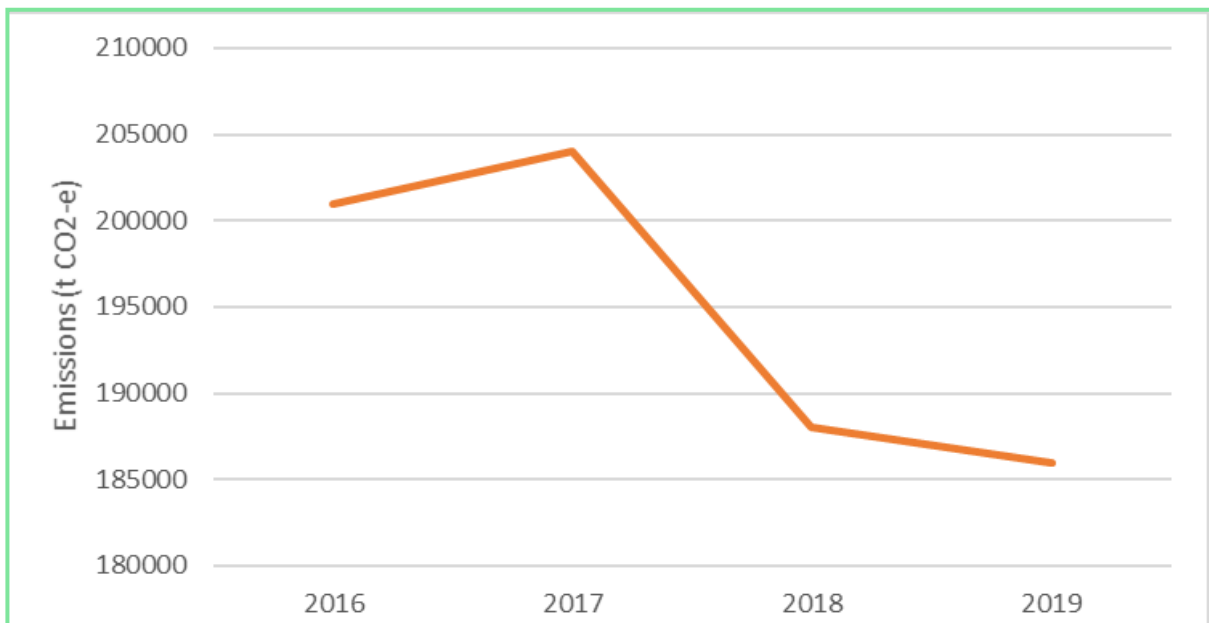
Figure 13.1: Greenhouse gas emission (equivalent CO₂ emissions) in NSW 2010-2019.

13.1 Greenhouse gas emissions in Dungog Shire

Annual greenhouse gas emissions in Dungog Shire LGA have been steadily decreasing from 2016-2019 (**Figure 13.2**). From 2016-2019 annual greenhouse gas emission have decreased by almost 7.5% within the LGA.

Adjusting greenhouse gas emission to an average annual emission/person, based on estimated residential population (ABS 2020), shows emissions have decreased from 22.09 t CO₂-e/person in 2016 to 19.74 t CO₂-e/person in 2019, or a **10.5% decrease in greenhouse gas emissions per person**.

Different sectors of Dungog Shire LGA have varying greenhouse emission profiles (See **Section 5.1**). However, the highest consumers of energy and greenhouse gas emission sectors in Dungog Shire LGA are agriculture and transport.



Source: Ironbark Sustainability 2019

Figure 13.2: Estimated annual greenhouse gas emissions from Dungog Shire Local Government Area 2016-2019.

13.2 Greenhouse gas pressures in Dungog Shire

Pressures from greenhouse gas emission in Dungog Shire include:

- Climate change impacts (**Section 14**). Increasing greenhouse gas emissions are the main environmental pressure leading to global warming and change in climate.
- Economic growth (See **Section 4**). Primary industry growth can result in increased greenhouse gas emissions while energy and resource intensive growth in industries such as construction can increase energy demand.
- Increasing level of private transport including increasing number of private vehicle registrations (See **Section 6 Transport**). Increased private vehicle use, or single person vehicle occupancy during trips, can result in increasing greenhouse gas emissions.
- Population increase (See **Section 3.1**). Population growth can result in increased levels of energy demand and consumption.

13.3 Greenhouse gas response in Dungog Shire

The limitation or reduction of greenhouse gases is a mitigation strategy in response to climate change. Key mitigation responses in Dungog Shire LGA are outlined in **Section 5.4**.



Greenhouse gas mitigation opportunities in Dungog Shire

Future opportunities for greenhouse gas mitigation for Council and the community may include:

- Adoption of an **emissions target** for the LGA. The NSW Climate Policy Framework has adopted an aspirational target of net zero emissions by 2050 and Council may consider a target also.
- Additional **promotion of the NSW Climate Change Fund programs** including the Energy Saver website and NSW Clean Energy Initiatives website. These programs may benefit local residential properties and businesses through specific programs such as the solar battery program.
- Advocate for Dungog Shire Council townships to be included in the NSW Government's **5 million trees initiative**. This initiative is currently confined to the Sydney Metropolitan Area.
- Promotion of the Australian Commonwealth Government's **Emission Reduction Fund**.

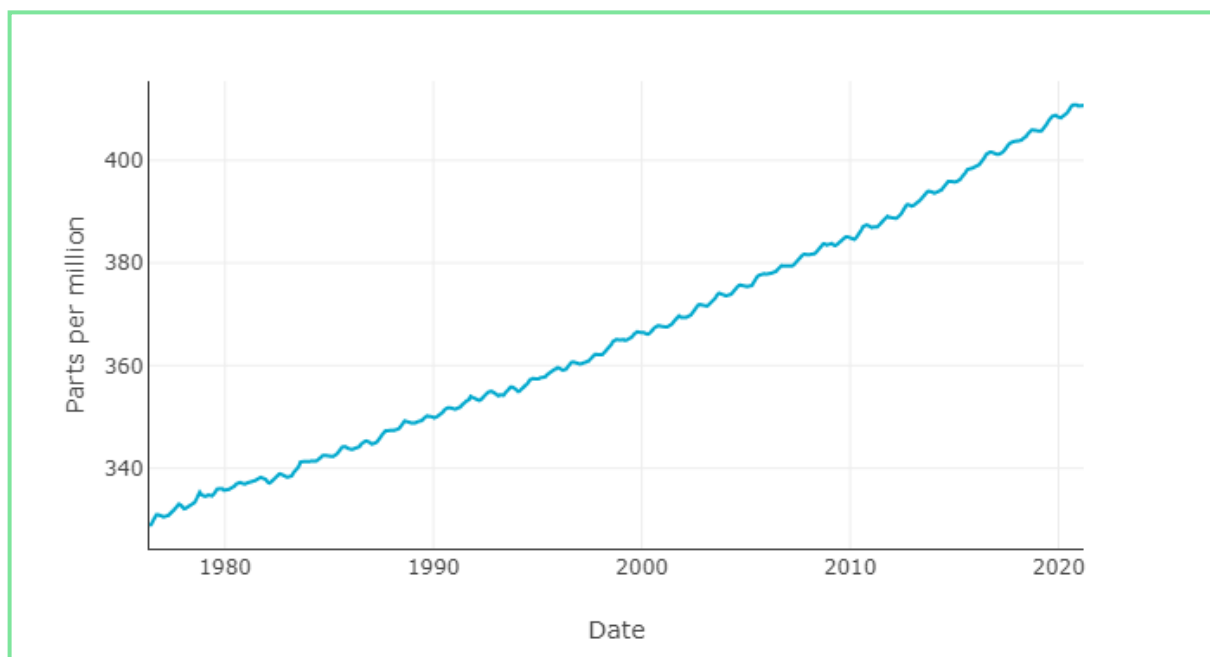
Also see other opportunities from **Section 5—Energy (page 27)**



14. Climate change



The surface temperature of Earth has not been constant over time. Global temperatures and atmospheric greenhouse gas concentrations, which contribute to global temperature regulation, have fluctuated naturally over the millennia. However, these natural cycles of change have developed over long timeframes. Since the start of the Industrial Age in the mid-18th century there have been growing emissions of greenhouse gases into the atmosphere with emissions escalating significantly since 1960. Carbon dioxide, a primary greenhouse gas, has increased in concentration at Cape Grim in Tasmania, one of three premier baseline air pollution stations in the World Meteorological Organisation Global Atmosphere Watch Network, by almost 25% from 1976-2020 (CSIRO 2021) (**Figure 14.1**).



Source: CSIRO 2021

Figure 14.1: Atmospheric concentrations of carbon dioxide at Cape Grim, Tasmania monitoring station 1976-2020.

The United Nations Intergovernmental Panel for Climate Change (IPCC) assesses the latest research on climate change and its effects around the world. While the sixth IPCC assessment report will be released in 2022 the most current report is the 2014 Fifth assessment report. Key findings from the Fifth Assessment Report include:

- research demonstrates warming of the climate is occurring and since the 1950s warming is accelerating in comparison to previous decades, centuries and millennia.
- research shows human influence through emissions is a dominant cause of global warming since 1950 (IPCC 2014).

Climate change poses a major threat to most living systems, including human settlements. Temperature increases have been observed globally, but in Australia the increase includes:

- The mean temperature from 2011-2020 was the highest on record at 0.94^{oC} above average and 0.33^{oC} warmer than the previous decade (BoM 2021). All years since 2013 are among the ten warmest on record for Australia.
- NSW has experienced the five warmest years on record in the last decade(2019, 2017, 2018, 2014 and 2009) (**Section 11**).

While impacts are currently being observed in NSW, they are likely to become more pronounced over time with extreme weather events increasing in duration, magnitude and frequency. In NSW warming is projected to increase on average 0.7^{oC} by 2039 and by 2.1^{oC} by 2079 (Adapt NSW 2014).

14.1 Climate change in Dungog Shire

Modelling of climate change has been undertaken for the Hunter Region, including the Dungog Shire LGA (HCCREMS 2010). The modelling has assessed previous climate change from 1970-2007 and includes projected changes to 2080. Climate change in Dungog Shire LGA, based on modelling, shows:

- Significant annual increase in minimum temperature of 0.6^{oC} from 1970-2007 with a higher increase in spring.
- Projected minimum annual temperature will increase by 0.8-1.5^{oC} by 2080 with higher increases in autumn and winter.
- Significant increase in annual maximum temperature of 1.2^{oC} from 1970-2007.
- Projected maximum annual temperature increase of 1-1.8^{oC} by 2080.
- Projected increase in frequency of storm events during autumn and winter.
- Projected increase in high rainfall events in frequency during summer and autumn.
- Increased frequency of extreme heat events during summer and autumn.

The NSW State Government has undertaken climate change modelling using the NSW and ACT Regional Climate Modelling (NARCLiM) modelling system. NARCLiM is an advanced climate change model developed by the ACT Government and University of NSW. The NARCLiM modelling for the Hunter Region resulted in the following climate change projections:

- Maximum temperatures will increase by 0.7^{oC} by 2040 and by 2^{oC} by 2080.
- Hot days (>35^{oC}) are expected to increase by an extra five days/year by 2040 and 14 extra days/year by 2080
- Cold nights (<2^{oC}) are expected to decrease by 6 cold nights/year by 2040 and 15 nights/year by 2080 (Adapt NSW 2014b).

14.2 Climate change pressures in Dungog Shire

Climate change pressures in Dungog Shire include:

- Economic growth (See **Section 4**). Primary industry growth can result in increased greenhouse gas emissions while energy and resource intensive growth in industries such as construction can increase energy demand and resultant greenhouse gas emissions.
- Increasing level of private transport including increasing number of private vehicle registrations (See **Section 6 Transport**). Increased private vehicle use, or single person vehicle occupancy during trips, can result in increasing greenhouse gas emissions.
- Population increase (See **Section 3.1**). Population growth can result in increased levels of energy demand and consumption.
- Greenhouse gas emissions (See **Section 13**).
- Social pressures as a changing climate can impact on industries such as agriculture through change in crop production and land management changes.
- Emergency management response (See **Section 22**). Pressure on emergency management resources is projected to increase as climate change results in more frequent extreme weather events.

14.2 Climate change pressures in Dungog Shire

Pressures on climate change in Dungog Shire include:

- Economic growth (See **Section 4**). Primary industry growth can result in increased greenhouse gas emissions while energy and resource intensive growth in industries such as construction can increase energy demand and resultant greenhouse gas emissions.
- Increasing level of private transport including increasing number of private vehicle registrations (See **Section 6 Transport**). Increased private vehicle use, or single person vehicle occupancy during trips, can result in increasing greenhouse gas emissions.
- Population increase (See **Section 3.1**). Population growth can result in increased levels of energy demand and consumption.
- Greenhouse gas emissions (See **Section 13**).
- Social pressures as a changing climate can impact on industries such as agriculture through change in crop production and land management changes.
- Emergency management response (See **Section 22**). Pressure on emergency management resources is projected to increase as climate change results in more frequent extreme weather events.

14.3 Climate change response in Dungog Shire

14.3.1 NSW Climate Change framework

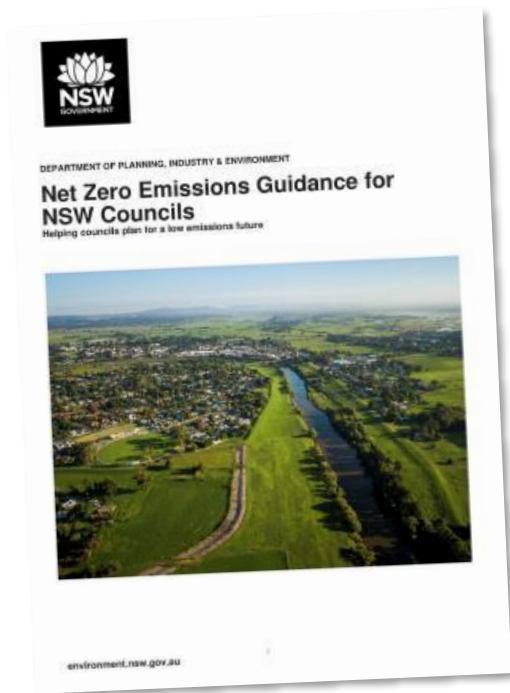
In 2016 the NSW State Government released the NSW Climate Change Policy Framework with an aspirational goal of net zero emissions by 2050. However, the policy framework does not provide significant guidance for local communities. Council has become part of the Cities Power Partnership (**Section 5.4.2**), but involvement to achieve the NSW State Government net zero emission goal requires further consideration.

14.3.2 Regional vulnerability assessment

The NSW State Government has collaborated with many stakeholders to develop the Hunter and Central Coast Enabling Regional Adaptation assessment (DPIE 2020). The assessment outlines potential vulnerabilities for the region from the effects of climate change. However, no implementation plan has been completed at this stage.

14.3.3 Local climate change adaptation projects

Council has collaborated with the Hunter Joint Organisation on a number of community resilience and adaptation projects. This includes the Beat the Heat program where cool spots are established during heatwave conditions. Cool spots in Dungog Shire include Dungog Library.





Climate change adaptation opportunities in Dungog Shire

Effective action to counteract the effects of climate change will depend on concerted action globally. However, the contribution of local governments to these actions can play a substantial role.

Strategies for climate change impacts are divided into two categories: mitigation and adaptation. Mitigation strategies to limit greenhouse gas emissions are outlined in **Section 5—Energy** and **Section 13—Greenhouse gases**. This section focuses on adaptation measures for Council and the community and includes:

- Council to consider grant funding opportunities for climate change adaptation projects through the NSW State Government’s Building Resilience to Climate Change program
- Council to consider undertaking urban heat monitoring for townships in the LGA. The monitoring may assist in urban planning projects for the townships including the provision of shade as a resilience outcome.
- Council to consider urban tree planning and/or planting in townships to assist in heat related impacts from climate change. Also see 5 million trees initiative in **Section 13** opportunities.
- Bushfire and flood planning opportunities to facilitate adaptive response to climate change (See **Section 22**).



Dungog residents calling for action on climate change (September 2020)



Heritage



15.1 Heritage in Dungog Shire

15.1.1 Aboriginal Heritage

The land within Dungog Shire LGA, including the fertile valleys of the Williams, Paterson and Allyn Rivers and the rugged slopes of the Barrington have been occupied by indigenous people for up to 40 000 years. The landscape within Dungog LGA encompasses the traditional lands of two major tribal groups, the Wonnarua and the Worimi (AIATSIS 2021). Within the upper reaches of the Williams, Paterson and Allyn Rivers where the lands of the family groups of the Gringai (Carste Studio 2012). While there is debate regarding tribal relationships of the Gringai areas within present day Dungog Shire reference Gringai place names such as Wangat, Caningulla and Wallarobba while the name Dungog itself is derived from Aboriginal dialect (Williams Valley History 2021).

While Dungog Shire LGA does not include any declared Aboriginal Places within the NSW heritage framework (Heritage NSW 2021a) significant Aboriginal cultural and archaeological sites have been recorded within the LGA. The NSW State Government has maintained a register of these Aboriginal heritage sites for the past few decades in various forms. Thirty Aboriginal sites were recorded on the State Government register in Dungog Shire LGA in the year 2000 (DSC 2001). The current NSW State Government Aboriginal Heritage Management System shows 86 Aboriginal sites within Dungog Shire LGA (Heritage NSW 2021b). This represents a 186% increase in the number of recognised Aboriginal sites in Dungog Shire LGA in the past twenty years. However, 86% of the registered sites are located within the southern half of the Dungog LGA with many sites likely to have been identified as a result of development.

15.1.2 European Heritage

The first exploration of the Hunter, Williams and Paterson Rivers by European settlers occurred after 1801 (Carste Studio 2014). By 1812 a number of small land holdings by European settlers were established around the Paterson and Williams River, near the current townships of Paterson and Clarence Town. Large land grants occurred from the 1820's onwards leading to increased land clearing and establishment of agriculture within the area that is now the current Dungog Shire LGA. For further reading on the history of European settlement in Dungog Shire LGA please see the Local Environmental Study Covering the Whole of the Dungog Shire Council Area (DSC 2001) and *A History in Three Rivers: Dungog Shire Heritage Study Thematic History* (Carste Studio 2014).

European heritage is recognised under the NSW *Heritage Act 1977*. In 2021 Dungog Shire has 7 heritage items listed on the State Heritage Register (Heritage NSW 2021a). The *Heritage Act 1977* also recognises items of local heritage significance that are listed in a Local Environmental Plan. In 2001 The Dungog LEP 1990 included 108 heritage items of local significance while in 2021 the Dungog LEP 2014 contains 155 heritage items. This represents a 43.5% increase in the number of heritage items listed in Dungog Shire LEP in the last twenty years.

European heritage is also recognised in the Federal Government's National Heritage List under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999. Dungog Shire has 1 item on the National Heritage List, Total Homestead and Rural Estate (DAWE 2021).

Dungog Shire LGA also contains a UNESCO World Heritage property and National Heritage Place under the EPBC Act 1999, the Gondwana Rainforests of Australia in the Barrington Tops National Park.

15.2 Pressure on heritage in Dungog Shire

Pressure on Aboriginal heritage in Dungog Shire includes:

- Development (**Section 4**). Increasing development can result in the loss or destruction of Aboriginal heritage items.
- Clearing of native vegetation or land (**Section 19**). Clearance of these areas can result in loss of scar trees, stone tool artefacts or middens.
- Cultural understanding. Lack of understanding of cultural significance of items can result in loss of Aboriginal heritage.

Pressure on European heritage in Dungog Shire include:

- Development (**Section 4**). Demand for new development can result in loss or damage to heritage buildings, items or alteration of heritage conservation areas. This pressure has been increased due to amendment to SEPP (Exempt and Complying Development Codes) 2008.
- Infrastructure development can result in loss or alteration to heritage items. This pressure has increased due to amendments to SEPP (Infrastructure) 2007.
- Non-adaptive reuse of heritage items or economic cost of maintaining heritage items.





15.3 Heritage response in Dungog Shire

15.3.1 NSW Marine Estate Management Strategy

The NSW State Government released the Marine Estate Management Strategy 2018-2028 (MEMA 2018) in August 2018. While Dungog Shire LGA is outside of the marine estate area the strategy also relates to estuaries that enter the ocean, of which the Paterson and Williams Rivers form part of the Hunter River Estuary (See **Section 21 Water catchment management**). Key actions from the Marine Estate Management Strategy 2018-2028 relate to delivering Aboriginal cultural values for Sea Country, including the watercourses that contribute to Sea Country. Sea Country is of particular importance to Worimi people. Implementation of Aboriginal cultural actions from the Marine Estate Management Strategy 2018-2028 are relevant for the watercourse areas of Dungog Shire LGA and interact with the requirements of the *Coastal Management Act 2016* (See Section 20).

15.3.2 Heritage advisory service

Council operates a bi-monthly heritage advisory service providing qualified heritage information to the community. The heritage advisory service is free of charge to the community.

15.3.3 Heritage Conservation Plans

Council has completed heritage conservation plans under the Heritage Act 1977 for a number of local heritage items in Dungog Shire LGA. While Council previously completed the Dungog Showground Heritage Conservation and Management Strategy in 2003 (DSC 2003) it has also completed the following plans in the reporting period:

- Clarence Town Courthouse and Site Conservation Management Plan (City Plan Heritage 2018)
- War Memorials Clarence Town Conservation Management Plan (Shillington Planning and Heritage 2020)

Council has also completed a number of Plans of Management under the LG Act 1993 that provide protection and management direction for heritage items on publicly owned or managed land.



Aboriginal heritage opportunities in Dungog Shire

Future opportunities for advancing Aboriginal cultural heritage understanding may include

- ❑ Review of the assessment of Aboriginal cultural heritage as part of development assessment and approval process in Part C17 of the Dungog DCP.
- ❑ Council to consider an Aboriginal heritage management strategy for the LGA. The Aboriginal heritage management strategy may consider a reconciliation action plan and actions such as dual naming of places within the Dungog Shire LGA.
- ❑ Increase consultation with Local Aboriginal Land Councils (LALC) including Worimi LALC, Karuah LALC and Mindaribba LALC.
- ❑ Promotion of Aboriginal heritage through engagement activities including NAIDOC week or workshops eg) workshops hosted by Dungog Common Reserve Trust with Karuah LALC.
- ❑ Promotion of grant programs for Aboriginal heritage including NSW State Government Heritage Grants and Commonwealth Australian Heritage Grants program.





European heritage opportunities in Dungog Shire

Future opportunities for European heritage for Council and the community include:

- Review of *A History in Three Rivers: Dungog Shire Heritage Study Thematic History* (Carste Studio 2014) and prioritise items for heritage listing through implementation strategy.
- Establishment of a Local Heritage Fund to assist in preservation of heritage items.
- Establishment of a Local Heritage Network or committee to connect with community based groups who work in the area of local heritage.



Biodiversity

Biodiversity

73



Biodiversity

74



Threatened Species

78



Invasive species

16. Biodiversity



Biodiversity refers to the full range of ecosystems in the environment including the individual species and populations they support. The concept of biodiversity also encompasses the complex interactions between living organisms and their surrounding environment. These interactions can maintain the health and productivity of habitats and ecosystems. In Australia there has been a general pattern of decline in biodiversity since European settlement with over 100 species listed as extinct since 1800 (DAWE 2021). In 2020/21 13 new species have been added to the extinction list in Australia.

16.1 Biodiversity in Dungog Shire

The quantification of biodiversity can be difficult due to variations in ecosystems, habitat types and general surveying effort. While there are various methods for modelling biodiversity **Table 16.1** provides an overview of the number of recorded species sightings within Dungog Shire LGA.

Table 16.1: Individual species records within Dungog Shire Local Government Area

Kingdom	Class	NSW Bionet	Atlas of Living Australia
Animal	Amphibians	45	31
	Birds	298	369
	Crustaceans		6
	Fish	7	17
	Insects and spiders	11	596
	Mammals	101	81
	Molluscs		82
	Reptiles	56	57
	Undescribed	5	
Plant	Flora	1642	1491
Fungi		1	173
Total		2166	3139

Source: OEH (2021), ALA (2021). OEH do not collect data for crustaceans or molluscs as part of Bionet. ALA records include introduced species recorded in the LGA.

Table 16.1 demonstrates the variation in the recording of biodiversity within an area with differing focus on animal classes. This is shown through Atlas of Living Australia recording a significantly higher level of insects, spiders and fungi in the LGA than NSW Bionet. However, both databases show a high diversity of species occur within Dungog Shire LGA.

17. Threatened species



There are currently 1031 species and 109 ecological communities listed as threatened or endangered in NSW (OEH 2021). 51 endangered populations of species also are listed in NSW under the Biodiversity Conservation Act 2016 (BC Act 2016).

17.1 Threatened species in Dungog Shire

In June 2021 185 threatened species listed under the BC Act 2016 were identified as occurring or recorded within Dungog Shire LGA (**Table 17.1**). 1 threatened fish species was also identified in Dungog Shire LGA under the *Fisheries Management Act 1994*.

Species can also be identified as a nationally threatened species under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999). Many of these nationally threatened species are also listed under the NSW BC Act 2016. 55 nationally threatened species are known to occur or have been recorded in Dungog Shire LGA (**Table 17.1**).

Table 17.1: Number of listed threatened species within Dungog Local Government Area

Kingdom	Class	NSW	National
Animal	Amphibians	10	6
	Birds	61	12
	Fish	1	
	Insects and spiders	1	
	Mammals	28	10
	Reptiles	7	
Plant	Flora	78	27
Total		186	55

Note: NSW – threatened species listed under Biodiversity Conservation Act 2016 or Fisheries Management Act 1994; National – threatened species listed under Environment Protection and Biodiversity Conservation Act 1999

Source: OEH (2021), DAWE 2021a

17.2 Threatened ecological communities and endangered populations in Dungog Shire

Native vegetation in Dungog Shire LGA ranges from northern cool temperate rainforest in the Barrington Tops to pockets of rainforest and sclerophyll forest (wet and dry) throughout the remainder of the LGA (DPIE 2012). However, considerable modification and clearing of native vegetation in Dungog Shire LGA (DPIE 2017) has resulted in a significant threat to native ecological communities.

Currently 20 threatened ecological communities listed under the BC Act 2016 are located within Dungog Shire LGA (OEH 2021). The EPBC Act 1999 lists 15 nationally threatened ecological communities as occurring within Dungog Shire LGA.

6 endangered species populations listed under the BC Act 2016 occur or have been recorded in Dungog Shire LGA. The endangered species populations include 4 plant and 2 animal populations.

17.3 Migratory species in Dungog Shire

Migratory bird species can travel great distances and across international borders. Australia has played an important role in the conservation of migratory bird species by entering migratory bird agreement with Japan (Japan-Australia Migratory Bird Agreement), China (China-Australia Migratory Bird Agreement) and Republic of Korea (Republic of Korea – Australia Migratory Bird Agreement). Australia is also a signatory to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Migratory species are listed under the EPBC Act 1999. In Dungog Shire 15 of the listed migratory bird species are known to occur or have been recorded in the LGA.

17.4 Pressure on threatened species in Dungog Shire

Pressure on threatened species in Dungog Shire LGA includes:

- Key threatening processes. The BC Act 2016 and Fisheries Management Act 1994 list threats that have substantial impacts on native species including clearing of vegetation and invasive species. In Dungog Shire LGA 35 of the key threatening processes listed under the BC Act 2016 are present while 6 key threatening processes listed under the Fisheries Management Act exist in the LGA.
- Clearing of native vegetation (see **Section 19**). Continued clearing of native vegetation can impact threatened species through direct removal or loss of habitat. Clearing may also result in fragmentation of habitat.
- Invasive species (see **Section 18**).
- Emerging effects of climate change including increasing incidents of bushfire and change to native species habitat.

Largest known population of Tall Rustyhood orchid found in Dungog LGA

Prior to the commencement of the Saving our Species program little was known about the Tall Rustyhood orchid (*Pterostylis chaetophora*), a vulnerable species under the Biodiversity Conservation Act 2016.

Columbrey National park, west of Clarence Town, was thought to contain only 10 individuals of the species, but through Saving our Species surveying 544 plants were counted in only 20% of the National Park. This is significantly larger than any other known population of Tall Rustyhood and it is estimated over 3000 plants could be within the Columbrey National Park.

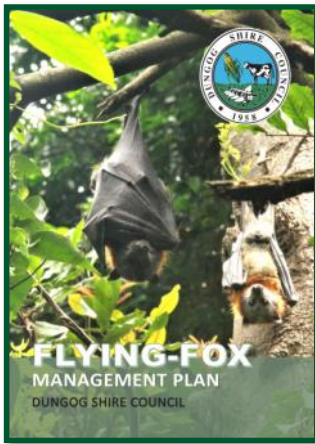
The surveying also identified 16 other terrestrial orchid species within the park showing a high diversity of these cryptic plants.



17.5 Threatened species response Dungog Shire

17.5.1 Saving Our Species Program

The NSW State Government implemented the Saving Our Species program through the introduction of the BC Act 2016 in 2017. The Saving Our Species program aims to improve threatened species conservation in NSW through improving knowledge of species and implementation of conservation management programs based on this knowledge base. The Save our Species program has 11 management programs currently operating in Dungog Shire LGA with key management sites in Mount Royal, Barrington Tops and Columbrey National Parks (OEH 2021a). **See inset on page 75** for an example of Saving Our Species' work in the Dungog LGA.



17.5.2 Flying-fox management plan

In May 2021 Council adopted the Dungog Shire Council Flying-fox Management Plan for nine camp areas in the LGA. The three flying-fox species known in the LGA are all listed as threatened under the BC Act 2016. The Dungog Shire Council Flying-fox Management Plan outlines management actions to further knowledge of these species in the LGA and provide a balance of species conservation and community amenity. Implementation of the plan will assist in conservation of flying-foxes in the region

17.5.3 Biodiversity offsetting scheme

In August 2017 the NSW State Government implemented significant reforms to threatened species conservation through the introduction of the BC Act 2016. Part of the reforms included the introduction of a biodiversity offsetting scheme that requires developers to offset the impacts of their projects by obtaining or purchasing biodiversity credits on land with native vegetation or threatened species. For further information on progress of the biodiversity offsetting scheme in Dungog Shire see **Section 19**.

17.5.4 WildCount

NPWS undertakes wildlife and threatened species monitoring through the WildCount program. WildCount is fauna monitoring program that uses motion-sensitive digital cameras in 200 sites across eastern NSW. In Dungog Shire LGA WildCount programs are undertaken in Columbrey National Park, Barrington Tops National Park and Black Bulga State Conservation Area. This NPWS lead citizen science initiative has resulted in a significance increase in native fauna information, including threatened species identification and distribution, for land managers.



Swamp wallaby captured by a WildCount Camera



Threatened species protection opportunities in Dungog Shire

Future opportunities for protection of threatened species for Council and the community include:

- Update of Part C16-Biodiversity of the Dungog DCP.
- Promotion of citizen science programs including WildCount or the I Spy Koala app. Dungog Shire LGA is considered an area of regional koala significance under the NSW Koala Strategy with a nominated koala reserve within the Barrington Tops National Park .
- Collaboration with the Biodiversity Conservation Trust to promote and increase uptake of biodiversity stewardship agreements within the LGA.
- Promote Save our Species projects within the LGA and increase volunteerism in these projects.



I Spy Koala

Make your koala sightings count

Available for download



18. Invasive species



18.1 Weeds

Over 1650 introduced weed species have been recorded in NSW with approximately 350 species recognised as threats to native biodiversity (Downey et al 2010). In NSW weeds account for approximately 21% of total vegetation cover in the State (DPI 2018) and impact productivity, including significant economic and operational impacts on agriculture. The estimated annual economic loss in NSW due to invasive weeds is \$1.8 billion/year with over \$170 million spent on control and management actions (NSW EPA 2018).

On 1 July 2017 the *Biosecurity Act 2015* commenced in NSW and replaced the *Noxious Weeds Act 1993*. Weeds that were previously identified as 'noxious weeds' were reviewed and are now managed as 'priority weeds' under the *Biosecurity Act 2015*.

18.1.1 Weeds in Dungog Shire

Priority weeds are managed in Dungog Shire LGA under the Hunter Regional Strategic Weeds Management Plan 2017-2022 (LLS 2017). While the management of weeds is the responsibility of all landowners and land managers under the general biosecurity duty introduced in the *Biosecurity Act 2015* Dungog Shire Council is appointed a Local Control Authority for weeds.

The number of priority weeds within Dungog Shire LGA is outlined in **Table 18.1**.

Table 18.1: Number of weeds in Dungog Shire Local Government Area

Document/Database		Number of weeds
Hunter Regional Strategic Weed Management Plan 2017-2022	State listed priority weeds	55
	Regional priority weeds	52
	Additional species of concern	34
	Priority weeds total	107
	Plan total	141
NSW Weedwise (priority weeds only)		110
Weeds of National Significance		20

Source: LLS 2017, *Weedwise* (DPI 2021), *Weeds of National Significance* (DAWE, 2021)

Note: Weedwise data date 3 June 2021

Table 18.1 shows an additional 3 priority weed species (excluding additional species of concern) have been added to the *Biosecurity Act 2015* for the Dungog Shire LGA since the completion of the Hunter Regional Strategic Weeds Management Plan 2017-2022 in 2017. Many of the weeds identified as Weeds of National Significance by the Commonwealth Government are listed as priority weed species under the NSW *Biosecurity Act 2015*.

In 2000 37 weeds species were identified as noxious weeds in the Dungog Shire LGA under the *Noxious Weeds Act 1993* (DSC 2001). A rapid increase in weed species identified for management action has occurred within the LGA in the last twenty years. This increase may be a result in changes to listing criteria or requirements for management or potentially due to expansion of distribution of weed species within the region.

18.1.2 Pressure on the environment from weeds in Dungog Shire

Pressure on the environment in Dungog Shire LGA from invasive weeds includes:

- Continuing spread and increasing distribution of weeds across the region. Spread can be increased by increased application of nutrients to the environment through agricultural practices, alteration of hydrological flows and altered fire regimes.
- Clearing of native vegetation or land (**Section 19**). Clearing of land allows for spread and colonisation of weeds in new areas.
- Climate change (**Section 14**). Changing conditions including increasing temperatures creates suitable conditions for proliferation of weed species.
- Introduction of new weed species through trade or inappropriate sale of plants.

18.2 Weed response in Dungog Shire

18.2.1 Weed inspections and treatment

Through its delegation as a Local Control Authority Dungog Shire Council undertakes an annual inspection program of properties for presence or infestation of priority weeds. The number of property inspections can fluctuate annually in response to surveillance undertaken, reports or complaints received by Council and resourcing (**Figure 18.2**). In the past ten years Council has undertaken an average of 249 property inspections annually with an increased average of 272 inspections/year from 2017-2021.

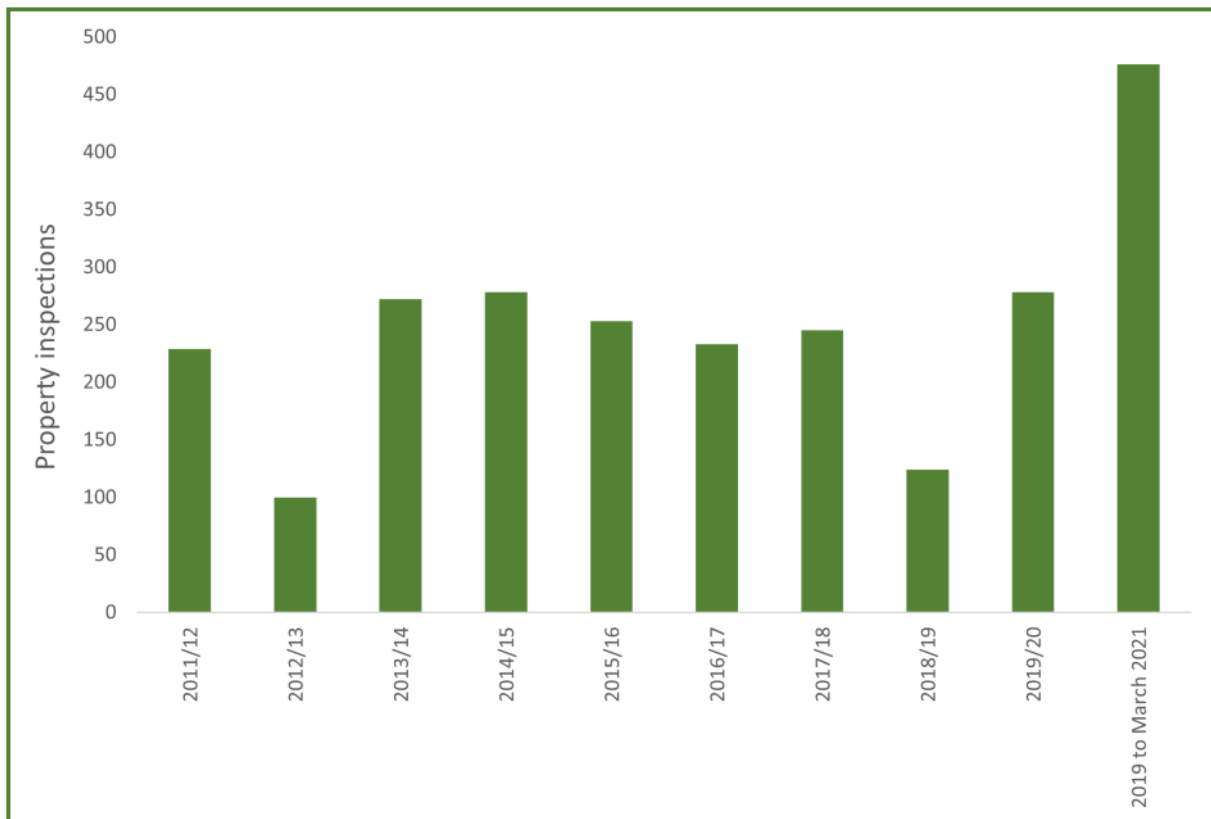


Figure 18.2: Property inspection for weeds by Dungog Shire Council 2011-2021.

Dungog Shire Council also undertakes treatment of priority weeds on Council managed road reserves and property. This treatment program is undertaken through a combination of grant funding through the NSW Weeds Action Program, administered by Department of Primary Industries, and Council operational funds.

Table 18.2 shows Council treats an average distance of 552km of road reserve/year for priority weeds and the program has resulted in a cumulative treatment distance of 3867km within the LGA since 2013/14. Since 2016 (excluding 2018/19) the average treatment length has increased to 603.5km.

Table 18.3: Length of road reserve weed treatment by Dungog Shire Council 2013/14 to March 2021

Year	Length of road reserve treated (km)
2013/14	685
2014/15	398
2015/16	370
2016/17	636
2017/18	520
2018/19	Data not recorded
2019/20	682
2020 to March 2021	576
Total	3867
Average/year	552.43

Financial resourcing of the weed treatment program is a constraint and **Figure 18.4** shows the level of grant funding provided through the NSW Weeds Action Program.

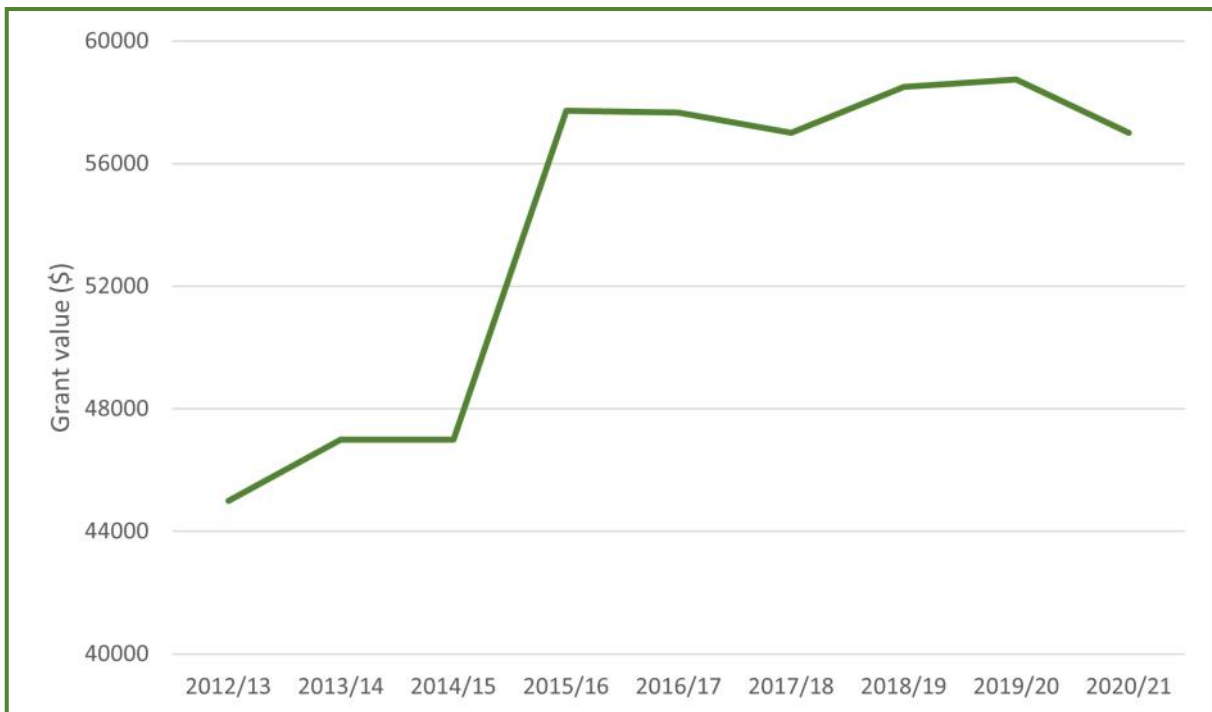


Figure 18.4: NSW Weeds Action Program grant funding provided to Dungog Shire Council 2012/13 to 2020/21.

Figure 18.4 shows a significant increase in grant funding from 2014/15 to 2015/16. This funding increase coincides with the increase in road reserve length treated from 2016 onwards (See **Table 18.3**). While further monitoring of the success of the weed treatment program is required to establish weed reduction and performance additional funding may assist in managing priority weeds within the LGA.



Invasive species program at Mount Breckin

Mount Breckin, near Vacy, is an 800ha remnant vegetation 'stepping stone' leading to the Barrington Tops. Hunter Local Land Services has worked with private landholders in the Mount Breckin area to reduce pests and weeds, address minor erosion issues and to generally learn more about the biodiversity values of the area.

The multi-benefit program is being undertaken over a 3 year period, through funding provided by the NSW Environmental Trust and Hunter Local Land Services. Key results to date include:

- ✓ Assisted weed control work completed across 174ha of the project area with focus on dominant weeds African Olive and Lantana - this work has reduced the weed load by 21%.
- ✓ Pest animal control measures with a focus on wild dogs, foxes and rabbits with 7 animals removed so far
- ✓ Workshops and trapping and baiting program for landholders
- ✓ Installation of sensory cameras to capture footage of both pest species and native fauna
- ✓ Eco-Survey Walks with small groups of landholders interested in learning more about what native plants and animals occupy Mt Breckin – landowners have reporting sightings of koalas, phascogales and quolls.
- ✓ Revegetation of creek lines.



18.2.2 Weed control

The general biosecurity duty introduced under the *Biosecurity Act 2015* has resulted in other NSW State Government Departments undertaking weed control on their own land and assisting private landholders in the management of weeds in the LGA. Weed control programs undertaken in Dungog Shire LGA include:

- Hunter Local Land Services (LLS) assisting in control of 41.7 hectares of terrestrial weeds on private land through the Landholder Extension and Incentives Program
- Hunter LLS assisting private landholders with weed control across 174 hectares of land at Mount Breckin as part of an integrated environmental program (**See inset page 81**).
- Aquatic weed control of Salvinia (*Salvinia molesta*) within the Paterson River as a collaborative project between Hunter LLS and Dungog Shire Council.
- Control treatment of Lantana (*Lantana camara*) and African Olive (*Olea europaea* subsp *cuspidata*) by National Parks and Wildlife Service (NPWS) in Columbrey National Park and State Conservation Area.
- Community weed control programs with assistance from Landcare. 3 Landcare groups operate within Dungog Shire LGA (See **Section 23**).



Weed control opportunities in Dungog Shire

Future opportunities and initiatives for weed control for Council and the community may include:

- Participation of Council and other stakeholders, identified through the Council chaired Local Weeds Committee, in the review of the NSW Invasive Species Plan 2018-2021 and NSW Biosecurity Strategy 2013-2021.
- Council participation in the review of the Hunter Regional Strategic Weed Management Plan 2017-2022.
- Council to advocate for additional investment of the NSW Weeds Action Program in Dungog Shire LGA
- Promotion of LLS programs and grants to assist landholder knowledge of weed management opportunities.
- Council to assist in promotion of Landcare opportunities in the LGA as in-kind support through memorandum of understanding.
- Council and other land managers to investigate partnerships with community engagement and bush regeneration programs such as Conservation Volunteers Australia.
- Promote volunteer opportunities for bird tracking through Birdlife Australia and State of Australia's Birds report series.

18.3 Pest animals

18.3.1 Pest animals in Dungog Shire

Pest animal species in the Hunter Region are managed under the Biosecurity Act 2015 and through the Hunter Regional Strategic Pest Animal Management Plan 2018-2023 (LLS 2018). Nine of the 13 pest animal species, or species categories, listed in the Hunter Regional Strategic Pest Animal Management Plan 2018-2023 currently have distribution within Dungog Shire LGA. Pest species include wild dog, European red fox, wild rabbit and feral pigs.

18.3.2 Pressure on the environment from pest animals in Dungog Shire

Pressure on the environment in Dungog Shire LGA from pest animals includes:

- Continuing spread and increasing distribution of pest animals across the region. Increasing distribution of pest species such as feral pigs can result in increased disturbance to the environment including erosion and loss of native vegetation.
- Impact on biodiversity. Pest animal species, such as wild dog and wild cat prey on native animal species while other pest species such as feral pigs or wild horses can significantly alter native habitat through foraging or trampling.
- Clearing of native vegetation or land (**Section 19**). Clearing of land can potentially allow easier movement of certain pest animal species.
- Climate change (**Section 14**). Changing conditions including increasing temperatures can create suitable conditions for increasing distribution of pest species including the southern movement of the Cane Toad (*Bufo marinus*).
- Introduction of new species of pest animals through inappropriate trade.
- Inappropriate release of animals or management of animals such as cats or dogs can result in increase in pest animal numbers or impacts on biodiversity.

18.4 Pest animal response in Dungog Shire

18.4.1 Control programs

Pest animal control programs are being undertaken across Dungog Shire LGA with coordination by Hunter LLS under the Hunter Regional Strategic Pest Animal Management Plan 2018-2023 (LLS 2018). These control programs have been undertaken across several land tenures including each of the National Parks in the LGA.

A multi-outcome project is also being undertaken with private landholders in the Mount Breckin area of Dungog Shire LGA (**See inset page 81**).



Trapping demonstration by Helen Leake to landholders at the Mount Breckin Pest Animal workshop



Pest animal control opportunities in Dungog Shire

Future opportunities and initiatives for pest animal control for Council and the community may include:

- ❑ Council participation in the review of the Hunter Regional Strategic Pest Animal Management Plan 2018-2023
- ❑ Promotion of pest species reporting including programs by Department of Primary Industries (DPI 2021) and FeralScan.
- ❑ Reporting of new invasive species in the area including cane toads.





Land management

19. Native vegetation



In 2018 native vegetation covered 61% of NSW (NSW EPA 2019). However, only 9% of the native vegetation cover is considered to be close to natural condition. Varying land uses and land management practices have contributed to decline in native vegetation and habitat. Land clearing is recognised as a significant threat to biodiversity in Australia and particularly in NSW where it is listed as a key threatening process under the Biodiversity Conservation Act 2016 (see **Section 17 Threatened Species**).

19.1 Native vegetation in Dungog Shire

In 2011 woody native vegetation accounted for only 8% (180430ha) of land area within Dungog Shire LGA (DSC 2017). The low amount of woody vegetation cover within the LGA is due to historical land clearing for agriculture within the region.

From 2015-2018 409ha of native woody vegetation was lost in Dungog Shire LGA (**Table 19.1**) (DPIE 2020). However, 43.8% of woody vegetation lost in this period was due to bushfire with 34% of loss due to agricultural clearing. It must be noted that additional woody vegetation loss occurred during the bushfires of the summer of 2019/20.

Table 19.1: Native vegetation woody vegetation change in Dungog Shire Local Government Area 2015-2018.

Type of change	2015	2016	2017	2018	Total 2015-2018	Percentage of change 2015-2018
Agriculture	20	46	60	12	139	34%
Forestry	3	29	6	1	39	9.5%
Infrastructure	3	14	27	8	52	12.7%
Fire	0	177	0	2	179	43.8%
				Total	409	

In August 2017 the NSW State Government introduced changes to the *Local Land Services Act 2013* regarding clearing of native vegetation as part of the biodiversity reforms for the State. The change to the Local Land Services Act 2013 has resulted in the clearance of over 108 000ha of native vegetation across NSW from August 2017 to the end of 2018 (DPIE 2020). Amendments to State Government reporting on native vegetation clearance has been amended after the introduction of the reforms. At this stage reporting at Local Land Service Region level shows the Hunter Region experienced a loss of 2233ha of native vegetation from August 2017 to the end of 2018. Reporting since the end of 2018 has not been completed at the time of this SoE Report.



19.2 Pressure on native vegetation in Dungog Shire

Pressure on native vegetation in Dungog Shire LGA includes:

- Land use and development. Land use such as agricultural use can result in clearing of native vegetation while development continues to place pressure on native vegetation.
- Invasive species including weeds (See **Section 18 Invasive species**).
- Fire protection programs including prescribed burns for bushfire protection.
- Emerging effects of climate change including increasing incidents of bushfire and change to native species habitat.

19.3 Native vegetation response in Dungog Shire

19.3.1 Biodiversity offset scheme

The biodiversity offset scheme established through the introduction of the Biodiversity Conservation Act 2016 has resulted in 4 biodiversity stewardship sites being formed in Dungog Shire LGA. The biodiversity stewardship sites protect established areas of native vegetation or ecological communities (See **Section 20 Protected Conservation Areas**).

19.3.2 Land management

Native vegetation clearance in the Hunter Local Land Services region has increased since the introduction of reforms to the Local Land Services Act 2013 (see **Section 19.1**). Further advance data on clearing in the Dungog Shire LGA has not been released as of the time of writing of the SoE Report, but will be undertaken in future reviews. However, there is likely to have been a net increase in native vegetation loss in the LGA due to bushfires during the summer of 2019/20 (See **Section 22 Emergency Management**).

19.3.3 Bush regeneration programs

Multiple bush regeneration programs are being undertaken in Dungog Shire LGA (See **Section 23 Community participation**). These programs focus on the regeneration and re-establishment of native vegetation communities within Dungog Shire LGA.



Native vegetation opportunities in Dungog Shire

Future opportunities for native vegetation initiatives for Council and the community may include:

- ❑ Update of Part C16- Biodiversity of the Dungog Shire Wide DCP to reflect the implementation of the Biodiversity Conservation Act 2016 and biodiversity offsetting scheme.
- ❑ Collaborate with the NSW State Government, including DPIE and the Biodiversity Conservation Trust, to promote biodiversity stewardship agreements within the LGA.
- ❑ Advocate for amendment of Part 5A of the Local Land Services Act 2013 to minimise or reduce native vegetation clearance in the LGA.
- ❑ Collaborate with NPWS and other Government agencies for high priority native vegetation areas, such as Pilchers Mountain, to be added as protected areas.
- ❑ Work with Hunter LLS and organisations such as Landcare to undertake native vegetation projects within the LGA e.g.) Dungog Common.





20.1 Protected areas in Dungog Shire

Protected areas or formal reserves in NSW that meet the standards of the International Union for Conservation of Nature (IUCN) Protected Areas System include:

- Public reserves protected under *National Parks and Wildlife Act 1974*
- Land reserved as flora reserves under the *Forestry Act 2012*

In 2018 4010km², or 17.8% of the Dungog Shire LGA area, was reserved as protected areas (ABS 2021). Protected areas within Dungog Shire LGA are outlined in **Table 20.1**. Between 2016 and 2018 156 hectares was added as protected areas in Dungog Shire LGA, with 151 hectares added to National Park estates (ABS 2021).

Table 20.1: Protected conservation areas in Dungog Shire Local Government Area

Type of protected area	Area name
National Park	Barrington Tops National Park
	Mount Royal National Park
	Columbrey National Park
	Wollaroo National Park
Nature Reserve	Monkerai Nature Reserve
	Killarney Nature Reserve
State Conservation Area	Black Bulga State Conservation Area
	Columbrey State Conservation Area
Flora Reserve	Mount Allyn Flora Reserve

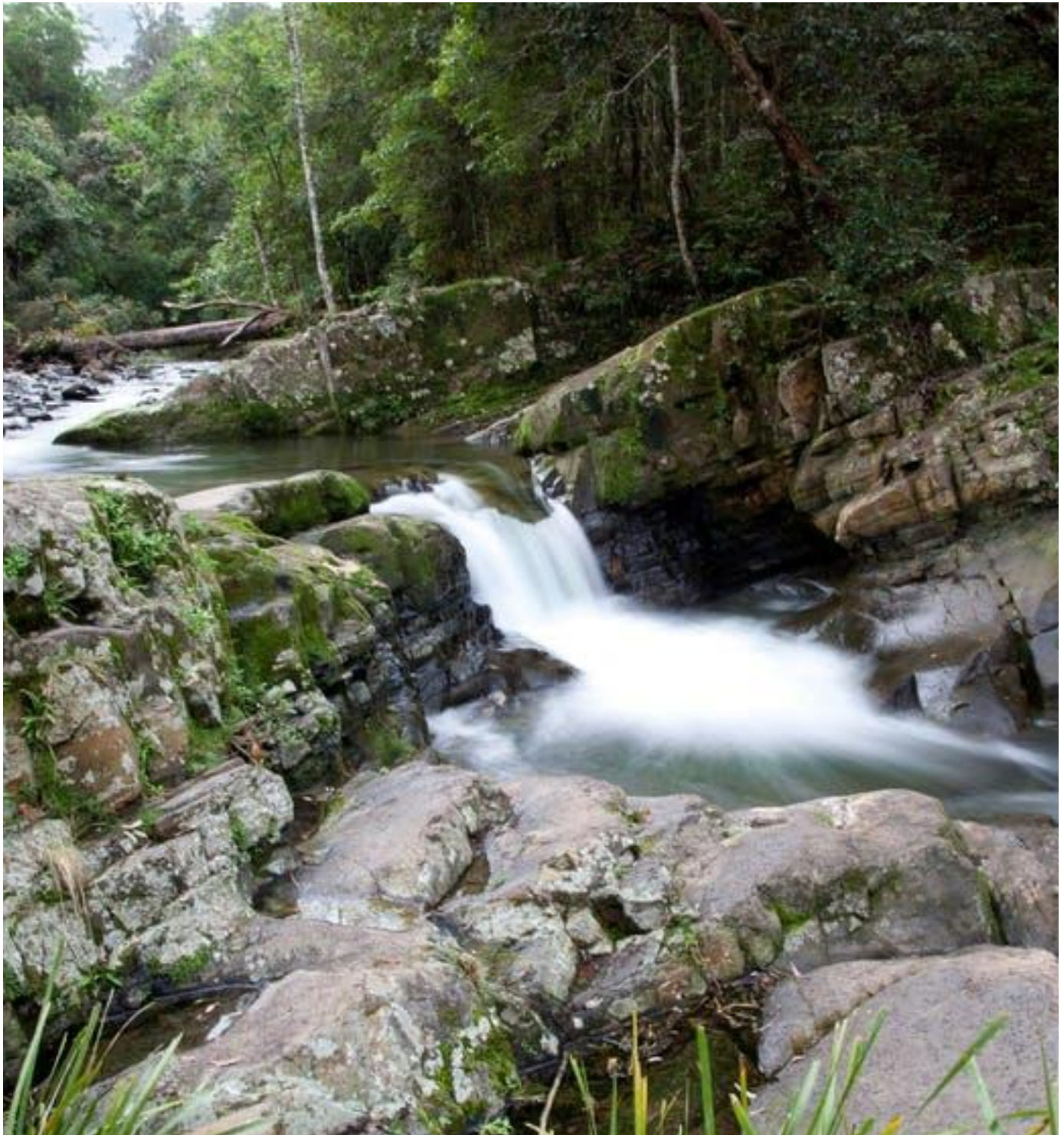
NSW State Forests are managed for harvesting, but can contain protected areas such as the Mount Allyn Flora Reserve. In 2018/19 12109ha of land in Dungog Shire LGA was managed as State Forest Area (Forestry Corporation 2020) and provides a form of managed habitat.



20.2 Private land conservation in Dungog Shire

In August 2017 the NSW State Government implemented significant reforms to threatened species conservation through the introduction of the *Biodiversity Conservation Act 2016*. Part of the reforms included the introduction of a biodiversity offsetting scheme that requires developers to offset the impacts of their projects by obtaining or purchasing biodiversity credits on land with native vegetation or threatened species habitat. The offsetting system is designed to facilitate conservation of native habitat on private land by providing a market system where landowners are financially compensated for maintaining their property for conservation purposes.

Since 2017 4 biodiversity stewardship agreements have been implemented in Dungog Shire LGA resulting in private conservation of 1698ha of land (BCT 2021).



20.3 Pressure on protected lands and conservation in Dungog Shire

Pressure on protected lands in Dungog Shire LGA includes:

- Invasion by weed species (See **Section 17 Invasive species**). Weed species have the potential to outcompete and displace native species and vegetation.
- Pest animal species (See **Section 17 Invasive species**). Pest animal species can impact on native species through competition, predation and habitat degradation.
- Bushfires (See **Section 22 Emergency management**).
- Illegal activities including waste dumping, unregistered trail bike riding, vandalism and hunting.
- Climate change (See **Section 14**). Climate change impacts can affect ecological communities and processes as increasing temperatures result in contraction of suitable conditions for species and communities.

20.4 Protected areas response in Dungog Shire

Protected area management in Dungog Shire include:

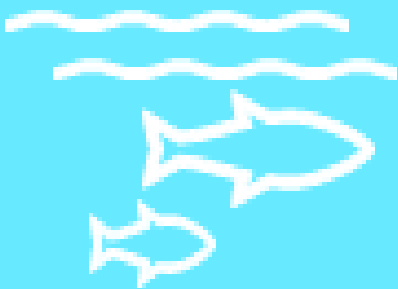
- Invasive weed treatment including lantana (*Lantana camara*) and African Olive (*Olea erupaea subsp. Cuspidate*) treatment programs in Columbrey National Park.
- Wild dog and fox control programs across the National Park estate in the LGA
- Hazard reduction burns in Columbrey National Park, Barrington Tops National Park and Black Bulga State Conservation Area
- Establishment of biodiversity stewardship sites (See **Section 19.3**).



Native vegetation opportunities in Dungog Shire

Future opportunities for protected areas in Dungog Shire LGA may include:

- Transfer of crown land at Pilchers Mountain to a protected area designation such as National Parks Estate.
- Promotion of the biodiversity offsetting and stewardship system by Council to facilitate increased private land conservation.



Water catchment management

21. Dungog Shire water catchment



Dungog Shire LGA is located within wider Hunter region catchment area, the largest coastal catchment in NSW (DPIE 2021). Dungog Shire LGA contains two river catchments, the Paterson/Allyn River and Williams River catchments. These two catchments flow from headwaters in the Barrington Tops, through Dungog Shire and meet the tidal limit of the Hunter River estuary, for the Paterson River, in the south of the LGA.

21.1 Paterson and Allyn River catchment

The Barrington Tops, the higher rainfall area of the Hunter region catchment area, provides the source of the Paterson and Allyn Rivers. Coursing through the north-western part of the Dungog Shire LGA the drinking water catchment area of the Paterson and Allyn Rivers cover a land area of 66km² (Port Stephens Council 2019). Lostock Dam, in the western part of the LGA, provides a regulated water source (operated by Water NSW) to townships along the Paterson River. Downstream of the township of Gresford/East Gresford the Paterson and Allyn Rivers continue south and converge near the township of Vacy. The Paterson River continues south through the township of Paterson and joins the Hunter River downstream of Maitland, outside of the LGA.

21.2 Williams River catchment

The Williams River catchment includes the Chichester River within the upper parts of the overall catchment. These two river systems both originate in the Barrington Tops. While the Williams River flows from the Barrington Tops the Chichester River catchment contains Chichester Dam, a significant water storage area for drinking water in the lower Hunter region. Chichester Dam stores water from both the Chichester and Wangat Rivers in the Barrington Tops National Park before the Chichester River travels south and meets the Williams River near Bandon Grove (Port Stephens Council 2019). Further downstream the Williams River flows through the townships of Dungog and Clarence Town and further south to Seaham Weir in the Port Stephens LGA. The Williams River continues south and meets the Hunter River upstream of Raymond Terrace.



21.3 Hunter River estuary in Dungog Shire

Estuaries are typically associated with the mouth and tidal floodplains of coastal river systems. While **Sections 21.1 and 21.2** outline the water catchment within Dungog Shire LGA the Paterson/Allyn River and Williams River catchment form part of the wider Hunter River estuary. While the tidal limit of the Hunter River estuary stops at Seaham Weir on the Williams River the tidal limit on the Paterson River extends into Dungog Shire LGA between Paterson and Gostwyck Bridge, approximately 70-75 km from the ocean (MHL 2003).

Estuaries in NSW are managed under the Coastal Management Act 2016. Mapping of coastal environment and use areas under SEPP Coastal Management 2018 shows the extent of the Hunter River estuary along the Paterson River into Dungog Shire LGA (**Figure 21.1**). The estuary is contained within the red outline along the Paterson River

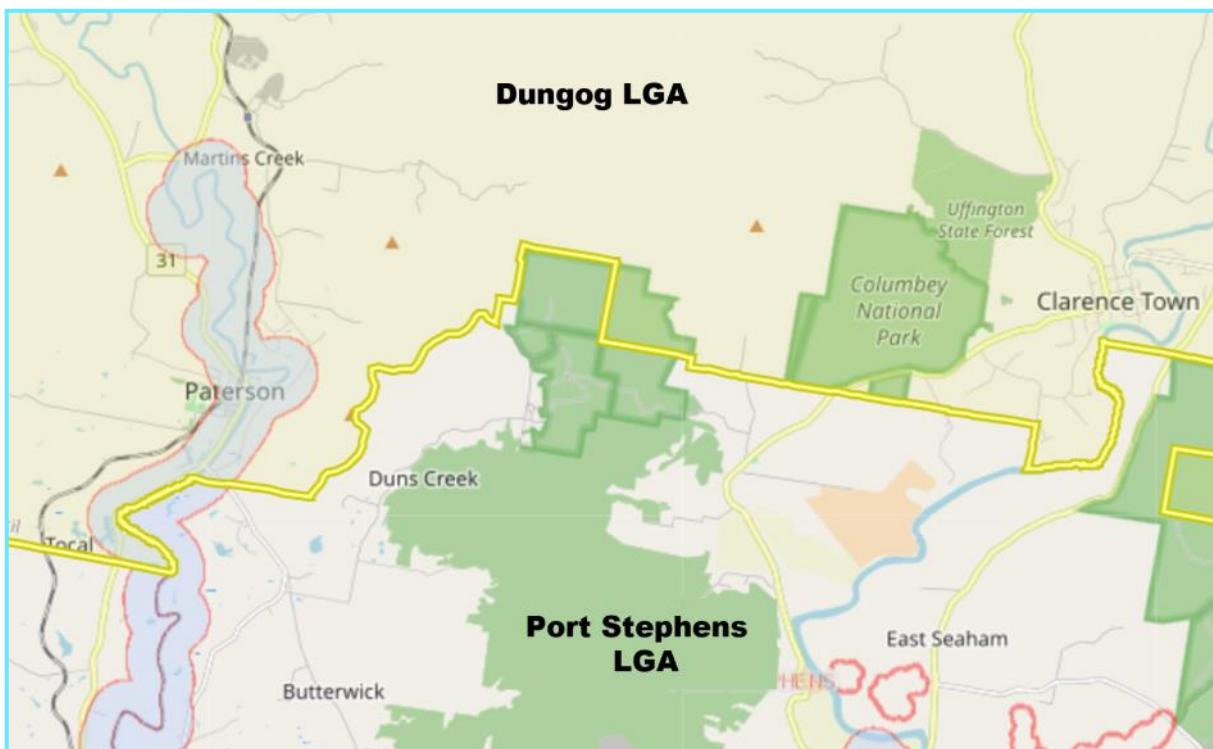


Figure 21.1: Coastal environment area under State Environmental Planning Policy (Coastal Management) 2018 in Dungog Shire Local Government Area.

21.4 Wetlands in Dungog Shire

While no coastal wetlands under SEPP (Coastal Management) 2018 are identified in Dungog Shire LGA it must be noted that two wetland areas near the township of Paterson were identified as significant wetland areas in the Hunter Regional Plan 1989 (now repealed). Further investigation of these two wetland areas on the floodplain of the Paterson River is required to determine the significance of the wetlands for inclusion in SEPP (Coastal Management) 2018.

21.5 Catchment health in Dungog Shire

Due to the connectivity of river catchment systems across LGA boundaries reporting on river health is undertaken on an overall catchment basis. The most recent assessment of river health in the wider Hunter catchment area was conducted in 2008 and reported in the State of the Catchment Report 2010: Hunter -Central Rivers Region (DECCW 2010). While the Hunter catchment area was provided with a good-fair rating condition in 2008 many of the data assessment points were not located within Dungog Shire LGA making assessment of river health in the LGA difficult. While reporting methodologies including the River Condition Index have been used after 2010 these methodologies are now also under review (WaterNSW 2021).

21.5.1 Algal alerts

Algal blooms can arise in river systems due to several environmental conditions including nutrients, temperature and turbidity. WaterNSW operates an algal alert system for recreational water systems (Water NSW 2021b). The algal alert system has three alert levels including:

- **Red** – represents ‘bloom conditions’ where water may appear green or have strong odour. The waterbody should not be used for recreation.
- **Amber** – Algae may be multiplying in numbers and water may have green tinge or odour.
- **Green** – visible blooms result in public enquiries.

Five sites are routinely tested for presence of algal species in Dungog Shire LGA with an additional sampling site on the Williams River at Seaham Weir in Port Stephens LGA. The number of algal red alerts significantly increased in 2017/18 to 2019/20 with Lostock Reservoir and the Williams River at Clarence Town being sites with higher numbers of alerts (**Table 21.1**).



Table 21.1: Algal alerts in Dungog Shire Local Government Area and Seaham Weir from 2014/15 to 2019/20.

Monitoring site	Alert level	2014/1	2015/1	2017/18	2018/19	2019/20
		5	6			
Lostock Reservoir	Red	0	0	9	10	9
	Amber	0	16	6	6	3
	Green	37	13	8	11	26
Paterson River (outflow from Lostock Reservoir)	Red	0	0	0	0	4
	Amber	0	7	0	0	0
	Green	0	19	0	10	6
Allyn River – East Gresford	Red	0	0	0	0	0
	Amber	0	0	4	2	9
	Green	0	0	6	5	7
Paterson River - Gresford	Red	0	4	0	0	0
	Amber	0	0	0	2	0
	Green	0	0	0	1	0
Williams River – Clarence Town	Red	2	2	9	2	6
	Amber	4	0	10	10	8
	Green	3	0	14	1	12
Williams River – Seaham Weir (Port Stephens LGA)	Red	0	3	0	5	1
	Amber	2	0	0	3	13
	Green	18	0	0	8	12
Total	Red	2	9	18	17	20
	Amber	6	23	20	23	33
	Green	58	32	28	36	63

Source: NSW Water 2021c



21.6 Pressure on catchment management in Dungog Shire

Pressure on catchment management in Dungog Shire LGA includes:

- Modification to natural river flows including water extraction and construction of structures.
- Catchment run-off and pollution from human use of the land. Run-off can increase nutrients, sediment or other pollutants in watercourses and the overall catchment.
- Clearance or removal of vegetation around watercourses can increase run-off into the catchment.
- Blockage of fish passage by constructed structures.
- Invasive species (**Section 18 Invasive species**). Invasive aquatic species can compete or prey on native fish species and alter aquatic environments eg) carp. Invasive aquatic plants can also alter habitat within river systems.
- Management of acid sulfate soils.

21.7 Catchment management response in Dungog Shire

21.7.1 Onsite sewage management program

A large portion of Dungog Shire does not have access to a reticulated system for management of sewage. Management of sewage has resulted in a large number of on-site management systems within the LGA. The number of on-site sewage management systems in the LGA continues to increase with 275 new approvals, under the Local Government Act 1993, issued from 2016 to 2021 (DSC 2021).

Council undertakes an annual inspection program of on-site sewage management systems. From 2016/17 to 2020/21 an average of 126 systems were inspected each year (**Figure 20.2**). However, funding for the Septic Tank and Rectification Program through HWC, was discontinued in late 2017. From 2018/19 to 2020/21 the average number of systems inspected were 79/year.

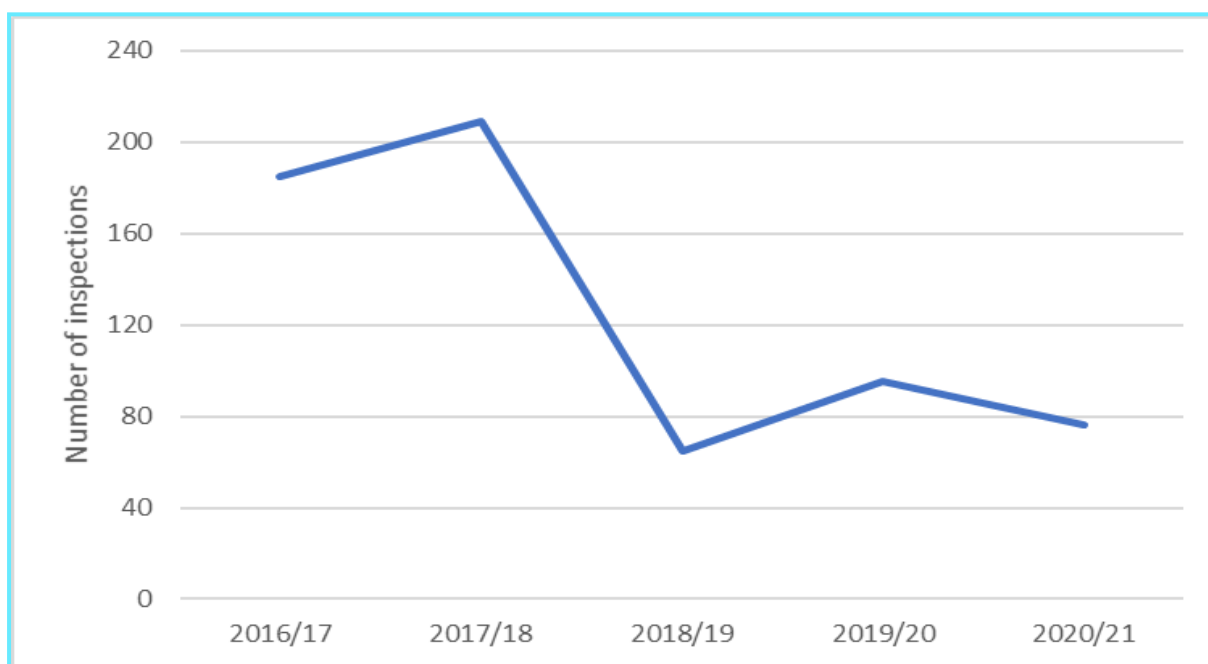


Figure 21.2: Number of on-site sewage management system inspections in Dungog Shire Local Government Area 2016/17 to 2020/21.

21.7.2 Dairy Improvement project

HWC collaborated with 13 dairy facilities in the Williams River catchment to improve water quality from operational practices. Over \$1 million was invested in upgrades to farm infrastructure through joint funding from 2013-2017. Through the upgrades over 18.5 tonnes of nitrogen and 4.3 tonnes of phosphorous is captured and reused per year and prevented from entering the river catchment. This volume of nutrients equates to an economic saving of \$110 000/year in equivalent fertilizer value (HWC 2021).

21.7.3 River management advocacy

The management of water catchments, including rivers and their tributaries, has responsibility separated between a significant number of NSW State Government agencies. While various committees have been formed over the last decade, including the Williams River Erosion Management Committee, the varying responsibilities have impeded progress in water catchment management. Council has previously resolved in 2020 to advocate for more structured management of water catchments, or the formation of an overarching agency for catchment management but has received no correspondence from the NSW Premier regarding this request.

21.7.4 Hunter Catchment contribution projects

The Hunter Catchment Contributions are collected from a levy on rateable land within the Hunter River catchment. The funds collected are used for projects to improve the catchment. Hunter LLS have undertaken erosion management and waterway rehabilitation within Dungog Shire LGA including projects at Bedding Down Creek at Alison and the Williams River at Glen William.





Water catchment management opportunities in Dungog Shire

Future opportunities for water catchment management initiatives for Council and the community may include:

- Council to advocate for a consolidated system for monitoring and reporting on river health. This could include the use of the River Condition Index as noted in **Section 20.5**, EcoHealth monitoring or re-establishment of a monitoring, evaluation and reporting strategy.
- Council to continue to advocate for consolidation of management of water catchment within the NSW State Government
- Council to consider the development of integrated water management plans for townships including stormwater management and use of water sensitive urban design
- Stakeholders to consider opportunities for improvement of fish passage within the catchment.
- Council to consider inclusion of wetlands listed under former planning instruments for inclusion as coastal wetlands under SEPP Coastal Management 2018
- Council to consider funding opportunities under the Marine Estate Management Strategy
- Council to consider participation in the development of the Coastal Management program under the Coastal Management Act 2016 for the Hunter River estuary.
- Further promotion of citizen science projects such as Waterwatch.





Emergency management



22.1 Emergency management in Dungog Shire

Natural hazards such as bushfire and flooding can have significant impacts on both the natural environment and human settlements. While the value of risks from natural hazards can be quantified from a monetary value the social and environmental loss are far more difficult to evaluate. This is particularly relevant for Dungog Shire LGA where flash flooding in April 2015 resulted in not only loss and damage to property in the Dungog township, but the loss of life. The subsequent social impacts after this flooding event cannot be estimated.

Natural hazards have continued to occur in Dungog Shire LGA including bushfires in 2019/20 that resulted in 103km² or 4.6% of the LGA being burnt in a single bushfire season (NBRA 2021). The bushfire affected area included 79km² of bushland and forest, mainly in the north of the LGA, and 21km² of agricultural land.

Heavy rainfall in March 2021 resulted in flooding along the Williams and Paterson Rivers. This resulted in damage to roadways and bridges with the LGA being declared a natural disaster area.

Emergency management in NSW is undertaken under the State Emergency and Rescue Management Act 1989. The SoE Report will not detail all plans under the State emergency framework, but relevant plans for Dungog Shire LGA include the recently updated Hunter-Central Coast Regional Emergency Management Plan (HCCREMC 2021) and the Dungog Shire Council Local Emergency Management Plan (DSLEMC 2017).

22.2 Pressure on emergency management in Dungog Shire

Pressures on emergency management in Dungog Shire include:

- Population increase (See **Section 3.1**). Population increase can result in increasing demand for development of land that may be subject to natural hazard risk eg) development on flood prone land.
- Economic growth (See **Section 4**). Economic growth in the LGA can increase demand for development of land that may be subject to natural hazard risks.
- Financial limitations for natural hazard maintenance such as hazard control burns.
- Climate change (See Section 14). Projected modelling shows an increased frequency of heavy or extreme rainfall events while increasing temperatures are likely to increase bushfire frequency and extent bushfire seasons.



Above: Road closed due to flash flooding in Dungog (2018)

Opposite: Flood level marker in Dungog (2021)

22.3 Emergency management response in Dungog Shire

22.3.1 Floodplain management

Council has completed a number of flood studies to inform flood **management** within the LGA and to assist emergency management during flood events. Council has completed the following flood studies and risk management plans:

- Clarence Town Floodplain Risk Management Study and Plan (BMT WBM 2014)
- Dungog Floodplain Risk Management Study and Plan (Royal Haskoning 2017)
- In 2017 the Paterson River Flood Study – Vacy to Hinton (WMA Water 2017) was completed. This flood study was a collaboration between Dungog, Port Stephens and Maitland Councils.

Council also implements floodplain management controls from Part C.8 of the Dungog DCP in development assessments under the EP&A Act 1979.



Floodwaters in Dungog Shire (2015)

22.3.2 Flood warning system

In 2020 Council installed a flood gauge near **Hooke** Street, Dungog to monitor water levels in the township. The gauge forms part of a flood warning system and sends alerts to emergency services as flood water rise. The flood warning system provides a preparation and response mechanism for flooding events in the Dungog township and surrounding area. The warning system was used during the rainfall and flooding event in March 2021.



Flood gauge in Alison Court, Dungog



Hazard Reduction Burn

22.3.3 Bushfire management

Bushfire management on public land in Dungog Shire LGA is undertaken in accordance with the Lower Hunter Bush Fire Risk Management Plan (LHBFMC 2009) under the Rural Fires Act 1997. A large part of public bushfire protection measures are located on protected lands, including National Parks. Since 2017 NPWS have undertaken scheduled hazard reduction burning at Barrington Tops National Park and Columbrey National Park to reduce fuel loads. These hazard reduction burns are undertaken through the NSW State Government Enhanced Bushfire Management Program.

Bushfire protection measures for private property are assessed through the development assessment process under the EP&A Act 1979. Section C5 of the Dungog DCP outlines the required bushfire protection measures for new developments or redevelopment on existing properties within Dungog Shire LGA in accordance with Rural Fire Service guidelines.



22.3.4 Bushfire habitat recovery

Bushfires in 2019/20 affected almost 80km² of bushland and forest habitat within Dungog Shire LGA. The National Bushfire Recovery Agency has provided almost \$400 000 to fund wildlife and habitat recovery projects in National Park areas in the LGA (NBRA 2021). These wildlife and habitat recovery projects are being undertaken in combination with the NSW Save our Species program to assist threatened species and biodiversity recovery within the Dungog Shire LGA.





Emergency management opportunities in Dungog Shire

Future opportunities to further emergency management in Dungog Shire LGA may include:

- Council to investigate the potential use of Australian Early Warning Network to further emergency management notifications.
- Council to consider undertaking an environmental security assessment to ascertain risk levels from natural hazards in the LGA
- Council to consider integration of Lower Hunter Bush Fire Risk Management Plan into GIS systems and asset management plans.
- Revision of Section C5 of the Dungog DCP
- Completion of a floodplain risk management plan for the Paterson River floodplain. This plan will be required to be undertaken with adjoining Council areas.





Community Participation



While environmental programs and projects are undertaken by Government agencies within Dungog Shire LGA many initiatives rely on the participation and passion of volunteers. These on-ground projects provide a real-world and tangible contribution to the health of the environment in the LGA.

Community members passionate about the environment can also drive true environmental behaviour change in the LGA and beyond. These behaviour changes can result in exponential benefits to the local environment while influencing decision-makers to make wider change.

Advancing environmental knowledge and education contributes to people's appreciation of the surrounding world, the wonder it inspires and the benefits the environment provides them. Enthusiastic knowledge seekers play a significant role in advancing community information and perception of the environment and play a substantial role in positive environmental change and learning. This section of the SoE Report provides a snapshot of some of the community projects within the Dungog Shire LGA, but is not an exhaustive list of the wonderful work that the community undertakes to benefit the environment.

23.1 Landcare

Council has entered a memorandum of understanding with Hunter Region Landcare to undertake bush regeneration projects at Council owned/managed sites. Three Landcare groups are active in Dungog Shire LGA (Landcare 2018).

23.1.1 Sustaining the Williams River

Sustaining the Williams River Incorporated Group is a community focusing on the regeneration of Weeping Lilly Pilly rainforest vegetation at Frank Robinson Park in Dungog. The weeping Lilly Pilly project is undertaking weed removal and the planting of over 50 different native species, including more than 5000 plants, to create native habitat and restore the riparian area of the Williams River.

23.1.2 Dungog Commoners

The Dungog Commoners Landcare Group has undertaken weed removal activities across 600 acres of the Dungog Common Recreation Reserve, a Crown Land Reserve, on the western side of Dungog. The weed activities have focused on lantana removal around the Hungry Hill area of the reserve. Bush regeneration activities have also been undertaken while plant propagation workshops have been conducted.

23.1.3 Gresford District Landcare

Established for over 30 years the Gresford District Landcare Group have undertaken bush regeneration along the Allyn River at the East Gresford camping ground. The group have also established the Arboretum of Native Trees at East Gresford and provide educational workshops on regenerative agricultural practices.

23.2 Plastic Free Dungog

Before 2016 the township of Dungog was using up to 3500 plastic bags every day. Witnessing these plastic bags entering the surrounding waterways and environment community members established the Plastic Free Dungog initiative. This community initiative is working towards eliminating the use of single-use plastics, by providing alternatives and closed loop solutions to recycle or upcycle waste and keep it out of the local environment.

Signing on as a 'Boomerang Bags' community the Plastic Free Dungog initiative makes upcycled fabric reusable bags with 5500 bags distributed in Dungog. The Boomerang Bags group have also made produce bags, cutlery tote bags and bees wax wraps available at local markets and business to reduce waste. Through the initiative Dungog IGA stores have stopped the use of single use plastic bags preventing these products from being disposed at landfill.

The Plastic Free Dungog initiative, in partnership with Dungog Shire council, saw soft plastics recycling introduced in 2017 (See **Section 8**), resulting in over 20 tonnes of soft plastics being diverted from landfill so far. The partnership with Council has also seen the installation of two water refill stations in the LGA in 2020 to support reusable drink bottle reuse.

In 2019, Dungog became Australia and the World's 1st take away coffee Cup Rescue town. Over 200kg of coffee and drink cups and lids have been collected by the Cup Rescue and upcycled into 'circular economy' products that come back into the community – such as carpark bump stops, kerbing, bike rails and reusable coffee cup.

The Plastic Free Dungog initiative has enjoyed strong community and local industry support, with over 45 local businesses awarded a Blue Planet or Green Planet Status for their commitment to 'no more single use plastics' and efforts in recycling/upcycling responsible/sustainable best practice.

The commitment of groups like Plastic Free Dungog have not only changed the behaviour of their local communities, but have lead to wider political and legislative change with the NSW State Government announcing the phase out of single use plastics in NSW by 2025.



Boomerang Bags/Plastic Free Dungog representatives at Dungog Festival



Blue Planet Status Ticking all 6 boxes

- no single-use plastic bags
- no plastic straws
- no plastic water bottles
- no plastic cutlery
- no plastic t/a containers
- Cup Rescue coffee cup recycling partner



DUNGOG CUP RESCUE COLLECTION POINTS



23.3 Paterson Allyn Williams Science Hub

The Patterson Allyn Williams Science Hub delivers year-round science focused events and activities that aim to engage the Dungog Shire community with STEM issues and build a deeper understanding of how science relates to the environment and other aspects of life.

The NSW Regional Science Hub initiative is supported by Inspiring Australia and the NSW Government, with each Regional Science Hub delivering its own community led program. By creating relevant, thought-provoking and entertaining events and experiences, the Patterson Allyn Williams Science Hub:

- promotes curiosity, creativity and critical thinking
- builds scientific literacy
- increase participants confidence and skills of to engage with scientific issues
- encourages positive attitudes towards STEM and STEM careers
- help ensure that citizens are informed, educated and look to evidence-based information when making important decisions.
- recognition of the contribution of the community to a sustainable environment.



Mycologist Pam O'Sullivan, and community members examining fungi species at the 2018 Fungi Foray

Paterson Allyn Williams FESTIVAL OF SCIENCE

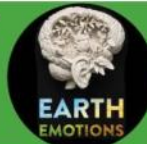
10-18 AUGUST
national science week 2018

5 FREE EVENTS
around
DUNGOG

1 SAT 10 AUG, 3.30PM
**Book launch +
Festival opening**

James Theatre

Book launch & conversation
with eco-philosopher
Glenn Albrecht on his
new book:
*Earth Emotions:
New Words For A
New World*



2 SAT 10 AUG, 6.30PM
**Scinema Film
Festival**

James Theatre

It's back on the BIG SCREEN
- all the award winning
films from the *Scinema
International Science Film
Festival*. With a special
guest from the UK...
Juliette Martineau,
director of *Smart Slime*



3 WED 14 AUG, 10.30AM
**Junior Science
on the Street**

Dowling St, Dungog

Join in experiments &
demonstrations with junior
scientists from schools across
the shire. From robotics
to chemistry, to biology &
more. You are sure to be
surprised and maybe even
learn a thing or three.



4 THURS 15 AUG, 6PM
**Fermentation +
Trivia**

Tinshed Brewery

It's A Fermentation Frolic -
& a little alcoholic...
for over 18s!
Micro-chats on
everything from beer
to flesh-eating fungi
interspersed with
Science Trivia Comp. Prizes!



5 SUN 18 AUG, 10- 4
Future Paddock

Allynbrook - limited numbers,
RSVP essential via Eventbrite
www.futurepaddock.eventbrite.com.au

The future of agriculture from
the soil to the skies.

A day of events
• Explore regenerative
agriculture
• Plant an ark
• Home-made invention
show & tell
• Drones in agriculture
• Rural robots



ALL FREE EVENTS For more details visit the Facebook page or www.pawsciencehub.com

Paterson Allyn Williams
SCIENCE HUB

This project received grant funding from the
Australian Government.
This initiative is supported by Inspiring Australia
and the NSW Government



sphere drones
your drone partner



national science week 2018
DUNGOG

Sun 12 August 2018, 3pm, James Theatre

THE TIDE HAS COME FOR CHANGE

BLUE

Film + Q&A

national science week 2018
DUNGOG

Fri 10 August 2018, 6pm, Hotel Beatty, East Gresford

Koalas in the Pub

Find out about
our local koalas

Followed by the
Gresford Community Dinner

Sat 18 & Sun 19 August 2018, Upper Allyn River area

Koala Count

Surveyors needed

You don't need to be an expert
- learn from professional ecologists.



Native Bee Workshop
with Dr Tim Heard & Dr Tobias Smith
Thursday 1 November

Paterson Allyn Williams
SCIENCE HUB



with
Dungog Bee Rapt

This initiative is supported by Inspiring Australia
and the NSW Government



23.4 Sustainability Spotlight on Dungog Shire

A number of community groups partnered with local business to host the Sustainability Spotlight on Dungog Shire in May 2019. This free community event featured a series of short talks showcasing and celebrating the practices of local businesses and community groups who have sustainability as a core component of what they do.

This event followed the Single Use Plastic Free Dungog launch and was a way to share with the community the sustainability efforts already underway in Dungog Shire.



Sustainability Spotlight on Dungog Shire

3-6pm Sunday 26 May James Theatre Dungog

Series of short talks showcasing sustainable practices in businesses and community groups in our shire.

A series of short, fast and punchy ('Pecha Kucha' style) talks from those who have sustainability as a core component of what they do.

Join us for FREE drinks and nibbles after the show!
FREE EVENT Everybody welcome.

Some of our speakers & stalls include: Tin Shed Brewery, HannanBuild, 4 Acre Farm, Wangat Lodge, Australian Sustainable Timbers, Tabbil Forest, Fosterton Farm, Local Growers Market, The Maggie, Westwood Provedores + others

Presented by Paterson Allyn Williams **SCIENCE HUB**
Sustaining the Williams Valley Inc

SPONSOR OF THE **PLASTIC FREE DUNGOG**

Thanks to:

To find out more details visit www.patersonahub.com

23.5 Sustainable Communities—Tidy Towns Awards



Since 1981, the Sustainable Communities – Tidy Towns Program has been rewarding and recognising projects around litter, waste management, recycling, heritage, community spirit and other environmental areas in towns both large and small across NSW.

In 2019 Dungog was presented with six awards in the **Keep Australia Beautiful NSW Sustainable Communities Tidy Towns Awards** in recognition of the contribution of the community to actively working towards sustainable practices and a sustainable environment.

Award category	Awarded for:
Waste Less Recycle More Waste Minimisation Award	Boomerang Bags- Plastic Free Dungog
Habitat and Wildlife Conservation Award	Protection and Restoration of 'Hungry Hill' at Dungog Common
Circular Economy Award	Dungog Shire Soft Plastics Recycling
Coastal and Waterways Protection Award	Weeping Lilly Pilly Riparian Rainforest Restoration
Community Spirit and Inclusion Award	Sustainability Spotlight on Dungog
Sustainable Communities—Tidy Towns Winner	Overall Winner for town with 200 - 6000 residents

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