

A Framework for Climate Action

Armidale Regional Council:
Climate Emergency Working Group

Report

19 July, 2020;

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1. Executive Summary

The climate is in crisis. In 2019, Armidale Regional Council (ARC) unanimously adopted a Climate Emergency Declaration as a response to community pressure to take action. As a result, the Climate Emergency Working Group (CEWG) was established in 2020 – this report is the result of the working group’s deliberations to provide a list of doable, viable and urgent actions for Council to move forward in addressing the Climate Emergency.

The Climate Emergency requires urgent action, mobilisation of the community and leadership that can be provided by ARC. Council has already developed the EcoARC Greenprint¹ and it is important that the CEWG report be read in conjunction with those guidelines. However, the CEWG report has been written in a different format to the EcoARC Greenprint as it needed to address the three pillars of the Climate Emergency in the first instance –

- Emissions Reduction,
- Carbon Sequestration, and
- Climate Change Adaption and Mitigation

Bringing together the CEWG report, the EcoARC Greenprint and actions by Council can, and should be, done under the auspices of the Council’s Environmental Sustainability Advisory Committee (ESAC).

While Council has established four Community Strategic Plan Categories (Growth Prosperity and Economic Development, Our People Our Community, Leadership for the Community, Environment and Infrastructure), it is important that all these principles are encompassed by the Climate Emergency Declaration and it provides the overarching guiding direction for all Council decisions. When the Community Strategic Plan is reviewed in 2021, the Climate Emergency should be incorporated in to that plan. Identifying transition to zero carbon emissions by 2030, transition to renewable energy, managing climate change risks and responding to climate change as Planning Priorities and identify appropriate actions and timeframes for implementation consistent with this report².

The following report addresses the three areas of concern, as well as issues of Community Engagement and Funding. Recommendations are noted throughout the report, as applicable to each specific area, with further detail noted in the Appendix and References. Moving forward with these recommendations means implementing specific projects as suggested throughout – not by writing yet another report. Which is why ESAC and Council’s Sustainability Officer should now be tasked with implementing the recommendations and converting them into real actions. Likewise the Risk Analysis tables provide a strong starting point to further develop the necessary actions to mitigate and adapt to future climate change impacts.

Timely to the preparation of this report, the NSW Government announced on 10 July, 2020, that the region, which includes Armidale Regional Council, would become the state’s largest Renewable Energy Zone (REZ)³. This game changer provides certainty for the renewables markets and sets ARC well-placed to take the leadership necessary to enact many of the recommendations of the CEWG report, and become the leading climate-responsible Council in NSW, if not Australia.

CEWG Co-Chairs – Mahalath Halperin & Annette Kilarr

Key Authors – Helen Webb & Mahalath Halperin

17th July, 2020

1 The draft document is available via download on yoursay.armidale.nsw.gov.au/exhibition-of-draft-ecoarc

2 Local Strategic Planning Statements for Bega Valley, Blue Mountains and Kiama Councils include some provisions that could be adapted for inclusion in ARC planning documents.

3 energy.nsw.gov.au/renewables/renewable-energy-zones
www.theguardian.com/australia-news/2020/jul/10/nsw-government-says-renewable-energy-zone-in-new-england-could-power-35m-homes

2. Introduction

Context

In October, 2019, Armidale Regional Council approved support of a Climate Change Emergency Declaration as a result of a community push to do so. The following Notice of Motion was unanimously approved –

Climate Emergency Declaration

A) That Council acknowledge our local and global communities are facing a climate emergency that requires urgent action by all levels of government; that human-induced climate change represents a great threat to humanity, civilisation and other species; and that, to prevent the most catastrophic outcomes, societies including local councils, need to take urgent action.

B) That Council therefore declares that we are in a 'Climate Emergency'.

C) That a report be prepared by February 2020, with input from a working group of the Environmental Sustainability Advisory Committee (ESAC) and the community, on current initiatives and additional future actions that can be undertaken in the short, medium and long term to:

1. Reduce greenhouse emissions aiming, by 2030, for no additional contribution from our region to the global temperature rise
2. Adapt to current and anticipated climate change impacts
3. Reduce atmospheric concentrations of greenhouse gases, e.g. sequester and store carbon in trees and soils

D) That Council encourages other local governments (that have not already done so) to take similar action to reduce greenhouse emissions and protect our climate.

E) That Council lobbies State and Federal Governments for urgent action to reduce greenhouse emissions and protect our climate.⁴

Climate Emergency Working Group⁵

In order to enact upon the declaration, it was agreed to form the Climate Emergency Working Group (CEWG) under the auspices of Council's Environmental Sustainability Advisory Committee (ESAC). There was delay in establishment of the CEWG, with the first meeting (held by webinar due to Covid19 restrictions) on 30th March, 2020. The aim was to provide input through ESAC to the report to be prepared by Council to action this motion.

Despite an extremely short time frame between the establishment of the CEWG and the April deadline for the provision of input from the working group, an Interim Report identifying priority actions for Council was submitted through the ESAC in April and accepted at the meeting of Council held by webinar on 22nd April, 2020.

This included -

- priorities highlighted for consideration for the 2020/2021 budget determinations.
- a larger draft and working document of compiled recommendations for consideration for short, medium and longer term action.

Herein is now the more detailed report to guide further actions for the short, medium and long term as the group was originally charged, and as the Climate Emergency continues.

We recommend that a Grant Development Strategy be developed between CEWG, ESAC and Council support staff to best utilise available corporate and community knowledge.

⁴ See Appendix 1 for Background notes to the Climate Emergency Declaration motion

⁵ See Appendix 2 for Climate Emergency Working Group Terms of Reference & EOI

Three modes of action are required as follows:

- *Council Operations* – actions undertaken directly by Council, relating to facilities and operational activities; This also relates to less tangible issues such as planning and regulation;
- *Community Engagement* – actions where Council engages the community in order to educate, raise awareness and facilitate further discussion and action;
- *Community Assistance* – actions where Council can facilitate proactive actions by the community (residential, individual, business, industrial etc) such as better planning, rebates, and so on.

Regardless of the make-up of those actions, any decisions should come under the **decisions making process** of:

- An overall strategy consistent with the Climate Emergency Declaration and goals of reducing greenhouse emissions, community adaptation to climate change, and carbon sequestration;
- Weighting to those actions with the greatest positive effect (particularly in relation to current base level emissions) as well as cost effectiveness;
- Building on initiatives in progress and/or where groundwork and/or an audit has already been done;
- Working collaboratively within the existing council framework including the Community Strategic Plan, EcoARC GreenPrints, and with Project Zero30, RGPAAC and SLA and the like;

In regards to the specific recommendations from this report in addressing the issues, CEWG has determined that the best format to provide more detailed input is in the following **three sections**, based on the initial list of priorities submitted to Council with the Interim Input report:

Part 1: Recommended initiatives to **reduce greenhouse emissions**

Part 2: Recommended initiatives to **reduce atmospheric concentrations** of greenhouse gas emissions (sequester and store carbon)

Part 3: **Adapt** to current and **anticipated** climate change impacts

Additionally, many of these recommendations address **engagement with the community** and the need for education towards reducing greenhouse emissions and adapting to climate change impacts as per the modes of action noted above. Additional information and recommendations are also provided in this regard.

And while the focus overall is to reduce greenhouse gas emissions and concentrations, we need to widen our lens about climate change solutions to include less obvious strategies:

- food waste reduction and plant-rich diets,
- preventing leaks and improving disposal of chemical refrigerants,
- restore ecosystems and prevent further land clearing,
- access high-quality health care, and

That said, the recommendations in this report are still not totally comprehensive, though do cover a broad range of issues beyond fossil-fuelled energy generation as noted.

2. CEWG Members

Membership

An Expression of Interest⁶ was circulated for membership of the Climate Emergency Working Group in mid-March, 2020, with selections made by late March. As per the Terms of Reference³ and Council resolutions, the CEWG is intended to be the enabler to develop this report for recommendations for Council to move forward on enacting their Climate Emergency Declaration.

Membership of the working group is as follows –

Dale Curtis, B.Sc (Hons), Dip Comp Sc.

- Key initiator of the Climate Emergency Declaration in Armidale;
Software Engineer, Angus Australia;

Thomas Davidson, Ph.D.

- National Coordinator Livestock Productivity Partnership, University of New England;

Mahalath Halperin, B.Arch, B.Sc (Arch), FRAIA, Cert IV Carbon Management

- ESAC member and Co-Chair CEWG; Former SLA Convenor;⁷ Architect and Environmental Consultant;

Annette Kilarr, BA(Hons) Anthropology; Grad Dip Nat Res;

- Co-Chair CEWG; SLA Climate Action Group Co-convenor;

Suzannah Mitchell, B Eng-Environmental Engineering (Hons)

- ESAC Member; Environmental Sustainability Manager, University of New England;

Dorothy Robinson, Adjunct Professor (UNE)

- (Suspended) Chair ESAC⁸; (suspended) Councillor ARC; Senior Statistician, University of New England

David Stellar, B. Eng, FIEAust

- Member Zero30 Community Committee; Former Director ADC Public Infrastructure;
Retired Local Government Engineer; Armidale Tree Group Inc. President;

Helen Webb, B.Sc

- Convenor SLA Climate Action Group; ARC Environmental Champion, 2019;
Presenter of the Climate Emergency Declaration to Council, 2019;

The report was predominantly co-authored by Helen Webb and Mahalath Halperin, with assorted input from the working group members, plus outside expertise and comment from Pats Asch, Dave Carr, Rachel Lawrence, Sara Schmude, Bec Smith and Karle Vernes.

⁶ See Appendix 2 for Climate Emergency Working Group Terms of Reference & EOI.

⁷ During the preparation of this report, Ms Halperin was SLA Convenor but has retired on 2 July, 2020 after a 3 year term.

⁸ Note that at the time of the CEWG appointment, Dr Robinson was both a Councillor and Chair of ESAC: However, all ARC Councillors were suspended in June 2020, and thus also membership of both ESAC and CEWG suspended for the time being.

3. Initial Priorities

Priorities

The Interim Input report was sent to Council in April, 2020. This report was produced in a very short time frame, and consequently, with more thought and time, the bulk of the following report has **rearranged some categories and issues**. However, the principles of the priorities remain the same.

The table shown was included as the proposed actions and projects for consideration into the 2020/2021 Council budget. Whilst there are many more projects to consider (see following) these were prioritised as the main ones to consider initially as determined by CEWG overall.

a) Reduce greenhouse gas emissions, aiming, by 2030, for no additional contribution from our region to the global temperature rise					
		Council operations	Community Engagement	Community Assistance	Potential specific projects
a)1	All Electricity sourced from renewable energy	✓	✓		PV array on Malpas
a)2	All other energy from renewable sources	✓			
a)3	PVs onto all Council facilities	✓			
a)4	Upgrade facilities for energy efficiency	✓	✓	✓	Insulation under CAB; Energy efficient retrofits; Audits;
a)5	Reduce emissions from wood heating		✓	✓	Enabling actions from WSAG Report group
a)6	Alternative vehicle fuels	✓	✓		Council Greenfleet; Enhanced bike use facilitation
b) Adapt to current and anticipated climate change impacts *					
b)1	Risk analysis on outcomes of climate change	✓	✓	✓	On Council operations, whole of LGA and community generally
c) Reduce atmospheric concentrations of greenhouse gases, e.g. sequester & store carbon in trees & soils*					
c)1	Wide-scale tree planting & carbon sequestration	✓	✓	✓	Dumaresq Dam planting; Enabling farmland; Minimum planning requirements;
c)2	Reduce agricultural emissions		✓	✓	Climate Solutions Fund access; Local Food; Regen Agricultural hub;

Table 1: Prioritised actions from the CEWG Interim Input Report, April2020

- **Council Operations** – actions taken by Council directly, such as facilities and operational activities; This also relates to less tangible issues such as planning and regulation;
- **Community Engagement** – actions where Council engages the community to educate, raise awareness and facilitate further discussion and action;
- **Community Assistance** – actions where Council can facilitate proactive actions by the community (residential, individual, business, industrial etc) such as better planning, rebates, etc.

* Note that these sections have been rearranged, and emissions from agriculture moved under Part A for emissions reduction

4. Process

Principles

In order to assess the recommendations proposed throughout this report, these should be aligned with a valid set of principles as appropriate to the intent of the Climate Emergency Declaration. In enacting the process of both making the declaration then taking action to implement the declaration, there is strong opportunity for Armidale Regional Council to become very inclusive of all its residents, businesses and associations, thus setting a high benchmark for good communities in general.

- It is essential that the process involves non-partisan whole-of-community engagement that fosters collaboration between Council members, staff, residents, businesses and educational institutions and adopts a commitment to science-based policies that make climate a first priority of government and of the community.
- By so doing, this will strengthen our democracy by involving the community in decision-making.
- Inclusiveness means taking action to empower our Indigenous residents and their leaders.
- Social justice for all residents should be at the heart of our decisions.
- Engage with local businesses, Council staff and other institutions to build an understanding of the risks, the pace of change and what they can do to cut emissions and lend their support to a whole-of-community transformation.
- There must also be an emphasis on the benefits of action, and in building a more inclusive, safer community, not just the danger of inaction.
- All Council decisions should be informed by duty of care to ensure the safety of our residents, which includes planning for events that are likely to occur e.g. increased frequency and severity of drought, decreased availability of regional water, increased likelihood of intense fires, probable increase in population leading to higher demands on infrastructure, education, water, food, jobs, and so on.
- Ensure enough flexibility to respond to the unexpected.
- Support the transformation of local agricultural practices to respond to climate change.
- Fiscal responsibility must be calculated in terms of the above principles.

In line with Council's EcoARC Greenprint, planning should take into account at least six overlapping categories: energy; the built environment; transport; agriculture; biodiversity, vegetation, local food; and waste plus consumption. It is important to keep at the forefront of all decisions – planning, action and so on – that the environment underpins all these issues.

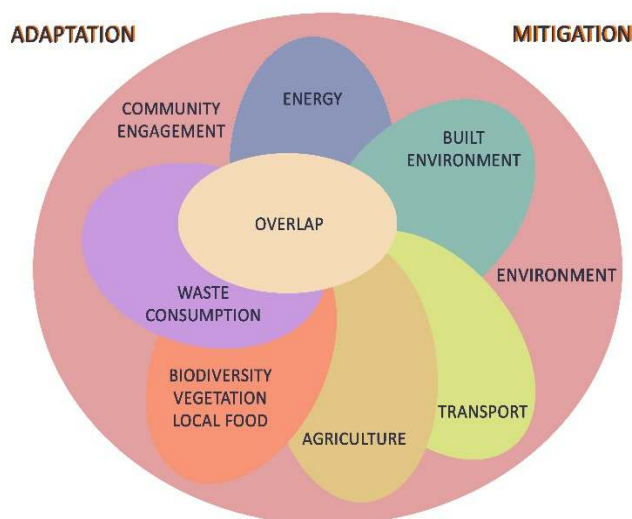


Diagram 1: Inter-relation between all decision making

Source: Patsy Asch, Armidale 2020

5. Recommendations

Part 1. Reduce Greenhouse Gas Emissions (GGE)

“Reduce Greenhouse Gas Emissions, aiming, by 2030, for no additional contribution from our region to the global temperature rise”

1. Council Planning & Strategy – make the climate planning framework coherent, and prioritise climate change action above other actions.

Climate change poses substantial risks and barriers to the achievement of the vision, key themes, strategic directions and community outcomes identified in Council's Community Strategic Plan 2017-2027. However, a transition to a zero emissions future also offers substantial opportunities for Council to be pro-active and build on, or tap into, initiatives already underway in the New England region, particularly the growth of renewable energy and the recently announced Government support for the New England Renewable Energy Zone.

The vision of regional growth should be based on careful planning with attention to potential adverse impacts or benefits for environment and community, availability of resources such as water and energy, potential to increase or decrease greenhouse gas emissions, existing and potential future infrastructure and employment.

We note that the ARC's Regional Growth and Place Activation Advisory Committee (RGPAAC) initial list for short, medium and long term actions to be taken to revitalise the economy as the Covid pandemic is managed, also includes attention to some similar veins such as renewable energy and local food production, and thus there is potential for coordination and synergy here.

Short term:

- In order to facilitate effective cross-departmental action, identify within Council a leader – a Climate Champion (an individual or small core team with the seniority and influence to implement change). The focus of the Champion will be to plan and facilitate action across the organisation, facilitate ongoing stakeholder engagement, monitor progress and hold people to account, challenge business-as-usual approaches, and help to find beneficial solution.
- Identify and prioritise actions that are consistent with the goals of the Climate Emergency Declaration and with Council's current planning framework, with emphasis on those that are likely to have greatest positive effect (particularly in relation to current base level emissions as well as cost effectiveness); In particular those that build on work already started arising from ARC Community Strategic Plan 2017-2027 and the EcoARC Greenprint for a sustainable future.
- Incorporate the above priority actions into ARC's operational plan and budget.
- Continue collaboration with University of New England (UNE) and Zero30 towards no additional contribution by ARC LGA to global temperature rise by 2030, achieving Climate Active Carbon Neutral Standard (formerly the National Carbon Offset Standard)⁹ by 2030.
- Maintain on-going communication and liaison between Council and its relevant committees including Environmental Sustainability Advisory Committee (ESAC), Regional Growth and Place Activation Advisory Committee (RGPAAC), Community Wellbeing Advisory Committee (CWAC) and their working groups, as well as community groups such as Sustainable Living Armidale (SLA), Southern New England Landcare (SNELC), and groups seeking or implementing climate change actions.
- Adopt and implement a Sustainable Procurement policy with procedures that support socially just work practices and environmentally sound sources and, where possible, support Australian and preferably local businesses and skills. Procurement policy should take into account a range of

⁹ www.ipaustralia.gov.au/sites/default/files/certification_rules/1369520.pdf
www.climateactive.org.au

factors (such as priority energy efficiency, reducing water consumption, use of recycled materials, reducing waste and single use plastics and so on).

- Facilitate (via planning) and incorporate small-scale co-generation measures into the design of new developments (such as the new Airport Business Park).
- Implementation of these strategies and plans (and following for medium and short term also) should be staged and occur concurrently with their development.

Medium term:

- Develop an overall Council strategy for council operations that is consistent with the Climate Emergency Declaration and the goals of reducing greenhouse emissions, adaptation to climate change and carbon sequestration. This would incorporate –
 - a Net Zero Emissions / Renewable Energy Strategy and Action Plan (with short, medium and long term targets and costed actions),
 - a Plan for Carbon Sequestration,
 - a Climate Change Risk Assessment and Adaptation Plan for Council, and,
 - where relevant to council jurisdiction, the community;

Strategies anchored to corporate objectives will add strength to potential funding grant applications.

- Review ARC Local Environment Plan (LEP) to incorporate flexibility of zoning in the context of climate change, especially where possible zoning of agricultural and environmentally sensitive land.
- While Council might not be able to specifically direct changes within the community, all planning should take into account Council's role to influence community outcomes for the greatest benefit (such as Council's highly successful 2019 program to reduce water consumption in the face of serious water shortages). Due to the urgency of the need for action and consistent with the zero emissions aim for 2030, it is recommended these strategies and plans should be placed directly underneath the Community Strategic plan, in turn informing underlying strategies and plans such as the Economic Sustainability and Development Strategy.
- Formalisation of a Grant Development Strategy, developed with assistance from CEWG, ESAC and Council support staff to best utilise available corporate and community knowledge (see Section 7).

Long term:

- Council must ensure that the elements of its Integrated Planning Framework are consistent with the priority of action towards a safe climate.
- Ongoing evaluation of implementation of strategies and plans, and where necessary making appropriate changes, to facilitate the best outcomes towards zero net emissions by 2030, increased community resilience to climate change impacts and drawdown of greenhouse emissions.

ARC collaboration with other councils and organisations:

- Collaborate with other LGAs in the New England region, including with the New England Joint Organisation (NEJO)¹⁰ to amplify and strengthen initiatives towards reducing greenhouse gas emissions, carbon sequestration and adaptation. This aligns with NEJO's aims for sustainable economic growth, and educated, healthy and connected communities.
- Work with resources such as the Z-NET Blueprint, a model created for rural towns, villages and regions to be able to assess and design their Z-NET plan to achieve the goal of 100% renewable energy and beyond. Utilise the approach taken, the logic and principles applied in assessing options and the framework used for developing the implementation plan¹¹.
- Likewise refer to resources available through other bodies such as C40 Cities¹², Cities Power Partnership, Beyond Zero Emissions¹³, Zero Carbon Communities.¹⁴

¹⁰ nejo.nsw.gov.au

¹¹ zneturalla.org.au, znet.org.au/hepburn

¹² www.c40.org

¹³ bze.org.au

¹⁴ bze.org.au/zero-carbon-communities

2. Specific Reduction of GGE

2.1 Undertake steps towards developing a Community Net Zero Emissions Strategy

In line with the issues identified in the NSW Government Draft Net Zero Guidance for NSW Councils¹⁵ -

- expand engagement of stakeholders (build on engagement already in progress through ongoing collaboration with UNE and other stakeholders via the Zero30 project and the community via the Climate Emergency Working Group of the Environmental Sustainability Advisory Committee).
- get to know your community greenhouse gas emissions profile,
- establish a net zero emissions target,
- identify emissions reduction pathways,
- develop and implement your net zero strategy,
- track your progress (monitor, evaluate and review) and
- share your success.

These principles are further detailed in the NSW Climate Change Policy Framework, NSW Electricity Strategy and New England North West Regional Plan (NENWRP) which provide additional information¹⁶.

a) Emissions Profile

For the purposes of this report, information on ARC emissions is sourced from Snapshot NSW¹⁷. This resource is designed to help identify the highest greenhouse emissions sectors, thence actions that can be taken to reduce and raise awareness about CO₂e emissions. Snapshot has been generated from 'top down' or state level data on the volume of greenhouse gases emitted within Armidale LGA - and the different sources of these emissions (refer Table 1). Snapshot should be used alongside local data sets where more detail is needed.

Source		Sector Emissions (t CO ₂ e)	% of Total
Electricity	Residential	96,400	11.96
	Commercial	60,500	7.5
	Industrial	95,800	11.88
			31.34
Gas	Residential	Not specified	Not specified
	Commercial	Not specified	Not specified
	Industrial	Not specified	Not specified
Transport	On road	122,800	
	Domestic air travel	19,500	
			17.65
Waste	Landfill	9,400	1.75
Agriculture ¹		397,100	49.26
Land Use ²		-11,400	
Total (net)		790,100	100.00

Table 2: Armidale region's 2017 Greenhouse Gas Emissions by Sector¹⁵

1. Emissions from agriculture are presumed to be based on the number of livestock in the region and estimates of the amount of methane emitted.
2. Land use data (see above table) is not defined on the web page but is a negative value and is presumed to be an estimate of the change in the amount of carbon stored in trees - based on LULUCF in Australia's emissions inventory.

This profile is based on 2017 emissions and may have significant omissions or errors - for example, cattle numbers in the region decreased significantly during the 2018-2019 drought; emissions increased due to the 2019 bushfires; and the contribution to greenhouse emissions of domestic use of gas is not included, nor are methane and black carbon emissions from burning wood for heating in Armidale. Also,

¹⁵ www.environment.nsw.gov.au/topics/climate-change/net-zero-plan

¹⁶ www.environment.nsw.gov.au/topics/Climate-change/Policy-framework
energy.nsw.gov.au/government-and-regulation/electricity-strategy

¹⁷ www.planning.nsw.gov.au/Plans-for-your-area/Regional-Plans/New-England-North-West

¹⁷ snapshotclimate.com

it is not clear which sector institutions such as local government, education and health care facilities are classified in with regard to electricity, transport and waste emissions, or what proportion of each sector is attributable to food production and distribution. Nevertheless, the profile gives a broad estimate of the proportional source of emissions for our region and therefore the sectors in which emissions reduction might be the most effective in reducing overall emissions.

Recommendations:¹⁸

- Armidale Regional Council join and contribute to Snapshot in order to feed information in and update information as it becomes available.
- Utilise the Project Zero30 collaboration between ARC and UNE to provide more accurate information with further breakdown of emissions from government, educational and health institutions and commercial, business and industrial emissions.

b) Establishment of a Net Zero Emissions Target.

This is a critical first step. For the purposes of this report ARC Zero Emissions target should be taken as 2030 goal based on Armidale Regional Council's Zero30 collaboration with the University of New England (UNE).

- Establish a Net Zero Emissions Target in conjunction with UNE Zero30 with *realistic and viable* outcomes.

2.2 Identify Emissions Reduction Pathways¹⁹

Planned reduction of greenhouse gas emissions should be based on the emissions profile and further refined as more detail regarding emissions and their sources becomes available. The NSW Government (Adapt NSW) Western Enabling Regional Adaptation New England North West Region Report (2017) has developed transitional models for key regional systems, including energy, and identifies actions that can be taken towards achieving the following aims:

- a decentralised renewable energy system with large scale renewables,
- net zero emission towns,
- electric vehicles and supporting infrastructure,
- green and active local transport options,
- emissions reduction actions accepted and widely supported by the community, and
- clean-energy jobs contributing to employment and the regional economy.

The recommendations in this report are all consistent with the aims of this model.

The steps in the pathway towards cost-effectively achieving significant levels of renewables are identified in the Northern NSW Renewable Energy Blueprint for Local Government²⁰ as follows:

- a) Reduce energy demand (energy efficiency, technology upgrades, sustainable growth)
 - b) Produce renewable energy (behind the meter, mid-scale)
 - c) Purchase renewables / offsets
- Investigation by Council for options for NSW Government funding that may be available to support some of these initiatives.

a) Council Reduce energy demand (energy audits, education, behaviour change, technical modifications)

The most cost effective way to achieve emissions reductions is to implement energy efficiency combined with onsite renewable energy initiatives in council operations. Efficiency and onsite renewables can

¹⁸ Note that Recommendations are listed throughout each section as relevant to the topic and discussion

¹⁹ The Z-net Hepburn Community Transition Plan provides a succinct example of a plan for a local community to set targets and achieve zero net emissions

²⁰ www.olg.nsw.gov.au/councils/policy-and-legislation/guidelines-and-policy-information-resources-for-councils/northern-nsw-renewable-energy-blueprint

typically reduce a local government's operational energy use by 20-40%²¹ depending on past initiatives, age of equipment and controls and available land and roof space. Purchasing green energy can still contribute in meeting a zero emissions goal by 2030 (see 2.2.c).

Council Energy audits

Energy use audits provide baseline information and are useful in identifying those changes (behavioural change and technical modification) that can result in the greatest gains in energy efficiency.

- Evaluate the effectiveness of actions arising from energy audits that have already been carried out for some areas of ARC buildings (Civic Administration Building, previous Library - now vacant, Water Treatment Plant, Airport - now redeveloped, and Monkton Aquatic Centre) and operations such as street lighting. Where justified by the audits, identify projects that are yet to be completed and make recommendations for their completion.
- Carry out additional audits to monitor effective changes, identify high emission areas and those areas with the greatest potential for change and form a basis for further action arising.
- Inform the community about improvements in energy efficiency and savings.

Council Education/Behaviour Change

- Educate staff with the energy audit results and the identified changes in behaviour needed to reduce energy demand (such as turning off lights, electrical equipment turned off at the wall, and energy efficient operation of air conditioners); as well as general behavioural actions that reduce energy demand (such as appropriate dressing, open/close doors and windows).

Council Technical modifications

- Prioritise energy efficiency and emissions reduction when purchasing new plant and equipment.
- Replace energy hungry technologies with newer, more efficient technologies where the energy cost of replacement (including the embodied energy in production) does not exceed the gain in energy efficiency (over a life cycle).
- Reduce energy losses from buildings through improved and upgraded fabric, such as the previously considered option of installing insulation under Armidale Council's administration building, above the below ground level car park.
- Incorporate minimum energy efficient design criteria into construction of any new facilities – such information is readily available from many sources, including in regards to the building design, building fabric and materials systems, and energy requirements.

b) Council Produce Renewable Energy (Transition from coal-fired electricity to renewable sources) aiming for 100% renewable energy source for electricity by 2028

It is important in the context of climate change that there is a rapid transition from fossil fuel energy to renewable energy rather than continuation of fossil fuel energy production as well as renewable energy growth. The New England North West Regional Plan 2036²² seeks growth of New England North West as the renewable energy hub of NSW. The opportunity exists for ARC to align its planned changes with NSW government initiatives and become a leader in renewable energy in the area and to take advantage of possible funding opportunities.

- Expand Council-owned renewable energy generation capacity in parallel with energy efficiency measures to achieve cost effective emissions reductions.
- Expert advice regarding quality and durability of new equipment, and monitoring of performance and efficiency of existing renewable energy installations, is essential in order to avoid undetected failures in productivity and future poor choices in quality of equipment²³.

²¹ www.energy.gov.au/business/large-businesses

²² www.planning.nsw.gov.au/Plans-for-your-area/Regional-Plans/New-England-North-West

²³ Refer article highlighting the risk of "performance issues" and significant reduction in output over time at a large scale solar farm - reneweconomy.com.au/performance-issues-hobble-output-at-ground-breaking-solar-farm-39496

- Provision should also be made for ongoing maintenance of facilities and preference given to employment of local installers and maintenance providers.

Energy Generation from Solar Panels

- Complete planned installation of solar panels on existing Council buildings and facilities –
 - Solar panels installed on roofs and land at Council facilities can partially or fully supply daytime demand for energy. If sized correctly, most of the renewable energy generation can be used directly without exporting anything to the grid. An update of ARC's energy audit should identify priorities for additional renewable energy installations.
 - Solar Panels have been installed at Armidale Information Centre, Kolora Aged Care, Armidale Sewerage Treatment Plant & Works Depot, and Guyra Aquatic Centre (underway). Information available to the Climate Emergency Working Group indicates that funding for solar panel installation is not fully expended to date (April 2020). Council should establish whether all planned installations have been completed and investigate the best options for further installations and expenditure of remaining funding.
- ARC is well placed in that it owns Armidale's and Guyra's water and sewer assets. Additional PV panels to power ARC's water and sewage treatment plants and waste facility could be investigated along with the potential for installing solar panels on land purchased by Council for the new waste facility. There is potential to use the sewage lagoon structure and the water surface of Malpas Dam to accommodate floating PV panels.
- Solar hot water and heat pumps provide additional options for renewable energy and efficiency. Energy audits can highlight locations where these may be the best option.

Energy Generation from Micro / Mini hydro

- Reconsider the installation of a turbine placed near the Armidale Water Treatment Plant to utilise the energy generated from the head difference between Malpas Dam and Armidale. The project has been scoped and is on file and could be investigated and funded through loans and/or increased water charges or levies over a small number of years.

Energy Generation from Pumped Hydro

- A number of potential local sites for pumped hydro have been identified by ANU²⁴, with funding from ARENA already allocated to investigate the Oven Mountain proposal²⁵. Council should be pro-active in investigating these to assess those with best potential and least environmental impact, and identify ways ARC can facilitate the most suitable projects²⁶.

Peer-to-peer trading

- Once changes in energy regulation are adopted to allow for electricity sharing between different solar installations, Council should take advantage of low cost renewable energy that is locally generated and stored through peer-to-peer trading. A pilot project implemented in Byron Bay Arts and Industry Estate Microgrid that was approved as a trial by the NSW government and was led by Byron Bay-based community-owned energy company Enova Energy in collaboration with Essential Energy. There is potential for Council to lobby the State Government for regulatory changes or an exemption and to set up peer-to-peer trading on Council-owned buildings or support business initiatives for peer-to-peer trading on buildings in the CBD.

Mid-scale Renewable Energy (500kW - 15 MW)

- Investigate options for Council to take on mid-scale energy generation and thus a supply role to energy retailers. Renewable energy generated by Council-owned facilities can be used to

²⁴ energy.anu.edu.au/research/highlights/anu-finds-22000-potential-pumped-hydro-sites-australia

²⁵ arena.gov.au/news/pumped-hydro-plant-could-unlock-new-england-renewable-energy-zone/

²⁶ It is important that ARC bases its forward planning on up to date information from the Australian Energy Market Operator (AEMO). Refer renew.org.au/renew-magazine/renewable-grid/transition-delayed indicating anticipated revisions to the draft 2020 Integrated System Plan.

provide supply for Council's own electricity use. Subject to available space, the system(s) could be sized large enough to meet a significant proportion of the electricity consumption of all council sites. Local generation would also employ local people, further signalling Council's commitment to renewables and emissions reduction to the community. All renewable energy projects 'in front of the meter' must have a retailer to sell the energy to the market. Caution is needed as there is a future risk that the grid may become saturated with solar energy during peak production times and that there will be constraints placed on supply to the grid.

- Consider the potential for supporting the establishment of a small renewable energy generation network owned by the community or co-owned between ARC and the community. If Council was a co-owner, this would provide return on investment as well as supporting the local community.

Battery storage

- Assess the need and potential for battery storage to help maximise the value of renewable energy systems in future and help to further reduce grid costs.

c) Council purchase renewable energy (Transition from coal-fired electricity to renewable sources)

A renewable electricity goal could be achieved by simply purchasing electricity from Greenpower® (energy supply offset from renewables) or a renewable energy Power Purchase Agreement (PPA), thus offsetting emissions from fossil-fuel electricity. Groups of organisations can now buy renewable energy from specific renewable energy projects (corporate PPAs), enabling purchasers to identify the source of their renewable energy. The performance risk sits with the developer. Organisations enter into these agreements primarily to lock in future energy prices and to meet carbon reduction or renewable energy targets where this can be achieved at no/minimal cost and with no greater risk than purchasing regular grid power.

Council Negotiate a Power Purchase Agreement.

- ARC could play a lead role with the New England Joint Organisation of Councils to negotiate a power purchase agreement with an energy producer / supplier that can reliably meet Council's energy needs. This is especially so in light of the recently announced REZ² which will potentially be an exporter of energy from the region. In considering options, rather than seeking the cheapest option (which could likely involve big corporations with heavy investment in fossil-fuel based energy) give weighting to energy producers that will feed back into the economic base of the local community. Formal agreements by government and industry to purchase renewable energy helps to make it more affordable. Note that in the current market, the period of a renewable energy contract is much longer than a regular electricity contract (7-10 years).

2.3 Identify Emissions Reduction Pathways for the Community

Council is a role model in the local community for energy use and encourages and supports energy efficiency in the broader community. ARC's community engagement towards reducing water consumption provides a blueprint for supporting the community in energy efficiency. The ARC collaboration with UNE on the Zero30 project provides opportunities to apply for funding and develop joint projects to support energy audits and efficiency gains by businesses and institutions.

a) Community Reduce energy demand (education, energy audits, behaviour change, technical modifications)

Community education and information is one of the main ways in which Council can help and encourage the community to act to reduce greenhouse gas emissions and save money. A community that is educated, informed and literate regarding climate change, renewables and other abatement measures, and is supported by its local government, can be empowered to make the changes needed.

Community Package

- Council, in association with the community, develop and implement programs focussed on engaging and working with residents, businesses and institutions towards undertaking energy

audits, reducing energy demand and making the behavioural changes needed to achieve energy use reduction, as well as generating or purchasing renewable energy. ARC's program to engage whole-of-community in behavioural change to reduce water usage was very effective in reducing per person usage from 240 L per day to 160 L per day. A similar model could be adapted for energy usage. Employment of a project officer to run these programs would greatly enhance its potential success. Funding could be sought through the state government for this. This could also involve revisiting SLA's 'I Can Do It' program which assisted households in reducing their energy demand. These programs and processes might include, but are not limited to, the following –

Energy audits

- Widespread energy audits and assessments are needed for households, businesses and institutions as they provide baseline information and can identify those changes needed (behavioural change and technical modification) that can result in the greatest gains in energy efficiency. SLA is planning to set up energy assessment opportunities for households by trained volunteers, while professional audits²⁷ are recommended for business and institutions. UNE has conducted audits and implemented recommended changes in some areas of its operations which can be evaluated, built on and expanded.
- Work with the community to promote and encourage above said energy audits by community, business and institutions to provide a basis for improvements in energy efficiency.

b) Facilitate and encourage Renewable Energy Generation in the community

- Foster installation of rooftop solar for households (5 kW systems recommended), businesses (such as high-energy-use shopping centres) and institutions. Give particular consideration to options for providing renewable energy access to low-income households (such as private/public funding for a Rolling Solar Scheme for low income housing). Provide planning for installation of PVs on new homes by 2023, potentially providing the basis for entire solar suburbs or 'solar gardens'.
- Investigate community energy connectivity. This could include Distributed Energy resources with consumer-led investments into a 2-way grid (refer to report by Australian Energy Market Operator²⁸. This could also be relevant for businesses.
- Lobby NSW government to support ways for businesses and households to share electricity in a peer-to-peer system (refer earlier comments) that lowers electricity costs and emissions while also supporting the grid; and to urge that all investment in poles and wires also supports the transition to renewable energy.

Battery Storage

- Facilitate opportunities for the community to benefit from NSW Government plan to support, through interest free loans, the installation of up to 300,000 solar-battery systems across the state over a period of 10 years²⁹. This program can potentially add up to 3000 MW hours of storage into the NSW energy system, hence helping with ARC's Zero30 goal.

c) Facilitate and encourage Renewable Energy Purchase in the community

- Educate the community regarding the benefits of purchase of green power where connection to locally generated renewable energy is impractical.

d) Energy Efficiency Options for Heating

Modification of ambient temperature is a significant component of energy consumption. Due to its topography, emissions from wood heating are exacerbated in the Armidale City area, with increased

²⁷ www.nabers.com.au

²⁸ aemo.com.au/en/initiatives/major-programs/nem-distributed-energy-resources-der-program

²⁹ www.nsw.gov.au/news/interest-free-loans-for-battery-systems

emissions of methane and black carbon (potent shorter term greenhouse gases) by wood heaters. An accurate estimate of these emissions in Armidale is not yet available, though there are long-term records of PM2.5 levels.

Use of inefficient or poorly operated wood heaters for home heating also contributes to unacceptable levels of air pollution in winter in the Armidale City area. The high levels of air pollution detected as a result of bushfires in 2019-2020 further highlighted harmful effects, and provides additional incentive for ARC to act effectively towards minimising pollution from wood heaters.

- The report³⁰ prepared by ARC's Wood Smoke Advisory Group (WSAG) provides recommendations for strategies to address the wood smoke issue in Armidale. The report notes that Reverse-cycle air conditioners (heat pumps) have become a reasonably cost-effective method of heating in Australia and lists advantages and disadvantages of these. As well as being energy efficient if used properly, they can be run during the day for pre-heating using free in-house solar energy (if available), as well as pre-cooling for summer.

Reduce emissions from wood heating

Baseline information is needed, although historical PM2.5 levels are available. Enactment of the recommendations from the WSAG will assist in reducing wood smoke and therefore the emissions created.

- Obtain baseline information through ARC and UNE Zero30 collaboration to better quantify the contribution of wood heaters to Armidale region's overall emissions and make research-based recommendations on reducing CO₂, black carbon and methane emissions from wood heaters.
- Council educate both staff and the community on recommendations re behavioural and technological changes to reduce energy loss (improved building fabric), exclusion of draughts and recommended changes to operation of heating and cooling devices (refer WSAG report for details)³¹ and the benefits of replacing inefficient wood heaters with low- or zero- emissions alternatives such as reverse cycle air conditioners.
- Establish the proposed Air Quality Working Group as soon as possible to enact the recommendations of the WSAG report.

e) Transition from Gas

Bottled gas is used throughout the ARC area by residents, businesses and institutions for cooking, heating water and heating buildings. The CEWG does not have information at this stage re the quantity of gas used or greenhouse gas emissions generated. While gas was popularly touted during the 1980s onwards as a transition fuel from coal-fired electricity to renewables³², this is no longer the case given the derivation of new gas sources, as well as the increased opportunity to leapfrog straight to renewable energy sources.

- Obtain baseline information through ARC / UNE Zero30 collaboration to better quantify the contribution of gas to the ARC region's overall emissions and make research-based recommendations towards reducing these emissions to zero by 2030.

2.4 Reduce transport emissions

a) Reduce transport emissions from Council operations

- Update Council's transport emissions audit to provide a basis for identifying potential priority areas for emissions reduction. This would include revisiting Council's participation in the NSW Greenfleet Program³³ (focused on offsets) and/or joining the NSW Clean Fleet Program³⁴ (focused on reducing emissions from diesel vehicles).

³⁰ slarmidale.org/wp-content/uploads/2020/06/WSAG-Rpeport-V6-26sep19-P.pdf

³¹ slarmidale.org/wp-content/uploads/2020/06/WSAG-Rpeport-V6-26sep19-P.pdf

³² www.greenamerica.org/fight-dirty-energy/amazon-build-cleaner-cloud/natural-gas-transition-fuel-myth#

³³ greenfleet.com.au

³⁴ www.rms.nsw.gov.au/documents/about/environment/air/clean-fleet-0606.pdf

- Collaborate with UNE Zero30 project towards increased research and development to enable early transition from fossil fuel powered transport to more efficient transport options powered by, or with potential to be powered by, renewable energy and batteries.
- Modify Council's vehicle and plant replacement program to ensure that opportunities are taken to replace current unleaded petrol vehicles with hybrid or electric vehicles; and diesel plant and equipment is replaced with equipment with power-plants that meet or preferably exceed, the current best emission standards. Aim to ultimately power these with renewable energy.
- Investigate locating plant and equipment strategically around the LGA to minimise travel time and therefore fuel consumption when travelling between jobs site and meetings.
- Educate staff regarding behaviour change and facilitate changes such as car-pooling to reduce emissions.
- Reduce long distance travel with opportunities for staff and councillors to communicate via webinar and by enabling staff to work from home where appropriate.
- Encourage bicycle travel on behalf of Council business by purchase of a fleet of electric bicycles for use by Council employees and representatives and / or by paying a transport allowance to councillors or staff who use their own bicycle (pay similar rates to those provided to public servants in other countries such as the UK).

b) Facilitate and support community reduction of transport emissions including safe bicycle travel

There was a noticeable increase in use of footpaths and cycleways for exercise by Armidale and Guyra residents in response to the Covid-19 restrictions. Recent installation by Council of signs on walking and cycling tracks is noted and appreciated by users.

- Prioritise ARC region-wide transport plan and actions to encourage, facilitate, improve safety of, and increase low emissions transport including cycling, walking and use of public transport. This may include or supersede the update of Council's bicycle strategy.
- Work with community to improve access and mobility for disabled people. (Whilst not specifically emissions reducing, still part of the bigger picture for a sustainable inclusive community overall).
- Engage with community to identify actions to facilitate pedestrian transport, (such as upgrade of footpaths and walking paths and safer road crossings).
- Develop and extend current walking and cycling tracks, ensuring inclusion in new residential subdivisions (possibly in conjunction with koala corridors).
- Identify and implement further key changes needed for safe bicycle transport such as community education, improved infrastructure including road marking to identify cycling routes on roads, secure parking and lock up options, better lighting, signage and maps.
- Engage with business to investigate options for, and implement reduction in, transport emissions, (such as transitions of Edwards Buses to electric vehicles powered by renewable energy).
- Facilitate integration of cycling and bus travel, especially improving the capacity of buses to carry bicycles.
- Engage with all levels of community to encourage transition to electric vehicles.
- Collaborate with stakeholders to identify optimum locations for fast charging of electric vehicles and support installations, encouraging renewable energy source for power³⁵. Additional to the

³⁵ myelectriccar.com.au/charge-stations-in-australia

www.mynrma.com.au/community/news-and-media-centre/nrma-fast-charging-new-england-north-west-tourism

existing EV charging stations at Armidale Showground, Quality Hotel Powerhouse, Armidale Motel and Petersons Armidale Winery & Guesthouse, more could be added at the Armidale Airport and Armidale & Guyra Visitors Centres as locations with the added benefit of encouraging tourism in our region. Vehicle batteries have potential to store solar energy, particularly from solar installations on roofed car parks.

- Work with Transport NSW to extend public transport options and train services generally, including those between Armidale and airport and adjacent towns and regions, (particularly faster and improved train links to Tamworth thence Sydney).
- Revisit potential for passenger and freight train services north to the Qld border.
- There is also considerable community support (but also non-support) for a bicycle rail trail north of Armidale on the unused northern rail corridor which Council has undertaken to investigate. The potential benefits of Council investment in this project need to be weighed against investment in other priorities consistent with greenhouse gas emissions reduction.
- Work with air services to reduce emissions arising from air transport. Note that the goal of increasing air travel in Council's Community Strategic Plan 2017-2027 is in conflict with the goal of decreasing greenhouse gas emissions.
- Investigate further options for reducing emissions arising from road construction and maintenance, building on recycling of road base material already underway.

2.5 Reduce emissions from Agriculture

Greenhouse emissions from agriculture are estimated on the Snapshot website³⁶ to be almost 50% of emissions overall in Armidale LGA. The basis for this estimate is likely to relate to the number of livestock (predominantly sheep and cattle) in the area and estimates of methane emissions from livestock digestion. Additionally, agriculture emissions arise from the use of fossil fuels embodied in inputs for fertiliser, pasture sowing and supplementary feed for livestock.

The 2018 Snapshot emissions estimate substantially reduced in 2019 due to extensive de-stocking during unprecedented drought conditions in 2017-2019. In early 2020 there is still a significant deficiency of post-drought livestock numbers compared to pre-drought. Following drought it takes some time for producers to return to previous stocking levels due to shortages, high costs of restocking, and the time lag for young cattle to reach sale weight.

The Snapshot emissions estimate shows that initiatives in the area of reduction of methane emissions from livestock are of value, although accurate emissions data would provide a better basis. Council has limited jurisdiction in the area of agriculture hence limited ability to influence outcomes.

The Zero30 collaboration between ARC and UNE and work already being undertaken by Local Land Services and Southern New England Landcare provides opportunities to develop joint projects to reduce agricultural GGE and to draw on government funding for this purpose.

The Federal Government has made funding available for this purpose via the Emissions Reduction Fund (ERF, established 2014 with \$2.55 billion available) and Climate Solutions Fund (CSF, established 2019 with a further \$2 billion)³⁷. The Clean Energy Regulator is responsible for administering the fund and approving contracts with the Commonwealth.

- Utilise the UNE Zero30 project to determine accurate emissions data for agriculture.

³⁶ snapshotclimate.com

³⁷ www.publications.industry.gov.au/publications/climate-change/climate-change/government/emissions-reduction-fund/about.html; www.cleanenergyregulator.gov.au/csf/Pages/Home.html

- Council collaborate with the UNE Zero30 project, Local Land Services (LLS) and Southern New England Landcare (SNELC) and local agricultural producers to identify funding opportunities and develop joint projects to reduce agricultural greenhouse gas emissions.
- ARC in the next 5 years implement UNE research recommendations for reducing livestock emissions through herd management strategies at Council's beef production operation located at the Waste Water Management Facility. This could provide a working example for the broader rural community.
- Lobby state government to revise land clearing laws to prevent further land clearing (ie retain tree cover).

Many of these issue are addressed by default if Regenerative Agricultural practices are implemented. As such some items are also referred to in Part 2 – Reducing Atmospheric Concentrations of GGE.

Reduce Horticulture emissions

The production of food and other plants in the region also creates similar emissions issues (other than animal digestion emissions) to the Agriculture industry overall. These include emissions from transport, delivery of product, machinery use, potential pollution of waterways and soils and so on. These can be similarly addressed through the above recommendations. While currently not a large local sector (compared to animal and fibre production), actions to reduce food miles with an increased local food supply and the consequent expansion of the local horticulture industry may ultimately increase emissions, so caution and best practice must be taken to ensure it does not produce new emissions issues.

2.6 Reduce Waste Emissions

2.6.1 Reduce emissions from human waste

Methane (a potent greenhouse gas) is emitted from primary digestion of sewage at ARC's two sewage plants – Armidale Sewage Treatment Plant and Guyra Sewage Treatment Plant. In Armidale, methane is harvested on-site and is currently used to operate a heating system for the primary digester, with excess methane flared to the atmosphere as CO₂.

- When Council investigates replacement of this ageing infrastructure, further use of methane capture for power, re-use as a fuel and potential for methane powered plant and equipment, should also be investigated and incorporated into the infrastructure renewal project.

2.6.2 Reduce emissions from Post-consumer waste

Waste is significant in the context of GGE as fossil fuels are used both as an energy source in the production and distribution of most consumer items (including production of food and availability of water) and fossil fuels are used as a raw material in manufacture of many items such as plastics.

Waste into landfill is responsible for approximately 1.75% of greenhouse gases in Armidale LGA³⁸. It is presumed that this estimate refers to operation and maintenance of plant and equipment involved in waste collection and landfill operation as well as release of methane from landfill. This figure would not take into account the fossil fuels used in manufacture and distribution of consumer items and the value of returning part of the fossil fuel value for re-use. In addition, the environmental and emissions cost of disposing of a consumer item are not factored into the price of the item, which means that the community overall pays those costs in terms of pollution and environmental degradation or measures to minimise pollution and environmental degradation.

As Council is responsible for waste collection, as well as the provision of landfill and recycling services, it is therefore in a position to have considerable influence over reducing waste emissions. ARC has been a leader in a number of waste management initiatives that have already enabled reduction of emissions from waste. These include recycling of paper, plastic, glass, metal including aluminium cans, building

38 snapshotclimate.com

waste and road materials as well as organic waste collection (City to Soil³⁹) and green-waste utilisation in production of saleable compost and mulch for use as soil conditioner, garden fertiliser and in conserving soil moisture. Recycling opportunities are influenced by positive engagement of the community as well as by the cost of recycling initiatives and the potential for cost recovery.

- Implement the strategic directions in the Waste section of Council's EcoARC.
- Revisit ARC's previous waste audit in order to assess effectiveness of interventions and provide a baseline for further emissions and waste reduction. In so doing, identify sectors with high contribution to waste and target with education and incentives.
- Investigate option to reduced frequency of non-recyclable waste collection (ie fortnightly collection of waste), while continuing or expanding organic and recyclable waste collection.
- ARC can further help to prevent items from entering the waste stream by influencing government initiatives that reduce single-use plastics, influence consumer choice in refusing unnecessary or high-emissions items, choosing more durable products, re-using and recycling rather than discarding.
- Tap into the recently announced grants program to develop new industry from recycled plastics⁴⁰, whether by forwarding ARC collection to other businesses, and/or establishing new local businesses
- Identify factors limiting success of previous or existing recycling initiatives, such as attrition of volunteers who recycle computer components leading the program to cease; insufficient undercover area at the Waste Transfer Station to protect items from deteriorating; balancing cost effectiveness with community benefits (such as mulch from green waste)
- Investigate incentives to encourage effective resource recovery such as paid or commissioned collectors, sorters and recyclers.

Refusing unnecessary or high-emissions items

With many unnecessary or high-emissions items available for consumer purchase in Armidale and Guyra, such as mass-produced clothing (with global statistics indicating major waste to landfill issues⁴¹), there is an opportunity to build on support for the local supply and manufacture, in particular the highly-prized local wool industry and support re-establishment of local or regional production of natural fibre, textiles and clothing as well as retail outlets and reduce emissions and reduction of waste.

- ARC community engagement and education programs could identify selected items to target initially and then follow up with further community engagement.
- Collaborate with local supply and manufacture, such as super-fine wool to re-establish local manufacture and natural fibre markets.

Recycling

- Continue to promote and encourage recycling and re-use of items made from fossil fuels when they are no longer useful, hence returning fossil fuels as consumer items for further use.
- Continue to promote and encourage recycling and re-use items that require substantial amounts of fossil fuels for manufacture and/or are composed of materials that are scarce or highly valued such as aluminium cans.

Reduce organic waste emissions from landfill (methane)

- Educate consumers to minimise their generation of organic waste by only buying what they need and where viable, recycling food scraps in-situ in compost or worm farms for their own garden use.

39 www.armidaleregional.nsw.gov.au/environment/waste-and-recycling/city-to-soil

40 minister.awe.gov.au/ley/media-releases/turbo-charging-recycling-nation

41 For wastage and emissions information, refer www.fibershed.org

- Expand City to Soil program to the commercial sector and institutions, collecting waste from restaurants, commercial hostel kitchens, food processors, university colleges, and the like.
- Work with UNE Sustainability officer to include organic waste for campus in the City-to-Soil program.
- Implement the proposed phytocapping design and reforestation of the landfill site at Long Swamp Road. A study has been completed on the closing of the landfill which would identify the value of phytocapping in offsetting the long-term fugitive methane emissions from landfill.
- Investigate the potential for manufacturing of biochar from organic waste for incorporation in carbon sequestration projects.

2.6.3 Reduce food emissions

The production, transport, storage, refrigeration, distribution, retailing, preparation and waste of food is responsible for a substantial proportion of global greenhouse gas emissions (up to 25% of the total where high emissions foods predominate). These emissions are attributed across all sectors such as electricity, transport, waste and agriculture sectors hence their connection to food is not easily identified.

Factors that help to minimise food emissions include consumption close to the point of production (locally produced food that is in season), using renewable energy sources for machinery and transport involved in production, using fertilisers, weed and pest control measures that are not made from fossil fuels in food production (organically certified foods) and choosing to buy low emissions foods that are minimally processed and packaged and do not require high energy storage for long periods. There is much potential for reduction of emissions through consumer choice.

- Council identify way to implement reduction of emissions from food production, transport and distribution, storage, preparation, retailing and waste.
- Council engage with community to identify and implement ways to encourage low emissions and low waste food choices.
- Amend planning policy to reduce food miles by better facilitating and encouraging food growing within city and town boundaries, including increased community gardens, food on footpaths and in parks.
- Revisit options for water restriction concessions for the growing of local food to encourage greater local production and therefore reduce emissions from food miles and packaging.

Part 2. Reduce Atmospheric Concentrations of GGE

“Reduce atmospheric concentrations of Greenhouse Gases via methods such as carbon sequestering, storing carbon in trees and soils”

If global greenhouse gas emissions were reduced to zero today, climate change outcomes would continue to manifest due to emissions already present in the atmosphere. Additional to ceasing to generate greenhouse gas emissions, excess carbon (and other greenhouse gases) need to be removed from the atmosphere and stored accordingly. One of the best ways to do that is carbon storage in soil and in biomass.⁴²

While reducing waste and other land-based emissions is also a way of reducing greenhouse gas emissions (as applicable to Part 1 of the recommendations) the practices involved in doing so – such as regenerative agriculture – will also contribute drawdown of carbon and other GGE.

1. Sequester Carbon through Agriculture

As noted in Part 1, greenhouse emissions from agriculture are significant in the ARC LGA. While beyond the scope of Council operations, encouragement of Regenerative Agricultural practices will assist in locking up carbon and improving soils, and therefore by default not only sequester carbon but also reduce emission (refer section 3.1 Regenerative Agriculture).

Additionally, within Council’s scope of influence is the following -

- Run a series of aggregated projects across a number of farms within the ARC in the arenas of
 - Soil carbon
 - Beef Herd Management
 - Plantation forestry
- Council Collaborate with the UNE Zero30 project to run a series of workshops to educate producers on current UNE research and the opportunities provided by the Carbon Reduction fund, with information on how the carbon market works in Australia and on aggregated carbon projects⁴³. This would facilitate evaluation of the viability of an aggregated approach at the regional level. The Council owned saleyards at Armidale and Guyra could provide a venue or an outlet for promoting such workshops.
- Lobby state government to revise land clearing laws to prevent further land clearing (ie retain tree cover).

2. Carbon storage / Drawdown of atmospheric carbon

Diverse solutions to climate change include removal of carbon from the atmosphere. There is potential for this to be achieved in part through innovative land use practices (including forest protection and afforestation), regenerative agriculture and agroforestry.

There is potential for Armidale Regional Council to collaborate with the UNE Zero30 project and with local revegetation initiatives to develop projects that achieve drawdown of atmospheric carbon as well as environmental and productivity benefits. The above mentioned Emissions Reduction or Carbon Solutions Fund provides substantial funding opportunities. Guidelines for the fund specify a number of methods defining how landowners can earn income from Carbon projects.

Approximately 70% of all Carbon reduction contracts under the current Emissions Reduction Fund scheme have been made with cattle or sheep producers across Australia and involve carbon reduction

⁴² 2040, *A Handbook for the Regeneration*, based on the documentary 2040, Gameau Damon, Pan Macmillan 2019

⁴³ Aggregation enables smaller farmers / participants to join together to make a larger project, or a larger farmer/participant to have a number of methods active on land under their control, but to trade them as one parcel of Carbon.

through retaining or enhancing native vegetation, revegetation, savannah burning management, soil carbon and or beef herd management.

- Drawing on UNE research that is being validated at the UNE Smart farm, Council take a proactive role as an advocate in our community to assist the rural community in reducing their carbon footprint and encourage the take-up of carbon storage in soils to offset livestock emissions.
- Council work with other councils to call for the introduction of a realistic carbon price ensure the real costs of carbon emissions are part of the decision-making process. Some activities Council is currently involved in will have to be stopped and the funds reallocated to carbon emission reduction operations and projects.
- Council take a proactive role as an advocate in our community to assist the rural community in reducing their carbon footprint and encourage the take up of carbon storage in soils to offset livestock emissions working closely with UNE research that is being validated at the UNE Smart farm.
- Council owns the saleyards in both Armidale and Guyra and could run education programs for livestock farmers on carbon storage and UNE research outcomes.
- Council operates the Effluent Re-use scheme at the Wastewater Treatment facility that usually sustains a herd of 400+ livestock and could in the next 5 years implement UNE research outcomes in management of the herd as a working example for the broader rural community.

2.1 Regenerative Agriculture

- Use the Zero30 project to determine the extent and nature of Regenerative Agriculture⁴⁴ (or similar such as Holistic Management⁴⁵, RCS⁴⁶ etc) in the LGA and its potential for sequestering carbon.
- ARC in collaboration with Zero30, Local Land Services, Southern New England Landcare and Armidale Tree group develop a series of Carbon reduction projects at the Regional Level with the aim of reducing / sequestering atmospheric carbon and with the added motivation for collaborative projects to benefit from the Carbon Reduction Fund. There is potential for aggregated projects across within the ARC region in the arenas of increasing soil carbon, reducing herd methane emissions and establishing tree / forestry plantations.

2.2 Tree Planting

The Armidale community has been engaged for many years in successful tree planting projects through Armidale Tree Group, Citizens Wildlife Corridors, Greening Australia, Southern New England Landcare, the High Country Biodiversity Project, and Armidale Urban Rivercare. Tree planting activities have additional benefits including biodiversity and wildlife corridor enhancement, improving water quality, improving public amenity and contributing to scenic beauty and people's enjoyment of public spaces. Tree planting and re-vegetation have an important role in absorbing and reducing greenhouse gas emissions as well as adaptation to climate change. Trees on farms help to modify climate extremes and also provide corridors for wildlife displaced by climate change.

A diversity of information is available on carbon sequestration through tree planting⁴⁷. The ability to store carbon can vary and fluctuates throughout a tree's lifecycle. Thus while agroforestry projects have potential to capture carbon to offset other emissions, it can be limited by the ability to accurately calculate the actual carbon absorbed.

⁴⁴ regenfarmers.com.au

⁴⁵ savory.global/hubs/australian-holistic-management-co-operative-limited

⁴⁶ www.rcsaustralia.com.au

⁴⁷ carbonneutral.com.au/faqs

- ARC in collaboration with Zero30, Local Land Services, Southern New England Landcare and Armidale Tree group assess opportunities for large scale tree planting and ecological restoration and develop tree planting projects for the purpose of carbon sequestration.
- ARC, in developing tree planting projects, considers the use of Council land and Crown land under its care and control. In addition to carbon sequestration, there is potential for ARC to grow additional harvestable wood for the building and construction industry and for ecological purposes to improve biodiversity.
- The Council-owned land adjacent to Dumaresq Dam (approx. 1600acres) that is leased to UNE for rural purposes could be partially removed from the lease and planted out over a twenty year period to replicate and expand the existing endangered grassy box woodland community growing around the dam and on the slopes of Mt Duval and enhance Koala habitat.
- Investigate options to participate in carbon offsetting services that help organisations to reduce their carbon footprint and achieve environmental goals. Council previously participated in Greenfleet offsetting vehicle emissions through planting of biodiverse native forests in Australia or New Zealand, and there are also options to offset functions, conferences and activities generally⁴⁸.
- Armidale Tree Group could take the lead in setting up a project or projects to form the basis for an aggregated Carbon market. In that case, the workshops would only need to explain the benefits of participating in an aggregated Carbon market and identify willing landowners.

Part 3. Adapt to Current & Anticipated Climate Change Impacts

“Recommended initiatives to reduce the severity of climate change risk and hence adapt to current and anticipated climate change impacts”

1. Identify Risks as a result of climate change

In assessing and determining how to move forward, it is important to determine what the current and anticipated risks will be as a result of inaction. The natural, social and economic systems of NSW will all be affected by climate change, requiring every sector of society to adapt. NSW councils are key players in adaptation to climate change, with responsibility for a broad range of functions that are likely to be affected, such as public infrastructure, local emergency responses, building regulation and planning, public health and environmental management. Early planning and preparation can minimise long-term economic, social and environmental costs to communities.

Regional information provided at the Adapt website can help to identify effect of the expected impacts of climate change on local communities, and identify opportunities to respond. The Regional Vulnerability Assessment (IRVA)⁴⁹ for Climate Change provides a process to help identify and understand regional climate vulnerabilities.

The NSW Government has both identified risks to local government and provided guidelines for adaptation and mitigation. This risk assessment guide⁵⁰ is focused on assessing the risks to council operations rather than wider community risks, but also acknowledges that councils should also carry out a process to consider these broader risks, in consultation with the community.

Local Impacts

The ARC local government area has its own unique set of geographical, environmental, economic and social circumstances, hence there is a need to identify effects and risks of climate change that are specific to the area. Rather than focusing on the background information, this report stresses the need for actions and thus the recommendations based on specific risk analysis for this region. As noted above, regional information from the Adapt website⁵¹ can help to identify how the expected impacts of climate change may affect local communities, and identify opportunities to respond. The report provides detailed information specific to New England and North West region, which have been used as a basis for further development of impact chains specific to the ARC region (refer Appendix 4).

Other resources include the IRVA as noted above. Local knowledge is important in identification of potential threats and response options and in helping communities prepare for climate change.

Definition of impacts and reactions are clarified as follows –

- Vulnerability is seen as the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes (IPCC 2001),
- Adaptation is defined as actions taken to reduce or moderate or adjust to the expected or actual negative effects of climate change and take advantage of new opportunities.
- Resilience is the ability of communities and settlements not to collapse in the face of crises such as adverse climatic conditions and water, food and energy shortages and their ability to respond to disturbance with adaptation. It may involve being more prepared for a leaner future.

The predicted alterations to ocean and climate systems, namely the impact of the Indian Ocean Dipole⁵², and more frequent El-Nino phases of the Southern Oscillation Climate driver⁵³, will significantly alter the ARC region in coming years, in some cases already impacting with the resultant severe drought and bushfires of recent years.

⁴⁹ climatechange.environment.nsw.gov.au/Adapting-to-climate-change/Regional-vulnerability-and-assessment

⁵⁰ climatechange.environment.nsw.gov.au/Adapting-to-climate-change/Local-government

⁵¹ climatechange.environment.nsw.gov.au/; including specifically Western Enabling Regional Adaptation New England North West Report

⁵² www.bom.gov.au/climate/iod/;

www.abc.net.au/news/2019-05-16/positive-indian-ocean-dipole-bad-news-for-drought-crippled-areas/11120566

⁵³ www.bom.gov.au/climate/enso/;

www.sciencedaily.com/releases/2019/10/191021153346.htm

Key areas identified

Areas identified in Armidale Regional Council's Planning documents, including the Community Strategic Plan 2017-2027 and ARC's Greenprint, are jeopardised by climate change. These include environment and infrastructure, growth, prosperity and economic development, community, living, air, water, transport, resilience, future, biodiversity. The potential for severe consequences of climate change is well documented⁵⁴ with impacts already occurring in the New England North West.

Consequence Rating	Criteria				
	Public safety	Local economy and growth	Community and lifestyle	Environment and sustainability	Public administration
Catastrophic	Large numbers of serious injuries or loss of lives.	Regional decline leading to widespread business failure, loss of employment and hardship	The region would be seen as very unattractive, moribund and unable to support its community	Major widespread loss of environmental well-being and progressive irrecoverable environmental damage	Public administration would fall into decay and cease to be effective

Table 3: Example of severe consequence rating, Australian Greenhouse Office guide (AGO 2006)

If the unprecedented drought and water shortage of 2019 had continued to the degree that Armidale ran out of water, some of these catastrophic outcomes could have eventuated. Similarly, the scale of the 2019-2020 bushfires had the potential to result in such catastrophic outcomes. This report stresses the need for actions and thus the recommendations based on specific identification of risks for this region.

In comparison, national and international responses to the 2020 coronavirus pandemic has potentially severe consequences for public safety and local economy and growth but does not directly threaten environment and sustainability which underpin food production and biodiversity. A co-operative national and global response, such as has occurred in response to the potential consequences of the Coronavirus Pandemic, has the potential to reduce the risk of severe consequences from climate change, which become greater the longer that action is delayed.

The introduction to Armidale Regional Council 2020-21 Budget notes that the 2019/20 financial year was highly unusual with the combined impacts of drought, fire, flood and pandemic in one financial year. Predicted climate change impacts mean that these impacts, identified as unprecedented and unusual, are highly likely to become more frequent and severe into the future. From a budgetary perspective in 2019/2020, the severe drought conditions negatively impacted Council's Water Fund by almost \$6 million. This included around \$3.2 million in net costs associated with drought response communications, rebate programs and bore drilling and around a \$2.5 million reduction in revenue from water usage charges resulting from decreased water usage. The risk posed by climate change impacts to Council's financial security as well as the community's water security is clearly demonstrated.

Analysis of Climate Change impacts so far

- ✘ *Sequential annual increase in average maximum and minimum temperature and seasonal shift with later onset of cold conditions and earlier onset of warm conditions, ground remaining warmer for longer, extended growing season and later frosts in spring (already evident from weather records, reversible only through reduction of atmospheric carbon / reversal of climate change).*
- ✘ *Changes in seasonal rainfall patterns - decreased winter rainfall, increased summer rainfall and changing water cycles.*
- ✘ *Increased incidence, duration and intensity of drought and water shortage, low rainfall combined with high evaporation, dust, dust storms.*

⁵⁴ www.environment.gov.au/system/files/resources/21c04298-db93-47a6-a6b0-eaaaae9ef8e4/files/risk-management.pdf

- ✘ *Increased hot days, heat waves*, episodes of prolonged and excessive heat (less frequent occurrence than at lower altitude due to cold climate but increasing impact with increasing warming particularly when associated with increasing incidence of drought and water shortages).
- ✘ *Increased incidence, intensity and severity of storm events* and associated weather events such as high velocity winds, heavy rain, hail and flooding.
- ✘ Decreased snowfalls and changed incidence of frosts including potential for *increased severity of frosts occurring later in the season* and during the growing season.
- ✘ *Increased duration of period of increased fire risk with increased frequency, intensity and severity of fire events* and reduced ability to reduce hazard and to manage fire effectively to protect life and property.

Potential Climate Impacts for New England Region

There is high risk across the board of varying issues as noted in the following table, with flow-on impacts which are complex and which affect a broad range of human impacts such as the natural environment, landscape, food production, livelihood and human health. Some of these flow on impacts are presented in tables (refer Appendix 4).

Potential Climate Impacts for New England Region								
Predicted & unfolding climate change outcomes	Natural environment	Built environment Housing & home environs	Food production & distribution (agriculture, horticulture)	Energy supply Communi- cations Transport & connectivity	Community cohesion Education Childcare	Business Livelihood Economy	Emergency response Governance & Service delivery	Health & wellbeing
Heat waves, hot days, episodes of prolonged & excessive heat	Impacts on fauna & flora, particularly threatened species Local extinctions Increased stress on trees & vegetation in public recreation areas	Existing buildings unable to cope, increased used of supplemental cooling	Compromised particularly if associated with periods of low rainfall	Increased use of air conditioners Increased energy demand Interruption to supply due to overload	School absenteeism Locals holiday elsewhere during hot periods People move to cooler regions	Loss of farm income, reduced viability Greater workload on farms	People seek cool public spaces	Increased stress and anxiety Human health impaired, increased mortality Challenge to keep outdoor workers cool Too hot to exercise
Increased incidence, duration and intensity of drought and water shortage Low rainfall combined with high evaporation Dust Dust storms	Ground hardens Prolonged desiccation and death of ground cover &/or plants Wetlands dry out Decreased water quality Pest & algae increase in water sources	Changes in gardening and household uses	Drying out of water storage for stock Reliance on ground water Water table depletion Death of or need to cull livestock due to shortage of water &/or feed. Disposal of carcasses - health issues Increased vulnerability of livestock to disease Changes in fertiliser usage Crop failure Reduced crop yield Decreased pollination	Increased use of air conditioners	School absenteeism Family members seek off-farm employment Social friction due to increased constraints and competition for water resources People leave the area / seek to move to 'better' regions	Productivity drops Loss of farm income & reduced viability Greater workload on farms Farmers need to buy water Unemployment in agricultural sector Collapse of markets Increased insurance claims & costs Increased commodity prices Decreased spending in region Decreased demand for	Water restrictions Changed attitudes to water use Water allocation conflict Policy and regulation changes Greater infrastructure costs Increased costs passed on to users Sporting injuries due to compacted surfaces - reduced participation	Increased stress and anxiety Adverse impacts on mental health Increased demand for medical services

	Potential Climate Impacts for New England Region							
Predicted & unfolding climate change outcomes	Natural environment	Built environment Housing & home environs	Food production & distribution (agriculture, horticulture)	Energy supply Communi-cations Transport & connectivity	Community cohesion Education Childcare	Business Livelihood Economy	Emergency response Governance & Service delivery	Health & wellbeing
	particularly threatened species Local extinctions Decreased pollination Competition between human land use & eco-system needs for resources eg water, grazing		Increased costs for producers & increased price of food. High cost of re-stocking			manufacturing services		
Changing water cycles Changes in seasonal rainfall patterns	Changes in wetlands and stream/river morphology Impacts on fauna & flora particularly threatened species Local extinctions eg snow gums Tree loss and increased dieback		Previously viable livestock or agricultural production no longer possible in the area Extension of invasive species			Productivity drops Loss of farm income and reduced viability.	Increased maintenance requirements for sporting fields	Increased vector borne disease Increased demand for medical services
Storms High winds Heavy rain Hail Snow and ice Decreased frost and/or increased frost severity	Trees down Erosion Instability of watercourse embankments	Property and infrastructure damage Destruction of glasshouses Increased demand for building and repair services Produce late to market	Damaged crops Injury or death of livestock from exposure Access to markets interrupted	Interruption to energy supply Communications limited or blacked out Damage to vehicles, roads, railway lines Interrupted / limited transport/ flights	School absenteeism	Loss of farm income and reduced viability Business interrupted Insurance claims	Increased demand for emergency services Emergency response times slower Maintenance & repair costs Council costs Access to services cut	Increased stress and anxiety Human injury and increased mortality
Fire	Impacts on fauna & flora particularly threatened species Injury & increased mortality to wildlife across extensive areas Decreased potential for population recruitment Local extinctions	Property damage - loss of homes, businesses and other infrastructure Increased demand for building and repair services	Damaged crops Injury or death of livestock.	Interruption to energy supply Communications limited or blacked out Damage to vehicles, roads, railway lines Interrupted / limited transport/ flights	School absenteeism Cancelled events that promote community cohesion Social friction and seeking to attach blame	Human exposure to effluent, chemical hazard, pollution Productivity drops or at a standstill Extensive insurance claims	Increased demand for emergency services Emergency response times slower Insufficient capacity to respond to the extent of the crisis and meet goals of protecting life and property	Human injury or death directly from fire or indirectly from smoke inhalation and associated illness Increased demand for medical services Volunteer fatigue

Potential Climate Impacts for New England Region								
Predicted & unfolding climate change outcomes	Natural environment	Built environment Housing & home environs	Food production & distribution (agriculture, horticulture)	Energy supply Communi-cations Transport & connectivity	Community cohesion Education Childcare	Business Livelihood Economy	Emergency response Governance & Service delivery	Health & wellbeing
	Air pollution from smoke Pollution of natural vegetation & waterways from fire retardants						Cancelled sporting events Volunteer fatigue	Decreased activity levels Social isolation
Flooding	Pollution, effluent and harmful chemicals in waterways Mechanical damage to vegetation Erosion	Property damage. Temporary relocation of residents Increased demand for building and repair services	Drowning of livestock Feed shortage for livestock Damaged or failed crops Food spoilage	Interruption to energy supply / blackouts. Interruption to communications Damage to transport routes Interrupted / limited transport/ flights	Access issues due to road closures	Access issues due to road closures	Cost of clean-up and maintenance	Loss of life from drownings Human exposure to effluent, chemical hazard, pollution Community disruption Stress on vulnerable people
Combined / cumulative impacts overall	Degradation of the environment, flora and fauna	Property values drop	Decreased agricultural productivity Change in crop selection	Increased demands	Increased pressures and disruptions	Increased regional unemployment Regional economy diminished Hard to attract people to region Tourism affected Increased insurance claims. Delayed payouts. Greater infrastructure costs Increased income support/ welfare claims	Emergency response time slower Increased demand for volunteers Volunteer fatigue Less productive workforce Policy and regulation changes Planning for water storage and improved efficiency of use	Vulnerable people particularly at risk / suffer from impacts. Increased demand for medical services Increased stress on hospitals Hospital staff work longer hours Demographic changes Regional decline Aging population

While effective global action to reduce greenhouse gas emissions and draw down atmospheric carbon is the only pathway to reduce the severity of predicted and unfolding changes identified above and return to a safe climate, local action is still essential and imperative.

- Council, potentially in conjunction with the Zero30 and relevant community representatives, hold workshops to inform the community regarding climate change risks and flow on impacts. These could be followed by focussed workshops for community members with expertise in different areas such as agricultural production, native species and ecosystem conservation, water management, built environment, and human health and wellbeing to enable identification of a diversity of possible interventions by Council and the community.

Impacts on water availability are highlighted as having the potential for the most severe consequences for the Armidale Regional Local Government Area.

2. Adaptation and Mitigation

As noted previously, **adaption** is defined as actions taken to reduce or moderate or adjust to the expected or actual negative effects of climate change and take advantage of new opportunities. **Mitigation** includes actions taken to limit the climate changes caused in the global climate by human activities. Mitigation activities are designed to reduce greenhouse emissions and/or increase the amounts of greenhouse gases removed from the atmosphere by greenhouse sinks.

Whilst many of the recommendations in Part 1 and Part 2 of the report address these issues anyhow, there are many interventions that have the potential to increase community resilience and reduce the severity of these flow on impacts. That is, adaptation and mitigation is more than just reducing GGE from energy use and other applications as highlighted in Parts 1 and 2 of the recommendations.

Further to those already highlighted, some possible interventions are included below; however the complexity of possible options is beyond the scope of this report.

2.1 Natural Environment

a) Water availability and water security

Council

- Complete 30-year Integrated Water Cycle Management (IWCM) Strategy and Secure Yield Model long-term assessment of the ARC's water infrastructure, supply needs and community expectations. Ensure that investigation is not weighted towards increase of storage capacity at Malpas Dam without proper assessment of alternative options including options for decreasing usage, upgrading existing infrastructure and increasing inflow.
- Plan for further grant applications to enable detailed planning, design and construction works to improve the region's water security.
- Identify and implement measures such as stock exclusion and revegetation to protect water catchments. This needs to be assessed in the context of increased blue-green algal contamination of domestic water storage due to increased temperatures and increased nutrient runoff due to livestock manure.⁵⁵ Further revegetation of Malpas and Dumaresq Dam catchments is consistent with the goal of carbon sequestration.
- Identify and implement measures to decrease evaporation from domestic water storage. Installation of floating solar panels on Malpas Dam has potential in this regard.

Council and community

- Engage with and inform community regarding environmentally sound options for optimising water security. Inform community regarding opportunities and potential barriers to security of domestic water supply in the face of predicted and unfolding changes to climate. For example, a costly elevation of Malpas Dam wall will not improve water security if there is insufficient rain or runoff to fill the increased capacity.
- Continue incentives for residential use of grey water and water storage in rainwater tanks.
- Council build on engagement started in 2019 with residents, businesses and institutions, in particular high water users, to bring about behaviour change and technical modifications to decrease water consumption and enhance efficient use of water.
- Work with UNE researchers to investigate potential for decreasing water usage particularly in the food production sector. For example, reduced stocking levels, rotational grazing and regenerative agriculture practices can help with water percolation and moisture retention in soils and water. Also, consumption by sheep is significantly less than that of cattle⁵⁶ hence there

⁵⁵ Council has not consistently implemented a recommendation by Southern New England Landcare to remove cattle from the catchment of Malpas Dam. Stock exclusion would help improve water quality and facilitate revegetation.

⁵⁶ www.agric.wa.gov.au/small-landholders-western-australia/livestock-water-requirements-and-water-budgeting-south-west

is potential for producers to re-evaluate their operations to retain farm dam supplies for longer periods.

- Continue to work with intensive horticultural operations to reduce their water usage. Tomato production at Guyra has incorporated water efficient design in more recent greenhouse construction. However, sufficient rainfall and/or underground water is still required in order to meet the design needs and expansion of intensive horticultural operations may need to be limited to ensure that domestic and underground water supplies are not depleted in the face of climate changes such as the unprecedented drought and water shortages of 2019.
- Facilitate planned joint workshops with agricultural producers

Council and State Government

- Council work with the NSW Natural Resources Access Regulator⁵⁷ to ensure that, in the face of predicted changes to climate, cumulative extraction of underground water will not exceed the overall capacity for underground aquifers to be replenished and will not reduce inflow into domestic water storage. The potential for reduced inflow into Malpas Dam due to depletion of aquifers from irrigation by bores, hence diminished flow from springs into waterways that feed domestic water storage must be carefully assessed.

b) Native fauna and flora / protection of threatened species and communities.

Local governments can help protect at-risk flora and fauna species and communities by working with local experts and interested community groups, encouraging collaborative citizens' science projects, providing community education and through sensitive planning, policy development and project design. These help to engage the community and bring about an integrated response as well as avoiding impacts on nationally protected matters and minimising the need for Australian Government regulation of local projects.⁵⁸

Opportunities for measures to protect two threatened fauna species are provided in Appendix 5 as examples of steps that Council and the community can take to reduce climate change risks to fauna and flora.

2.2 Built Environment

As climate change impacts hit home, the functionality of existing buildings and infrastructure will alter. Residential buildings designed for cool winters but mild summers may, on the one hand, cope better with reduced winters, but no longer cope with increased summers. While the sun's angles have not altered, the heat has and where once shading provided appropriate protection for summer and solar penetration for winter, this will become increasingly inaccurate during spring and autumn. While Council does not have the authority to legislate above the requirements of National and State building regulations, best practice can be encouraged and Council can lead by example.

Council

- Upgrading of all Council infrastructure to best cope with changing weather patterns (insulation, improved lighting, improved glazing, new shading, water storage and so on).
- Upgrading existing water supply infrastructure as it nears its end-of-use to a dual system that provides recycled water from the two sewerage treatment systems in Armidale and Guyra. Consideration of dual-plumbing systems to new infrastructure (to allow for future use of recycled water).

Council and Community

- Education programs and encouragement of best practice for good building design to ensure long-term adaptation of buildings to cope with changing weather patterns.

⁵⁷ www.industry.nsw.gov.au/natural-resources-access-regulator

⁵⁸ www.environment.gov.au/resource/local-government-and-australian-environment-law

- Rebates and incentives for water saving and storage (such as the 2019 Water tank and Water efficient appliances rebates).
- Assistance with audits and assessments to allow for forward planning for improvements.

Council and State Government

- Lobbying for higher standards in building design for increased energy and water efficiency and long-term thermal comfort, with acknowledgment of local climate-specific variations.

2.3 Food Production

With water scarcity likely to have the biggest impact on local food production, so will heat, fire, and extreme weather events. (Refer Appendix 5). Mitigation and forward planning can ensure security of food for the region and a long-term reduced reliance on imported (state, national and international) supplies. Encouragement of Regenerative Farming practices (refer Recommendations Part 2, section 3.1) can assist with ensuring long-term viability of local food production.

Council

- Consideration of Council planting to include food trees, such as nut and fruit trees for street trees as has been done in various other council jurisdictions.⁵⁹
- Enacting policy for preferential use of local suppliers and growers for Council events and services.

Council and Community

- Amending regulation to allow for and encourage verge planting,⁶⁰ especially for residents who do not have direct access to suitable gardens of their own.
- Increasing flexibility for community gardens, for local sales and genuine farmers markets.

Council and State Government

- Lobbying to relax rules on local suppliers (such as mobile butchers) to encourage local production and investment.

For **Energy Supply** and **Transport** refer to **Recommendations Part 1: Reducing Greenhouse Gas Emissions**.

⁵⁹ theconversation.com/our-land-abounds-in-nature-strips-surely-we-can-do-more-than-mow-a-third-of-urban-green-space-124781

⁶⁰ communitygarden.org.au/verge-gardens/

6. Community Engagement

Community Engagement

While many of the recommendations already noted relate in some form to community involvement, specific whole-of-community engagement with residents, businesses (including agricultural producers) and institutions is essential for this process to successfully move forward. Building local engagement with climate emergency action will empower the community to take action and to be proactive towards the climate emergency. This will involve raising community awareness regarding climate change, and ways in which the community can act to reduce greenhouse gas emissions, draw down atmospheric carbon and reduce the severity of the adverse impacts of climate change. A sense of urgency needs to be maintained consistent with ARC's Climate Emergency Declaration, the need to implement change towards a safe climate and the real affects such as water shortages ie take action now not later.

Community Engagement Policy

ARC has a Community Engagement Policy, which provides guidance for a “consistent and best practice approach to engaging with the community across all Armidale Regional Council (ARC) area and functions”⁶¹. These principles should also be applied in relation to the recommendations to advance positive action on the climate emergency, as per the policy table adapted below.

	Public Participation Goal	Relationship to Climate Emergency Declaration
INFORM	To provide the public with balanced and objective information to assist them in understanding the problems, alternatives, opportunities and/or solutions	Inform regarding the Climate Emergency Inform the need for urgent action Inform proposed actions and solutions
CONSULT	To obtain public feedback on analysis, alternatives and/or decisions	Receive feedback on proposals Obtain information on current understanding, perceptions, needs in regard to Climate issues Be open to community alternative suggestions
INVOLVE	To work directly with the public throughout the process to ensure the public concerns and aspirations are consistently understood and considered	Ensure relevance to our specific region as well as the wider global context Facilitate networks relationships across the various environmental and community groups as well as like-minded and like-skilled groups and bodies
COLLABORATE	To partner with the public in each aspect of the decision including the development of alternatives and identification of the preferred solution	Make use of local skills and expertise on Climate emergency related actions Provide regular forums, newsletters etc on progress and input
EMPOWER	To place final decision-making in the hands of the public	Allow the community to own the issue and therefore the solution Assist the community in influencing government on climate issues

Table 2: Public Participation Components as applicable to the CED

61 epathway.newengland.nsw.gov.au/ePathway/Production/Web/GeneralEnquiry/EnquirySummaryView.aspx
Note that an updated policy is currently being produced but not yet available on Council's website.

- Identify options and establish the best methods of getting the community engaged, making use of ARC's Sustainability Officer in collaboration with UNE's Sustainability Officer, such as holding community days, as part of the strategy.
- Adhere to the principles of the current Community Engagement Policy with the option to develop an Environmental Engagement Strategy and Climate Emergency Action Plan as per budget that prioritises action consistent with the Climate Emergency declaration commitment. Ideally this should underpin all community engagement, and potentially append the current Community Engagement Policy.
- Identify potential catalysts to community action on climate, such as:
 - knowledge regarding climate impacts and risks most likely to mobilise action in diverse community sectors
 - the opportunities for the region in encouraging innovative businesses with a 'clean-green' image
 - eco-tourism initiatives that promote the Armidale region as being environmentally friendly
 - the benefit of acting early to reduce the compounding cost of Climate Change, if nothing is done to reverse it (such as insurance costs and decrease in property values)
- Identify barriers to climate action and strategies that might overcome these, such as community scepticism about climate science and limited perception of climate risk, as well as deliberate dissemination of confusing and contradictory information; Engagement with specific local issues such as acting to conserve water in the face of water shortages have been highly successful.

Council support for business opportunities

Both Armidale and Guyra have Chambers of Commerce, and while not all businesses are members of the Chambers, there is an opportunity to work together and disseminate and assist with information and recourses.

- Liaise with Armidale and Guyra Chambers of Commerce to further disseminate and assist with information, and create opportunities to access programs and subsidies.
- Set up a region-wide, public smart network. It would have the potential to spawn a self-sustaining economy and put Armidale and Guyra at the forefront of using tech to improve communities. Some prospective services might include pet location, car park location, resource monitoring, intelligent traffic lights, smart signage, smart street lighting, garbage bin monitoring, and so on.
- Support development of green skills, in part by working with TAFE, and doing an assessment of the skills needed in our region.
- There is opportunity to also facilitate and enable communication with the Indigenous community on issues such as land-management practices that may enhance actions towards addressing the Climate Emergency.
- Provide regular reporting to promote progress.

Business impacts and opportunities

- Liaise and work with members of the new Regional Development Business Hub currently being established in the former Memorial Library premises in Armidale.
- Work with ARC's RGPAAC (Regional Growth and Place Activation Advisory Committee) on relevant issues and projects as they are identified.
- Encourage hi-tech businesses to the region, as part of the region's clean-green image.
- Establish a register of 'green' businesses, encouraging good consumer choice. However care must be taken to avoid 'greenwash'.

- Investigate business sponsorship, detailing ways that businesses can help the process forward and gain 'brownie' awards, but in a way that avoids Council bias.
- Spread information on the dangers of inaction and also the benefits of action for businesses
- Encourage eco-tourism initiatives – the Armidale LGA is eco-friendly.

Research collaboration

The University of New England (UNE) enables access in Armidale LGA to world class experts working in a diverse range of relevant fields including botany, ecology, water, waste, education, psychology, law and business. It is part of every academics' role is to demonstrate 'service' when they go for promotion and is therefore in their interest to demonstrate involvement in our community through partnerships and projects.

- Council engage with UNE for mutual benefit and access to the valuable resource it provides.
- Council collaborate with UNE to identify relevant projects for UNE honours, masters and PhD students to facilitate actions identified in the report.

7. Funding

Resources

While the bottom line is often the final assessment to proceed with issues, under a CED, this should be based on the triple bottom line – ie social and environmental weighting equally with fiscal. So fiscal responsibility must be factored into, rather than dominate, all environmental decisions, especially since the long term cost (financial and otherwise) of not taking action on many of these issues may be far greater down the track. Climate actions have been demonstrated to get substantial net operational savings over net implementation costs, sometimes 4-5 times the cost of implementation⁶². That said, upfront funding is always an issue with local government, and additional resources should be sought if current funds do not provide what is needed.

As previously noted, a comprehensive Grant Development Strategy should be developed between CEWG, ESAC and Council support staff to best utilise available corporate and community knowledge.

- Many of these opportunities/projects can be funded through Council's normal operations, albeit with additional cost, but at some point Council will have to invest in Zero30 to ensure that emissions are reduced. This will require a refocus by Council to change: transitioning from a business as usual approach to the level of response required by the urgency of the need to act. Council will need to include the impact of its activities on the environment and cost that as part of its cost/benefit analysis of operations and project outcomes.
- Funding opportunities are available from State and Federal Governments and there is a web based service that Council officers can subscribe to as grants submissions are called and where and when applications can be made.
- Environmental Trust Grants are often available for environmental projects that rehabilitate damaged ecosystems such as riparian and degraded lands requiring rehabilitation. These projects can address multiple criteria and environmental outcomes, including carbon emission offsets through use of plants and trees to store carbon in trees and soils.
- ARC must prioritise allocation of its own funding towards relevant projects (such as ARC's obligation of the rehabilitation of the Long Swamp Rd Waste Management Facility's landfill in the next 5 years once it has closed).
- Philanthropic funds are available as a source of funding and Council can assist not-for-profit groups to get involved in these opportunities as they are not always open to Local government agencies.
- Carbon Offsets funding is available to Council as many businesses are unable to reduce their carbon emissions but through social conscious want to purchase carbon offsets. An example is airline passengers have the option to offset their carbon emission contribution for a small additional fee, the collected funds then used by the airline on carbon offset or mitigation projects.
- Council's Sustainability Officer ideally has the knowledge and contacts to pursue many of these funding opportunities, and this should be included under the terms of reference for their employment.

Divestment

Relevant to this discussion, in order not to be hypocritical, it is advisable that Council divests itself of those organisations that extract and supply fossil fuels, or who directly invest in such companies.

62 drawdown.org

- Actively invest with fossil-fuel free financial institutions within the limitation of any existing Investment Policy.
- Create awareness about divestment and related campaigns
- Lobby government to divest from and phase out extraction and supply of fossil fuels in Australia.

8. References

References

Additional to and/or including references cited throughout the document, the following references, while not exhaustive, were either referred to in preparation of this report, or add valuable further input into the various issues addressed:

Armidale Regional Council references:

City to Soil program

www.armidaleregional.nsw.gov.au/environment/waste-and-recycling/city-to-soil

Community Engagement Strategy

epathway.newengland.nsw.gov.au/ePathway/Production/Web/GeneralEnquiry/EnquirySummaryView.aspx

EcoARC Green Print

yoursay.armidale.nsw.gov.au/exhibition-of-draft-ecoarc

WSAG Wood smoke report

slarmidale.org/wp-content/upload/2020/06/WSAG-Rpeport-V6 26sep19-P.pdf

Other Armidale region specific resources:

Projected changes to climate New England North West

climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/Climate-projections-for-your-region/New-England-North-West-Climate-Change-Downloads

Armidale emissions profile

snapshotclimate.com.

Planning NENW

www.planning.nsw.gov.au/Plans-for-your-area/Regional-Plans/New-England-North-West

New England Joint Organisation (7 local Councils NENW)

nejo.nsw.gov.au

Northern NSW Renewable Energy Blueprint

www.olg.nsw.gov.au/councils/policy-and-legislation/guidelines-and-policy-information-resources-for-councils/northern-nsw-renewable-energy-blueprint

Australian Government resources & other national resources:

Annual Climate Statement 2019

www.bom.gov.au/climate/

Australian Energy Market Operator

aemo.com.au/en/initiatives/major-programs/nem-distributed-energy-resources-der-program

Australian Government quarterly update of Australia's national greenhouse gas inventory June 2019

publications.industry.gov.au

National Australian Built Environment Ratings System (non-residential)

www.nabers.com.au

NSW Government resources:

NSW Electricity Strategy

energy.nsw.gov.au/government-and-regulation/electricity-strategy

NSW emissions - NSW government analysis

climatechange.environment.nsw.gov.au/About-climate-change-in-NSW/NSW-emissions

NSW Government Climate Change Policy framework

www.environment.nsw.gov.au/topics/climate-change/policy-framework

NSW Government net zero emissions plan.

www.environment.nsw.gov.au/topics/climate-change/net-zero-plan

Draft Net Zero Emissions Guidance for NSW Councils

www.energetics.com.au/insights/thought-leadership/nsw-net-zero-emissions-goal-for-2050-and-new-energy-efficiency-drive

Batteries

www.nsw.gov.au/news/interest-free-loans-for-battery-systems

Other Climate resources:

Climate Transparency - Australian section - clear analysis of Australia's emissions and where we are at with mitigation and adaptation

www.climate-transparency.org/countries/asia/australia

International Renewable Energy Agency 2020 Global Renewables Outlook Summary 2020

www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Apr/IRENA_GRO_Summary_2020.pdf

Climate solutions resource

drawdown.org;

Book: 2040, A Handbook for the Regeneration, by Damon Gameau, Pan Macmillan, 2019

Book: Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming

Paul Hawken, Penguin Books, 2017

Carbon Neutral & Carbon Reduction information:

Carbon offsets programs

carbonneutral.com.au

Carbon offsets registry

marketplace.carbonmarketinstitute.org/

Climate Solutions Funds

www.cleanenergyregulator.gov.au/csf/Pages/Home.html

National Carbon Offset program

www.ipaustralia.gov.au/sites/default/files/certification_rules/1369520.pdf

Renewable Energy Certificates and Clean Energy Regulator

www.rec-registry.gov.au/rec-registry/app/home

Climate related articles:

Australian government and international initiatives

publications.industry.gov.au/publications/climate-change/climate-change/government.html

Editorial comment and news

reneweconomy.com.au

Hydro research

energy.anu.edu.au/research/highlights/anu-finds-22000-potential-pumped-hydro-sites-australia

Built Environment Resources:

Australian Sustainable Built Environment Council

asbec.asn.au

Australian Renters Guide to Energy Efficiency

energy.gov.au/publications/english-renters-guide

Nationwide House Energy Rating Scheme (NatHERS)

nathers.gov.au

Passive Solar design basics

www.yourhome.gov.au/passive-design

Regenerative Agriculture and related systems:

Regenerative Australian Farmers
regenfarmers.com.au

Australian Holistic Management Co-operative Limited
savory.global/hubs/australian-holistic-management-co-operative-limited

Resource Consulting Services & Grazing for Profit
www.rcsaustralia.com.au

Transport:

Clean Fleet diesel vehicle maintenance program
www.rms.nsw.gov.au/documents/about/environment/air/clean-fleet-0606.pdf

Electric charging stations locations
myelectriccar.com.au/charge-stations-in-australia

Electric car NENW
www.mynrma.com.au/community/news-and-media-centre/nrma-fast-charging-new-england-north-west-tourism

Transport emissions offset program
greenfleet.com.au

Zero Net & Zero Carbon organisations:

Beyond Zero Emissions climate change think tank
bze.org.au

Beyond Zero Emissions communities
bze.org.au/zero-carbon-communities

C40 cities megacities network
www.c40.org

Australian local government climate network
citiespowerpartnership.org.au

Zero net energy towns
z-net.org.au/hepburn; zneturalla.org.au

Waste

Climate Change & Resource & Waste Recovery sectors
www.environment.gov.au/system/files/resources/2fbcdb0b-be9b-435b-9799-db16e4e1bfbd/files/climate-change.pdf

National emissions from waste
www.abs.gov.au/ausstats

Wastage and emissions information
www.fibershed.org

Appendix 1

ARC Climate Emergency Declaration

What do we mean by a climate emergency?

- **The situation where significant and/or catastrophic changes to the world's climate caused by human activity result in the loss of a safe climate and threaten all life on earth.**
- **The response which seeks to mobilise and act at a scale and speed that will restore a safe climate with the least possible loss and damage during the transition back to a safe climate.**

Community Support

There is strong support within the Armidale, Guyra and surrounding Communities for the Armidale Regional Council to declare a Climate Emergency, as evident from the signatures (approximately 1800) on the petition from all parts of our community that was presented to Council. It includes at least 750 participants, both young and old, in the Global Strike for Climate in Armidale, 20th September 2019. These numbers substantiate the organisers' estimate of 1000 locals who gathered at Central Park to show or voice their concern. Council's support for this event is noted and appreciated.

Feedback from residents also indicates that many more people would have signed had they been aware of the petition.

Our community is calling upon Council to show strong leadership to bring about urgent action to reduce global warming and to mitigate, adapt to and where possible, reverse the adverse effects of the climate reality we face. An all-of-community response is needed: there are many people in the community who have appropriate skills and knowledge and are willing to support and work with Council in responding to the Climate Emergency.

Through its networks, Council is in a strong position to strengthen the response of other councils as well as laying down the groundwork for climate action at higher levels of government.

Precedents already set

Climate Emergency Declarations (CED) have been made, as at June, 2020, by 1,731 jurisdictions in 30 countries across the world. In Australia this includes about 100 jurisdictions, representing over 8.8 million Australians, with 37 in NSW. These declarations are being made with increasing frequency⁶³.

Why declare a climate emergency?

The Scientific Evidence

There is a vast body of scientific evidence for the existing and predicted changes and trends in climate and for the need to act urgently and effectively. These include:

- **Australian Bureau of Meteorology and CSIRO State of the Climate report 2018⁶⁴** which states that observations and climate modelling paint a consistent picture of ongoing, long term climate change interacting with underlying natural variability. These changes affect many Australians, particularly the changes associated with increases in the increasing frequency or intensity of heat events, severe fire weather and drought. We will need to plan for and adapt to some level of climate change.
- **The Special Report on Global Warming of 1.5°C by the Intergovernmental Panel on Climate Change (IPCC)⁶⁵**, published October 2018, describes the enormous harm that a 2°C rise is likely to cause compared to a 1.5°C rise, and tells us that limiting Global Warming to 1.5°C may still

⁶³ Climate emergency declarations in 1,110 jurisdictions and local governments cover 273 million citizens. Update as at 9 October 2019: <https://climateemergencydeclaration.org/climate-emergency-declarations-cover-15-million-citizens>

⁶⁴ www.csiro.au/en/Showcase/state-of-the-climate

⁶⁵ www.ipcc.ch/sr15/

be possible with ambitious action from national and sub-national authorities, civil society, the private sector, indigenous peoples and local communities.

- **The IPCC's Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security and Greenhouse gas fluxes in Terrestrial Ecosystems, published August 2019⁶⁶**, states that many land-related responses that contribute to climate change adaptation and mitigation can also combat desertification and land degradation and enhance food security.
- **The Reserve Bank of Australia (RBA)⁶⁷** has warned changing weather patterns could lead to some risks becoming uninsurable.
- **A report by Admiral Chris Barrie (former Chief of the Australian Defence Force) and the Australian Climate Council⁶⁸** warns that: 1) Climate change poses a significant and growing threat to human and societal wellbeing, threatening food, water, health and national security; 2) Global military forces are labelling climate change a “threat multiplier” and 3) Climate change puts the Australian Defence Force under pressure.
- **The Australian Medical Association⁶⁹** has formally declared climate change a health emergency, pointing to “clear scientific evidence indicating severe impacts for our patients and communities now and into the future”.

Despite current interventions Australia's greenhouse emissions are increasing rather than decreasing. We are running out of time - much stronger and more effective action is needed. The unprecedented drought and water shortages are made more severe by underlying climate change that:

- threatens our food security, local economy and potentially our ability to continue to live in this region.
- undermines and detracts from Council's ability to implement its Community Strategic Plan 2017-2027.

The more quickly we act and the more co-ordinated our action is as a community, the more effective our action is likely to be and the less damage and cost in the long term.

Strengths and the Anticipated Benefits to Our Region

- During 2019, ARC successfully mobilising resources to address the critical and unprecedented water shortage that developed in the LGA, as well as in adjacent areas including Tenterfield, Stanthorpe, Dubbo and Orange. Council's leadership in identifying the problem and providing information and technical assistance to support appropriate response by the community to the water crisis has been effective in gaining positive community response.
- ARC already has in place, or in plan, a number of initiatives that can be expanded on, endorsed and implemented to form the basis for effective climate action. For example, Council's EcoARC Greenprint for a Sustainable Future refers to policies and practices in relation to climate change mitigation and adaptation which can be integrated into Council's operations and services to the community.
- Council is to be congratulated for its most recent agreement to partner with the University of New England (UNE) to undertake Project Zero30, aiming by 2030 for no additional contribution from our region to the global temperature rise.

⁶⁶ www.ipcc.ch/report/SRCCL

⁶⁷ RBA warns climate risks may become uninsurable, www.afr.com/policy/energy-and-climate/rba-warnsclimate-risks-may-become-uninsurable-20191004-p52xt8

⁶⁸ Be Prepared: Climate Change, Security and Australia's Defence Force by Chris Barrie, Will Steffen, Alix Pearce and Michael Thomas (Climate Council of Australia) - apo.org.au/node/57413

⁶⁹ Australian Medical Association declares climate change a health emergency, 3 September 2019. www.theguardian.com/australia-news/2019/sep/03/australian-medical-association-declares-climate-change-ahealth-emergency

- Council has demonstrated leadership in environmental issues, with (amongst other things) waste management and sewage management systems that integrate sustainable practices that other councils have sought to emulate.
- The local community has shown itself to be highly supportive of sustainable living practices such as sustainable housing, renewable energy installations, supporting local businesses, local food production including farmers' markets and community gardens, and revegetation activities.
- Council, the University of New England and local businesses have supported several Sustainable Living Expos that highlighted sustainability practices.
- Investment in renewable energy will bring jobs and growth to our region and lower power prices. New England and the Northern Tablelands are two of the four Renewable Energy Zones listed in the AEMO's (Australian Energy Market Operator's) Integrated Systems Plan.⁷⁰ In October 2019, the head of NextEra Energy, the biggest and most successful power utility in the United States, said the cost of renewables and battery storage – without subsidies – is beating gas, as well as existing coal and nuclear on costs⁷¹. In December 2018 a joint report by CSIRO and the AEMO noted that renewables are the cheapest new-build power.⁷²
- Current policy confusion is deterring investment and pushing up power prices.⁷³

Armidale Regional Council is well placed to join other councils seeking to mobilise and take action at a scale and speed that will restore a safe climate, with the least possible loss and damage during the transition back to a safer climate.

70 AEMO's integrated Systems Plan: www.aemo.com.au/Electricity/National-Electricity-Market-NEM

71 reneweconomy.com.au/us-energy-giant-says-renewables-and-batteries-beat-coal-gas-and-nukes-78962/

72 www.csiro.au/en/News/News-releases/2018/Annual-update-finds-renewables-are-cheapest-new-build-power

73 Energy companies pocketing an extra \$1 billion profit.

www.dailytelegraph.com.au/news/national/energy-companies-pocketing-an-extra-1-billion-profit/news-story/59b15191e33ffe5da5c2d2c0bb8a65cb

Appendix 2

CEWG Terms of Reference

Name

Climate Emergency Working Group

Establishment

The working group is a sub-committee to the Environmental Sustainability Advisory Committee.

Term

The Working Group will function until 30 June 2020, or until the report is prepared as per the Council resolution 266/19, whichever is sooner. The Council reserves the right to dissolve the committee at any time by a resolution of the Council. A recommendation from the Working Group report may be that the committee continues to be considered by ESAC after June 2020.

Delegations

The working group has no delegations from the Council.

Financial Arrangements

The working group has no powers to commit or expend any Council funds.

Purpose

The working group will research, explore funding opportunities for, and report upon initiatives in the short, medium and long term that council and our community can undertake to:

- a) Reduce greenhouse emissions, aiming, by 2030, for no additional contribution from our region to the global temperature rise
- b) Adapt to current and anticipated climate change impacts
- c) Reduce atmospheric concentrations of greenhouse gases, e.g. sequester and store carbon in trees and soils.

Core Responsibilities

The core responsibilities of the working group are to:

- a) Recommend actions that council and the community can undertake, after considering the costs vs benefits of those activities;
- b) gather a list of current activities and future actions for council and the community to reduce global warming and adapt to current and anticipated climate change impacts, including those proposed in EcoARC;
- c) engage the community and stakeholders to develop this list, after considering whatever information is available on the costs vs benefits of each action;
- d) explore funding options
- e) provide relevant content for a report to the Council Ordinary Council Meeting (OCM) in April 2020.

Membership

The working group membership is to be determined by an Expression of Interest process, and will include members of the Environmental Sustainability Advisory Committee and other interested people. All potential members must apply through an Expression of Interest, which will be assessed by council staff in mid March. Youth and indigenous applications are strongly encouraged. The working group will be a maximum of 12 people, and no more than half the membership will be ESAC members. Membership will be supported by a council officer.

Reporting

The committee will report to the ESAC.

Frequency of Meetings

Meeting schedules will be determined by the Chairperson, in consultation with working group members and Council Officers.

Code of Conduct

The Model Code of Conduct applies to the members of the working group.

Code of Meeting Practice

The Council's Code of Meeting Practice shall guide the meeting procedures. However, videoconferences e.g. by Zoom or GoToMeeting will be permitted if members desire this option.

Remuneration of Members

Working Group members will not be remunerated for meeting attendance and no reimbursement of travel expenses will be payable, unless prior approval from the CEO (or delegate).

Chairperson

The chairperson shall be determined by an election at the first meeting of the working group.

CEWG Call for Expression of Interest

Do you want to help Council Respond to the Climate Emergency?

Armidale Regional Council Residents are invited to express their interest in membership of the Climate Emergency Working Group, to be set up as a sub-committee of the Environmental Sustainability Advisory Committee. Young and Indigenous community members are strongly encouraged to submit an application.

The primary function of the working group is to provide relevant content for a report to the Council Ordinary Council Meeting (OCM) in April 2020 by:

- a) Recommending actions that council and the community can undertake, after considering the costs vs benefits of those activities;
- b) Gathering a list of current activities and future actions for council and the community to reduce global warming and adapt to current and anticipated climate change impacts;
- c) Engaging the community and stakeholders to develop this list, after considering whatever information is available on the costs vs benefits of each action;
- d) Exploring funding options;
- e) Providing relevant content for further reports as required by Council.

The role of the individual members is to:

- a) Understand and gather ideas from our local community;
- b) Have some knowledge of climate change and the types of activities that can reduce emissions;
- c) Be passionate in making a positive contribution to local climate change mitigation and adaptation;
- d) Be able to gather ideas from others within the community; and
- e) Actively contribute to the Working Group to provide relevant content for reports to Council.

Expenses will not be reimbursed

Unless Council resolves otherwise. Working Group members will not be remunerated for their time and no reimbursement of travel expenses will be payable, unless prior approval is received from the CEO (or delegate). However, it might be possible to attend meetings via video-conferencing. See yoursay.armidale.nsw.gov.au for further information and the Terms of Reference. Information is also provided on other Environmental Sustainability policies, including:

- a) EcoARC Greenprint strategy that was adopted on 11 December 2019 and will guide Council's operations and assist groups in the community to improve sustainability in our region.
- b) Information on Project Zero30, a partnership with UNE that aims for no additional contribution from our region for the global temperature rise by 2030.
- c) Background reports to the Climate Emergency Declaration adopted on 23 October 2019.

If you think you have the skills and enthusiasm to serve on the Climate Emergency Working Group, please email an expression of interest (EOI) to council@armidale.nsw.gov.au by 20 March 2020. The EOI should be in the form of a letter, addressing each selection criteria in 100-150 words.

Appendix 3

Zero30 Project Action Plan Years 1-3

In October of 2019 the University of New England and the Armidale Regional Council came together to create a joint venture, Project Zero30⁷⁴.

**The aim of Project Zero30 is to bring the
Armidale Local Government Area (ALGA) to net zero emissions by 2030.**

Project Zero30 will achieve its goal of bringing the ALGA to net zero emissions by 2030 through a unique partnership between science to the community. The project will leverage the combined networks of UNE and ARC to identify, develop and implement both climate mitigation and adaptation activities through the innovation and research that can be only achieved by community successfully working with its civic university. The open and transparent nature of Project Zero30 will provide communication pathways to ensure other communities can progressively adopt rather than wait for completion of the project to benefit from its research and innovation. Project Zero30 will achieve the Federal Government's Climate Active Carbon Neutral Standard (CACNS). CACNS is a voluntary standard to manage greenhouse emissions and achieve carbon neutrality. CACNS provides best-practice guidance on how to measure, reduce, offset, report and audit emissions for organisations, products & services, events, precincts and buildings.

Project Zero30 will achieve CACNS certification for the ALGA by 2030 under CACNS category five - Precincts.

Climate adaptation will influence carbon emissions and play an important part in achieving CACNS certification. To recognise the importance of climate adaptation in achieving certification, CACNS will be known as CACNSA within Project Zero30.

The activities of Project Zero30 will contribute to growing the ALGA gross regional product to \$2b by 2030. This will be achieved through the following outcomes of the ALGA.

The ALGA will:

1. Be a net renewable energy exporter;
2. Have 50% of its businesses and farms accredited under the national climate action carbon neutral standard;
3. Have 90% of its riparian zones revegetated;
4. Have 50% of its industry and homes exporting solar energy to the grid;
5. Generate power using biochar power generation technologies;
6. Have planted 1,000,000 trees to offset carbon usage;
7. Be active in the bio-sequestration market;
8. Have 25% of its buildings carbon certified;
9. Be an eco-ag tourism destination;
10. Be a true circular economy;
11. Be a model for carbon transitions and adaptation;
12. Have a green house accounting system;
13. Utilise green logistics and transport; and Winter air quality levels below the Department of Health's guidelines.

⁷⁴ zero30.org.au

Project Zero30 consist of two phases. Phase 1 is concerned with short term actions that can be undertaken from Years 1-3, while Phase 2 will begin once Phase 1 is complete and build upon the activities in Phase 1 and the baselining activity of Phase 1.

Action	Year of Completion
Establish Zero30 web site.	Year 1
Develop and circulate Information packs for farmers, business and community on how to achieve carbon neutrality.	Year 1
Establish school engagement campaign where every child in the ALGA is provided with a Project Zero30 t-shirt. This campaign also includes the development of educational activities for schools to distribute the t-shirt.	Year 2
Attract sponsorship from business and government.	Year 2
Establish citizen science network that enables community to collect data that can be utilised in science projects.	Year 2
Develop a carbon counter tool for individuals, businesses and farmers to track and map their own carbon footprint.	Year 2
Baseline the ALGA	Year 2
Establish a tree planting program	Year 2
Develop a 'led lit' free community program	Year 3
Undertake a feasibility study on biochar as an energy source	Year 3

Appendix 4

Risk Analysis of Climate Change Impacts for New England

Climate Change Impacts on Natural Environment for Armidale Guyra Area

Predicted and unfolding climate change outcomes	Impacts on natural environment that are already being experienced or are predicted to occur as a result of climate change						
	Surface water creeks and wetlands Dams	Ground water	Soil	Native Vegetation (significant areas on rural land)	Fauna (Rural land important in supporting and enabling dispersal of many native fauna species)	Human modified natural landscape	Air Quality
<p>Increase in average maximum and minimum temperature and seasonal shift.</p> <p>Changed seasonal rainfall patterns - decreased winter and increased summer rainfall</p> <p>Changing water cycles</p>	Threat multiplier in association with other threats listed below	Threat multiplier in association with other threats listed below	Threat multiplier in association with other threats listed below	Change in times of flowering and fruiting. Potentially out of sync with fertilising insects and breeding cycles of fauna. Disruption of connections between plants or plants and insects or plants and animals.	Cold adapted species unable to move to higher altitudes / become locally vulnerable to extinction or extinct Threat multiplier in association with other threats listed below	Autumn trees retain leaves longer Deciduous trees come into leaf / blossom earlier in season. Vulnerable to frost damage.	Minimal impact in the short term
<p>Increased hot days, heat waves, episodes of prolonged and excessive heat</p> <p>Increased hot days, heat waves, episodes of prolonged and excessive heat</p>	Increased evaporation. Water bodies store less oxygen. Stagnation and algal growth.	Increased extraction of ground water for domestic, agricultural and commercial use.	Potential for soil loss increasing with extent of bare soil and wind intensity	Cold adapted species such as snow gums adversely affected if heat exceeds their tolerance levels. Local extinctions	Sensitive animals such as flying foxes heat stressed with potential for widespread mortality. Reduced health of animal species due to poor water quality / decreased availability. Change in aquatic fauna due to hotter water temperatures.	Deciduous trees lose leaves early Landscape less attractive, extensive areas of dead grass or bare ground and vegetation Increased wildfire risk with potential for catastrophic fire risk.	Increased dust levels in air from dusty roads
<p>Increased incidence, duration and intensity of drought and water shortage</p> <p>Low rainfall combined with high evaporation</p> <p>Dust</p> <p>Dust storms</p>	Progressive reduction and drying out of water storage (waterholes and dams) that supply wildlife. Wetlands dry out. Water shortage. Decreased water quality - increased algae and bacterial contamination, potential for dead animals contaminating	Decreased rainfall replenishing groundwater supplies. Increased extraction of ground water for domestic, agricultural and commercial use. Decreased water infiltration and increased groundwater extraction	Progressive decrease in soil moisture. Expanding areas of bare ground / loss of ground cover. Ground hardens and cracks. Soil biota dies or moves deeper in soil. Soil less fertile and less able to store	Prolonged drying, death and desiccation of ground cover and / or of shrubs and trees. Decreased pollination. Reduced breeding success and recruitment of new plants. Adverse ecosystem impacts due to failure of parts	Insufficient water in leaves for foliage dependent animals such as koalas Competition with domestic animals for water resources Insufficient food impacting on survival and breeding success, multiplication of threat for endangered species.	Deciduous trees lose leaves early. Die back of non-native trees Landscape and parks and gardens unattractive Increased wildfire risk with potential for catastrophic fire risk.	Dust storms, dust pollution of air

Predicted and unfolding climate change outcomes	Impacts on natural environment that are already being experienced or are predicted to occur as a result of climate change						
	Surface water creeks and wetlands	Ground water	Soil	Native Vegetation (significant areas on rural land)	Fauna (Rural land important in supporting and enabling dispersal of many native fauna species)	Human modified natural landscape	Air Quality
	<p>Dams</p> <p>water. Sequential loss /adverse impact on aquatic species with repeated events. Increased competition for water between human land use and ecosystems. Changes in stream morphology</p>	<p>causing depletion of aquifers, including those that feed into springs and water storages</p>	<p>carbon. Exposure of soil to wind erosion, soil loss. Bare soil vulnerable to water erosion during storm events</p>	<p>of connected systems eg flowering of plants no longer co-occurring with breeding of associated fauna. Decreased habitat for waterbirds. Local extinctions / biodiversity loss</p>	<p>Disruption of ecosystem connections. Loss of habitat / refuge. Increased susceptibility to predation and disease. Longer travel distance between water sources. Biodiversity loss.</p>		
<p>Increased incidence, intensity and severity of storm events and associated weather events such as high velocity winds, heavy rain, hail and flooding</p>	<p>Pollution from effluent and garbage associated with flooding, dead animals and harmful chemicals washed into waterways.</p>	<p>Replenishment of some aquifers where flood water is stored and is able to seep into groundwater.</p>	<p>Erosion, damage to creek banks and waterways</p>	<p>Mechanical damage to vegetation. Death of vegetation arising from prolonged immersion. Tree fall in storms, hail damage, defoliation from hail</p>	<p>Drowning of animals. Interruption to life cycles. Death, injury or illness of wildlife arising from hail impact, loss of shelter, flooding, subsequent exposure to cold or predators</p>	<p>Mature trees lost from extensive swathes of land due to windstorms. Loss of stored carbon to atmosphere</p>	
<p>Fire - increased duration of fire season, earlier onset, later cessation. Increased intensity, spread, extent and destruction of fires.</p>	<p>Less water available for fire suppression in times of drought. Pollution of natural vegetation and waterways from use of fire retardants</p>	<p>Unknown</p>	<p>Baking of soil and destruction of soil biota relative to heat penetration of soil. Erosion of exposed soil in follow up storm events.</p>	<p>Destruction of flora with variable potential for recovery dependent on cumulative impacts.⁷⁵ Decreased potential for population recruitment where fires are extensive. Local extinctions. Damage to vegetation through use of fire retardants</p>	<p>Injury and substantially increased mortality where fires are severe or catastrophic and extensive.⁷⁶ Decreased potential for population recruitment where fires are extensive.</p>	<p>Destruction of landscape elements by fire. Landscape unattractive for visitors.</p>	<p>Particulate pollution of air from smoke with adverse health effects for animals and humans. Extensive loss of stored carbon to atmosphere</p>

75 More than 8 million hectares of land was devastated in Australia in the 2019-2020 bushfires (The Conversation 10/06/2020)

76 The world Wide Fund for Nature estimated that 1.25 billion animals were killed in Australia in the 2019-2020 bushfires, with 800 million lost in NSW (www.wwf.org.au/what-we-do/bushfires#gs.9wibvb).

Climate Change Impacts on Food production for Armidale Guyra Area

Predicted and unfolding climate change outcomes	Impacts on food production that are already being experienced or are predicted to occur as a result of climate change						
	Surface water and stored water Ground water - bores and springs	Soil / Landscape / Land tenure	Rural vegetation Crops and pasture, fodder production, availability	Effects on livestock, rural animals	Energy supply Communi-cations Transport and connectivity	Technical resources Productivity and business profitability Markets Local economy	Human resources Livelihood
<p>Increase in average maximum and minimum temperature and seasonal shift.</p> <p>Changed seasonal rainfall patterns - decreased winter and increased summer rainfall</p> <p>Changing water cycles</p>	Threat multiplier in association with other threats listed below	Threat multiplier in association with other threats listed below	<p>Invasive species able to move to higher altitudes, extend range and populations; greater resources required for control. Crop and pasture flowering potentially asynchronous with fertilising insects.</p> <p>Potential for increased range and productivity of some crops and pasture species due to extended seasons but only if sufficient water available.</p>	Potential for increased livestock productivity if sufficient water available.	Threat multiplier in association with other threats listed below	Potential for productivity increase and increase in farm income and viability due to longer growing season if occurring in the absence of other threat multiplier effects listed below and if agricultural producers change their production to reflect change in climate. Increased probability of combined impacts listed below may negate potential increases in productivity.	Threat multiplier in association with other threats listed below
<p>Increased hot days, heat waves, episodes of prolonged and excessive heat</p>	<p>Increased evaporation and drying out of water storage for stock.</p> <p>Increased water consumption by livestock.</p>	Soil dry, compacted. Increased vulnerability of soil to wind and water erosion.	<p>Decreased growth / die off of ground cover and pasture and crop species during prolonged or excessive heat. Leaf fall from trees (especially introduced trees such as willows).</p>	Heat stress and decreased weight gain in livestock.	<p>Increased energy demand to service water supply and cooling devices. Potential Interruption to supply due to overload.</p>	<p>Reduced farm income and reduced viability and profitability of agricultural enterprises.</p> <p>Less money available to spend locally on farm equipment, education and other services</p>	<p>Less energy for outside work. Challenge to maintain conditions cool enough for horticultural workers in glasshouses. Smaller and less efficient landholders forced out reducing rural population diversity</p>
<p>Increased incidence, duration and intensity of drought and water shortage</p> <p>Low rainfall combined with high evaporation</p> <p>Dust</p> <p>Dust storms</p>	<p>Decrease in water quality due to algal and bacterial growth and potentially animals dying in water reserves.</p> <p>Progressive reduction and drying out of water storage (waterholes and dams) for stock. Need to purchase water increases</p>	<p>Soil dry, compacted, progressive loss of groundcover. Decreased soil nutrients due to impoverished soil biota and decreased ability of soil to store humus. Stored carbon released to atmosphere. Increased vulnerability</p>	<p>Changes in fertiliser usage</p> <p>Increased crop and pasture disease and stress, reduced crop yield, crop failure.</p> <p>Previously viable agricultural production no longer possible for extended periods.</p> <p>Trees and shrubs die off. Decreased shelter for stock</p>	<p>Increased feed purchasing, thus increased costs. Decreased animal health and weight loss due to reduced availability and quality of feed and water. Death of or need to cull livestock due to shortage of</p>		<p>Productivity substantially reduced or absent. Increased commodity prices. Loss of farm income and reduced viability. Greater workload on farms. All resources directed to survival rather than productivity. Productivity drops or absent. Decreased rural employment/une</p>	<p>Increased stress and anxiety</p> <p>Human health and wellbeing impaired / increased mortality</p> <p>Challenge to keep outdoor workers cool. Less energy for outside work. Increased demand for medical services</p>

Predicted and unfolding climate change outcomes	Impacts on food production that are already being experienced or are predicted to occur as a result of climate change						
	Surface water and stored water Ground water - bores and springs	Soil / Landscape / Land tenure	Rural vegetation Crops and pasture, fodder production, availability	Effects on livestock, rural animals	Energy supply Communi-cations Transport and connectivity	Technical resources Productivity and business profitability Markets Local economy	Human resources Livelihood
	costs. Reliance on ground water where available. Decreased water infiltration and increased groundwater extraction causing depletion of aquifers, including those that feed into springs.	of soil to wind and water erosion. Progressive land degradation consistent with intensity and duration of drought. Increased sell off of rural land.	as well as wildlife.	water and or feed. Health issues arising from disposal of carcasses. Increased vulnerability of livestock to disease. Potential loss of breeding stock, increased cost of restocking following drought. Livestock carrying capacity reduced. Decreasing viability of livestock production for longer periods.		employment in agricultural sector. Decreased spending in region Decreased demand for manufacturing services	Adverse impacts on local community (including community cohesion and cooperation in times of emergency) Reduced volunteers available for emergency services such as firefighting. Increased vector borne disease such as Ross River fever. Increased demand for medical services
Increased incidence, intensity and severity of storm events and associated weather events such as high velocity winds, heavy rain, hail and flooding		Property damage. Temporary relocation of residents Increased demand for building and repair services Access to markets interrupted	Damaged or failed crops Food spoilage	Injury or death of livestock from exposure. Drowning of livestock Feed shortage for livestock Need to purchase fodder - increased costs	Blackouts / interruption to energy supply Communications limited or blacked out Damage to vehicles, roads, railway lines Interrupted / limited transport/ flights	Loss of farm income and reduced viability. Property and infrastructure damage and associated costs. Destruction of glasshouses. Resources directed to rebuild and recovery rather than productivity. Increased insurance claims and costs. Increased demand for building and repair services (may stimulate economy) Produce not able to be harvested or late to market. Repair and maintenance costs Council costs Interruption to service provision	Increased stress and anxiety Human injury and increased mortality. Increased demand for emergency services Emergency response times slower. Loss of life from drownings Human exposure to effluent, chemical hazard, pollution in floodwater Community disruption Stress on vulnerable people
Fire - increased duration of fire season,	Likely to coincide with times of water	Soil baked and left bare in intense fire conditions.	Damaged crops.	Injury or death of livestock.	Blackouts / interruption to energy supply	Property and infrastructure damage. Productivity	Human injury or death directly from fire or

Predicted and unfolding climate change outcomes	Impacts on food production that are already being experienced or are predicted to occur as a result of climate change						
	Surface water and stored water Ground water - bores and springs	Soil / Landscape / Land tenure	Rural vegetation Crops and pasture, fodder production, availability	Effects on livestock, rural animals	Energy supply Communi-cations Transport and connectivity	Technical resources Productivity and business profitability Markets Local economy	Human resources Livelihood
<p>earlier onset, later cessation. Increased intensity, spread, extent and destruction of fires.</p>	<p>shortage. Redirection of water usage to fire fighting, further depletion of water storage. Damage to water storage infrastructure such as melting of plastic tanks during bushfire. Water unavailable to people in burnt out areas</p>	<p>Soil fauna destroyed to depth of heat penetration. Soil exposed to erosion from wind or rain following fire.</p>	<p>Productivity drops or at a standstill.</p>	<p>Loss of fences to contain livestock. Destruction of pasture. Need to buy in fodder at a time when costs likely to be high. Resources directed away from productivity to repair and rebuild</p>	<p>Communications limited or blacked out. People unable to access electronic funds to purchase essentials Damage to vehicles, roads, railway lines Interrupted / limited transport/ flights</p>	<p>reduced or at a standstill. Loss of income due to livestock losses and cost and time needed to rebuild Extensive insurance claims and increased costs. Property values drop</p>	<p>indirectly from smoke, and associated illness. Loss of home and means of livelihood in short or long term. Increased demand for medical and volunteer services Volunteer fatigue Decreased activity levels Social isolation Crisis can bring communities together as well as challenge them</p>
<p>Combined / cumulative impacts overall</p>	<p>Progressive depletion of surface and underground water storage. Water allocation conflict. Withdrawal rather than expansion of water hungry industries such as intensive horticulture. Decreasing ability to sustain rural population and agricultural production.</p>	<p>Progressive soil erosion and land degradation Property values drop. Increased sell off of rural land. Potential for purchase by corporate or international buyers with minimal connection to local community environment or economy</p>	<p>Decreased crop and pasture production capability in area</p>	<p>Decreased livestock production capability in area</p>	<p>Potential for connectivity and technical issues to</p>		
<p>Predicted and unfolding climate change outcomes</p>	<p>Water restrictions Changed attitudes to water use substantially decreased Policy and regulation changes</p>	<p>Reduction of water usage by horticultural industries to a level that is able to be sustained.</p>					

Climate Change Impacts on human community, built environment, health and wellbeing

Predicted and unfolding climate change outcomes	Impacts on human community, built environment, health and wellbeing that are already being experienced or are predicted to occur as a result of climate change						
	Food production, distribution and availability Water availability	Built environment housing and effects on home environs	Business Livelihood Economy	Energy supply Communi-cations Transport and connectivity	Emergency response Governance and Service delivery	Community cohesion Education Childcare	Health and wellbeing
<p>Increase in average maximum and minimum temperature and seasonal shift.</p> <p>Increased hot days, heat waves, episodes of prolonged and excessive heat</p> <p>Changed seasonal rainfall patterns - decreased winter and increased summer rainfall</p> <p>Changing water cycles</p>	<p>Compromised particularly if heat waves associated with periods of low rainfall and high evaporation.</p>	<p>Potential for expanded range of garden species with extended warmer seasons. Heat waves cause leaf fall and potential loss of shade trees from gardens, parks and recreational areas especially when combined with drought and fire.</p> <p>People seek shade in surrounding environs during hot periods whereas previous priority has been warmth from sun during cool seasons.</p>	<p>Less tourism during hot periods</p>	<p>Increased use of air conditioners Increased energy demand Potential for interruption to energy supply due to overload. Potential impact on rail services due to warping of train lines by heat or out of area impacts Reduced use of air services due to decrease in tourism.</p>	<p>Flow on effects from impacts on other sectors eg increased need for shade, potential interruption to energy supply, increased need for invasive species control</p>	<p>School absenteeism during heat waves. Locals take holidays during hot periods hence reduced demand for goods and services. Reduced options for people to move away to cooler regions as local area is identified as a cooler region.</p>	<p>Heat waves cause adverse human health effects and increased mortality. Increased demand for health care services. Challenge to keep outdoor workers cool. Too hot to exercise Increased vector borne disease due to extension of warm weather seasons and decreased cold.</p>
<p>Increased incidence, duration and intensity of drought and water shortage</p> <p>Low rainfall combined with high evaporation</p> <p>Dust</p> <p>Dust storms</p>	<p>Reduced or severely compromised ability to grow local food; Most food for the region is distributed by, and purchased from, three major supermarkets. Water restrictions greatly limit capacity for local food growing. Increased demand for food increases food cost in line with the degree to which drought and bushfire impact on food supply from outside sources. Risk that available food will be preferentially distributed within urban areas. Reduced viability of livestock or agricultural production due to increased frequency of adverse events.</p>	<p>Water restrictions impact on peoples' enjoyment of their environs and recreational gardening. People unable to sell houses due to perception of area as undesirable to move to. Reduction in real estate values.</p>	<p>Loss of income, reduced viability of businesses with high water demand (farms, horticulture, institutions, car wash) or are reliant on scenic landscape (tourism). Greater workload for domestic water supplier (ARC) and for some businesses in managing water usage. Drop in productivity Increased costs for businesses needing to buy water. Unemployment in vulnerable sectors (tourism) Increased commodity prices Decreased spending - flow-on effect to</p>	<p>Increased use of air conditioners Increased energy demand. Potential for interruption to energy supply due to overload.</p>	<p>Water restrictions Changed attitudes to water use Water allocation conflict Policy and regulation changes Greater infrastructure costs Increased costs passed on to users Increased maintenance requirements for sporting fields and or reduced quality and appeal.</p>	<p>Reduced enrolments at private schools due to flow on of economic impacts. Increase at public schools. School absenteeism Family members leave area to seek employment. Pressure to close valuable services enhancing social cohesion such as swimming pools. Social friction due to increased constraints and competition for water resources Locals take holidays during hot periods</p>	<p>Increased stress and anxiety Adverse impacts on mental health - sadness and grief arising from adverse impact on environs, loss of income. Increased demand for medical services Adverse health effects due to increased dust. Sporting injuries due to compacted surfaces leading to reduced participation and reduced fitness.</p>

Predicted and unfolding climate change outcomes	Impacts on human community, built environment, health and wellbeing that are already being experienced or are predicted to occur as a result of climate change						
	Food production, distribution and availability Water availability	Built environment housing and effects on home environs	Business Livelihood Economy	Energy supply Communi-cations Transport and connectivity	Emergency response Governance and Service delivery	Community cohesion Education Childcare	Health and wellbeing
	Extension of invasive species.		other businesses				
Increased incidence, intensity and severity of storm events and associated weather events such as high velocity winds, heavy rain, hail and flooding	Local food sources damaged or lost in impacted areas. Injury or death of livestock from exposure. Access to markets interrupted.	Property and infrastructure damage, eg damage to roofs and windows and vehicles from hail, wind, treefall; road damage from flooding Destruction of glasshouses Increased demand for building and repair services	Loss of farm income and reduced viability. Business interrupted Increased insurance claims and costs	Blackouts / interruption to energy supply Communications limited or blacked out Damage to vehicles, roads, railway lines Interrupted / limited transport/ flights	Increased demand for emergency services Emergency response times slower. Repair and maintenance costs Council costs Access to services cut	Interrupted School absenteeism	Increased stress and anxiety Human injury and increased mortality Human exposure to effluent, chemical hazard and pollution particularly during flood events.
Fire - increased duration of fire season, earlier onset, later cessation. Increased intensity, spread, extent and destruction of fires.	Damaged crops. Injury or death of livestock. Feed shortage for livestock Damaged or failed crops Food spoilage Increased food costs. Potential disruption to	Property damage - loss of homes, businesses and other infrastructure Increased demand for building and repair services	Productivity drops or at a standstill. Long time-frame for recovery where resources and labour are directed away from productivity towards rebuilding of housing and infrastructure such as fences, shed, business premises, and water storage. Source of income may be lost and employees may be stood down for extensive periods Extensive insurance claims and subsequent increases in insurance costs	Blackouts / interruption to energy supply with potential impacts on ability of people to access electronic funds to pay for water, food and petrol plus impact on essential services such as water supply, sewerage. Communications limited or blacked out Damage to vehicles, roads, railway lines Interrupted or limited transport/ flights available	Potential short term acute shortage of water and food. Increased demand for emergency services Emergency response times slower Insufficient capacity to respond to the extent of the crisis and to meet goals of protecting life and property Volunteer fatigue.	Community effort directed towards safety, protection of human life and property during fire events. Extensive short term and potentially long term displacement of people from their homes, communities and places of work. School absenteeism Cancelled events that promote community cohesion Social friction and seeking to attach blame	Human injury or death directly from fire or indirectly from smoke inhalation and associated illness. Human exposure to effluent, chemical hazard and pollution from damage to infrastructure causing release of pollutants Increased demand for medical services Volunteer fatigue Decreased activity levels Social isolation
Combined / cumulative / overall impacts	Decreased agricultural productivity Change in crop selection	Decreased resilience and capacity to recover from adverse events occurring with greater frequency, intensity and longer duration. Property values drop. Greater infrastructure	Regional economy diminished Region less attractive to visitors or people wishing to relocate. Decreased diversity and prosperity of businesses and	Interruption to energy supply / blackouts. Interruption to flights communications Damage to transport routes Interrupted / limited transport/ flights	Emergency response time slower Increased demand for volunteers Volunteer fatigue Less productive workforce	Decreased community resilience and cohesion. People move away from area	Decreased overall level of health and wellbeing in community. Increased mortality. Loss of life from drownings Human exposure to effluent,

Predicted and unfolding climate change outcomes	Impacts on human community, built environment, health and wellbeing that are already being experienced or are predicted to occur as a result of climate change						
	Food production, distribution and availability Water availability	Built environment housing and effects on home environs	Business Livelihood Economy	Energy supply Communi-cations Transport and connectivity	Emergency response Governance and Service delivery	Community cohesion Education Childcare	Health and wellbeing
		<p>costs. Increased incidence of property damage not able to be repaired due to decreased economic resilience.</p> <p>Temporary relocation of residents</p> <p>Increased demand for building and repair services</p>	<p>institutions resulting in Increased regional unemployment.</p> <p>Increased insurance costs and increased conditions of insurance .</p> <p>Delayed payouts.</p> <p>Increased income support/ welfare claims</p>		<p>Cumulative increase in cost of clean up and maintenance</p>		<p>chemical hazard, pollution</p> <p>Community disruption. Vulnerable people particularly susceptible to adverse impacts as decrease in stability of environs and community detracts from wellbeing. Increased demand for medical services</p> <p>Increased stress on hospitals</p> <p>Hospital staff work longer hours</p> <p>Demographic changes</p> <p>Regional decline</p> <p>Aging population</p>
<p>Interventions that may help to reduce severity of impacts</p>	<p>Policy and regulation changes</p> <p>Behaviour change and technical modifications to decrease water consumption and enhance efficient water use.</p> <p>Measures to protect water catchments, decrease evaporation from water storage.</p> <p>Investigate potential for increased size of community water storage to enhance water security.</p> <p>Increase soil percolation of water</p> <p>Planning for water storage and improved efficiency of use</p>						

Appendix 5

Native fauna and flora - Protection of threatened species and communities

Koalas

In April 2012, the Australian Government declared the Koala as ‘Vulnerable’ under the Federal EPBC Act in New South Wales, the ACT and Queensland. Koalas are in serious decline suffering from the effects of habitat destruction, domestic dog attacks, bushfires and road accidents. Recent research indicates that the koala population in Armidale is relatively healthy, despite a significant and alarming decline in koala numbers in the drier slopes and plains of northern NSW. In light of this, it has been proposed that the New England Tableland potentially represents a key cool upland refugia that will be vital to regional koala populations with an increasingly warming climate. This is significant in the context of substantial eucalypt die off in the area of Mt Duval (an important koala habitat area) during the 2019 drought and extensive death of koalas in south eastern Australia during the 2019-2020 bushfires.

Koalas are regularly seen in the vicinity of Armidale. A Council pamphlet entitled 'The survival of the koala is in our hands' lists the locations of koala sightings in the area⁷⁷. It states that around Armidale, fragmentation of woodland on the urban rural fringe (peri-urban area) and the wider landscape, makes it harder for young koalas to find new home ranges and adult koalas to find mating partners.

Climate change has been clearly identified as a threat to koalas. The June 2020 New South Wales parliamentary inquiry of the Legislative Council into Koala populations and habitat in New South Wales⁷⁸ states that at every hearing, the committee received evidence that climate change was having an extremely detrimental effect on koala populations and that the International Union for Conservation of Nature recognises the koala as one of ten species most likely to be adversely impacted by climate change.

The Parliamentary Inquiry made a number of recommendations for action⁷⁹ by the NSW Government that are relevant to koalas in the Armidale area. These are listed as follows:

- Urgently prioritise the protection of koala habitat and corridors in the planning and implementation stages of urban growth areas.
- Fund and support local councils to conserve koala habitat, including by identifying pockets of urban bushland to include in the State's protected area network.
- Provide additional funding and support to community groups, so that they can plant trees and regenerate bushland along koala and wildlife corridors and explore mechanisms to protect these corridors in-perpetuity. This will assist in the maintenance of koala populations locally, and gene flow regionally.
- Ensure that in planning for future bushfires, conservation values and the protection of koala habitat is given greater priority.
- Increase funding to local councils to support the implementation of local koala conservation initiatives.
- In finalising the State Environmental Planning Policy (Koala Habitat Protection) 2019 framework, strengthen the ability of consent authorities to protect koala habitat.
- Require all councils with koala populations to develop comprehensive koala plans of management in a timely manner.
- Publish the final State Environmental Planning Policy (Koala Habitat Protection) Guideline as soon as practicable.
- Increase resources to local councils to support them in conducting mapping required for comprehensive koala plans of management.

⁷⁷ www.armidaleregional.nsw.gov.au › ArticleDocuments

⁷⁸ Legislative Council Portfolio Committee No. 7 - Planning and Environment Koala populations and habitat in New South Wales June 2020 Report 3 - June 2020.
<https://www.parliament.nsw.gov.au/lcdocs/inquiries/2536/Koala%20populations%20and%20habitat%20in%20New%20South%20Wales%20-%20Report%203.pdf>

⁷⁹ www.parliament.nsw.gov.au/lcdocs/inquiries/2356/Koala%20populations%20and%20habitat%20in%20New%20South%20Wales%20-%20Report%203.pdf

- Work with willing landholders to identify koala habitat that is of outstanding biodiversity value under the Biodiversity Conservation Act 2016 in order to facilitate more koala habitat on private land being protected.
- Ensure that the NSW Koala Strategy: Bushfire Recovery Plan contains as its key focus, the protection of koala habitat.

Understanding the habitat needs of koalas at local and landscape levels, and the factors that influence occupancy of koalas in the region, is vital ecological information that will inform future management. Mapping, such as where koalas have been recorded and their habitat, is a critical component for local councils to develop comprehensive koala management plans. Further, by understanding how the Armidale region is physically (habitat) and genetically connected to populations elsewhere, we stand a stronger chance of maintaining strong koala populations in the face of impacts from climate change. Koala conservation must take priority over land clearing, regardless of the demand for that land. That principle might seem simple, but so far it's proved agonisingly difficult.

- It is recommended that Armidale Regional Council develops a comprehensive koala plan of management and lobbies the NSW government to implement these recommendations, in particular increasing funding to local councils to support the implementation of local koala conservation initiatives and increasing resources to local councils to support them in conducting mapping.

Grey-headed Flying-fox, *Pteropus poliocephalus*

Anecdotal evidence from a local orchardist stated that flying foxes were common in the region in the past and that landowners used to seek out their roosts and shoot them⁸⁰. A colony of grey-headed and little red flying foxes started forming at Black Gully in Armidale in October 2017 and reached a peak population of between 40,000 and 50,000 in December that year. Both species are protected under biodiversity protection laws. Neighbouring residents were concerned regarding noise, smell, droppings and damage to vegetation, raising issues on how to manage the site.

The colony left the city in early 2018 and Stage 1 works that year removed selected trees to create a buffer between flying fox habitat trees and neighbouring homes. A management plan for the flying-fox camp at Black Gully was adopted by Council at the Ordinary Council Meeting held on Wednesday 25 July 2018⁸¹, allowing Council to take action to reduce the impact on residents if flying foxes return.

The Grey-headed Flying-fox is currently listed as vulnerable under the Environment Protection and Biodiversity Conservation Act.

A 2009 Draft Recovery plan for the species⁸² states that climate change in the coming decades has the potential to affect food availability and heat related mortality in Grey-headed Flying-foxes. Exposure to high temperatures results in mortality in Grey-headed Flying-foxes⁸³. Mortality rates are low at ambient temperatures of 41 to 43.5° C but increase rapidly at temperatures > 43.5°C, particularly affecting flightless young. Climate change is also predicted to affect nectar food supplies as many eucalypts have a narrow range of tolerance to temperature and rainfall, and the predicted levels of change are expected to impact distribution and reproduction.⁸⁴

It is possible that the cooler Armidale climate may enable flying foxes to persist in the region in the short term. Retained willows and native vegetation planted alongside Dumaresq Creek in 2011 are currently (June/July 2020) providing habitat for a small population of Grey-headed Flying-foxes. Expansion and

80 www.armidaleregional.nsw.gov.au/news/news-2019/black-gully-weeds-cleared-for-flying-fox-plan

81 www.armidaleregional.nsw.gov.au/living-here/animals-and-pets/flying-foxes

82 [www.environment.gov.au/cgi-bin/sprat/publicspecies.pl?taxon_id=186#.~:text=Lack%20of%20foraging%20resources%20can,%20Dfoxes%20\(Tidemann%20et%20al.](http://www.environment.gov.au/cgi-bin/sprat/publicspecies.pl?taxon_id=186#.~:text=Lack%20of%20foraging%20resources%20can,%20Dfoxes%20(Tidemann%20et%20al.)

83 Parry-Jones 2000, Eby et al. unpublished, Welbergen et al. 2007

84 Hughes et al. 1996, Hughes 2003

maturation of plantings in the area could provide additional habitat while at the same time avoiding adverse impacts on residential areas.

Brush-tailed Rock-wallaby, *Petrogale penicillata*

The brush-tailed rock-wallaby occurs in significant numbers in the gorges of northeastern NSW. The species is listed as Endangered in New South Wales, and some of the most important and intact populations occurs in Oxley Wild Rivers National Park and Guy Fawkes River National Parks, parts of each of these parks fall within the Armidale Regional LGA. Most brush-tailed rock-wallaby habitat burned in the recent summer fires. About 82% of all NSW habitat burned, including most habitat in the Armidale Regional LGA. Fires were so intense in many places that there was little to no food for many weeks after fire. Loss of ground cover probably led to higher rates of predation by cats and foxes, especially because animals would have venture further from the safety of the rocky refuges to seek food. Immediate conservation activities included air-dropping and hand-delivering food such as sweet potato and carrots to vulnerable populations. Medium to longer-term actions must address predation pressure by cats and foxes that will further threaten populations under predicted scenarios of increasingly intense and widespread bush fires in eastern Australia with climate change.

Great Glider, *Petauroides volans*

The Armidale LGA contains a nationally important population of the vulnerable-listed greater glider on Mount Duval, part of which is managed as a research station by the University of New England, and part of which falls within the National Parks estate (Duval Nature Reserve). This possum species is a hollow-dependent animal, requiring intact tracts of old-growth forest for food and shelter requirements. Recent research has indicated that Mount Duval's forests contain among the highest densities of greater gliders anywhere in Australia (Emerson et al. 2019). Furthermore, there have been sharp reduction seen in southeastern populations of this species (a decline of one third of the density in Victoria in the last decade) with local extinctions in some areas; thus far, such declines have not been seen on the New England Tableland. However, the impacts on greater gliders of tree death seen on Mount Duval in the recent drought are unknown; loss of tree cover and leaf nutrient quality may affect both the dietary ecology of the animals, and their ability to traverse the landscape. More research is required to understand how drought may have affected these animals, and how increasing impacts of climate change could threaten the population.