Increasing Resilience to Climate Change (IRCC) Project

Climate Change Adaptive Private Domestic Water Supplies for Rural and Remote Properties

Volume 3

Supporting Project Documents

December 2021

BSC is being assisted with this NSW Government Funded project by a Project Team from Management Solutions (Queensland) Pty Ltd, the Institute for Land Water and Society (ILWS) at Charles Stuart University (CSU) and the SEGRA Foundation.

ACKNOWLEDGEMENT OF COUNTRY

Council acknowledges the traditional Custodians of the lands and waters within our Shire and recognises their ongoing responsibility to care for Country and of teaching and learning.

We pay our respects to Elder's past, present and emerging and extend our respects to all Aboriginal and Torres Strait Islander First Nations Peoples.

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Supporting Project Documents

2019 Submitted BSC Project Proposal

Application: IRCC2-0000000055

Gavin Helgeland - ghelgeland@balranald.nsw.gov.au
Increasing Resilience to Climate Change

Summary

ID: IRCC2-0000000055

Last submitted: 2 Sep 2019 06:44 PM (AEST)

Applicant Details

Completed - 26 Aug 2019

You will only need to complete this form once for all your applications on this portal.

Applicant Details

Applicant Details

Council/Organisation:	Balranald Shire Council
Postal Address:	70 Market Street
Suburb:	Balranald
State:	NSW
Post Code:	2715

Contact person for this project

Title:	Mr
First name:	Gavin
Surname:	Helgeland
Position:	Manager Strategic Development
Daytime Phone:	0350201300
Mobile:	0350201300
Email:	ghelgeland@balranald.nsw.gov.au

Project Title (optional):

Increasing Resilience to Climate Change: Adaptive Rivers and Wetlands Action Plan

Increasing Resilience to Climate Change Application Form

Completed - 2 Sep 2019

Submissions close midnight Monday 2 September 2019.

Please refer to the Grant Guidelines and the FAQs to assist in your application.

If you have any queries, please contact:

Stefanie Garland (02) 9242 4019 or Stefanie.Garland@lgnsw.org.au

Denise Anderson (02) 9242 4056 or Denise.Anderson@lgnsw.org.au

If you would like to re-work an application from a previous round, please contact LGNSW to unlock it.

Applicant details

Organisation	Balranald Shire Council
ABN	74678751581

1. Project Title

Climate Change Adaptive Private Domestic Water Supplies on Rural and Remote Properties

Eligibility Criteria

2. Are you a Local Government organisation?

Applications must be lodged by a council or related local government organisation who will receive and administer the funds. However, the grant program encourages partnerships and collaboration across council boundaries and with private sector or community sector organisations. By partnering with local government, your project can still apply for funding.

Yes

3. How have you identified the climate change risk or vulnerability you wish to address?

Vulnerability assessment (peer reviewed methodology) in the last 5 years

To be eligible for a grant, the proposal must be responding to a previously identified climate change risk or vulnerability. Proposals must cite a climate change risk assessment, meeting Australian standards (AS/NZS 4360 or ISO 31000), conducted in the last five years; or a climate change vulnerability assessment (peer reviewed methodology) conducted in the last five years, which includes participation in cross government Integrated Regional Vulnerability Assessments (IRVAs) or Enabling Regional Adaptation (ERA) projects led by OEH. If the risk assessment or vulnerability study is over 5 years, provide alternative documentation showing how a climate change risk has been previously identified, that it is still current, and what work has been done to determine the suitability of the proposal as an adaptation project.

Name of risk or vulnerability assessment

Western Enabling Regional Adaptation - Far West Region Report: "Water" Transformative Change Model (pages 7-8) - transition pathways four and five.

Year in which risk or vulnerability assessment was undertaken

2017

Select your preference for providing the risk or vulnerability assessment from the options below:

Provide a link to the risk or vulnerability assessment

Please provide a link to the risk or vulnerability assessment

https://climatechange.environment.nsw.gov.au/-/media/NARCLim/Files/Section-4-PDFs/Far-West-Enabling-Regional-Adaptation-Report.pdf?la=en&hash=27D069BBA91B10E9F65ABA8F14AFF99EFCBF7D11

Risk ID number or page number

pages 7-8

If other, provide additional/alternative documention

High priority actions from older climate risk assessments and vulnerability studies will be accepted if council has reviewed and reassessed the climate risk and identified that the action is still a high priority. Alternative documentation may include the minutes of council's risk assessment committee undertaking the review.

(No response)

Upload alternative documentation

Q4. Are you applying for

an individual council project (grants between $30,000 and $120,000)

Assessment Criteria

5. What is the adaptation project or climate risk treatment you are proposing to implement?

150 words for proposed project including project description, why there is a need for the project and how it will reduce the climate risk that it relates to.

This project aims to identify and pilot measures to mitigate the risk of increasing temperatures and variable rainfall under climate change to the provision of adequate and safe private domestic water supplies for people on rural and remote properties in the Shire. Rural properties are dependent on private domestic water supplies (rivers, farm dam's, aquifers, rainwater tanks) and are vulnerable to decreased adequacy and quality of supply. In the past year Council has trucked water to some rural properties to maintain essential supplies for residents. This project will establish a baseline assessment of risk to human health, identify a range of solutions to improve water sanitation and water use efficiency, address barriers to adoption and monitor success, and develop a Safe and Secure Domestic Water (SSDW) Program to ensure that the products of the project are disseminated in Balranald Shire, the Far West and for NSW non-scheme water users generally.

6. Please list your project objectives.

150 words for project objectives. These are what you want to achieve with your project, not a list of activities. You should have a maximum of three objectives

Objective #1:	To build a sustainable institutional, local government and community-based partnership. Over two years, the collaboration would deliver and measure the effectiveness of engagement, education and community science activities that address the effects of climatic changes on the sufficiency and safety of domestic water supplies on rural and remote properties.
Objective #2:	To establish an 'environmental base line' for domestic supplies on rural and remote properties. Within six months, to provide: a quantitative inventory of sources of supply and infrastructure at risk from changing climatic conditions; and qualitative information on attitudes and behavior of householders towards health risks.
Objective #3:	.To develop and pilot a SSDW Program for rural and remote properties. Over eighteen months, this will address water adequacy and safety issues at properties identified as being at risk through the environmental baseline process. The program will embed community awareness, engagement, education and science and communications activities.

7. Please provide your proposed methodology.

In 300 words, please provide an overview of the steps or actions needed to meet your objectives.

Objective 1. Actions to establish a sustainable institutional and community based partnership include:

- Identifying and formally linking with governmental, institutional and community based partners.
- Holding scheduled meetings with partners, stakeholders and non-government and community based organisations. This will ensure that the results of survey/market research that identifies potential influencers and new partners are incorporated into the project.
- Forming a steering committee and/or reference group from primary industry bodies, educational institutions and service organisations.
- Developing and initiating a 'communications strategy and action plan' using multi-media mechanisms to engage communities across the Shire.

Objective 2. Establishing the 'environmental base line' will entail:

- Mapping the location of rural and remote properties and categorising them according to dominant land use and hydrological characteristics. Properties will be identified and information provided to ratepayers privately about their risks, and they will be invited to join the project.
- Water quality sampling, questionnaire survey and market research techniques to document: sources, adequacy and quality; water treatment used; consumption patterns; and attitudes of householders to underlying climatic drivers and health risks. The survey instrument and water quality sampling protocol are attached.
- Metadata and information management protocols to maintain the project beyond the funding period. Council will control the information management system.

Objective 3. Developing and piloting the SSDW Program will encompasses:

- Identifying and, prioritising the properties for adaptive action using results of the questionnaire survey and water quality sampling. Potential actions will be agreed with a number of pilot householders who are at risk.
- Documenting adaptive actions in relation to the baseline conditions and determining site relevant measurements for use as indicators of success in reducing climate driven risks to supplies.
- Developing a range of communication products and feedback loops to stakeholders outside of the pilot group to help them understand household risks and actions to address them.

8. How does the proposed project increase resilience to a changing climate?

In 300 words, describe how your proposed project will reduce the associated climate risk and increase climate resilience. This may include how the project will build the capacity of council to reduce climate risks.

The SSDW Program will provide a coordinating mechanism to help people on rural and remote properties undertake adaptive actions to increase resilience to changing climates. Resilience to increasing temperatures, reduced winter rainfalls – manifestly a risk to quality and quantity of water supply for rural residents – will be built by supporting the capacity of stakeholders and decision makers to:

- Assess vulnerabilities and risks using semi-quantitative and participatory approaches by quantifying the risks, assessing the drivers behind the risks, identifying current barriers and opportunities for addressing them.
- Develop practical adaptive responses tailored to the risks identified for householders who have joined the program by trialing new solutions to address those barriers (example: better infrastructure, feedback loops to users, new partnerships, provision of water storage and disinfection resources, building skills and communicating facts).
- Monitoring the results of the risk identification methods used (example: site mapping, evaluation of security of water sources, testing bacteria levels) and risk reduction applied against benchmark conditions and agreed property specific responses (again with feedback to participants and stakeholders).

Through the SSDW Program householders will be encouraged to:

- Increase their knowledge on enhancing water supplies and reduce health risks as outlined (for example) in the NSW Health Guidelines on Private Water Supplies.
- Conserve water by following 'fit-for-use' approaches in the way domestic water supplies are used.
- Treat all water sources used for domestic purposes.
- Seek guidance on reducing vulnerability of supply by installing or increasing the capacity of rainwater tanks, collaborating with neighbours in developing new bore fields, and applying innovative ways of treating low saline supplies.

The SSDW Program seeks to minimise resident infections/illnesses on properties at risk thereby reducing demands on medical services. Council recognises that such actions could achieve adaptation and mitigation objectives. Responses can then be applied regionally across the FWJO.

9. Please describe any social, economic or environmental co-benefits expected from your proposed project.

Word limit of 300 to give a brief description of co-benefits.

The SSDW Program will be a key objective under regional frameworks to provide broader understanding of climate change impacts on communities in the Far West. As an information source and knowledge exchange, this will have biophysical and socio-economic co-benefits for local and regional stakeholders. Awareness raising, community education, on-ground adaptive projects and citizen science would be tools in the program.

Knowledge transfer could include providing projections on changes in rainfall and temperature conditions across the region and how this information could help rural and remote property holders to better prepare for climate induced changes – physically with improved water supply and treatment infrastructure and, psychologically by understanding the material and health implications of the risks from extreme conditions that could affect water sources and supplies. Direct co-benefit could be demonstrated by measurable reduction in costs of hospital and medical services needed to address physical and mental health issues arising from inadequate supplies and poor quality water.

The implementation of the SSDW Program initiatives at a regional scale could meet the challenges of changing climatic conditions from the 'bottom-up' to complement the strategic 'top-down' approach provided by NSW Health guidelines. Of benefit to stakeholders, an enhanced knowledge base and shared experience of measured success of adaptation measures. Sustainability related benefits include reduction in energy use, greater amenity during dry times and use of first flush water for gardens. Increasing primary producer and community knowledge of biophysical and socio-economic benefits of adopting integrated catchment management approaches to protect surface and ground water sources is another potential benefit.

Co-beneficiaries could include:

- Aboriginal communities by linking cultural water to safe water.
- Teachers and students involved in 'citizen science' water supply and safety projects.
- Township residents who use rainwater tanks to complement scheme supplies.
- Tourists/recreation facility operators who are dependent on private supplies.

10. How will you engage and disseminate your project within council and to external stakeholders?

Describe who you will partner with and how you will involve and engage participation in your project to build and share knowledge about adapting to climate change (adaptive capacity). Describe strategies that you will use to maintain the outcomes of this project once the funding support ceases. 200 word limit.

Engagement and dissemination is core to the success of the SSDW Program and will be guided by the communications strategy and action plan. Consequently, Balranald Shire will become a network hub for engaging with regional stakeholders and disseminating information generated from piloting the SSDW Program. Key governmental and civic bodies for engagement and participation in knowledge building and sharing process are (for example): the MDBA, MDA, FWJO, Balranald Local Aboriginal Land Council, SEGRA, service organisations, and church groups.

Local and regional schools and youth groups will also be included in the engagement and knowledge generation and dissemination network. Citizen science is seen as tool for monitoring the adequacy and quality of water resources on rural and remote properties.

Council will embed the SSDW Program in its Revised Community Strategic Plan and inform financial planning with recommendations for adaptation measures that are either wholly funded, a co-contribution or self-funded beyond the two years of the proposed Project. A fully scoped funding plan will be prepared for the scaling and dissemination of the project findings, including funding applications and developing relationships with potential funding partners nationally.

11. List project partners and specify their role in this project.

Must be no more than 200 words

ILWS, SEGRA and the FWJO are key project partners, letters of support are attached. Others partners will be identified and invited to join as the program is initiated. ILWS are a multi and trans-disciplinary Research Centre at CSU, Australia's largest regional university. In partnership with government and others, ILWS undertake biophysical, social and economic research to address local, regional, national and global issues. Over the past 23 years SEGRA has come to be acknowledged as the 'voice for regional Australia'. ILWS-SEGRA bring professional experience, knowledge and skills to the program and will (for example):

- Support community and governmental engagement, information management and knowledge sharing.
- Support questionnaire and water quality surveys to identify properties at risk.
- Technical advice on the piloting of adaptive measures on properties that have agreed to join the program.

The FWJO has a regional coordination role with governmental and community bodies and will assist in networking, knowledge sharing and catalysing take up of the initiative in the Far West councils facing similar climate risks.

Do you require the ability to upload letters of support?

If you select yes, an upload facility will appear.

Yes

Q12. How will the project's learnings be applied by council beyond the project? How can the learnings be used by other organisations?

Describe strategies that you will use to maintain the outcomes of this project once the funding support ceases. Describe how you will share the outcomes and learnings from your project. How the learnings can be scaled/replicated in other councils? 200 word limit.

Council will work proactively with LGAs in the Far West through FWJO and the MDA and community based organisations to share the outcomes and learnings from the Project. In collaboration with FWJO, Council will become a network hub for: engaging with local and regional stakeholders and disseminating information gained from piloting the implementation of the SSDW Program; and communicating outcomes of similar climate change adaptation activities of LGAs and community based organisations.

Council will support community-instigated adaptation measures piloted in the Shire beyond initial funding by:

- Sharing, scaling, replicating and disseminating the outcomes of the Project.
- Assisting with the delivery of practical measures to increase the resilience of people on properties identified as at risk from increasing temperatures and variable rainfall under climate change.
- Fostering community groups and citizen scientists to support improvements with the provision, monitoring and reporting on the effectiveness of adaptive measures for private supplies on rural and remote properties.
- Helping catalyse the raising of funds guarantee that the SSDW initiative becomes self-sustaining.
- Catalysing broad support for capacity building process within and with LGAs and communities to better mitigate the risk of increasing temperatures and variable rainfall under climate change.

13. How is this project aligned with organisational objectives, strategies or commitments?

In 200 words or less, applicants must demonstrate how the proposed project meets relevant organisational objectives. How does this project link to the Integrated Planning and Reporting framework? IRCC will not fund projects that are already identified within Council's operational plan as this is considered business as usual.

The proposed Project is very much aligned with organizational objectives and priorities through the strategic objectives for promoting health in Council's Community Strategic Plan. The linkage is seen in PILLAR FIVE: OUR INFRASTRUCTURE with Objective 5.2 – Promote key health, community communications and infrastructure improvements, with Strategies 5.2.3 – "Prepare and implement plans and strategies in support of maintaining health standards in the Shire" and the priority action being "to implement public health programs". Council sees this Project as increasing climate change resilience in the sector of public health where the risk of poor water quality making our rural residents sick (or worse) is mitigated by adaptive measures generated by this Project.

14. What are the expected project outcomes and how will you know you have achieved them?

When answering this question, imagine what the success of your project will look like and how will you know you have achieved the outcomes. Must be no more than 300 words.

The development and piloting of the SSDW Program will be phased with an initial time line of 18 months for confirming initial outcomes. Qualitative and quantitative mechanisms will be designed to measure the achievement of key performance indicators (kpi) for the Project. These could provide a climate change assessment and adaption framework beyond the initial funding.

The on-ground activities and measures of progress for the Project across the two year work plan are outlined in full in the Preliminary Work Plan (uploaded file: "Private_Drinking_Water_Sources_Project-Preliminary_Work_Plan_FINAL.xlsx").

- Environmental & Social Baselines Report completed by Project Officers and key outcomes shared with all stakeholders. Stakeholder's engage with Steering Group to build a network of awareness.
- Proved adaptive actions are discovered through SSDW Pilot Program and communicated effectively throughout Shire resulting in improved awareness and take-up.
- New database on quality and quantity of water sources and supplies available to rural householders (kpi – 60 accessible database available within a six month timeframe at 60 locations);
- Network of engaged rural householders (kpi –100 pilot households over project lifespan, 300 stakeholders in Balranald Shire engaged with the SSDW Pilots Program over an 18 month period);
- Collated and analysed survey results on barriers and opportunities to change (kpi – 100 survey respondents in first six months, 30 people involved in Steering Group).
- Specific improvements in the water efficiency and quality at pilot households measured by metering and quality parameters (kpi – 100 litres /person/day, zero bacteria in supplies at pilot properties).
- Dissemination of learnings through network/hub (kpi – 1,000 likes/250 shares on project Facebook in first year and 3,000 likes/500 shares by end of funding period
- Reduced numbers presenting to medical services with physical and psychological symptoms attributable to poor quality water and adequacy of supply (kpi – 50 percent reduction from baseline numbers).

15. What are some of the potential risks that could hinder progress of the project and how will you manage them?

Identify key project risks and proposed management measures. Risk categories covered should include schedule, budget, environmental and WHS risks. Must be no more than 200 words.

Council has identified the following risks that may impact on the delivery of the Program.

- Lack of interest and engagement from stakeholders and institutional or organisational resistance impacting on project implementation. Innovative measures to reduce this risk include:
  - partnering with stakeholder groups and developing a participatory approach with a Steering Group that includes end users
  - survey and focus group work to understand social barriers to engagement and adoption in the initiation phase
  - technical challenges and issues relating to benchmarking, supporting field and social research and outcome monitoring being addressed collaboratively
- Sub-optimal scheduling of activities and scope creep disrupting the delivery of project products. Realistic scheduling, project management, and clear understanding of the roles and responsibilities of partners should reduce this risk. To this end:

  - Planning process will anticipate potential environmental contingences and optimise arrangements for undertaking water quality monitoring and questionnaire survey work.
  - WHS risks that could impact on personnel such as access to private properties, extreme heat and personal hydration will be assessed and mitigated.
  - Budget control and review processes will follow Council cashflow practices and State government audit requirements.

16. Please declare any actual, potential or perceived conflict of interest that you are aware of.

This can relate to land ownership, salary and/or contractor payments.

There are no actual, potential or perceived conflict of interest that I am aware of.

17. Total Amount Requested.

Please complete the separate spreadsheet "Preliminary Work Plan" and transfer the total "grant amount sought" here.

Individual councils can apply for amounts between $30,000 to $120,000. Collaborations cross councils can apply for amounts between $50,000 to $300,000.

$82500

Do you require the ability to upload supporting documents directly to your application?

If you select yes, an upload facility will appear.

Yes

Privacy

When you apply for a grant, Local Government NSW (ABN 49 853 913 882) ('LGNSW', '**we**', 'us', 'our') collects your personal information from you to manage grants and reporting obligations under those grants. We also collect your personal information from other sources, such as council websites and your referees.

If you do not provide or we cannot otherwise collect all the information we request or need, we may not be able to assess your application.

LGNSW may disclose your personal information to the grants technical committee, our member councils (and their staff), general managers, councillors and other council stakeholders where necessary to provide our services; and government agencies for the purpose of reporting on grants. We may disclose your personal information to third party service providers who are located overseas.

Our privacy policy, which is available at https://www.lgnsw.org.au/privacy or by emailing or calling us on the details below, explains more about the types of personal information we usually collect and how we handle your personal information, as well as how you can request access to and correction of personal information we hold about you, how you can complain about our handling of your personal information and how we deal with complaints.

OPTIONAL: Upload Letters of Support from Project Partners (IRCC)

Completed - 2 Sep 2019

SEGRA-Letter of Support -BSC_IRCCr2 Application 2 September 2019

Filename: SEGRA-Letter_of_Support_-BSC_IRCCr2_Ap_VAsZlXv.pdf **Size:** 170.4 kB

Letter of Support - FWJO - Balranald IRCC Round 2

Filename: Letter_of_Support_-_FWJO_-_Balranald_I_njwGAsR.pdf **Size:** 222.6 kB

Balranald Shire - Letter of Support ILWS

Filename: Balranald_Shire_-_Letter_of_Support_ILWS.pdf **Size:** 431.5 kB

Password = Balranald

Lea Lawrie reflecting on the quality of the Murrumbidgee River when she was growing up and how it has become of poor quality.

https://vimeo.com/357266661

OPTIONAL: Upload Proof of Risk Assessment or Vulnerability Assessment (IRCC)

Incomplete - Hidden from applicant

OPTIONAL: Further Supporting Documents (IRCC)

Completed - 2 Sep 2019

DRAFT 240819 IRCC Grant Attachment Survey Instrument

Filename: DRAFT_240819_IRCC_Grant_Attachment_Su_V7fVURl.docx **Size:** 28.2 kB

Upload preliminary workplan (IRCC)

Completed - 2 Sep 2019

Please complete the Preliminary Work Plan form and upload.

Private_Drinking_Water_Sources_Project-Preliminary_Work_Plan_FINAL

Filename: Private_Drinking_Water_Sources_Projec_ei3hdeP.xlsx **Size:** 17.6 kB

Request GM Approval

Incomplete - Hidden from applicant

Recommenders

Logo

Incomplete - Hidden from applicant

Attachments

Incomplete - Hidden from applicant

SEGRA
National Conference
Sustainable Economic Growth for Regional Australia

Agricultural Innovation

Indigenous Issues

Communications & IT Connections

Enivronmental Sustainability

Heritage Infrastructure & Investment

Mr Gavin Helgeland

To whom it may concern

RE: Climate Change Adaptive Private Domestic Water Supplies on Rural and Remote Properties

I am writing in support of the Balranald Shire Council's funding application to IRCC to conduct a project on climate change adaptive private domestic water supplies on rural and remote properties

The intent of the project is to mitigate the risk of increasing temperatures and variable rainfall under climate change, to the provision of adequate and safe private domestic water supplies of people on rural and remote properties in Balranald Shire. This is an important and ongoing issue for regional Australia first raised as a Challenge at ***SEGRA*** 2015. Elements of this project has been beta tested in north Queensland from which a number of regional initiatives were implemented. This is critical work with wide ramifications for regional, rural and remote Australia and I commend Balranald Shire for advancing this issue.

As Australia's most credible, independent voice on issues affecting regional Australia, ***SEGRA*** supports Balranald Shire Council's funding application and plan to ensure safe and secure water supply for residents.

Yours sincerely

K. E. Charters

Kate Charters

Founding Member and Convenor

SEGRA (Sustainable Economic Growth for Regional Australia)

SEGRA Secretariat
Management Solutions
(Qld) Pty Ltd

ABN 73 072 601 560
GPO Box 2301
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W: www.segra.com.au

Far West Joint Organisation

Stronger Together

Wentworth Shire | Broken Hill City | Central Darling Shire | Balranald Shire

31 August 2019

To the IRCC Program Team,

Subject: Balranald Shire Council's "Climate Change Adaptive Private Domestic Water Supplies on Rural and Remote Properties" Project Application

The Far West Joint Organisation (FWJO) wishes to offer its support for the aforementioned application under Round Three of the Increased Resilience to Climate Change (IRCC) Program.

The issue of continuing diminishment in quality and quantity in our rural and remote private domestic water supplies is one of increasing concern. Balranald Shire Council's proposed Project will undoubtedly offer a significant opportunity to these communities to mitigate the risks and build resilience.

The other Member Shires in our Joint Organisation will certainly reap the benefits of this program as those proven adaptive measures are adopted more broadly. The FWJO intends to play a key role in ensuring these benefits are maximised across our region.

On behalf of the FWJO, I do look forward to hearing of this Program becoming funded.

Yours sincerely,

Mark Forbes

Chief Executive Officer
Far West Joint Organisation
+61 0400 655 441
ABN: 64 877 480 306
mark.forbes@fwio.nsw.gov.au
www.fwjo.nsw.gov.au

Institute for Land, Water and Society
Charles Sturt University

To: Adapt NSW (IRCC Fund), 2 September 2019

Re: Balranald Shire Council's IRCC – Round Three Application: "Climate Change Adaptive Private Domestic Water Supplies on Rural and Remote Properties"

Building resilience for rural Australians is at the heart of what the Institute of Land, Water and Society (ILWS) at Charles Sturt University seeks to achieve. We offer our full support for the project proposed by Balranald Shire.

ILWS wishes to also be a partner in this Project acting in an advisory capacity to ensure the delivery of climate adaptive solutions through a process of on-ground piloting with rural householders. This draws on our considerable experience in working with stakeholders and river and wetland management, including across the Murray-Darling Basin.

On behalf of the ILWS, I certainly think that Balranald Shire Council's application is a priority for this funding and we look forward to being a part of its successes.

Yours sincerely

Professor Max Finlayson

Director, Institute for Land, Water & Society

Charles Sturt University, Albury, NSW

Annex 3-A

Action Plan

BALRANALD SHIRE COUNCIL (BSC) INCREASING RESILIENCE TO CLIMATE CHANGE (IRCC) PROJECT

Climate Change Adaptive Private Domestic Water Supplies on Rural and Remote Properties

Draft Project Operational Plan 210920

Contractual Requirements and Work Schedules

The BSC IRCC project is funded by the NSW Government. Contracted requirements for the project between NSW Department of Local Government and Balranald Shire Council are listed at Attachment 1.

Tasks, approach, information links and sources for Phases II, III and VI are overviewed in Tables 1-3. Resilience

Communications

BSC delivers the "Communications Strategy" through:

- Letters to residents
- Council Facebook page
- Media release
- Flyers

Information is being complied for periodic dissemination through: blogs connected to a twitter account; a digital newsletter; and as hard copy to rural and remote residents. These communication materials outline:

- potential health risks from private domestic water supplies
- how householders can ensure that private supplies of domestic water are adequate and safe
- reducing social barriers to adopting health risk reduction practices through testing and treating private supplies

Networks of the Project Steering Committee and Skilled Advisory Group members could be used in the information dissemination process. Feasibility of holding zoom 'coffee shop' or 'drop-in-spot' meetings with focus groups will be investigated.

Information management for ongoing awareness raising, engagement and communications tasks is currently with the Project Team. Formats being used enable direct transfer of materials to Council.

Geospatial mapping

Public base maps and satellite images used to produce analytical tools for the environmental and social baselines and illustrations for communications materials. These provide simplified coverages of:

- Landscapes (riverine wetlands, floodplains, ephemeral lake systems, drylands)
- Land uses (irrigated areas, croplands, grazing, forest, conservation reserves)
- Generalised property boundaries and dwelling locations

Water quality questionnaire survey and testing

The water quality survey and testing is proceeding as a stepped process. Steps 1 and 2 are an integral part of Phase II of the project with Steps 3 and 4 being delivered in Phase III.

Step 1 rural property holders and town residents with water tanks or other private supplies invited to participate in the survey and testing program. Participants will be able to complete the questionnaire by either survey monkey or on a hard copy mailed back to the Project Team.

Step 2 questionnaire responses collated and analysed. Water sources being used on individual properties will be cross referenced to the landscape conditions and land uses. These data will be used to identify and prioritise properties with potential health risks from their private water sources.

Step 3 residents at priority sites invited to participate in the water quality scanning for bacteria and other parameters using Do-it-Yourself (DIY) test kits provide by the Project Team.

Step 4 collation, analysis and reporting of results by Project Team.

Institutional and Industry Collaboration

Contact has been established with NSW Health re community awareness and education material. Key web links are listed in Table 4. They will be included in Blogs and media on health risks.

Published information on changing climatic conditions across the MDB has been identified. These materials can be accessed from institutions and organisations engaged in climate action activities in the MDB. Summarised text and links from these sources will be used for raising awareness of:

- projected changes in regional climatic conditions and exposure to climate induced hazards
- potential implications of these changes at property and personal scales
- vulnerabilities of water sources and the quality of supplies from drought
- adaptation strategies to ensure adequacy of supply and reduction in health risks

Water industry companies have been contacted to explore:

- Cost and utility of Do-it-Yourself (DIY) test kits for water quality screening
- Participating in a ***Virtual Water Technology Expo*** to show case technologies for storage and treatment of domestic water supplies
- Feasibility of demonstrating technologies for storage and treatment at selected SSDW pilot locations and private water supply provision and testing services in the Shire

Projected professional commitment July to November 2020

Phase II has 40% of the total hours for the budget for the project.

Professional inputs	60hrs
Administration, coordination and reporting	20hrs
Zoom meetings and communications	20hrs
Questionnaire survey administration and analysis	60hrs
Total	160hrs

Projected outcomes for Phase II

- Project communications established and maintained in spite of CIVID 19 restrictions
- Environmental and social baselines mapped and documented
- Opportunities and strategies for SSDW Pilot Project activities identified
- Community awareness and engagement sustained

Table 1. Overview of Phase II Work Program September to November 2020

Phase II. Establish Environmental & Social Baselines

Tasks and timeline	Approach	Information links and sources
T II-1 Continue community awareness and education to: o Deliver communications strategy and coordinate information management o Identify, document and communicate potential risks from private water supplies using 'BSC IRCC Blogs' o Analyse effectiveness of information dissemination aimed at addressing social barriers to participation ***Continuing activity all phases***	**T II-1** Consultants to: ➢ Use literature, published reports and web sources for the preparation and dissemination of information to community on health risks, regional climate change projections, and building community resilience ➢ Undertake gap analysis and identify additional information requirements ➢ Prepare BSC IRCC Profile ➢ Embed web linkages in communications materials	NSW Health links covering private water supplies and guidelines for rainwater tanks are listed in Table 4. Climate change information is accessible from institutions and organisations engaged in climate action activities in the MDB such as: Medical centres, aged care institutions and primary health care practitioners will be invited to contribute professionally in Phase III of the project
T II-2 Undertake geospatial mapping to: o Characterise landscapes, drainage patterns and private water supply source conditions o Identify and map rural and remote properties in relation to landscapes ***To be completed by 23 October***	**T II-2** Council to utilise public base maps and/or satellite images to produce illustrations for communications materials. ➢ Landscapes (riverine wetlands, floodplains, ephemeral lake systems, drylands) ➢ Land uses (irrigated areas, croplands,	The draft invitation is at Attachment 2

T II-3 Initiate water quality survey and testing program

- Invite households/properties to participate in water quality survey and screening program
- Undertake questionnaire survey and analyse results.
- Select households/properties to be invited to participate as a Pilot Group for the SSDW Pilot Project

To be completed by 20 November

T II-4 Establish and maintain Project Database that includes:

- metadata
- property categorization
- questionnaire survey answers
- water quality testing results
- project maps
- communications information packages

Continuing activity all phases

grazing, forest, conservation reserves)

- Generalised property boundaries and dwelling locations

T II-3 Consultants to:

- Prepare invitations to participate in water quality survey and DIYS screening program (see draft at Attachment 1)
- Administer the water quality survey questionnaire (see draft at Attachment 2)
- Analyse results of survey and identify potential respondents to participate in DIY water quality screening in Phase III

T II-4 Consultants to:

- Applying maps and data modelling from questionnaire survey to identify and prioritise properties potentially having

The draft water quality survey questionnaire is at Attachment 3.

Water industry companies contacted re their demonstrating technologies for storage and treatment of domestic water supplies.

Do-it-yourself (DIY) home drinking water test kits are available from (for example):

- ✓ Watertest Systems
- ✓ Pacific Water Technologies
- ✓ OZ Filter Warehouse

These kits can be used to determine unsafe or undesirable levels of: Alkalinity, Bacteria (Coliforms), Chlorine (Free), Copper, Hardness (total), Iron, Nitrates, Nitrites, and pH

Innovative filter and other systems for rainwater harvesting are available from (for example):

Doust Plumbing---Rainwash Filters

https://rainwatch.com.au/why-rainwatch/

Acqua by Davey

https://acquabydavey.com/

T II-5 Milestone Report

Model data from Project Database and write milestone report outlining social and environmental baselines and identification of screening and SSDW piloting opportunities and implementation strategies for Phase III

health risks from poor quality private water supplies

- Use baseline reports and database for biophysical and socio-economic modelling to develop protocols for water screening roll out and SSDW Pilot Project strategy

Submit by 30 November 2020

T II-5 Consultant Coordinator will prepare the Milestone/Progress Report to include:

- Balranald Shire Social and Environmental Baselines
- Water quality survey questionnaire results
- SSDW Pilot Project strategy and opportunities
- Screening/sampling protocols for Phase III

Table 2. Overview of Draft Phase III Work Program January to September 2021

Phase III. Develop and Implement Safe and Secure Domestic Water (SSDW) Pilot Program

Tasks	Approach and Key Performance Indicators (kpi)	Comments and Projected Outcomes
T.III.1 Consultant Project Coordinator (PC) will advise and assist Council with: • Implementing the water quality screening survey at questionnaire properties • Engaging with the Pilot Group selected for the SSDW pilot project • Collating analysing and documenting results of water quality screening • Recommending and implementing adaptive actions that have been scoped and agreed between members of SSDW SAT and Pilot Group participants • Monitoring and documenting adaptive actions that are being implemented by residents	**T.III.1** Consultants to: • Compile data set on quality and quantity of water sources and supplies available to rural landholders based on results of DIY screening and other testing ***(kpi – 60 accessible data set available within a six month timeframe at 60 locations)***; • Finalise and document spatial analysis of rural and remote properties in relation to: regional surface and groundwater hydrology; range lands for graising sheep and cattle; dryland farming; and irrigation for pasture, crops and horticulture ***(kpi – GIS layers covering key parameters with property identities secured to ensure privacy is maintained)***.	<u>Communications</u> As for Phase I and II <u>Performance Measurement</u> The development and piloting of the SSDW Program will be phased with an initial time line of two years to confirm initial outcomes. Qualitative and quantitative mechanisms will be designed to measure the achievement of key performance indicators (kpi) for the project. These could provide a climate change assessment and adaption framework beyond the initial funding.
T.III.2 Consultant Project Coordinator (PC) will advise and assist Council with: • Developing a range of communication products focused on land and water supply categorisation and	**T.III.2** Consultants to: • Promulgate publically accessible climate change	<u>Institutional & Industry Collaboration</u>

realities from the SSDW pilot project situations

- Establishing feedback loops to stakeholders outside of the Pilot Group to help them understand household health risks and adaptive actions to address them

T.III.3 Consultant Project Coordinator (PC) will

will prepare the following project documents:

- Final report on:
    - results and recommendations from questionnaire survey, screening and any other water quality sampling
    - results of monitoring of adaptations measures undertaken by Pilot Group
- Regional roll-out strategy
- Communications materials for feedback loops to stakeholders in Balranald Shire who are outside of the Pilot Group
- Communication materials promoting regional roll-out

projection maps of Shire and region

(kpi – GIS layers developed from NSW and BoM resources)

- Establish network of engaged rural landholders and stakeholders

(kpi –100 pilot households over project lifespan, 300 stakeholders in Balranald Shire engaged with the SSDW program over a five year time period)

T.III.3 Consultants to:

- Collate and analyse survey results on barriers and opportunities to change

(kpi – 200 survey respondents in first six months, 60 people involved in focus groups).

- Disseminate of learnings through network/hub

(kpi – 3 000 hits on project Facebook in first year and 5 00 by end of funding period)

- Report on specific improvements in the water efficiency and quality at pilot households measured by metering and quality parameters.

  (Goal ***kpi – 100 litres /person/day, zero bacteria in supplies at pilot properties***).

- Report on numbers presenting to medical services with physical and

Continuation of collaborative activities from Phase II

<u>Projected outcomes for Phase III</u>

Measured achievement of key performance indicators (kpi) for the project as per kpi's listed for **T.III.3**.

Indicative climate change assessment and adaption framework beyond the initial funding.

psychological symptoms attributable to poor quality water and adequacy of supply.

(Goal ***kpi – 50 percent reduction from baseline numbers***).

Table 3. Overview of Draft Phase IV Work Program September to October 2021

Phase IV. Reporting and Regional Roll-out

Tasks and Products	Approach and Outcomes	Comments
T.IV.1 The Consultant Coordinator will: • Prepare a final IRCC SSDW Adaptation Report and associated communication products • Advise on dissemination of project products to stakeholders, governmental bodies and community based organisations ***Submit by October 2021***	**T.IV.1** The Consultant Coordinator will confirm BSC achieves: • Rigorous documentation of project and outcomes • Confirmed regional utility of approach • Agreed commitment to having adequate safe, secure domestic water supplies on rural and remote properties in the Shire • Assured safe, secure domestic water supplies from rainwater tanks in towns and settlements in the Shire • Reduced numbers presenting to medical services with physical and psychological symptoms attributable to poor quality water and adequacy of supply	<u>Communications</u> As for Phases I to III <u>Institutional & Industry Collaboration</u> Continuation of collaborative activities from Phases II&III
T.IV.2 The Consultant Coordinator will: • Liaise with and provide advice to regional LGAs, Governmental bodies and non-government organisations on approaches to rolling out SSDW adaptive actions		

Table 4 NSW Health Web Links

Document	Web URL
Private water supply guidelines	**http://www.health.nsw.gov.au/environment/water/Publications/private-water-supply-guidelines.pdf**

Rainwater tank information	**http://www.health.nsw.gov.au/environment/water/Documents/rainwater_tanks.pdf**
NSW Health *Naegleria fowleri* Fact Sheet	**https://www.health.nsw.gov.au/Infectious/factsheets/Pages/Naegleria-fowleri.aspx**

Contractual requirements from Project Plan Template submitted by BSC for the Climate Change Grant

2. Environmental & Social Baselines Established

(a) [Shire, Project Officers] In consultation with Steering Group, geospatial mapping and categorisation of rural and remote properties

Baseline map and metadata complete by Shire and Project Officers using Shire GIS and property database resources

(b) [Project Officers] Information compiled and provided privately to rural/remote residents outlining potential private water risks, addressing social barriers to participation and an invitation to join the Project

Residents responses to invitation are compiled and a register of participants established

(c) [Shire, Project Officers] Water quality sampling and questionnaire survey provided to participants to complete.

Working with Skilled Advisory Team and Shire Officers, Project Officers establish the Project Database that includes: property categorization, questionnaire survey answers and water quality sample results.

(d) [Project Officers] Model data from Project Database; write report outlining social and environmental baselines and identification of piloting opportunities and strategies

Environmental & Social Baselines Report completed by Project Officers and key outcomes shared with all stakeholders;
3. Developing and Implementing Safe and Secure Domestic Water (SSDW) Pilot Program

(a) [Project Officers] Using Environmental & Social Baseline Report and database, develop SSDW pilot strategy

SSDW Pilot Program strategy completed by Project Officers

(b) [Shire, Project Officers] Using Data modelling, identify and prioritise properties for adaptive action - residents at significant risk

(b) [Shire, Project Officers] Using Data modelling, identify and prioritise properties for adaptive action - residents at significant risk

(c) [Shire, Project Officers, Skilled Advisory Team] Pilot Group Engagement: Adaptive actions scoped and agreement between members of Skilled Advisory Team and residents established

In consultation with Skilled Advisory Team, Project Officers concurrently scope Pilot Group Programs, agree and finalise with participants - ready for action

(d) [Project Officers] SSDW Pilot Program roll-out: Guiding investment (brokering price-competitive purchases according to available innovation/technologies), supporting implemented adaptive actions and, in relation to the baseline conditions, determining site relevant measurements for use as indicators of success in mitigating/reducing climate driven risks (18 months)

Pilot Group adaptive actions and behaviours will be measured by Project Officers (In consultation with Skilled Advisory Team) at regular intervals and residents interviewed to quantify/qualify benefits. Steering Group and broader community will be engaged at key stages to communicate learnings/benefits as they are realised/prioritised.

(e) [Project Officers] Develop a range of communication products and feedback loops to stakeholders outside of the pilot group to help them understand household risks and actions to address them.

Benefits are realised through SSDW Pilot Program and communicated effectively throughout Shire resulting in improved awareness and take-up of proved adaptive actions.

Annex 3-B

Communications Strategy

BALRANALD SHIRE COUNCIL

Increasing Resilience to Climate Change (IRCC) Project
DRAFT PARTICIPATIVE COMMUNICATION STRATEGY AND ENGAGEMENT PLAN
Climate Change Adaptive Private Domestic Water Supplies for Rural and Remote Properties

DRAFT Part A: Participative Communication Strategy

Project Description

This project aims to identify and pilot measures to mitigate the risk of increasing temperatures and variable rainfall under climate change to the provision of adequate and safe private domestic water supplies for people on rural and remote properties in Balranald Shire. Rural properties are dependent on private domestic water supplies (rivers, farm dam's, aquifers, rainwater tanks) and are vulnerable to decreased adequacy and quality of supply. In the past year BSC has trucked water to some rural properties to maintain essential supplies for residents.

This project will establish a baseline assessment of risk to human health, identify a range of solutions to improve water sanitation and water use efficiency, address barriers to adoption and monitor success, and develop a Secure and Safe Domestic Water (SSDW) Program to ensure that the products of the project are disseminated in Balranald Shire, the Far West-and for NSW non-scheme water users generally. Background information on the SSDW initiative in the Murray Darling Basin (MDB) and beyond is at **Attachment 1**.

BSC gratefully acknowledge that this project will be assisted by the New South Wales Government and supported by Local Government NSW and the Department of Planning, Industry and Environment.

Background to the project

Background information on the ***Increasing Resilience to Climate Change (IRCC) Project*** at **Attachment 1** covers:

- government and governance issues relating to the provision of secure and safe domestic water on rural and remote properties who are dependent on private sources/supplies
- implications of changing conditions on the quantity and quality of surface and ground water sources
- what is the Increasing Resilience to Climate Change (IRCC) Project and what it seeks to achieve
- what is the SSDW initiative and the desired outcomes

<u>Partnerships, community engagement, information and knowledge</u>

Partnerships, community engagement, information generation and knowledge dissemination are pivotal to the success of the SSDW Program. These activities will be guided by this *Participatory Communications Strategy* at **Part B** of this Plan.

<u>Communication strategy</u>

A communication strategy is 'a well-planned series of actions aimed at achieving certain objectives through the use of communication methods, techniques and approaches' (Tuft and Mefalopulos 2009).
The purpose BSCs SSDW communications strategy is to provide mechanisms and processes to assist residents of the Shire to identify, understand and resolve problems relating to the adequacy and quality of private water supplies. Such problems are attributable to changing climatic conditions and they will be addressed by utilising:

- findings from research activities
- experience from similar or analogy projects
- communication methods, techniques and media that are tailored to the geographic and demographic realities of the Shire and the Far West Region

This is being done with the people of the Shire, not just for the people of the Shire. That is, it is fully participatory. And the strategy is:

- consistent with research findings and the project framework
- feasible with respect to the resources available and the project timeframe
- effective in the use of the available resources in order to achieve the set objectives

Participatory communications

Participatory communications is an approach based on dialogue which allows the sharing of information, perceptions and opinions among the various stakeholders and thereby facilitates their empowerment (Tufte T and Mefalopulos P. 2009, Participatory Communication: A Practical Guide, World Bank, Washington, DC). The World Bank approach is outlined at **Attachment 2.**

Objectives and principles of the BSC Participatory Communication Strategy

Objectives

The objectives of the BSC participatory communication are to:

1. *Build sustainable institutional, governmental, commercial and community based partnerships to work collaboratively on increasing resilience and undertaking adaptive actions to meet the challenges of changing climatic conditions.*

Over this year the collaboration seeks to deliver and measure the effectiveness of engagement, education, community science activities and adaptive actions that address the effects of climatic changes on the sufficiency and safety of domestic water supplies on rural and remote properties.

2. *Provide a unifying approach to proactively address the effect of changing conditions on personal health and wellbeing.*

Specifically, on ensuring that:

- communications are a two way process
- messages are consistent
- adaptive actions are being delivered under one inclusive vision
- private domestic water supplies across the Shire are adequate and safe
- attitudes and behaviour towards water quality and potential health risks are changed positively
- there is a reduction in potential health risks and medical costs from unsafe private water supplies

3. *Strengthen the voice of the community and raise the profile of local adaptive and mitigative solutions.*

This will be done through:

- codesign and co-production of the communications materials
- more effective use of communications tools
- utilising collaborative processes for implementation

Principles guiding the project are:

1. Capitalize on the strengths and existing networks. Specifically, built on what has been established by various BSC and regionally based projects in order to fill gaps, complement, expand and strengthen the local engagement and trust that has been generated over past years.

2. Focus communication actions on individuals, institutions and organisations who are influential and/or decision-makers. This helps to facilitate message penetration at the level of the home/family and the wider community.

3. Acknowledge the multiethnic, multicultural, and multilingual nature of the demographic structure of the Shire's population. Effective communications can then:

- engender an atmosphere of respect
- facilitate an exchange of knowledge
- value different ways of looking at problems and solutions

4. Concentrate on the 'home' as the key base for health and wellbeing. This recognises that there is accumulated local knowledge and wisdom that can be built on with respect to the potential effects on physical and mental health of changing climatic conditions. Specifically, the impacts of heatwaves, prolonged drought and reduction in the quantity and quality of surface and ground water supplies.

5. Utilise emotions and aspirations as catalysts of change. This means exploring not only cognitive aspects associated with domestic water management practices but also framing aspirations within opportunities to reduce health risks and ensure that private domestic supplies are adequate and safe.

Collaborating partners and stakeholders

Key governmental and civic bodies identified for engagement and participation in knowledge building and sharing processes include (for example):

- NSW and Federal departments and agencies
- Local Government Authorities (LGAs) and associated organisations
- community based service organisations and clubs
- regional and local faith based groups
- university research institutes and centers
- Balranald Local Aboriginal Land Council and Balranald Chamber of Commerce

The Institute for Land, Water and Society (ILWS) at Charles Sturt University (CSU), Sustainable Economic Growth for Regional Australia (SEGRA) and the Far West Joint Organisation (FWJO) are key project partners. Others partners will be identified and invited to join as the program is initiated.

ILWS are a multi and trans-disciplinary Research Centre at CSU, Australia's largest regional university. In partnership with government and others, ILWS undertake biophysical, social and economic research to address local, regional, national and global issues.

SEGRA is a community of diverse interests that is able to draw on a wide range of professional expertise in addressing core problems being faced by communities and individuals across rural, regional and remote Australia. For nearly 25 years SEGRA has come to be acknowledged as the 'voice for regional Australia'.

ILWS-SEGRA bring professional experience, knowledge and skills to the SSDW program and will (for example) assist with:

- supporting community and governmental engagement, information management and knowledge sharing
- administering questionnaire and water quality surveys to identify properties at risk
- piloting of adaptive measures on properties that have agreed to join the program
- collaborative field, technological and social science investigations on the viability of alternative sources, storage and sanitation of domestic supplies
- changing attitudes and behaviour towards adopting climate adaptive approaches to reducing health and related risks

The FWJO has a regional coordination role with governmental and community bodies. The JO will assist in networking, knowledge sharing and catalysing take up of the initiative with LGAs, commercial enterprises and community based organisations in the Far West who are facing similar climate change driven risks.

Local and regional schools and youth groups are included in the engagement and knowledge generation and dissemination network and processes. Citizen science is seen as tool for:

- gathering baseline water supply and environmental information
- monitoring the adequacy and quality of water resources on rural and remote properties

Actions to establish a sustainable institutional and community based partnership include:

- Identifying and formally linking with governmental, institutional and community based partners.
- Holding scheduled meetings with partners, stakeholders and non-government and community based organisations. This will ensure that the results of survey/market research that identifies potential influencers and new partners are incorporated into the project.
- Forming a Steering Committee from primary industry bodies, educational institutions, service organisations and members of the community.
- Developing and initiating a 'communications strategy and action plan' using multi-media mechanisms to engage communities across Balranald Shire.

A register of collaborating partners and key stakeholders is at **Attachment 3**. This is an emerging and dynamic document and membership will change with changing interests and needs.

DRAFT PARTICIPATIVE COMMUNICATION STRATEGY AND ENGAGEMENT PLAN
Climate Change Adaptive Private Domestic Water Supplies for Rural and Remote Properties

DRAFT Part B: Participatory Engagement Plan

General

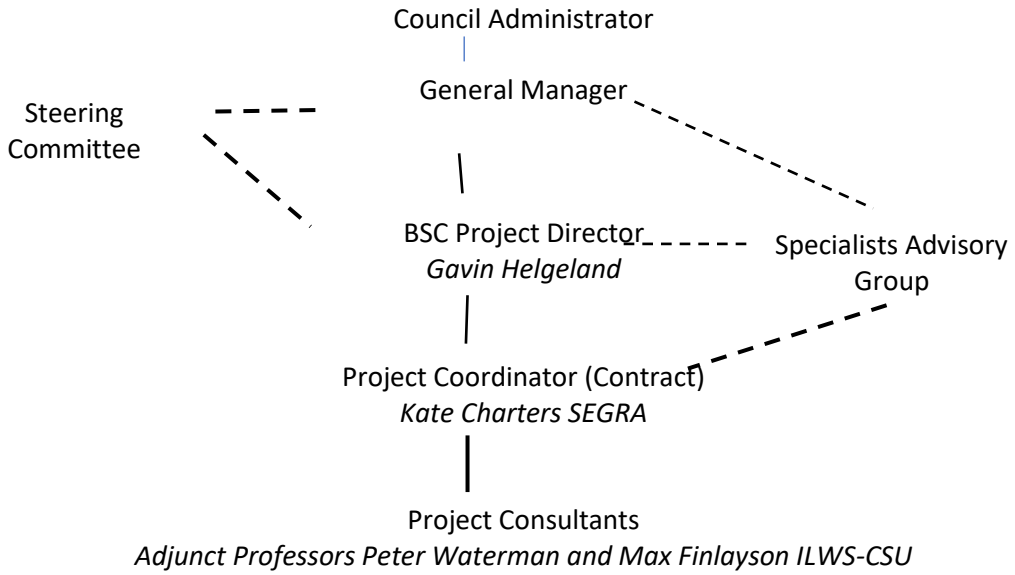
Partnerships, community engagement, information generation and knowledge dissemination are pivotal to the success of the SSDW Program. These activities will be implemented through this *Participatory Engagement Plan*.

Structure of the Action Plan

- Program coordination
- Information Management:
    - BSC 'Regional Knowledge ConneXion'
    - Media materials
- Engagement activities
- Citizen Science
- Innovative collaborative regional initiatives
- BSC SSDW Case Study
- Meetings schedules

Program coordination

The operational structure for the project is summarised as follows.



Membership of the Steering Committee includes officers of the NSW Government, industry representatives and community stakeholders with specific interests in the provision of adequate and safe non-scheme domestic water supplies.

Specialist Advisory Group members have extensive experience in: building and sustaining resilient communities; engagement and awareness; adapting to changing climatic conditions; and mitigating impacts of prolonged drought on production and conservation landscapes in the MDB and beyond.

Information Management

BSC 'Regional Knowledge ConneXion'

Information management for the SSDW Program will be an integral part of the BSC 'Regional Knowledge ConneXion'. This portal is a virtual network hub for engaging with local and regional stakeholders and disseminating information generated from (for example):

- Council and community based scheme and private water supply projects
- land, water (surface and ground), energy and biological resource enterprises
- local and regional economic growth initiatives
- community awareness, engagement and education activities

Broadly, the 'Regional Knowledge ConneXion' (as shown schematically at **Figure 1**) aims to provide a dynamic knowledge base to underpin the economic and social future of the BSC in its Far West Region (FWR) context by (for example):

- stimulating innovative industrial, business and essential services initiatives
- enhancing technical skills and foster professional development
- developing regionally relevant research capabilities
- promoting and celebrating regional self-sufficiency

Additionally, the 'Regional Knowledge ConneXion' seeks to maximise the use of the capacity already in place with education and training personal, regional research institutions and event based professionals who are geared to local and regional knowledge needs. This is an essential step towards Council being better equipped to:

- optimise the opportunities offered by the natural and human resources of the FWR
- address and mitigate natural and human caused risks and challenges
- achieve self-sustaining economic and social development
- deliver sustainable project outcomes for existing, new and innovative economic activities
- reduce health risk and costs
- enrich lifestyles and livelihoods
- enhance local and regional amenity

BSC information management protocols, approaches, tools and procedures as relevant to the project are summarised in **Table 1**.

Media materials

Media materials including releases, social media links, central messages and notes on innovative collaborative regional initiatives are at **Attachment 4.**

Engagement activities

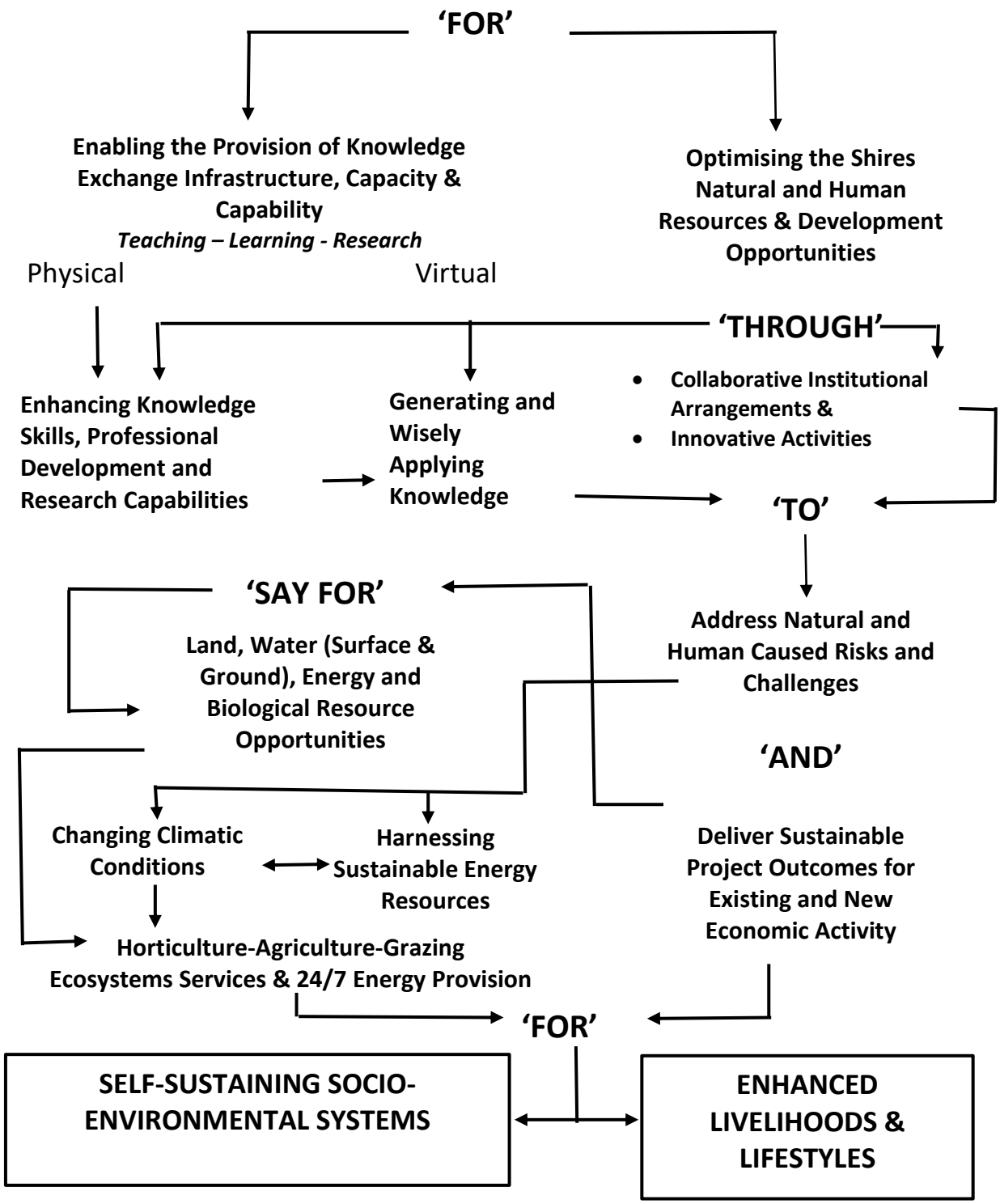
Purpose.

Embedded engagement and awareness raising activities seeks to harness community support in:

Figure 1.

Framework for the 'Regional Knowledge ConneXion'

Intention--Balranald Shire Council (BSC) to be a catalyst



- garnering greater stakeholder involvement in ensuring safe domestic water at the property scale
- sustaining the information flow
- obtaining feedback on actions being taken to address poor quality domestic water from rainwater tanks, surface and ground supplies at the household level
- initiating 'citizen science training' on how to be a 'safe water ' communicator and operative
- celebrating success when there is evidence that the messages are getting through and attitudes and behaviour towards treating private domestic water supplies are changing for the better

Letter box drops

Letter box drops will be used to ensure all residents are fully informed of the purpose for the project, how they can participate and benefits to them and the wider community.

Meetings and information sessions

Safe domestic water 'drop-in' sessions will be undertaken using informal 'open house' or 'coffee shop' discussions at venues where stakeholders can come individually or as groups of representatives of community organisations to discuss:

- health risks arising from poor water quality
- screening and testing
- managing the quality of household sources and supplies including simple technical approaches to disinfection and filtration
- being part of a community based 'safe water' collaboration

Citizen science

Awareness raising and training sessions and will be scheduled with schools and community groups with the aim of maximising public participation in:

- awareness raising and public education campaigns
- information dissemination
- inventorying the adequacy and quality of private sources of domestic water supplies
- establishing and monitoring SSDW demonstrations projects
- monitoring of the quality of private domestic sources and supplies

Innovative collaborative regional initiatives

The BSC Increasing Resilience to Climate Change (IRCC) Project titled *Climate Change Adaptive Private Domestic Water Supplies for Rural and Remote Properties* is a dynamic proactive process. Thus, it is anticipated that innovative collaborative regional initiatives will arise over the duration of the undertaking.

BSC SSDW Demonstration Project Case Study

BSC is required to assist in the development of a case study based on the delivery, products and measured outcomes of the SSDW pilot project. Although this will not be finalised until the end of the project a photographic record will be kept of key events and achievements that marked progress with the initiative.

The DPIE is keen for LGNSW to work with some IRCC grant recipients on the production of short promotional videos to assist in the sharing of project successes and key learnings with other councils and communities. A separate budget is available for the videos.

Also, LGNSW is exploring the option of preparing podcasts as a more in depth and personal approach for sharing project learnings that might better suit some projects. There will be further discussion of this promotion along with other aspects of the BSC project in 2020.

Meetings and engagement activities schedule

Meetings and engagement activities scheduled for 2020 are as follows.

Activity and purpose	Locations	Date	Desired outcomes
Open house/coffee shop sessions to discuss project and community involvement	-BSC facilities -Community facilities -Club venues	TBA (various)	-Acknowledgment of need for the initiative -Commitment to participation
Citizen Science Action: Introducing SSDW to schools and community based groups	Schools Community facilities -Club venues	TBA (various)	Active participation in: • awareness raising • information dissemination • water supply and quality inventorying and monitoring
Property visits to enlist partnership in the pilot SSDW program	To be determined from mapping	TBA (various)	Meet kpi –100 pilot households over project lifespan Improved water security
Inputs to Community Fora	BSC facilities	TBA (various)	Message attracts more partners

BACKGROUND INFORMATION ON THE SSDW INITIATIVE

Government and governance

A common response to a water supply crisis is: *get the government to fix it.* And based on experience that is not going to happen. To know why, we need to look at government and governance in the domestic water supply space.

Nationally, State and Territory governments have statutory responsibility for centralised (scheme) domestic water supplies. This encompasses the adequacy of sources and the quality of supplies. And this includes the measure to ensure that domestic water supplies are not a public health risk.

Australia wide the Federal Government has a limited role to play in ensuring the water supplies in rural towns are adequate and safe. However, in the MDB its role through the MDBA in meeting 'critical human water needs' is crucial. And these needs are defined in subsection 86A (2) of the Water Act 2007 and Chapter 11 of the *Basin Plan* and cover all uses of surface and ground water for domestic purposes. The second exception is for Commonwealth facilities on Australian Government owned land or properties.

Under delegation by state departments or agencies, in all Australian jurisdictions, Local Government Authorities (LGAs) only have statutory responsibility for the quantity and quality of 'scheme water' provided to rural cities, towns and settlements.

People on farming and pastoral properties are left to their own devices to secure adequate domestic water supplies and ensuring that the water being used is not a health risk. This inequity could be considered a serious gap in policy and practice if all Australians are to have adequate and safe domestic water. And arguably, this situation has implications for economic productivity and the quality of life for people in the MDB.

Changing climatic conditions

Common use of the language of climate and water is essential to a better understanding of the effects changing climatic conditions. Specifically, the possibility of day zero in rural towns and settlements and on remote properties. As some would say, we all need to be reading the same page. And there is universal terminology to enable us to appreciate climatic changes. And **Annex A-1** provides a simple example.

Climate change is the greatest physical, biological, social, economic and cultural threat now being faced by human kind. Moreover, it has moral, ethical and spiritual dimensions that are manifest at global, national, regional, local and personal scales. Tragically, these dimensions have largely been lost in the debates about the robustness of the science on the causes of global warming, and in the mostly media driven unsupported opinions on the impacts of changed climates on ecosystems, lifestyles and livelihoods. A more people and their 'basic needs' based approach to climatic changes is needed to counter the unnecessary debates and counterproductive opinions.

In this context, water as an essential requirement for all lifeforms, provides a start point to look at what changed climates can mean to people in regions such as the MDB who are now facing challenges arising from extreme weather events and changed climates.

BSC Increasing Resilience to Climate Change (IRCC) project

Balranald Shire Council (BSC) has obtained NSW Government funding for an Increasing Resilience to Climate Change (IRCC) project. This initiative aims to identify and pilot measures to mitigate the risk of increasing temperatures and variable rainfall under climate change to the provision of adequate and safe private domestic water supplies for people on rural and remote properties across the Shire.

Rural properties are dependent on private domestic water supplies (rivers, farm dam's, aquifers, rainwater tanks) and are vulnerable to decreased adequacy and quality of supply. In the past year BSC has trucked water to some rural properties to maintain essential supplies for residents.

The IRCC project will establish a baseline assessment of risk to human health, identify a range of solutions to improve water sanitation and water use efficiency, address barriers to adoption and monitor success, and develop a Safe and Secure Domestic Water (SSDW) Program to ensure that the products of the project are disseminated in Balranald Shire, the Far West and for NSW non-scheme water users generally.

To put this 'grant' into perspective and shed some light on past involvement in water issues, here is some information the *Secure Safe Domestic Water (SSDW) for Regional Australia* initiative that underpinned the application. Hopefully, this will also indicate an area of common interest for catalysing future collaborative involvement by rural communities across the MDB and beyond.

The Secure Safe Domestic Water (SSDW) initiative

Aim and objectives

Changing climatic conditions and their impact on the sources, availability and quality of domestic water and the associated health risks and costs are key drivers for the SSDW initiative.

The overarching aim of this multi-staged SSDW collaborative research project is to: *support the sustainable provision of adequate safe domestic water supplies for people in rural and remote regional Australia.*

The objectives to be achieved to attain the aim are as follows.

- Detail and evaluate the roles and responsibilities of governmental bodies with respect to the provision of public and private domestic water supplies.
- Document community attitudes, understanding and behaviour with respect to the provision of adequate secure and safe domestic water supplies.
- Provide broad quantitative and qualitative information on the sources, adequacy, quality and levels of water treatment of water being used by Local Government Authorities (LGAs) in meeting statutory water planning and services requirements.
- Document the status of sources, adequacy, quality and treatment provisions used privately in remote settlements and public facilities, commercial enterprises and isolated properties in vulnerable catchment areas.
- Propose long term integrated management measures to ensure that domestic water supplies for communities, individual homes, isolated homesteads, community facilities and business premises are adequate and safe.

For this project, domestic water is operationally defined as: *Water used day to day by people for indoor and outdoor household and commercial purposes including drinking, preparing food, bathing, washing clothes and dishes, brushing teeth, watering gardens, swimming pools and children's play.*

Securing adequate safe domestic water for rural and remote regional Australia goes beyond potable/drinking water supplies. As defined above, domestic water encompasses all uses by which people can come into physical contact with their water resources. And, because of its quality, the water may or may not be a risk to their health.

Formal genesis of the SSDW initiative

The SSDW initiative had its formal genesis in 2015 with the Sustainable Economic Growth for Regional Australia (***SEGRA***) Conference 'Regional Challenge' process and is being delivered through collaborative research activities by the Institute for Land Water and Society (ILWS) Charles Sturt University (CSU) and the Sustainability Research Centre (SRC) at the University of the Sunshine Coast (USC).

Michael Kitzelmann, General Manager Balranald Shire Council (BSC), has championed SSDW since it was initiated as at SEGRA 2015. At that time, Michael was the CEO of Etheridge Shire Council (ESC) in the Gulf Region of Qld. Specifically, ESC asked: *How might we provide secure and safe water for rural and remote regions?* This was voted the 'Delegates Choice' for ***SEGRA 2015-16***.

In turn, this led to research and community engagement activities by the ILWS-CSU-USC collaboration to explore the challenges for implementation of the 2012 *Basin Plan* (pursuant to the *Commonwealth Water Act 2007*) from the 'bottom up'. Securing adequate safe domestic water supplies to meet *critical human water needs* (as defined in Water Act and the Basin Plan) was seen as a priority issue in the drought stressed MDB with one third of the Basin lying in southern Qld. As well, it applies equally across rural and remote NSW and Qld.

For Queensland, the ESC situation was viewed as a microcosm of the challenges being faced by LGAs across the Gulf Rivers Region and indeed for all the rural and remote catchments to the west of the Great Dividing Range. And indeed for all LGAs across the nation where the rural population was not served by scheme supplies and/or utilise rainwater tanks for potable water supplies in towns and settlements.

The pilot ESC project demonstrated that people's attitudes towards health risks from inadequate and poor quality domestic supplies is a major challenge for rural and remote regional Australia. And this has been further confirmed through ILWS workshop and informal community consultation activities in the MDB in 2017 and 2018.

Since 2016, with the encouragement of the Murray Darling Association (MDA) and the Murray Darling Basin Authority (MDBA), the SSDW project has been an important aspect of the collaborative research activities the ILWS-CSU-USC research team in the Northern, Central and Lower Darling and the Far West region of NSW. That said, we see the challenge as having relevance anywhere in Australia where people do not have the luxury of safe scheme water.

Towards a bigger picture

The SSDW initiative is viewed as a tangible product of the SEGRA 'Regional Challenge' process that was introduced as a SEGRA activity to move consideration of critical areas of issues from 'talking' to on-the-ground action.
At SEGRA 2013, the Delegate's choice for the major challenge facing large parts of regional Qld, NSW, Victoria and SA was: *How might we maximise the opportunities of the Murray Darling Basin Plan?* The 2013 challenge was actively pursued by the champions and key outcomes included holding SEGRA 2015 at Charles Stuart University (CSU) at Bathurst, and the cementing institutional links.

Community water planning (CWP) was identified at the SEGRA 2015 conference as a crucial need and one that could be undertaken as a Basin wide collaborative initiative. This was discussed and documented through the *Rural and Remote Regions Research Agenda* and the *Murray-Darling Round Table.* As such, it could embed a community driven participative approach like that used by the National Water Council (NWC) for Indigenous communities. Key potential partners identified included the MDA, the MDBA and Local Government Associations of NSW and Queensland (LGAQ). Already, MDBA, MDA and LGAQ have provided written statements of support for the SSDW initiative.

Arguably, the initiative could also be supported by State Government departments and agencies encompassing (for example): water sector regulatory bodies; public and environmental health; primary industry; and natural resources management. As well, there could be involvement by regional organisations of councils, non-government and community-based organisations, service and religious bodies. Water quality data could be collected by collaborative field sampling and laboratory analysis involving state bodies, LGAs and by using school based citizen science projects. This level support and action is still to be harnessed. That said, there has been progress, albeit slowly.

The establishment of community-based groups that could action SSDW initiatives, was seen as a step in moving CWP forward. SSDW was activity promoted during engagement activities in the Central and Lower Darling in 2017-18, at SEGRA 2018, and at the BSC Community Forum in October 2018. The SSDW is work in progress. Again slowly due to resource constraints.

SSDW needs championing and leadership through groups such as religious bodies that have a wide geographic reach and direct links to homes and families. A briefing note for a SSDW initiative is at **Annex A-2**.

Operational definitions and discussion of changing climatic conditions

Globally, anxieties over the increasing frequency and intensity of extreme weather events and how changing climates and their biophysical and socio-economic effects on humankind are well documented in the scientific literature and the media. Community and commercial concerns over the risks arising from climate driven changes are discussed and debated broadly.

For the Murray Darling Basin (MDB) and the Far West Region (FWR) of NSW the focus is on the impacts of the prolonged drought on the rivers and wetlands including (for example):

- loss of Indigenous connectivity to cultural lands and waters
- degradation of riverine and floodplain systems
- reduction in aquatic and terrestrial biodiversity
- physical impairment of infrastructure and buildings
- financial losses from decreased primary production and tourism
- adverse effects of extreme weather events on regional transport and infrastructure
- increased environmental and population health risks and associated costs

Terminology being used in discourses on climate related issues can be problematic because the words 'climate change' can mean different things to different people. Drawing on Intergovernmental Panel on Climate Change (IPCC) 2007 and United States Environmental Protection Agency (USEPA) 2010 definitions, the following summary list of terms may help to explain what climate change and 'changing climatic conditions' mean.

- ***Global Warming*** is the heating of the earth's atmosphere by natural and human drivers
- ***Weather*** is what we are experiencing now, it changes every day and through the day
- ***Climate*** is 30 years of average weather, usually measured from the International Meteorological Organisation (IMO) baseline 1961-1990
- ***Climate variability*** is measured in terms of extremes such as conditions being hotter and colder or wetter and drier
- ***Climate change*** is measured statistically in terms of averages and variances from a 30 year baseline (usually the IMO baseline)
- ***Changing climatic conditions*** is the summation of long term measured changes in mean and variable temperature, rainfall and other weather parameters signaling that what is observed now is statically significantly different from the past and this trend is projected to continue (as illustrated in Figure 3.1 below).

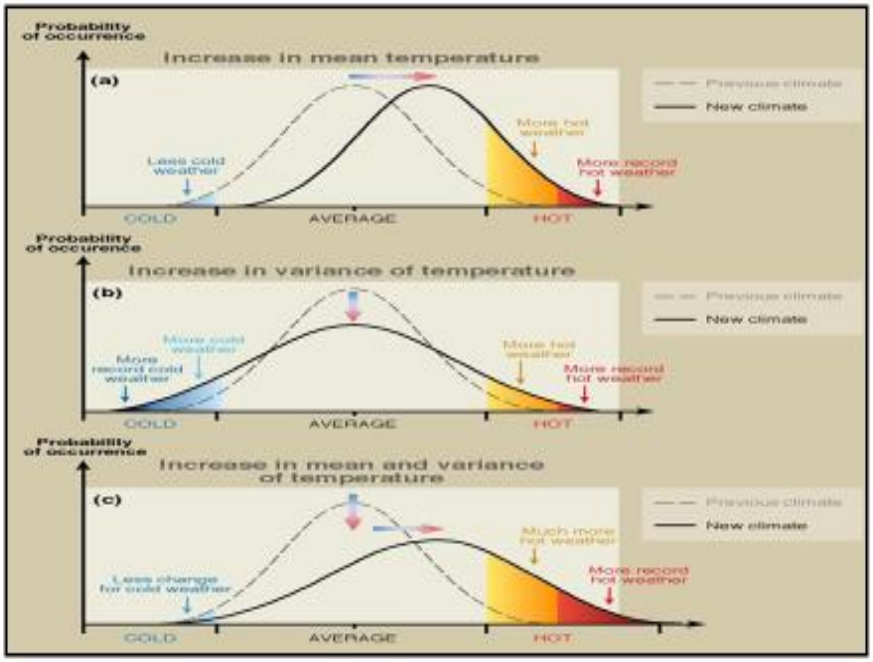
To illustrate, we know that:

- Globally temperatures are rising
- Australia wide weather is becoming more variable and with greater extremes
- Temperatures have been increasing across Australia over the past seventy years
- Rainfall has been decreasing along the East coast of Australia and across the Murray Darling Basin and beyond over the past seventy years
- Prolonged drought and heatwave conditions have become the observed norm

Being based on a long time series of climatological data, this summation demonstrates clearly that climatic conditions are changing. And there is a range of analysed data, models and projections to support this conclusion.
Extreme weather events and climate change-are not the same and the two terms should not be confused. Far too often this happens in the media when reporting of floods, intense storms (eg cyclonic activity and monsoons), prolonged drought and bushfires.

Although there is still ongoing media and societal debate as to the causation of climatic variability and change there is no longer scientific uncertainty. Changing climatic conditions are anthropgenetically driven. Statistically measured changes in seasonal conditions (averages, variances and occurrences of extreme weather events) across Australia's landforms and landscapes are not conjecture or uninformed opinion. They are a geographic, mathematical and climatological realities.

Figure 3. 1 *Changes in extreme events due to shifts in mean and variance (IPPCC 2007)*



Synopsis: Secure Safe Domestic Water (SSDW) in Balranald Shire

Setting the scene

Australia wide, apart from health information brochures, little assistance is provided by any level of government to reduce potential health risks from non-scheme water in rural and remote regions. People on farming and pastoral properties are left to their own devices to secure adequate and safe domestic water supplies. Currently, the sufficiency and quality of these resources is largely unknown and the potential health risks arising from this situation are not being addressed. And this deficiency has implications for economic productivity and the quality of life for people in 'regional Australia'.

Policy underpinning for projects in the a Murry Darling Basin (MDB)

Critical human water needs are defined in subsection 86A (2) of the Water Act 2007 and Chapter 11 of the *Basin Plan* and cover all uses of surface and ground water for domestic purposes. Essential first steps towards understanding how this statutory requirement is being met at the property scale include: raising awareness of potential health risks; water quality screening; and providing information on remedial actions to reduce the impacts of poor quality domestic water supplies. To this end, the Murray Darling Basin Authority (MDBA) supports the idea of SSDW projects and are keen to see it initiated in the Basin.

What a SSDW project seeks to achieve

SSDW projects seek to establish a community-based collaborations to support the sustainable provision of adequate safe domestic water from private supplies. Specifically, for people who are dependent on surface and ground water and rainwater tanks. This covers remote towns and settlements, farming and pastoral properties and isolated commercial enterprises such as tourist infrastructure, caravan/camping parks and service stations. Rainwater tanks in regional cities and towns are also private supplies and the quality of the water needs to be monitored.

What is required?

Community organisations could take leadership roles in the collaboration by assisting in raising awareness of potential health risks from poor quality supplies, fostering water quality screening, and promotion of simple cost effective measures to reduce health risks.

What costs may be involved?

For the 'initiating stage' of the proposed collaboration, costs will be incurred for participating in project coordination, in-kind support in disseminating awareness raising information and communicating with residents to encourage them to be involved in regional workshops/information sessions. Ongoing in-kind support would be incurred in sustaining the initiative and disseminating health promotion information. Costs for simple water quality screening are still to be determined and this item would be addressed in formalising SSDW collaborations.

The benefit for people in Balranald Shire

The SSDW project has as its core purpose the reduction of health risks from poor quality domestic water supplies from rainwater tanks in the towns and from all sources on farming and pastoral properties and other remote enterprises in the Basin. Better focused health promotion and protection are the fundamental benefits for all people living in or passing through the region.

PARTICIPATORY COMMUNICATION

The World Bank Publication *Participatory Communication: A Practical Guide'* outlines the four key phases of the participatory communication programme cycle. Genuine participatory communication is rare, but it can facilitate the empowerment of marginalised groups and have wider social and political effects. It requires continual dialogue with stakeholders.

However, proper application of participatory communication methods are not enough to ensure a project's success. Broader contextual requirements are important, including a flexible project framework (especially in terms of timelines), a politically conducive environment, and an enabling attitude among key stakeholders.

Participatory communication is an approach based on dialogue, which allows the sharing of information, perceptions and opinions among the various stakeholders and thereby facilitates their empowerment. It is not just the exchange of information and experiences: it is also the exploration and generation of new knowledge aimed at addressing situations that need to be improved.

Participatory communication tends to be associated with community-driven development, but it could be used at any level of decision making (local, national, international) regardless of the diversity of groups involved.

By actively engaging stakeholders from the start and by seeking a broader consensus around development initiatives, participatory communication has begun to be considered a crucial tool. This is partly because many conflicts and obstacles can be prevented if addressed quickly. Genuine participation also increases the sense of ownership by local stakeholders, enhancing sustainability.

To be genuinely participatory and truly effective, communication should occur among all parties affected, ensuring all have similar opportunities to influence the outcome of the initiative. Ideally, participatory communication should be part of the whole project process:

- Two-way communication should be adopted from the beginning and be applied consistently.
- Full participation by all stakeholders in any step of the process is not possible and, in some cases probably not desirable. Broad consensus may be sufficient.
- Inclusiveness must be balanced with consideration of stakeholders' time, resources, interests and knowledge. After their input is taken into account, stakeholders may not need to be involved in detailed decisions beyond the scope of their interests.

The communication programme cycle can run parallel to the project cycle when they both start at the same time. The basic phases of a communication programme are:

- *Phase One – Participatory Communication Assessment (PCA)*: Issues are researched and analysed through exploratory two-way communication. For these tasks to be successful, it is necessary to establish an open or common space where key stakeholders can interact freely with each other.

- *Phase Two – (Participatory) Communication Strategy Design*: Successful strategy design begins with the definition of the objectives. Instances where strategies are designed on broad, poorly understood objectives are surprisingly frequent.

- *Phase Three – Implementation of Communication Activities*: An action plan is needed to guide implementation and facilitate the management and monitoring of all relevant activities.

- *Phase Four – Monitoring and Evaluation*: Evaluation should be planned from the beginning of an initiative. Furthermore, if participation means that stakeholders are partners in the decision-making process, they must also be partners in impact evaluation.

Tufte T and Mefalopulos P. 2009, Participatory Communication: A Practical Guide, World Bank, Washington, DC

Attachment 3

INITIAL DRAFT REGISTER OF IDENTIFIED COLLABORATING PARTNERS

To be completed in collaboration with BSC Project Director, the Project Steering Committee (PSC) and Specialist Advisory Group (SAG)

Key governmental and civic bodies identified for engagement and participation in knowledge building and sharing processes include (for example):

Federal Government

- MDBA
- RDA Murray
- RDA Riverina
- RDA Far West NSW

New South Wales Government

- FWJO
- Adjoining LGAs
- Local Land Services

Community based

- Balranald Local Aboriginal Land Council
- MDA
- SEGRA
- community based service organisations
- faith based groups
- Balranald Chamber of Commerce.

Attachment 4.

MEDIA MATERIALS

Climate Change Adaptive Private Domestic Water Supplies for Rural and Remote Properties Project

1. Media Releases

DRAFT MEDIA RELEASE 001

18 March 2020

General Manager, Michael Kitzelmann, announced this morning that Balranald Shire was the only Council in Western NSW to win a grant to undertake an Increasing Resilience to Climate Change (IRCC) project.

"This is an important first step in Council addressing the impacts of changing climatic conditions on people on rural and remote properties across the Shire" He said.

Mr Kitzelmann explained that "This project aims to identify and pilot measures to reduce harm to people's health and wellbeing from increasing temperatures and variable rainfall under prolonged drought."

He went on to say that "This is essential for the provision of adequate and safe private domestic water supplies for people on rural and remote properties in Balranald Shire".

Rural properties across the Shire are dependent on private domestic water supplies (rivers, farm dam's, aquifers, rainwater tanks) and these are vulnerable to decreased adequacy and quality of supply.

Mr Kitzelmann revealed that "In the past year Council has trucked water to some rural properties to maintain essential supplies for residents".

When discussing the initiative, Mr Kitzelmann said that the 'Climate Change Adaptive Private Domestic Water Supplies for Rural and Remote Properties Project' will:

- establish a baseline assessment of risk to human health from rural water supplies
- identify a range of solutions to improve water sanitation and water use efficiency
- address barriers to adoption and monitor success

He went on to say that through this project, BSC will work with the communities and families to work towards mitigating climate risk by:

- developing and documenting a Secure and Safe Domestic Water (SSDW) Program
- undertaking a SSDW demonstration project at household and facility scales
- implementing a communications strategy to ensure that the products of the program and demonstration project are disseminated in the Shire, the Far West and for NSW non-scheme water users generally

"Reducing health risks and demands on medical services from poor quality domestic water is an important cost saving measure for our communities." Mr Kitzelmann said. "And Council recognises that such actions could achieve climate change adaptation and mitigation objectives"

"Importantly" he concluded, "responses could be applied to other Councils across the Murry Darling Basin".

BSC gratefully acknowledge that this project will be assisted by the New South Wales Government and supported by Local Government NSW and the Department of Planning, Industry and Environment.

For further Information contact:

Gavin Helgeland
Project Director

2. Draft briefing material for Web page/Facebook

BSC IRCC SSDW Program and Demonstration Project

On 12 November 2019 the NSW Minister for Energy and Environment, the Hon Matt Kean, announced successful local council IRCC grants at the AdaptNSW Forum. Balranald Shire Council (BSC) was the only Council in Western NSW to win a grant and will undertake a project titled: ***Climate Change Adaptive Private Domestic Water Supplies for Rural and Remote Properties***

This project aims to identify and pilot measures to mitigate the risk of increasing temperatures and variable rainfall under climate change to the provision of adequate and safe private domestic water supplies for people on rural and remote properties in Balranald Shire.

Rural properties are dependent on private domestic water supplies (rivers, farm dam's, aquifers, rainwater tanks) and are vulnerable to decreased adequacy and quality of supply. In the past year BSC has trucked water to some rural properties to maintain essential supplies for residents.

This project will:

- establish a baseline assessment of risk to human health from rural water supplies
- identify a range of solutions to improve water sanitation and water use efficiency
- address barriers to adoption and monitor success

BSC will work with the communities and families to work towards mitigating climate risk by:

- developing and documenting a Secure and Safe Domestic Water (SSDW) Program
- undertaking a SSDW demonstration project at household and facility scales
- implementing a communications strategy to ensure that the products of the program and demonstration project are disseminated in the Shire, the Far West-and for NSW non-scheme water users generally

BSC gratefully acknowledge that this project will be assisted by the New South Wales Government and supported by Local Government NSW and the Department of Planning, Industry and Environment.

3. Social media link material

Draft briefing material for BSC IRCC SSDW Program and Demonstration Project

On 12 November 2019 the NSW Minister for Energy and Environment, the Hon Matt Kean, announced successful local council IRCC grants at the AdaptNSW Forum. Balranald Shire Council (BSC) was the only Council in Western NSW to win a grant and will undertake a project titled: ***Climate Change Adaptive Private Domestic Water Supplies for Rural and Remote Properties***

BSC gratefully acknowledge that this project will be assisted by the New South Wales Government and supported by Local Government NSW and the Department of Planning, Industry and Environment.

Project Description, Demonstrated Need, How it mitigates Climate Risk

This project aims to identify and pilot measures to mitigate the risk of increasing temperatures and variable rainfall under climate change to the provision of adequate and safe private domestic water supplies for people on rural and remote properties in Balranald Shire.

Rural properties are dependent on private domestic water supplies (rivers, farm dam's, aquifers, rainwater tanks) and are vulnerable to decreased adequacy and quality of supply. In the past year BSC has trucked water to some rural properties to maintain essential supplies for residents.

This project will:

- establish a baseline assessment of risk to human health from rural water supplies
- identify a range of solutions to improve water sanitation and water use efficiency
- address barriers to adoption and monitor success

Through this project, BSC will work with the communities and families to work towards mitigating climate risk by:

- developing and documenting a Secure and Safe Domestic Water (SSDW) Program
- undertaking a SSDW demonstration project at household and facility scales
- implementing a communications strategy to ensure that the products of the program and demonstration project are disseminated in the Shire, the Far West-and for NSW non-scheme water users generally

How the Project will increases resilience to Climate Change

The SSDW Program will provide a coordinating mechanism to help people on rural and remote properties undertake adaptive actions to increase resilience to changed climates. Resilience to increasing temperatures and variability of rainfall and associated risk to quality and quantity of water supply for rural residents will be built by supporting the capacity of stakeholders and decision makers to:

- Assess vulnerabilities and risks using semi-quantitative and participatory approaches by quantifying the risks, assessing the drivers behind the risks, identifying current barriers and opportunities for addressing them.
- Develop practical adaptive response tailored to the risks identified for properties who have joined the program by trialing new solutions to address those barriers (eg better infrastructure, feedback loops to users, new partnerships, provision of water storage and disinfection resources, building skills and communicating facts).
- Monitoring the results of the risk identification methods used (eg site mapping, evaluation of security of water sources, testing water for bacteria) and risk reduction applied against benchmark conditions and agreed property specific responses (again with feedback to participants and other stakeholders).

Through the SSDW Program householders will be encouraged to:

- Increase their knowledge on enhancing water supplies and reduce health risks as outlined (for example) in the NSW Health Guidelines on Private Water Supplies.
- Conserve water by following 'fit-for-use' approaches in the way domestic supplies water are used.
- Treat all sources water used for domestic purposes.
- Seek guidance on reducing vulnerability of supply by installing or increasing the capacity of rainwater tanks, collaborating with neighbor's in developing new bore fields, and applying innovative ways of treating low saline supplies.

The S&SDW Program seeks to moderate harm to residents on properties at risk by reducing health risks and reduce demands on medical services. Council recognises that such actions could achieve adaptation and mitigation objectives. Responses could be applied regionally.

Social, Economic or Environmental Co-benefits

The S&SDW Program will provide a framework to provide broader understanding of climate change impacts on communities in the Far West. As an information source and knowledge exchange, this will have biophysical and socio-economic co-benefits for local and regional stakeholders. Awareness raising, community education, on ground adaptive projects and citizen science would be tools in the program.

Knowledge transfer could include providing projections on changes in rainfall and temperature conditions across the region and how this information could help rural and remote property holders to better prepare for climate induced changes. Physically, with improved water supply and treatment infrastructure and psychologically by understanding the material and health implications of the risks from extreme conditions that could affect water sources and supplies. Direct co-benefit could be demonstrated by measurable reduction in costs of hospital and medical services needed to address physical and mental health issues arising from inadequate supplies and poor quality water.

The implementation of the S&SDW Program initiatives at a regional scale could meet the challenges of changing climatic conditions from the 'bottom up' to complement the strategic 'top-down' approach provided by NSW Health guidelines. Of benefit to stakeholders is an enhanced knowledge base and shared experience of measured success of adaptation measures. Sustainability related benefits include reduction in energy use, greater amenity during dry times and use of first flush water for gardens. Increasing primary producer and community knowledge of biophysical and socio-economic benefits of adopting integrated catchment management approaches to protect surface and ground water sources is another potential benefit.

Co-beneficiaries could include:

- Aboriginal communities by linking cultural water to safe water.
- Teachers and students involved in 'citizen science' water supply and safety projects.
- Township residents who use rainwater tanks to complement scheme supplies.
- Remote mine sites and tourists/recreation facility operators who are dependent on private supplies

Project Objectives and Indicative Timescale

Objective 1. To build a sustainable institutional, local government and community based partnership. Over two years, the collaboration would deliver and measure the effectiveness of engagement, education and community science activities that address the effects of climatic changes on the sufficiency and safety of domestic water supplies on rural and remote properties.

Objective 2. To establish an 'environmental base line' for domestic supplies on rural and remote properties. Within six months, to provide: a quantitative inventory of sources of supply and infrastructure at risk from changing climatic conditions; and qualitative information on attitudes and behavior of householders towards health risks.

Objective 3. To develop and pilot a SSDW Program for rural and remote properties. Over eighteen months, this will address water adequacy and safety issues at properties identified as being at risk through the environmental baseline process. The program will embed community awareness, engagement, education and science and communications activities.

Methodology

Objective 1. Actions to establish a sustainable institutional and community based partnership include:

- Identifying and formally linking with governmental, institutional and community based partners.
- Holding scheduled meetings with partners, stakeholders and non-government and community based organisations. This will ensure that the results of survey/market research that identifies potential influencers and new partners are incorporated into the project.
- Forming a steering committee and/or reference group from primary industry bodies, educational institutions and service organisations.
- Developing and initiating a 'communications strategy and action plan' using multi-media mechanisms to engage communities across Balranald Shire.

Objective 2. Establishing the 'environmental base line' will entail:

- Mapping the location of rural and remote properties and categorising them according to dominant land use and hydrological characteristics. Properties will be identified and information provided to ratepayers privately about their risks, and they will be invited to join the project.
- Water quality sampling, questionnaire survey and market research techniques to document: sources, adequacy and quality; water treatment used; consumption patterns; and attitudes of householders to underlying climatic drivers and health risks.
- Metadata and information management protocols to maintain the project beyond the funding period. BSC will control the information management system.

Objective 3. Developing and piloting the S&SDW Program will encompasses:

- Identifying and, prioritising the properties for adaptive action using results of the questionnaire survey and water quality sampling. Potential actions will be agreed with a number of pilot householders who are at risk.
- Documenting adaptive actions in relation to the baseline conditions and determining site relevant measurements for use as indicators of success in reducing climate driven risks to supplies.
- Developing a range of communication products and feedback loops to stakeholders outside of the pilot group to help them understand household risks and actions to address them.

4. Overviewing the Water Crisis----------Day Zero!

Focusing questions and short answers

A key question people in parts of the MDB are asking is: *what happens on day zero when water runs out?*

The underlying assumptions when answering this question are that:

- households and businesses are on reticulated town scheme supplies sourced from local surface runoff fed dams
- drought conditions have depleted the impoundments
- shallow or deep ground water resources have not been developed
- households do not have rainwater tanks or private wells/bores

Under this scenario, from day zero people will have to make do with what limited water sources and supplies are accessible including:

- trucking in water if they have a storage tank on the premises
- buying bottled water for cooking and kitchen purposes

As well they will need to:

- understand that poor quality potable water could be a health risk
- find alternative ways of disposing of human waste (faeces and urine) as there would be no sewerage system in operation
- limit personal hygiene and laundry due to lack of water

Depending on the severity of the water shortage they may need to relocate to where water supplies are available to suite their residential lifestyle. In short, they will become drought refugees.

And you noted that an extension of that is: *what should water authorities be doing to prepare for that eventuality?*

State and local authorities need to:

- understand and document the climate drivers that are responsible for prolonged drought conditions that are depleting surface sources of domestic water supplies
- map and optimise regional and local hydrological conditions (surface and ground water) to enhance accessible sources of supply
- proactively plan for worst case drought scenarios and communicate this information to the community
- implement demand management campaigns to conserve supplies
- initiate water reclamations for recycling/reuse to augment scarce sources and diversify sources of domestic water supplies for scheme systems (surface and ground)
- invest in supply systems that will withstand extended dry periods and improve water capture and storage
- foster and support domestic water self-sufficiency at the household and enterprise scale

Or you may ask what could households should do to prevent their water supplies running out and do if their private supplies run out. Again, the answers are to be found in:

- understanding the implications of changing conditions at the personal and household scales
- ensuring domestic water self-sufficiency by reducing dependency on centralised scheme supplies
- investing in alternative sources of supply (eg rainwater tanks or shallow or deep bores)
- initiating ‘water for purpose’ procedures to optimise the diversity of sources available
- practicing demand management to conserve supplies and reduce household expenditure on water

Guiding principles that could be followed to drought proof communities include:

- supporting decentralisation of sources of domestic water to reduce supply risks
- fostering innovative business practices in the water sector to optimise investment in infrastructure and lower operational costs
- promoting community and personal adaptive and mitigative action through initiatives such as SSDW

Pulling these together, collaborative community based commercial decentralised integrated retail water supply, waste water treatment (recycling and reuse) and renewable energy enterprises could be scaled and tailored to local geographic, economic and demographic realities. And this could help to turn an environmental challenge into a social and economic opportunity.

Summing up

With proper planning and resourcing for people having scheme supplies in towns and settlements there should be no day zero. That said, questions still to be addressed include:

- how are changing climatic conditions impacting on the adequacy and quality of water supplies
- why are communities only now having to confront this challenge
- what can be done immediately by governments and communities to alleviate this situation

Trusting that the background material at Annex A-1, along with the short answers above, has given you an appropriate over view of climate as the underlying driver and the SSDW initiative as an action focused response. Importantly, the potential to roll-out SSDW as a climate change adaptation and resilience building tool in and rural and remote regions. And one that could be supported at the community scale by collaborative community, ecumenical and cross-cultural engagement and on the ground adaptive and mitigative actions.

5-A. Flyer 1 for Notice Board

Secure Safe Domestic Water (SSDW) for Balranald Shire

What is the SSDW project seeking to achieve?

We are seeking to

Establish community based collaborations to support the sustainable provision of adequate safe domestic water from private supplies

Especially for

- remote towns
- settlements
- farming and pastoral properties
- isolated commercial enterprises (eg tourist infrastructure, caravan/camping parks and service stations)

Benefit for people in Balranald Shire

The core purpose of the SSDW project is:

Reduction of health risks from poor quality domestic water supplies on farming and pastoral properties and other remote enterprises

•

The fundamental benefits for communities and households are:

- ***Clearly identified health risks***
- ***Focused health promotion***
- ***Cost effective risk reduction and protection***

That are for

- **you**
- **your family**
- **friends and visitors**

Are you interested in part of this initiative?

If you are, please contact ----------

Community engagement sponsored by:

Peter Waterman
Adjunct Professor
Institute for Land Water and Society,
Mobile: 0418 628 431
Email: **pw.ems@bigpond.net.au**

5-B. Flyer 2 for Notice Board

Safe Water Australia (SWA)

Securing adequate safe domestic water for rural and remote regional Australia

What is SWA seeking to do?

Establishment of community based collaborations to support the sustainable provision of adequate safe domestic water from private supplies

Especially for

- remote towns and settlements
- farming and pastoral properties
- isolated commercial enterprises (eg tourist infrastructure, caravan/camping parks and service stations)

Benefit for people in regional Australia

The core purpose of SWA is:

Reduction of health risks from poor quality domestic water supplies on farming and pastoral properties and other remote enterprises

The important benefits for communities and households are:

- ***Clearly identified health risks***
- ***Focused health promotion***
- ***Cost effective risk reduction and public health protection***

Especially for

- **farming and pastoral families**
- **Indigenous communities**
- **isolated workforces**
- **friends and visitors**

Are you interested in being part of this initiative?

If you are, please contact ----------

Peter Waterman
Adjunct Professor
Institute for Land Water and Society, Charles Stuart University
Mobile: 0418 628 431 Email: **pw.ems@bigpond.net.au**

5-C. Flyer 3 for Notice Board

Critical human water needs and you!!

Putting people's needs to the forefront.

Statutorily, ***Critical human water needs*** in Balranald Shire should be being met because Subsection 86A (1a) of the **Water Act 2007** says---

'critical human water needs are the highest priority water use for communities who are dependent on Basin water resources'

Yes, this covers your drinking water supplies and how you use water for other domestic purposes. And **Chapter 11** of the **Basin Plan** outlines how *critical human water needs* are to be delivered.

All that said:

Are your *critical human water needs* being met?

And if the answer is **NO**:

Why aren't they?

So--------

What can you going to do about it?

Be part of a collaborative initiative to ensure----------

Secure Safe Domestic Water for rural and remote properties in Balranald Shire

Contact----------

Peter Waterman
Adjunct Professor
Institute for Land Water and Society, Charles Stuart University
Mobile: 0418 628 431
Email: **pw.ems@bigpond.net.au**

Annex 3-C

Information Sheets
Promulgated in the BSC Newsletter

BSC IRCC Information Sheet 01

How safe are your household water supplies?

Water that does not harm you from consumption or physical contact is considered to be safe. The most common use of the term 'safe' is for drinking or potable water. However, it also applies equally to water used for cooking, bathing and showering, cleaning and other household uses. As well, it is applied to water used for recreation purposes such as swimming and children's paddle pools.

To be safe, the water must have sufficiently low concentrations of 'harmful' contaminants to avoid making people who use it either sick or result in injury or death.

The list of harmful contaminants includes:

- disease-causing microbes such as bacteria, viruses, and protozoans
- cancer-causing chemicals such as many pesticides, organic solvents and petroleum products and chlorinated by products of the disinfection process
- some metals and metalloids, nitrates and nutrients, endocrine-disrupting compounds, strong acids and bases, radionuclides and acutely toxic substances

Risk assessment and testing is needed to determining whether water is safe. We need to consider the chance of illness or injury from drinking the water, in comparison to the risk of illness or injury from the many other hazards in our lives. And we need to know that there are no contaminants such as bacteria or harmful chemicals in the water.

Using water piped from government supplied schemes is safe. Such supplies are filtered and treated to kill microbes and keep contaminants at safe levels. And bottled waters and treated domestic supplies from private surface, underground or rainwater capture sources is safe.

So, is water that you are using from your private surface or groundwater sources or rainwater tanks safe?

For further information on this important initiative please contact:

Peter Waterman RFD, Adjunct Professor, Institute for Land Water and Society
Email: **pw.ems@bigpond.net.au** and Mobile: 0418 628 431

BSC is being assisted with this NSW Government Funded project by a Project Team from the Institute for Land Water and Society (ILWS) at Charles Stuart University (CSU) and the SEGRA Foundation.

Increasing Resilience to Climate Change (IRCC) Project: ***Information Sheet 02***

Who is responsible for ensuring that private household water supplies are secure and safe?

A common response to household water supply issues is *get the government to fix it!*

Based on experience that is not going to happen. And to know why, we need to look at the roles and responsibilities of governments in ensuring that household supplies are adequate and healthy.

State and Territory governments in Australia have statutory responsibility for centralised (scheme) domestic water supplies. This encompasses the adequacy of sources and the quality of supplies. Importantly, this includes the measure to ensure that household water supplies in towns are not a public health risk.

Australia wide the Federal Government has a limited role to play in ensuring the water supplies in rural towns are adequate and safe. However, in the Murray Darling Basin (MDB) the Federal role through the MDBA in meeting 'critical human water needs' is crucial. And these needs are defined in subsection 86A (2) of the Water Act 2007 and Chapter 11 of the *Basin Plan* and cover all uses of surface and ground water for domestic purposes. But are they being met?

Under delegation by state departments or agencies, in all Australian jurisdictions, Local Government Authorities (LGAs) only have statutory responsibility for the quantity and quality of 'scheme water' provided to rural cities, towns and settlements.

People on farming and pastoral properties are left to their own devices to secure adequate household water supplies and ensuring that the water being used is not a health risk.

This inequity could be considered a serious gap in policy and practice. Arguably, all Australians should have adequate and safe domestic water. And this situation has implications for economic productivity and the quality of life for people in Balranald Shire, the MDB and beyond.

So, is the water from your private surface or groundwater sources or rainwater tanks adequate and healthy?

And if not*:* ***<u>What are you going to do about it</u>?***

For further information on this important initiative please contact:

Peter Waterman RFD
Adjunct Professor, Institute for Land Water and Society
Email: **pw.ems@bigpond.net.au**, Mobile: 0418 628 431

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Increasing Resilience to Climate Change (IRCC) Project

BSC IRCC Information Sheet 03

Climate Change and Changing climatic conditions------What do they mean?

Water as an essential requirement for all lifeforms and it provides a start point to look at what changed climates can mean for people in Balranald Shire who are facing challenges arising from prolonged droughts, extreme weather events and changed climates.

Terminology being used in discussions on climate related issues can be problematic because the words 'climate change' can mean different things to different people. The following list of terms explain what ***climate change*** and ***changing climatic conditions*** mean.

- ***Global Warming*** is the heating of the earth's atmosphere by natural and human drivers
- ***Weather*** is what we are experiencing now, it changes every day and through the day
- ***Climate*** is 30 years of average weather, usually measured from the International Meteorological Organisation (IMO) baseline 1961-1990
- ***Climate variability*** is measured in terms of extremes such as conditions being hotter and colder or wetter and drier
- ***Climate change*** is measured statistically in terms of averages and variances from a 30 year baseline (usually the IMO baseline)
- ***Changing climatic conditions*** is the summation of long term statically measured changes in mean and variable temperature, rainfall and other weather parameters signaling that what is observed now is statically significantly different from the past and this trend is projected to continue.

Extreme weather events and climate change-are not the same and the two terms should not be confused. Far too often this happens in the media when reporting of floods, intense storms (eg cyclonic activity and monsoons), prolonged drought and bushfires.

For further information on this important initiative please contact:

Peter Waterman RFD, Adjunct Professor, Institute for Land Water and Society
Email: pw.ems@bigpond.net.au
Mobile: 0418 628 431

BSC is being assisted with this NSW Government Funded project by a Project Team from the Institute for Land Water and Society (ILWS) at Charles Stuart University (CSU) and the SEGRA Foundation.

Increasing Resilience to Climate Change (IRCC) Project

BSC IRCC Information Sheet 04

Rainwater tanks and health risks---

Rainwater tanks are widely used as a source of drinking water throughout Balranald Shire. Water used for household purposes for drinking, food preparation or bathing should meet water quality guidelines in order to protect you and your family's health. The water should be free of harmful microorganisms or harmful levels of chemicals.

By far the greatest potential risk to your health comes from contamination of water with harmful microorganisms such as bacteria and parasites from bird or animal droppings. Roof or plumbing materials can also contaminate tank supplies. The microbiological quality of rainwater collected in domestic tanks may be poorer than that of many public water supplies. Occasionally there are cases of illness from contaminated rainwater. However, providing systems are well maintained the risk of harmful organisms being present is low. 'First flush' systems are considered to be essential.

People who choose to use rainwater for drinking and cooking should be aware of potential risks associated with microbiological and chemical contamination. Rainwater tanks in rural and urban areas in the Shire can be contaminated by dust storms, traffic and agricultural sprays. Health risks can be reduced by treatments such as filtering, chlorination, ultra-violet systems or simply boiling your water.

Premises that serve the public or employees and use rainwater for drinking and/or cooking should comply with NSW Health's Private Water Supply Guidelines.

NSW Health's rainwater tank information is at
http://www.health.nsw.gov.au/environment/water/Documents/rainwater_tanks.pdf

And the private water supply guidelines link is
http://www.health.nsw.gov.au/environment/water/Publications/private-water-supply-guidelines.pdf

For further information on this important initiative please contact:

Peter Waterman RFD, Adjunct Professor, Institute for Land Water and Society
Email: **pw.ems@bigpond.net.au** Mobile: 0418 628 431

BSC is being assisted with this NSW Government Funded project by a Project Team from the Institute for Land Water and Society (ILWS) at Charles Stuart University (CSU) and the SEGRA Foundation.

Increasing Resilience to Climate Change (IRCC) Project

BSC IRCC Information Sheet 05

The 'Bigger Picture'---------adapting to *changing climatic conditions in your region!*

The 2017 NSW Office of Environment and Heritage report *Western Enabling Regional Adaptation – Far West region* provides a **snapshot of climate vulnerability in the Far West region.** Balranald Shire is part of this region.

The report states that heatwaves are projected to occur more often, be more intense and last longer and across most of NSW there will be more days over 40°C. Also, droughts, evaporation and fire weather will increase. And people will be more vulnerable to health risks from poor quality water.

NSW councils are key players in adaptation to climate change. They have 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.

With each local government area having a unique set of geographical, environmental, economic and social circumstances, the effects and risks of climate change will differ. Early planning and preparation can minimise long-term economic, social and environmental costs to communities.

For this reason, the NSW Government has provided the following information for councils to help residents understand, prepare for and minimise the impacts of future extreme events and hazards caused by climate change.

- **A Guide to Climate Change Risk Assessment**
- **Integrated Regional Vulnerability Assessments**
- **Regional Climate Data**
- **Adaptation Planning for Local Government checklist**

To learn more please visit the Adapt NSW website:
https://climatechange.environment.nsw.gov.au/Adapting-to-climate-change

BSC is an active partner in the climate change adaptation process through the IRCC project.

For further information on this important initiative please contact:

Peter Waterman RFD, Adjunct Professor, Institute for Land Water and Society
Email: **pw.ems@bigpond.net.au** Mobile: 0418 628 431

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Increasing Resilience to Climate Change (IRCC) Project
BSC IRCC Information Sheet 06

Amoebic meningitis (*Naegleria fowleri*) – warning for households

People are urged to take precautions to avoid potentially fatal amoebic meningitis from *Naegleria fowleri*.

What is *Naegleria fowleri*?

Naegleria fowleri is an amoeba (microorganism), commonly found in unchlorinated warm fresh water and soil. Any water supply that seasonally exceeds 30°C or continually exceeds 25°C may be a risk. This includes lakes, rivers, dams, bores, tanks, pipelines, natural hot waters/springs and spa and swimming pools that are poorly maintained, under-chlorinated or unchlorinated. *Naegleria* cannot survive in water that is clean, cool and adequately chlorinated.

Households with a private water supply

Households with a private water supply should be familiar with the quality of their drinking water. Private supplies may include rainwater, groundwater (from bores or springs), surface water (from a dam or stream) or carted water. Water used for household purposes such as drinking, food preparation and personal hygiene (including cleaning teeth/oral hygiene and bathing) should meet water quality guidelines in order to protect you and your family's health. You do not need to test for *Naegleria fowleri* directly. Any warm unchlorinated fresh water could contain *Naegleria*.

NSW Health recommends that groundwater and surface water is not used for drinking, cooking and personal hygiene (including cleaning teeth and bathing) without testing and appropriate treatment including disinfection. This can be done by testing the microbiological, chemical and radiological quality of the water and disinfecting with chlorine.

Source: NSW Health *Naegleria fowleri* Fact Sheet
http://www.health.nsw.gov.au/Infectious/factsheets/Pages/Naegleria-fowleri.aspx

For further information on this important initiative please contact:

Peter Waterman RFD, Adjunct Professor, Institute for Land Water and Society
Email: pw.ems@bigpond.net.au
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BSC is being assisted with this NSW Government Funded project by a Project Team from the Institute for Land Water and Society (ILWS) at Charles Stuart University (CSU) and the SEGRA Foundation.

Increasing Resilience to Climate Change (IRCC) Project

BSC IRCC Information Sheet 07: *Bringing it together------finalising the project!*

On 12 November 2019 the NSW Minister for Energy and Environment, the Hon Matt Kean, announced successful local council IRCC grants at the AdaptNSW Forum. Balranald Shire Council (BSC) was the only Council in Western NSW to win a grant to undertake a project titled: ***Climate Change Adaptive Private Domestic Water Supplies for Rural and Remote Properties***

To quote from the 2019 BSC proposal to NSW Department of Planning, Industry and Environment (DPIE) and Local Government NSW (LGNSW) for project funding ----------

> *This project aims to identify and pilot measures to mitigate the risk of increasing temperatures and variable rainfall under climate change to the provision of adequate and safe private domestic water supplies for people on rural and remote properties in Balranald Shire.*
>
> *This project will establish a baseline assessment of risk to human health, identify a range of solutions to improve water sanitation and water use efficiency, address barriers to adoption and monitor success, and develop a Secure and Safe Domestic Water (SSDW) Program to ensure that the products of the project are disseminated in Balranald Shire, the Far West-and for NSW non-scheme water users generally.*

The project is to be completed by November 2021 and the Project Team are assembling baseline environmental and social information for the Shire, collating and analysing questionnaire survey and water testing results, and preparing the final report. The COVID 19 situation has adversely impacted on the project. Nonetheless, a lot has been learnt about water sources, use and quality on rural properties and households using rainwater tanks in the towns and settlements. The SSDW Program will be used to disseminate the findings and explore ways of increasing resilience to changing climatic conditions and reducing health risks.

Special thanks are extended to all in the Shire and beyond who have assisted and supported the project through communications, questionnaire survey, and water testing activities.

For further information on this important initiative please contact:

Peter Waterman RFD, Adjunct Professor, Institute for Land Water and Society
Email: **pw.ems@bigpond.net.au** Mobile: 0418 628 431

BSC is being assisted with this NSW Government Funded project by a Project Team from the Institute for Land Water and Society (ILWS) at Charles Stuart University (CSU) and the SEGRA Foundation.

Annex 3-D

Questionnaire Survey

- **QR Code Link**
- **Letter of transmittal**
- **Survey instrument**

CLIMATE CHANGE ADAPTIVE PRIVATE DOMESTIC WATER SUPPLIES ON RURAL AND REMOTE PROPERTIES

Balranald Shire Council is undertaking a survey of water adequacy and quality for the *Increasing Resilience to Climate Change Project* funded by the NSW Department of Planning, Industry and Environment and assisted by Local Government NSW. This is being done in order to:

- help to ensure that everyone can have adequate and safe household water supplies
- better appreciate the water supply problems being confronted by residents in the Shire living on rural properties or using rainwater tanks
- identify any possible health risks that may be present due to the quality of the water that is being used

Council are inviting people on rural and remote properties in the Shire who are dependent on private sources of water for their household use to participate in this collaboration. Private sources include surface water from farm dams or creeks or rivers, ground water from deep or shallow bores, and rainwater tanks that capture runoff from roofs.

People in Balranald and Euston who have rainwater tanks for household use (eg drinking, cooking, showers, bathing and children's play) are also invited to participate in the project by completing the survey.

Here is the web address (url) for the survey **https://www.surveymonkey.com/r/DGDQWVB** (You may need to cut and paste this into your web browser).

Or use the following QR Code through your mobile phone.

We would like to have your completed questionnaire by Friday 10 July 2021.

Please encourage others to complete the survey.

For further information please contact:

Peter Waterman, Adjunct Professor, Institute for Land Water and Society, Charles Stuart University
Email: **pw.ems@bigpnd.net.au**
Mobile: 0418 628 431

Attachment 2

Draft: Invitation to participate in a water quality survey and testing for the BSC IRCC Project

Dear Resident

How adequate and safe are your domestic water supplies?

Balranald Shire Council is committed to ensuring that all people in the Shire have access to adequate safe domestic water supplies. Our commitment applies equally to those living in the towns as well as on pastoral properties.

Council is undertaking a survey of private water sources, water treatment and water use in order to:

- better appreciate the dimensions of the water supply problems being confronted by residents in the Shire living on rural properties
- identify any possible health risks that may be present due to the quality of the water that people are using
- help to ensure that everyone can have adequate and safe domestic water supplies

For this survey, domestic water is:

Water used day to day by people for indoor and outdoor household and commercial purposes including drinking, preparing food, bathing, washing clothes and dishes, brushing teeth, watering gardens, swimming pools and children's play.

Securing adequate safe domestic water for the people of Balranald Shire goes beyond potable/drinking water supplies. It is more than water from your kitchen tap.

As defined above, domestic water encompasses all uses by which you and your family and friends or employees or visitors or guests (if you re operating a commercial activity), can come into physical contact with the water resources being used on your property. And, because of its poor quality, the water may or may not be a risk to the health of people who use it every day.

Recently, we sent you a letter to explaining Balranald Shire Council involvement in a NSW Government funded project aimed at increasing resilience to climate change (IRCC). Especially, the impacts of drought on the availability and quality of domestic water supplies on rural properties.

To action this initiative, Council is inviting people from across the Shire to participate in a collaborative project that:

- helps to dimension water supply problems on rural properties by documenting the sources, amount and quality of private domestic water supplies that are being used
- provides information on the causes and effects of health risks from inadequate and poor quality supplies and what can be done to improve the situation
- enables householders to test their private domestic water supplies for potential health risks
- suggests actions can be taken to ensure that private domestic supplies are sufficient and safe

Council are inviting properties dependent on private sources of water for their household use to participate in this collaboration. Private sources include: surface water from farm dams or creeks or rivers; ground water from deep or shallow bores; and rainwater tanks that capture runoff from roofs. Separate tests will be undertaken for each source of supply being used.

People in Balranald and Euston who have rainwater tanks for domestic use (eg drinking, cooking, showers, bathing and children's play) are also invited to participate in the project.

Water quality questionnaire survey and testing

As part of the IRCC project Council is undertaking a five-step water quality survey and testing program.

Step 1. As a rural property holder dependent on your own water supplies or as a town resident with water tanks we invite you to:

Either----------
complete the attached questionnaire and return it to the Project Team in the reply paid envelope

Or----------
complete the questionnaire on the 'survey monkey' at this link--------

Step 2. Questionnaire responses will be collated and analysed by the Project Team. Water sources being used on individual properties will be cross referenced to the landscape conditions and land use. These data will then be used to identify properties who could have health risks from their private water sources.

Step 3. Residents at priority sites will be invited to participate in water quality scanning for bacteria and other contaminants using 'Do-it-Yourself (DIY)' test kits provide by the Project.

Step 4. Please email us at ----------or mail to us the results of your tests. Our guidelines will tell you what to do if you detect bacteria in the water you are using for domestic purposes (eg drinking, cooking, showers and children's recreation).

Step 5. The Project Team will collate and analysis the results of the Shire wide testing program and report the findings to all participants. Data will be aggregated to maintain anonymity and ensure that the privacy of respondents is fully protected.

This NSW Government Funded project is being undertaken on behalf of BSC by a Project Team from the Institute for Land Water and Society (ILWS) at Charles Stuart University (CSU) the SEGRA Foundation. The Murray Darling Association (MDA) and the Murray-Darling Basin Authority (MDBA) are most supportive of the project.

We are looking forward to your answers to the questions on either the attached questionnaire or online on the survey monkey. Your response will help Council better understand the domestic water supply issues across the Shire and how we can work together to address them

Contacts for further information----------

Logos' etc

Attachment 3

Balranald Shire Council Private Domestic Water Providers: Residents Questionnaire Water Sources, Water Treatment and Usage Survey

This survey relates to domestic use water ONLY. Domestic water means tap water supplied via plumbing fittings to your home for drinking, washing, cooking, laundry, sanitation and other household uses.

Address: _____ Date: ___/___/2020

Question 1

Please specify how many people in the relevant age groups currently live at your residence?

Age Group	Number of people
< 1	
1 - 4	
5 - 9	
10 - 19	
20 - 54	
55+	

Question 2

Do all persons living at your residence use the onsite domestic water supply? Circle the most appropriate answer.

Yes	No	If no, who does not use the water? Specify age:_____

Question 3

Does anyone at your residence identify as having a chronic health condition or immunocompromised such as transplant patients, cancer patients, dialysis patients or other?
Circle the most appropriate answer.

Yes	No

Question 4

Approximately how much water is used in total at your residence for domestic purposes each day? Circle the most appropriate answer.

<10L	10 – 99L	100 – 199L	>200L

Question 5

Where is your domestic water sourced from? Please circle *Yes or No* for each and tick the applicable boxes where appropriate.

Source	Circle Yes or No
Rainwater: Collected from roofs and stored within a tank for future use.	Yes or No
If ***yes*** to rainwater, tick the following that apply: ☐ Trees over hang the roof. ☐ First flush device installed. ☐ Bitumen or lead items on roof. ☐ Animal droppings (bats, birds) on roof. ☐ Aerial spraying occurs on nearby lands.	
Surface water: Drawn from rivers, creeks and dams which may or may not be stored in a tank prior to use.	Yes or No
If ***yes*** to surface water, tick the following that apply: ☐ Intake distant from septic tanks. ☐ Surface water restricted from live stock.	
Shallow groundwater: Drawn from bores, wells or springs that are 1 to 20 meters deep, which may or may not be stored in a tank prior to use	Yes or No
If ***yes*** to shallow ground, tick the following that apply: ☐ Bore distant from septic tanks. ☐ Bore cover secure. ☐ Bore protected from contaminated seepage from rubbish or agricultural run-off.	
Deep groundwater: Drawn from bores, wells or springs that are >20 meters deep, which may or may not be stored in a tank prior to use	Yes or No
If ***yes*** to shallow ground water, tick the following that apply: ☐ Bore distant from septic tanks. ☐ Bore cover secure	
Carted water: From a mains or town water supply, transferred by tanker and stored in a tank prior to use	Yes or No
If ***yes*** to carted water, tick the following that apply: ☐ Tanker is purpose built and maintained for drinking water transportation. ☐ Tanker hose appears clean and does not come in contact with water in your tank.	
Other (Please specify):_____	

Go to next page…

Question 6

If you use a tank to store your domestic water, which if the following best describes your tank? Tick the most appropriate answer.

Tank description	Tick if applicable
Above ground tank with screens or is totally sealed	☐
Above ground without screens or is unsealed	☐
Below ground tank	☐
Use both above & below ground tanks	☐
I don't use a tank to store domestic water	☐

Question 7

Which best describes the type(s) of water treatment used on your domestic water supply? Tick all that apply.

Treatment type	Tick if Applicable
Untreated – No treatment (e.g. filtration, disinfection) used on site	☐
Filtered – Using a sand and/or activated carbon filter	☐
Disinfection – using commercial compounds such as chlorine (Sodium hypochlorite)	☐
Ultra-violet (UV) – short wavelength ultraviolet light	☐
Boil water	☐
Other treatment method not listed above. Please specify: _____	☐

Go to next page….

Question 8

What part of your residence is supplied treated water? Tick the most appropriate answer.

Part of the residence where treated water is available	Tick if Applicable
None – No taps supply treated water. All water available is untreated	☐
One outlet – Only one tap supplies treated water e.g. kitchen sink only	☐
Multiple outlets – A number of taps supply treated water. How many: _____	☐
All outlets – All taps throughout the residence supply treated water.	☐

Question 9

Specify if domestic water used for the following activities at your residence is treated or untreated? Please circle *Yes or No* for each

Domestic water use activity	Treated? Yes or No
Drinking water	Yes or No
Food preparation	Yes or No
Bathing	Yes or No
Washing clothes and dishes	Yes or No
Brushing teeth	Yes or No
Watering gardens	Yes or No
Children's play	Yes or No
Provided to a business E.g. Accommodation / food business or other business venture.	Yes or No or Not Applicable
Other:_____	Yes or No

Go to next page…

Question 10

On a scale of 1 to 10 how satisfied are you with the **quality** of your domestic water supply? Circle the most appropriate answer.

1 – Very dissatisfied ***10 – Very satisfied***

1 ☹	2	3	4	5 😐	6	7	8	9	10 ☺

Question 11

On a scale of 1 to 10 how concerned are you about the **safety** of your domestic water supply? Circle the most appropriate answer.

1 – Very Concerned ***10 – Not concerned at all***

1 ☹	2	3	4	5 😐	6	7	8	9	10 ☺

Do you wish to make any additional comments relating to your water supply?

_____

_____

_____

Finished

Thanks for your participation.

Please return the completed questionnaire to the Project Team.

BSC IRCC Questionnaire Survey Responses

Balranald Shire Council Residents' Questionnaire Survey for Private Domestic Water Providers: Water Sources, Water Treatment and Land Usage

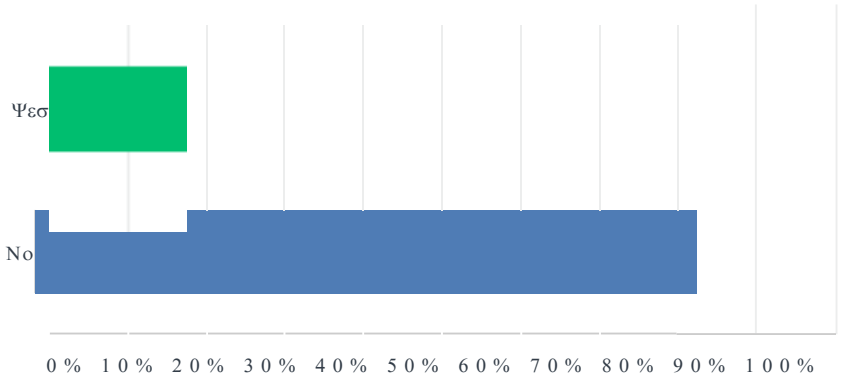
Q1 Please specify how many people in the relevant age groups currently live at your residence.

Answered: 50 Skipped: 1

ANSWER CHOICES	RESPONSES	
Under 1	10.00%	5
1-4	30.00%	15
5-9	22.00%	11
10-19	38.00%	19
20-54	54.00%	27
55+	40.00%	20

Q2 Does anyone at your residence identify as having a chronic health condition or immunocompromised such as transplant patients, cancer patient dialysis patients or other? Check the appropriate.

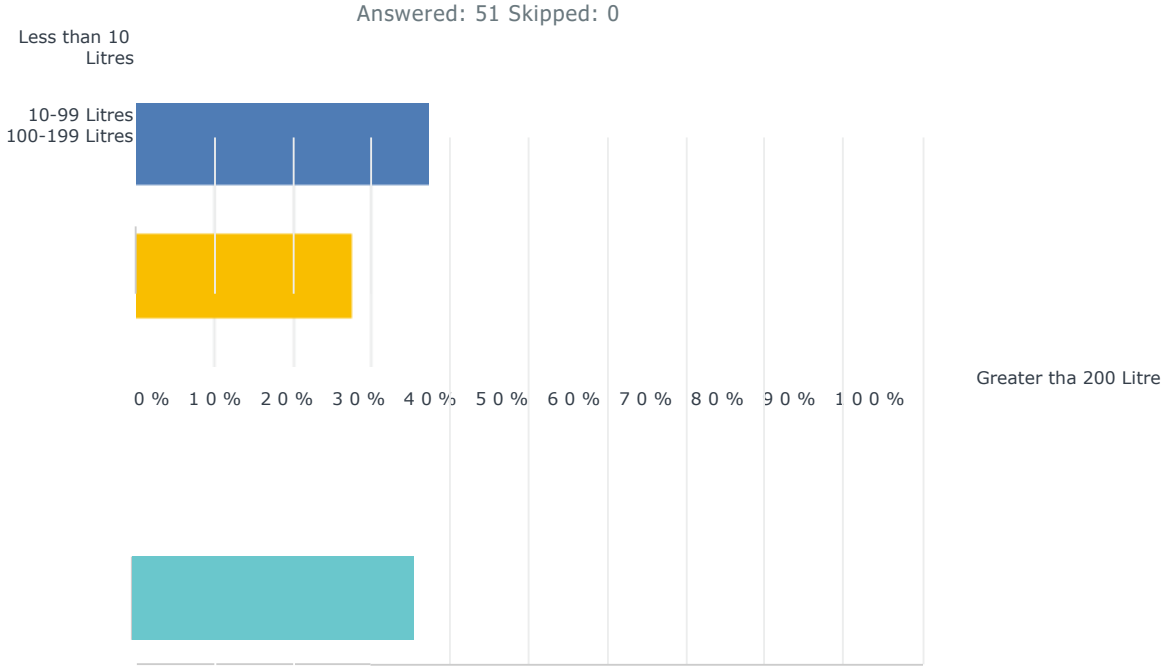
Answered: 51 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	17.65%	9
No	82.35%	42
Total Respondents: 51		

Q3 Approximately how much water is used in total at your residence for domestic purposes each day?

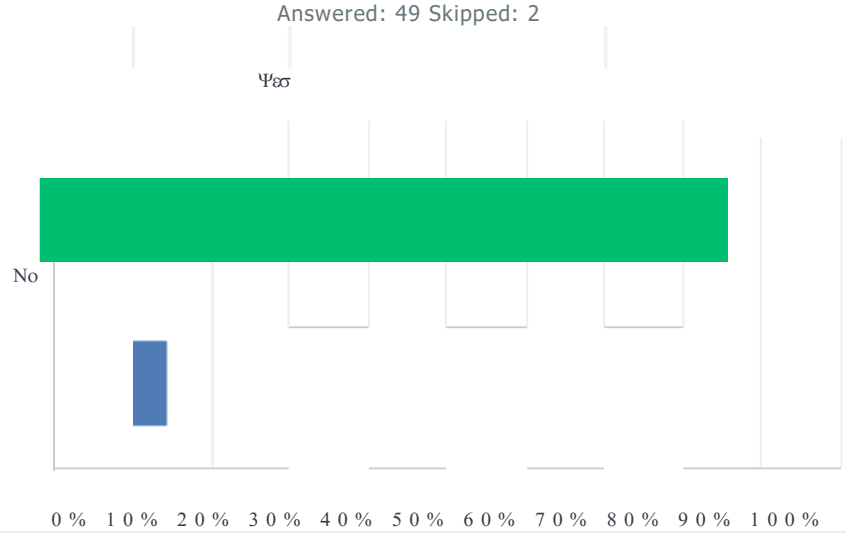
Answered: 51 Skipped: 0



ANSWER CHOICES	RESPONSES	
Less than 10 Litres	0.00%	0
10-99 Litres	37.25%	19
100-199 Litres	27.45%	14
Greater than 200 Litres	35.29%	18
Total Respondents: 51		

Q4 Where is your domestic watersourced from? Please check the applicable boxes.Rainwater: Collected from roofs and stored within a tank for future use.

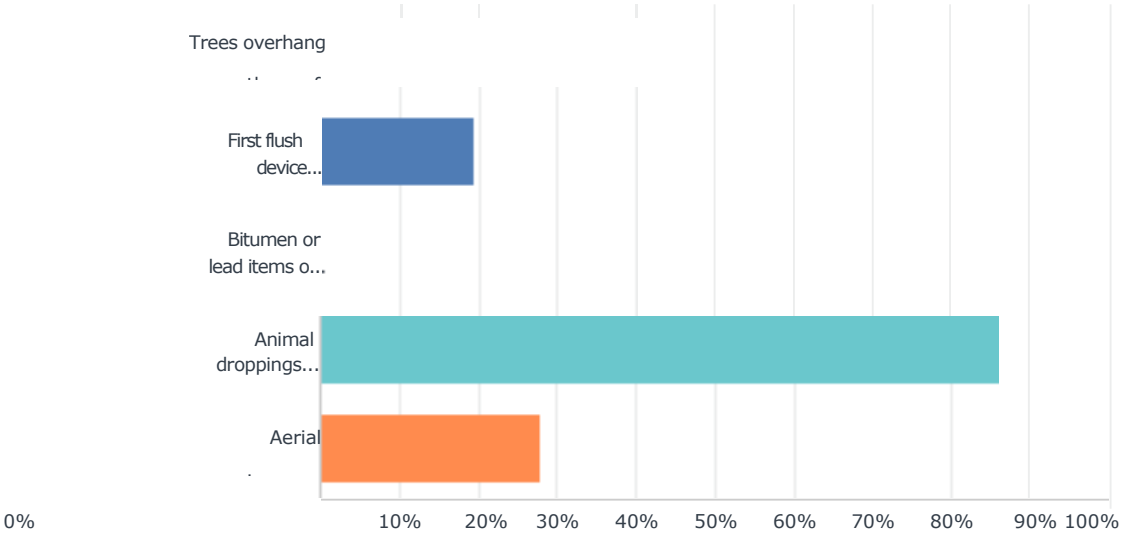
Answered: 49 Skipped: 2



ANSWER CHOICES	RESPONSES	
Yes	85.71%	42
No	14.29%	7
Total Respondents: 49		

Q5 If yes to rainwater,please check the following that apply:

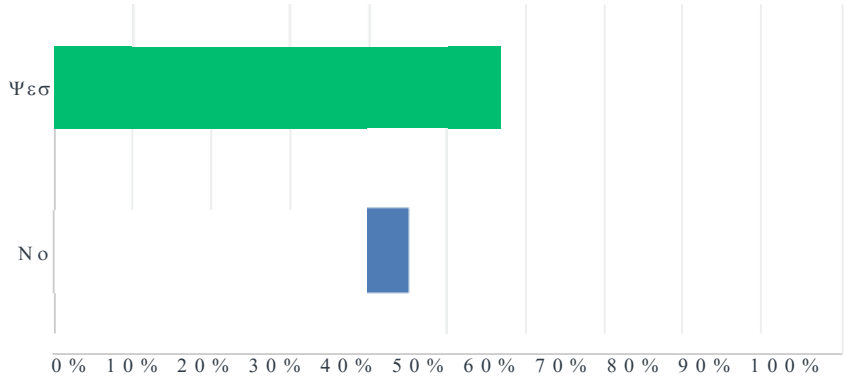
Answered: 36 Skipped: 15



ANSWER CHOICES	RESPONSES	
Trees overhang the roof	44.44%	16
First flush device installed	19.44%	7
Bitumen or lead items on the roof	0.00%	0
Animal droppings (bats, birds, reptiles, mammals) on roof	86.11%	31
Aerial spraying occurs on nearby lands	27.78%	10
Total Respondents: 36		

Q6 Surface Water: Drawn from rivers, creeks, and dams which may or mayn't be stored in a tank prior to use.

Answered: 51 Skipped: 0

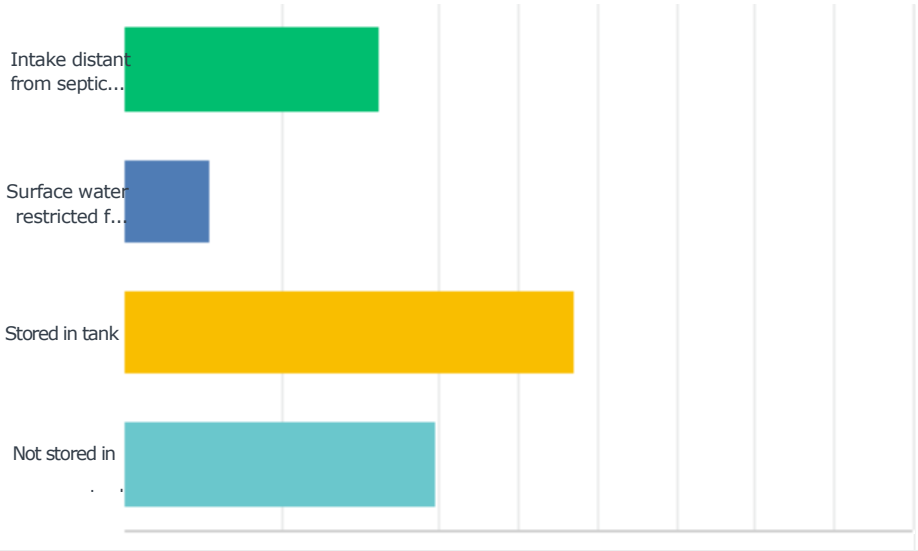


ANSWER CHOICES	RESPONSES	
Yes	56.86%	29
No	45.10%	23
Total Respondents: 51		

Q7 If yes to surface water, please check the following that apply.

Answered: 28 Skipped: 23

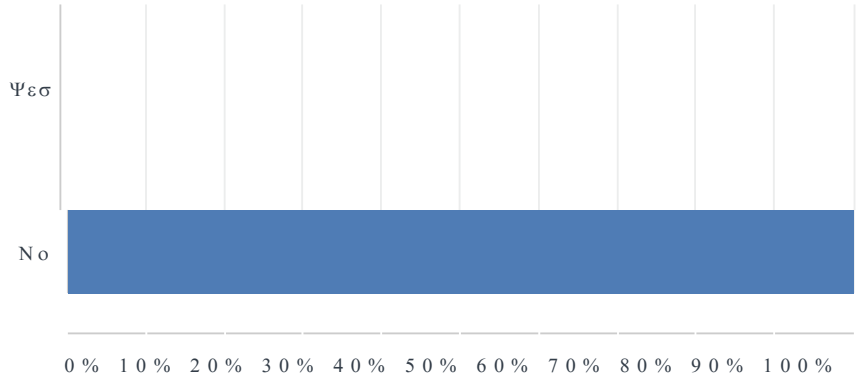
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%



ANSWER CHOICES	RESPONSES	
Intake distant from septic tanks	32.14%	9
Surface water restricted from livestock	10.71%	3
Stored in tank	57.14%	16
Not stored in tank	39.29%	11
Total Respondents: 28		

Q8 Shallow groundwater: Drawn from bores, wells or springs that are 1-20 metres deep which may or may not be stored in a tank prior to use.

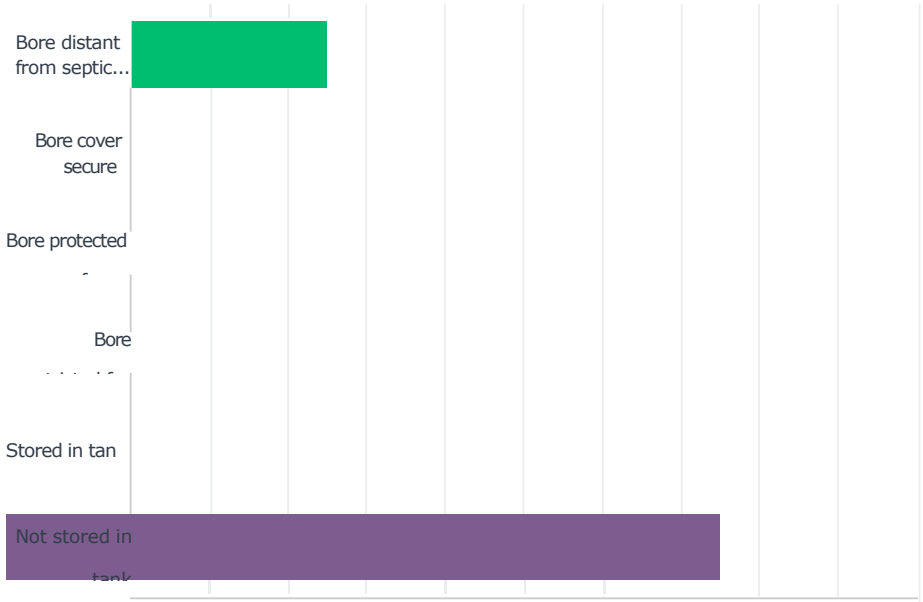
Answered: 47 Skipped: 4



ANSWER CHOICES	RESPONSES	
Yes	0.00%	0
No	100.00%	47
Total Respondents: 47		

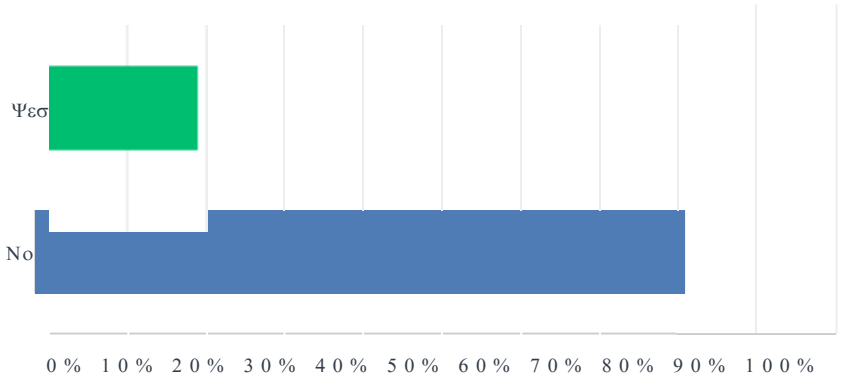
Q9 If yes to shallow groundwater, please check the following that apply.

Answered: 4 Skipped: 47



ANSWER CHOICES	RESPONSES	
Bore distant from septic tanks	25.00%	1
Bore cover secure	0.00%	0
Bore protected from contaminated seepage from rubbish or agricultural run-off	0.00%	0
Bore restricted from livestock	0.00%	0
Stored in tank	0.00%	0
Not stored in tank	75.00%	3
Total Respondents: 4		

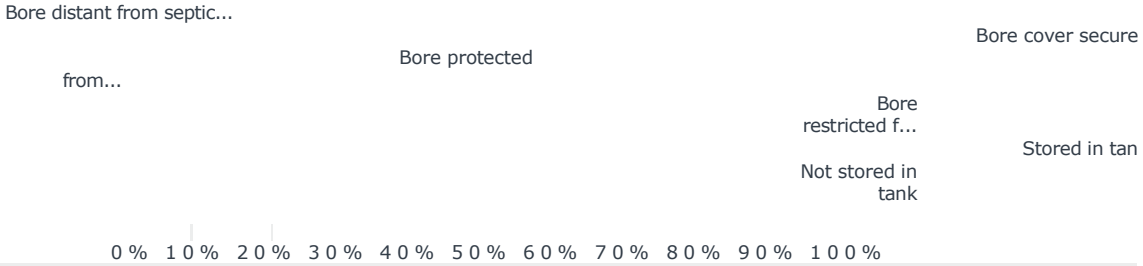
Q10 Deep groundwater: drawn from bores, wells or springs that are greater than 20 metres deep, which may or may not be stored in a tank prior to use.



ANSWER CHOICES	RESPONSES	
Yes	19.05%	8
No	80.95%	34
Total Respondents: 42		

Q11 If yes to deep groundwater, please check the following that apply.

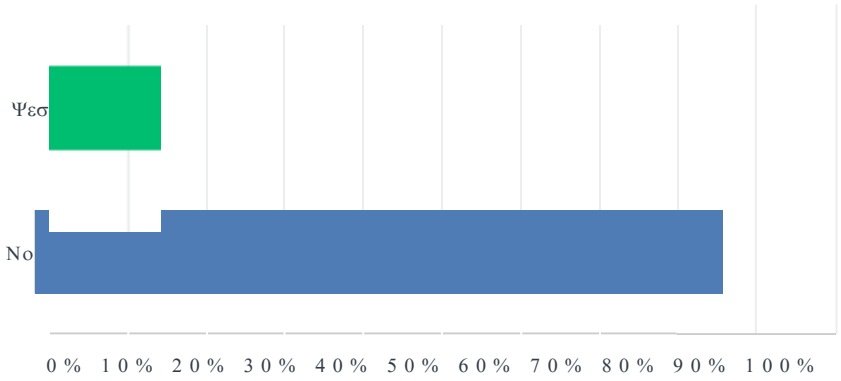
Answered: 10 Skipped: 41



ANSWER CHOICES	RESPONSES	
Bore distant from septic tanks	80.00%	8
Bore cover secure	80.00%	8
Bore protected from contaminated seepage from rubbish or agricultural run-off	70.00%	7
Bore restricted from livestock	50.00%	5
Stored in tank	70.00%	7
Not stored in tank	30.00%	3
Total Respondents: 10		

Q12 Carted Water: from mains or town water supply transferred by tanker and stored in a tank prior to use.

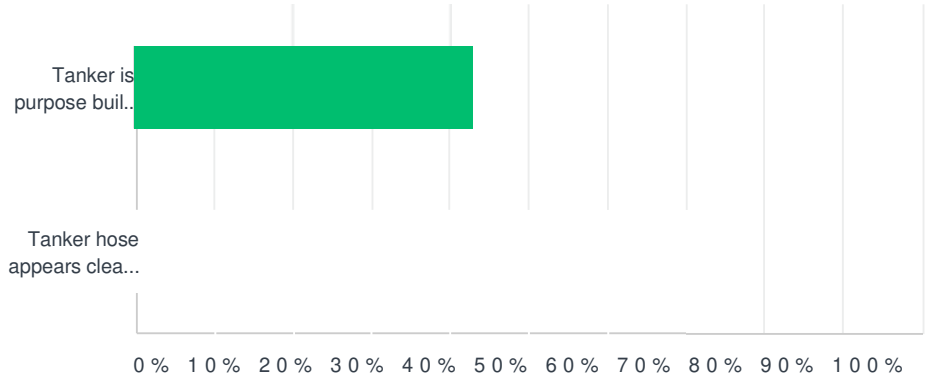
Answered: 42 Skipped: 9



ANSWER CHOICES	RESPONSES	
Yes	14.29%	6
No	85.71%	36
Total Respondents: 42		

Q13 If yes to carted water, please check the following that apply.

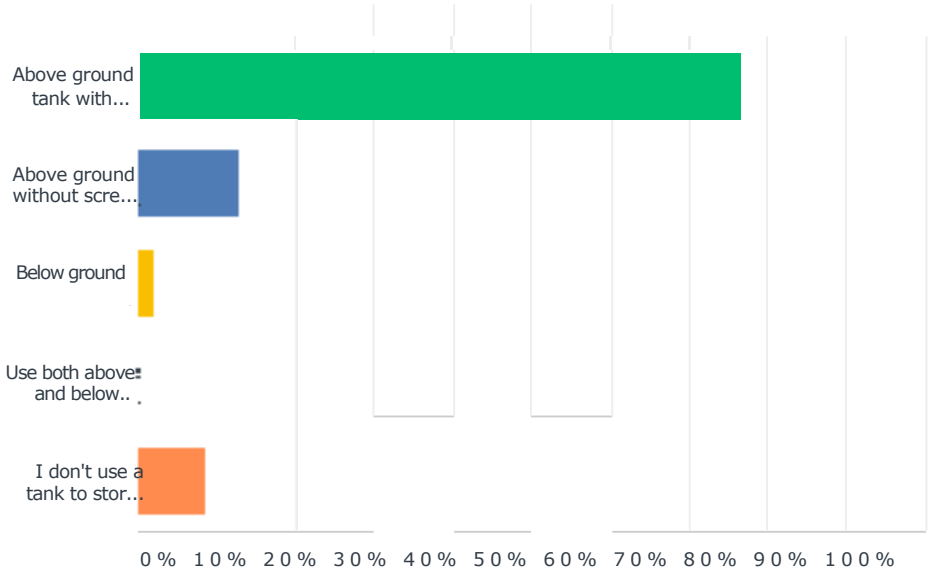
Answered: 7 Skipped: 44



ANSWER CHOICES		RESPONSES
Tanker is purpose built and maintained for drinking water transportation	42.86%	3
Tanker hose appears clean and does not come in contact with water in your tank	71.43%	5
Total Respondents: 7		

Q14 If you use a tank to store your domestic water, which of the following best describes your tank? Check the most apropriate.

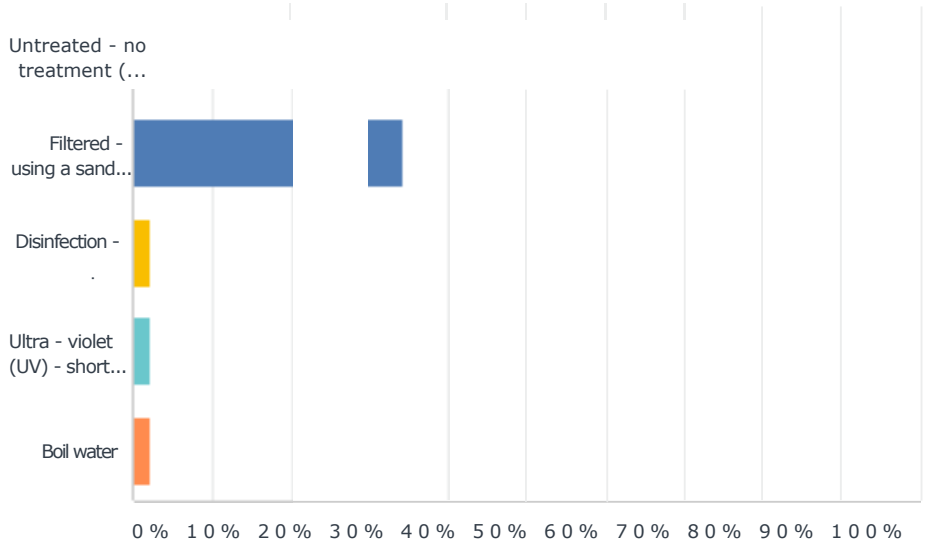
Answered: 47 Skipped: 4



ANSWER CHOICES	RESPONSES	
Above ground tank with screens or is totally sealed.	76.60%	36
Above ground without screens or is unsealed	12.77%	6
Below ground tank	2.13%	1
Use both above and below ground tanks	0.00%	0
I don't use a tank to store domestic water	8.51%	4
TOTAL		47

Q15 Which best describes the type (s) of water treatment used on your domestic water supply? Check all that apply.

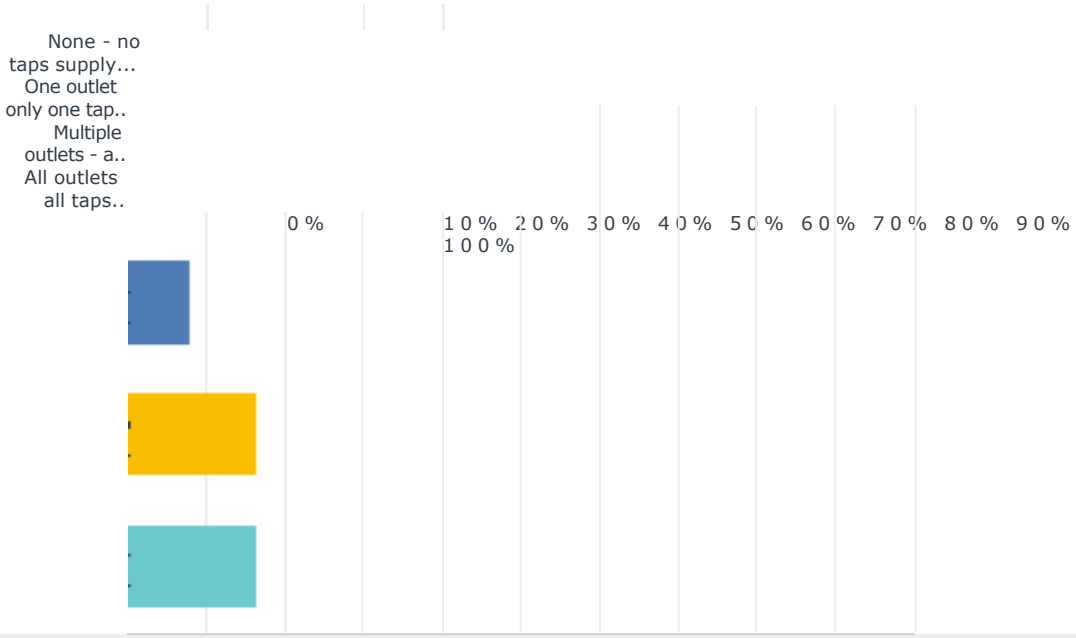
Answered: 47 Skipped: 4



ANSWER CHOICES	RESPONSES	
Untreated - no treatment (e.g. filtration, disinfection) used on site	72.34%	34
Filtered - using a sand and/or activated carbon filter	34.04%	16
Disinfection - using commercial compounds such as chlorine (Sodium hypochlorite)	2.13%	1
Ultra - violet (UV) - short wave length ultra violet light	2.13%	1
Boil water	2.13%	1
Total Respondents: 47		

Q16 What part of your residence is supplied treated water? Check the most appropriate answer.

Answered: 49 Skipped: 2

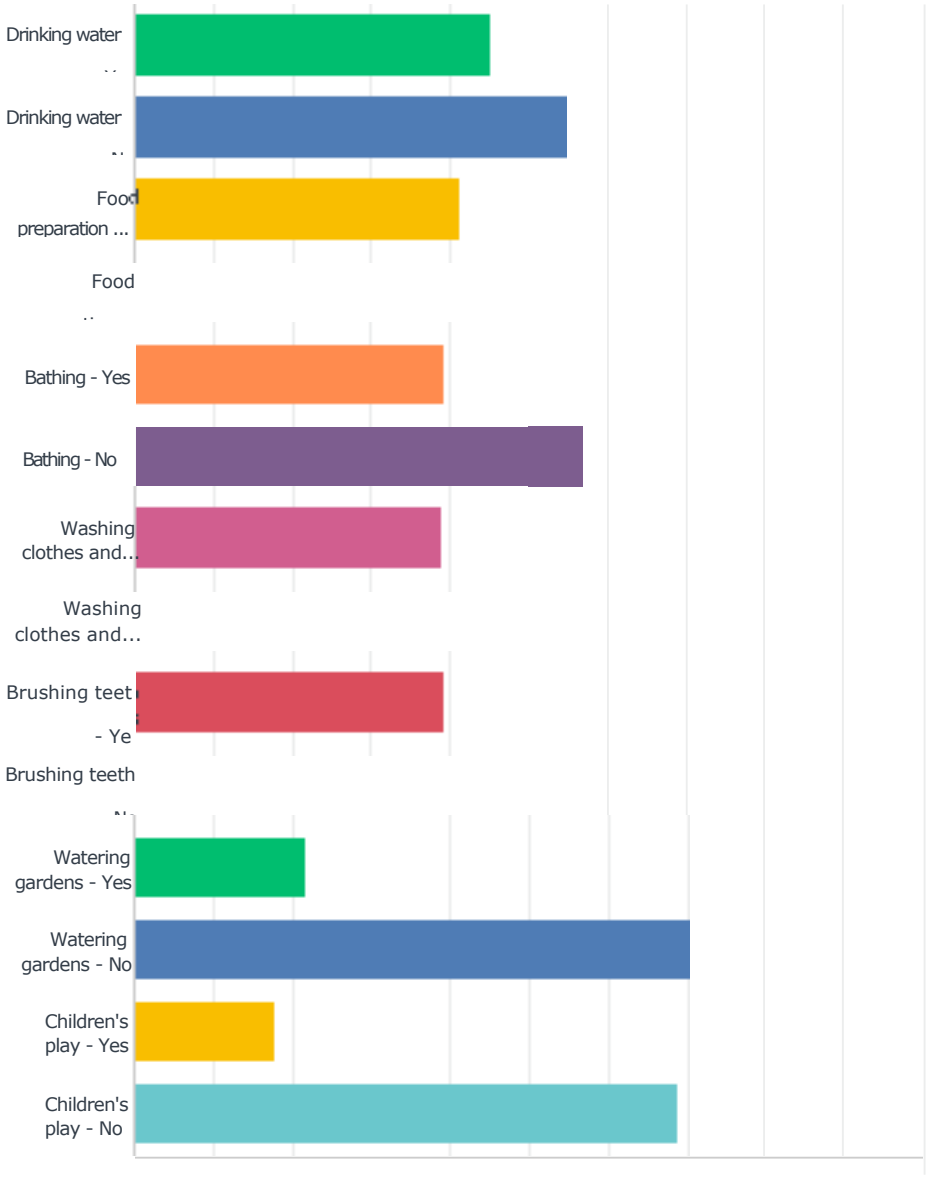


ANSWER CHOICES	RESPONSES	
None - no taps supply treated water. All water available is untreated	59.18%	29
One outlet - only one tap supplies treated water (e.g. kitchen sink only)	8.16%	4
Multiple outlets - a number of taps supply treated water	16.33%	8
All outlets - all taps throughout the residence supply treated water	16.33%	8
Total Respondents: 49		

Q17 Specify if domestic water used for the following activities at your residence is treated. Please check yes or no for each.

Answered: 51 Skipped: 0

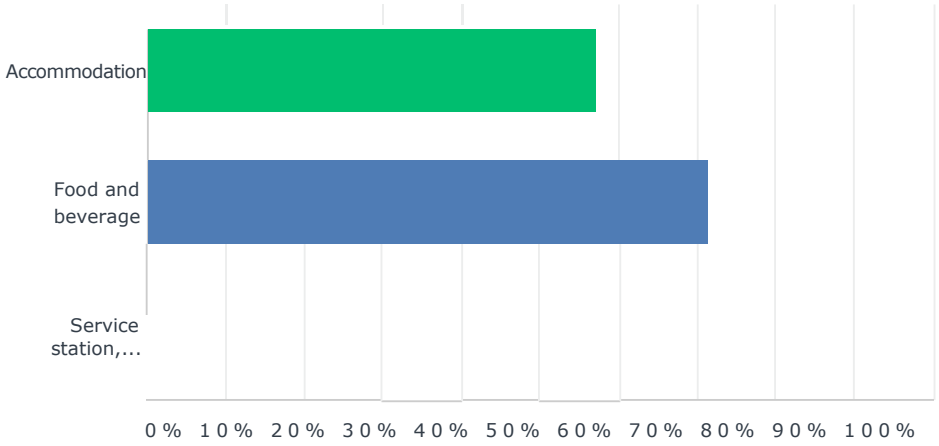
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%



ANSWER CHOICES	RESPONSES	
Drinking water - Yes	45.10%	23
Drinking water - No	54.90%	28
Food preparation - Yes	41.18%	21
Food preparation - No	54.90%	28
Bathing - Yes	39.22%	20
Bathing - No	56.86%	29
Washing clothes and dishes - Yes	39.22%	20
Washing clothes and dishes - No	58.82%	30
Brushing teeth - Yes	39.22%	20
Brushing teeth - No	56.86%	29
Watering gardens - Yes	21.57%	11
Watering gardens - No	70.59%	36
Children's play - Yes	17.65%	9
Children's play - No	68.63%	35
Total Respondents: 51		

Q18 Is private domestic water provided to a business? Check all appropriate.

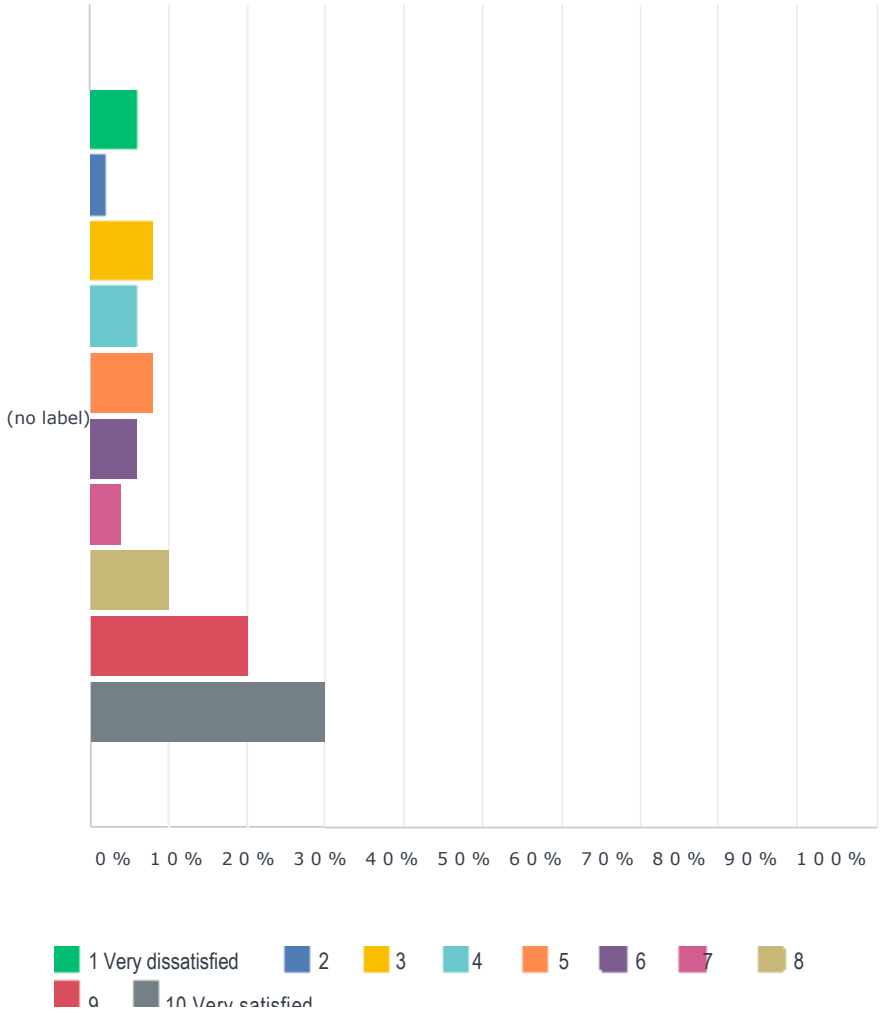
Answered: 7 Skipped: 44



ANSWER CHOICES	RESPONSES	
Accommodation	57.14%	4
Food and beverage	71.43%	5
Service station, transport hub	0.00%	0
Total Respondents: 7		

Q19 On a scale of one to ten how satisfied are you with the quality of your domestic water supply. Where one is very dissatisfied and ten is very satisfied Check the most appropriate answer.

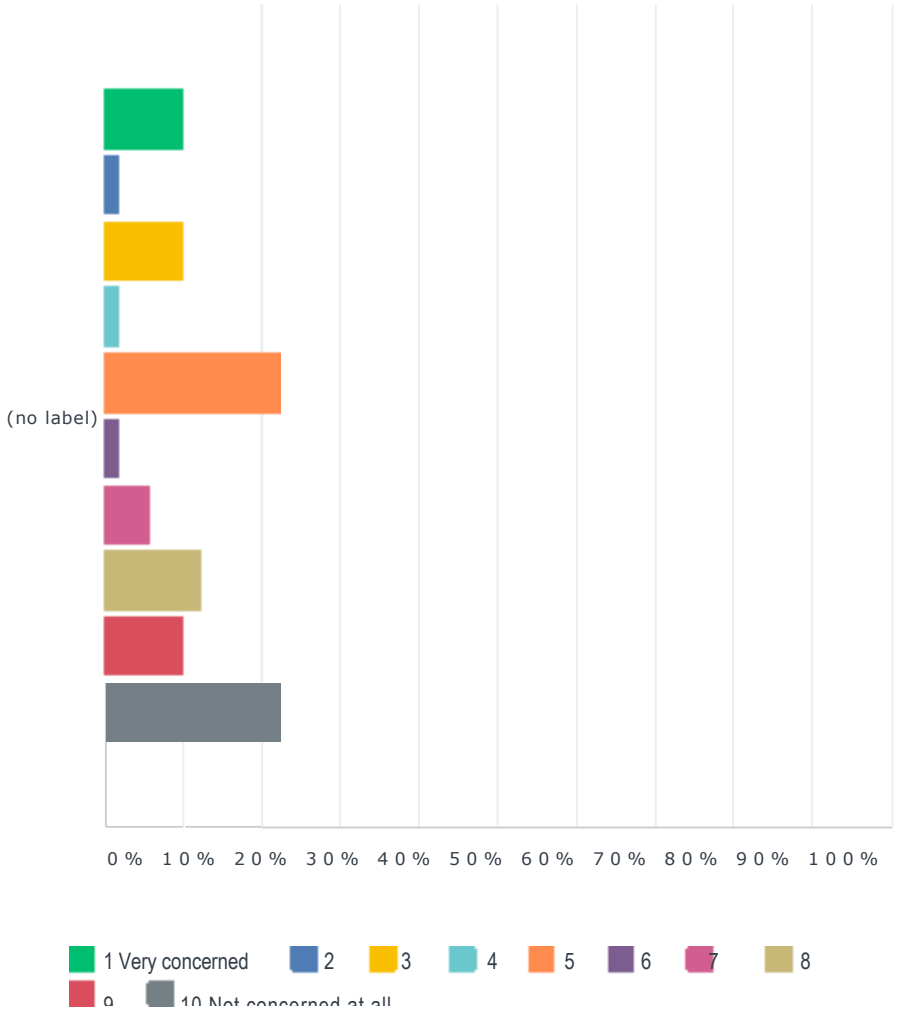
Answered: 50 Skipped: 1



	1 VERY DISSATISFIED	2	3	4	5	6	7	8	9	10 VERY SATISFIED	TOTAL	WEIGHTE AVERAGE
(no label)	6.00% 3	2.00% 1	8.00% 4	6.00% 3	8.00% 4	6.00% 3	4.00% 2	10.00% 5	20.00% 10	30.00% 15	50	7.

Q20 On a scale of one to ten how concerned are you about the safety of your domestic water supply? Where one is very concerned and ten is not concerned at all. Check the most appropriate answer.

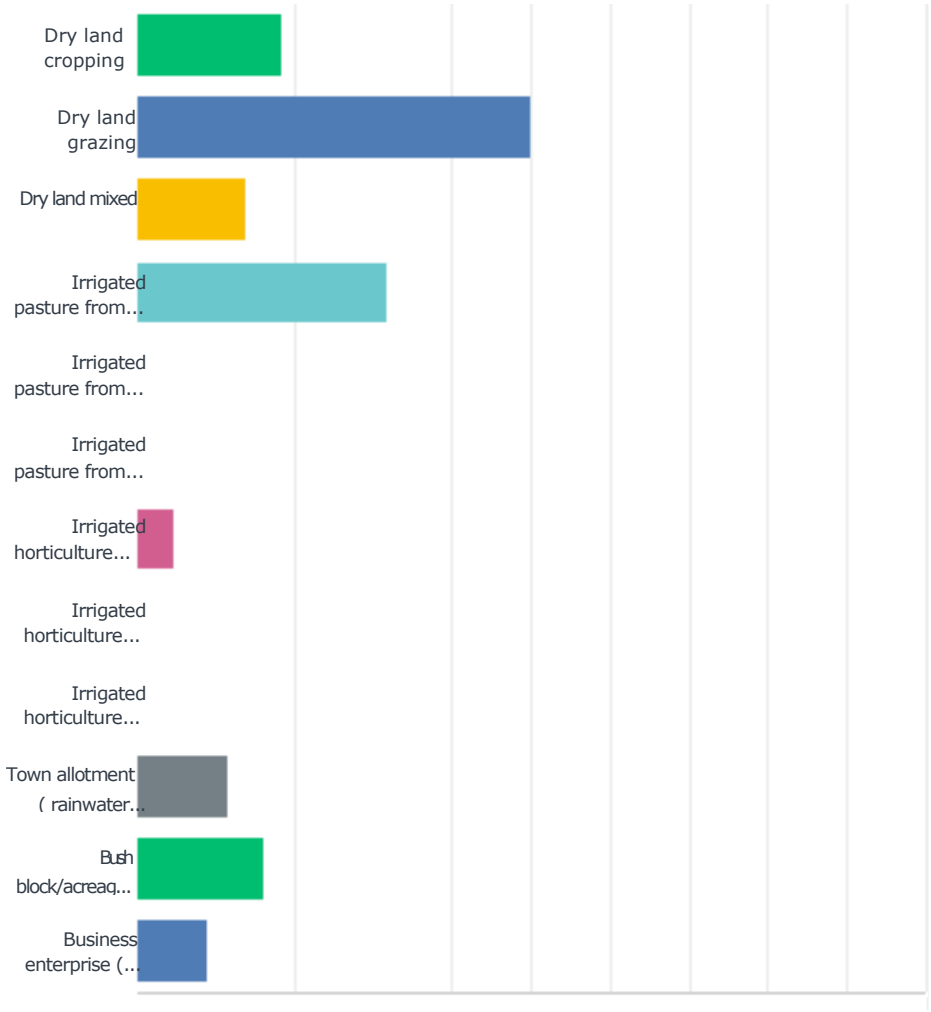
Answered: 49 Skipped: 2



	1 VERY CONCERNED	2	3	4	5	6	7	8	9	10 NOT CONCERNED AT ALL	TOTAL	WEIG AVERA
(no label)	10.20% 5	2.04% 1	10.20% 5	2.04% 1	22.45% 11	2.04% 1	6.12% 3	12.24% 6	10.20% 5	22.45% 11	49	

Q21 How would you describe the land use for the property on which your private water sources and residence are located? Check all that apply.

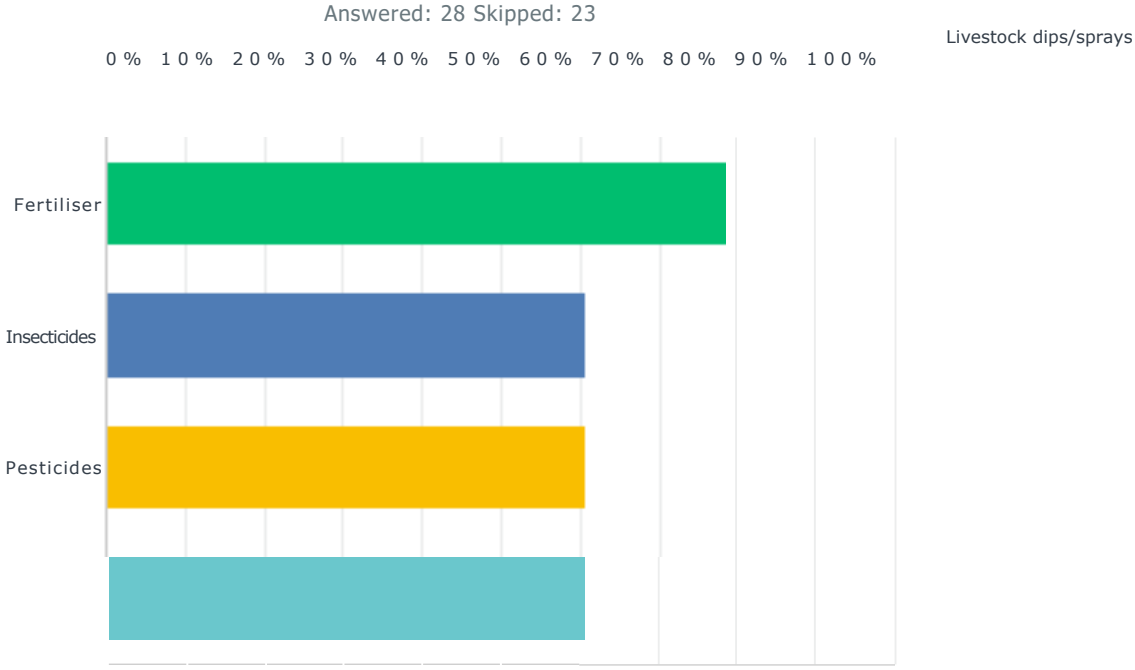
Answered: 44 Skipped: 7



ANSWER CHOICES	RESPONSES	
Dry land cropping	18.18%	8
Dry land grazing	50.00%	22
Dry land mixed uses	13.64%	6
Irrigated pasture from surface sources (e.g. river/stream/dam)	31.82%	14
Irrigated pasture from shallow underground sources (wells or springs that are one to twenty meters deep)	0.00%	0
Irrigated pasture from deep underground sources (wells or springs that are greater than twenty meters deep)	0.00%	0
Irrigated horticulture/ viticulture from surface sources (e.g. river/stream/dam)	4.55%	2
Irrigated horticulture/viticulture from shallow underground sources (wells or springs that are one to twenty meters deep)	0.00%	0
Irrigated horticulture/viticulture from deep underground sources (wells or springs that are greater than twenty meters deep)	0.00%	0
Town allotment (rainwater tank or private bore)	11.36%	5
Bush block/acreage (rainwater tank or private bore)	15.91%	7
Business enterprise (rainwater tank or private bore)	9.09%	4
Total Respondents: 44		

Q22 When undertaking the land use activity for the property on which your private water sources and residence are located do you use any of the following? Check all that apply.

Answered: 28 Skipped: 23



ANSWER CHOICES	RESPONSES	
Fertiliser	78.57%	22
Insecticides	60.71%	17
Pesticides	60.71%	17
Livestock dips/sprays	60.71%	17
Total Respondents: 28		

Q23 Do you wish to make any additional comments relating to your private domestic water supply?

Answered: 22 Skipped: 29

Q24 Please provide your address for analytical purposes. This will be used in compliance with the Privacy Act.

Answered: 43 Skipped: 8

Annex 3-E

Project Status Reports

BSC Increasing Resilience to Climate Change (IRCC) Project Status Report 01/21

Secure and Safe Domestic Water (SSDW) on Rural and Remote Properties

Draft for Discussion January 2021

Purpose

The purposes of this Status Report are as follows.

- Critique the implementation of the community engagement program in 2020
- Overview the key findings of the BSC questionnaire survey undertaken in the last quarter of 2020
- Outline the options for testing private household water supplies for bacteria
- Indicate a strategy for piloting approaches for improving the quality and quantity of private sources of supply
- Comment on the finalisation of the Environmental and Social baseline and the acquisition of spatial information for the report

Community engagement

Pursuant to contractual requirements between BSC and DPIE, community engagement is being delivered through a *Participatory Community Engagement Plan* that includes a citizen science element. The document is held electronically in the Project Data Base and has been provided to Skilled Advisory Group (SAG) and Project Steering Committee (PSC) members. Copies can be obtained by the public upon request**.**

Elements of the strategy undertaken in 2020 include:

- Establishment of a Skilled Advisory Group (SAG) and Project Steering Committee (PSC)
- Production of Flyers
- Shire newsletter articles including a QR Code link to the BSC questionnaire survey
- Postings on the Shire website
- 'Word of Mouth' messaging thorough the SAG and PSG
- Media interviews
- Shire Facebook postings
- Direct phone calls to key community members, churches and schools

Prior to Covid-19 the intention was to hold meetings and information sessions across the Shire. To this end, safe domestic water 'drop-in' sessions were to be undertaken using informal 'open house' or 'coffee shop chats' at venues where stakeholders could come individually or as groups of representatives of community organisations to discuss:

- health risks arising from poor quality water
- screening and testing of private household supplies
- managing the quality of household sources and supplies including simple technical approaches to disinfection and filtration
- being part of a community based 'safe water' collaboration

Meetings and sessions were not held due to COVID-19 restrictions and a single survey methodology was developed in its stead. Personalised community focused engagement needs to be re-established now that restrictions have been lifted. Early action for 2021.

Residents Questionnaire Survey of Water Sources, Treatment and Usage.

The survey applied to domestic water use only and was focused on private supplies on rural and remote properties and rainwater tanks in Balranald and Euston. For the survey, domestic water means tap water supplied via plumbing fittings to homes for drinking, washing, cooking, laundry, sanitation and other household uses. The survey instrument and raw data from the responses is held in the project Data Base.

The initial plan was to conduct a survey following the community meetings and information sessions. The questionnaire survey was to be distributed during these activities and sent out to rural properties in the Shire. Due to COVID 19, this methodology was not possible.

Instead, copies of the questionnaire were to be posted to all rural and remote residents as an enclosure with the rates notice. This would include an addressed, reply paid envelope. Council experienced internal difficulties and it was not possible to send individual copies to rural rate payers.

Subsequently, the SAG recommended that the survey be emailed to all households. Unfortunately, the Shire could not provide a consolidated email list of rural rate payers. In the light of this difficulty it was agreed to maximise responses by phoning all rural properties.

To facilitate this the Shire provided:

- A list of the addresses of rural properties that were sent rate notices.
- A PDF of a Shire Business Phone Directory circa 2014

The Project Team then:

- Converted the directory into an excel spread sheet.
- Combined the directory with the list of addresses of rural properties
- Identified properties under a single property owner or manager
- Matched station information with the Directory
- Accessed white pages on-line to search for phone numbers
- Accessed privately supplied contact numbers and email addresses.

Using this process the survey population was as follows.

- 201 rural properties were identified in the Shire
- 162 had discreet ownership
- some properties were owned by the same family/company and only had one residence or one discreet water supply for all dwellings
- where there were residences on multiple properties, respondents were requested to fill in multiple surveys
- 106 discreet properties with contact details were recognised and attempts have been made to contact all by telephone
- 47 Surveys have been submitted providing a 44 % response rate and if all properties are included the response rate is 21%
- 5 respondents were on town allotments

Key findings of the BSC questionnaire survey

1. Daily consumption of water for domestic purposes

Data provided by respondents shows that:

- 34 percent use more than 200 litres per day
- 27.5 percent 100-199 litres
- 38 percent 10-99 litres
- 0.5 percent less than 10 litres

The size of household didn't correlate to the amount of water used, although this was a trend.

2. Domestic water sourced by household

- Roofs and stored in tank for future use 87%
- Surface water 55%
- Shallow groundwater 0%
- Deep groundwater 20%
- Carted supply 13%

Twenty-five percent had more than one source of supply for domestic water.

Of the 47 returned questionnaires, 39 (87 per cent) had rainwater tanks and 33 responded to the security of the water source as follows:

- *88% had animal droppings on the roof*
- *48.5% had trees overhanging the roof*
- *27% had aerial spraying occurring on nearby lands*
- *Only 18% had first flush devices installed*

3. Domestic water sourced by household from surface water drawn from rivers, creeks and dams which may or mayn't be stored in a tank prior to use.

Twenty-six (55 %) of the 47 respondents used surface water and 52% stored their water in a tank and 44% did not. Thirty six percent reported that the intake was distant from septic tanks and 3 (12%) respondents, reported the surface water was restricted from livestock.

4. Domestic water sourced by household from deep groundwater drawn from bores, wells or springs that are greater than 20 metres deep which may or may not be stored in a tank prior to use

Only 40 respondents answered this question and of these 8 people 20 %, used deep ground water. Of these 40 respondents (9 people) responded as follows

- 89% bore was distant from septic tanks and that the bore cover was secure
- 78% each offered that (a) the bore was protected from contaminated seepage from rubbish or agricultural run-off (b) stored in a tank
- 55% reported that water was stored in a tank,
- 55.5% reported that bore was restricted from livestock
- 22 % that it was not stored in a tank before use in house

5. Domestic water sourced by household from carted supply transferred by tanker and stored in a tank prior to use.

39 respondents answered and only 5 people (13 %) used carted water. *(Of the people that used carted water 84.5% reported the tanker hose appears clean and does not come in contact with water in the tank, and 33.5% reported that the tanker is purpose built and maintained for drinking water transportation)*

6. Type of storage tank by household

Forty-three of the respondents answered this question and of these 32 (75 %) have above ground tanks with the top sealed and 6 (14 %) have above ground tanks that are not sealed. One respondent had below ground tanks and four respondents (10 %) reported no tanks at all.

7. Water treatment for domestic water by household

Seventy-seven percent of the 43 properties who responded to this question reported that their water was untreated. Thirty percent (13 respondents) indicated that their water was filtered. One property reported that they boiled the water that was used for drinking and cooking purposes. And one property used technology to treat their water.

8. Concern about quality of water

When asked to rank concern about quality of water (where 1 is highly concerned and 10 is not at all concerned) 9 respondents (20 %) showed that they were not at all concerned with a rating of 10 out of 10. Twenty-one per cent (10 respondents) rated their concern at 8-9. (ie 41 % ranked between 8 and 10). At the other end of the scale a total of 10 respondents (21%) ranked their concern at 1-3.

Of those 33 respondents using untreated water:

- 9 were concerned (identified as a ranking of 1-4)
- 5 identified a neutral position on concern
- 16 were not concerned (i.e. identified no concern as a ranking of 6-10)

Observations

The survey

A great deal of effort was committed to community engagement to raise awareness of the survey and its purpose through Information Sheets in the Council Newsletter and the media. The original intent was to mail out the survey with the rate notice including a reply-paid envelope as well as direct contact with members of survey team. As explained, this was not possible.

Tools used to reach out to the community and encourage residents to use the QR Code link to the Survey Monkey included the Council Newsletter, Facebook and the strategic placement of posters in Balranald and Euston. Hard copies of the questionnaire were placed in libraries and at the Council Office. All in all, these techniques were not overly effective because they were not linked to person to person engagement activities. This situation can be remedied in 2021.

Direct links to rural and remote residents was difficult because of poor telecommunications and people not having email addresses. Notwithstanding, once telephone numbers became available, 75% of surveys were completed in response to direct contact.

Messages have been left on private numbers offering to take down survey responses. Should it be considered useful, this could be followed up to increase the response rate. As well, dissemination of the results of the survey could reawaken interest in the BSC IRCC project and the need of rural residents to participate. And the invitation to participate in the water quality testing should help reactivate community engagement processes.

Levels of concern

Given the disparate sources of household water supply being used, that 57% of the properties use untreated water is of some concern. Twenty-seven households indicate that they do not use treated water for drinking or food preparation resulting in a potentially high level of health risks due exposure to pathogens in the domestic supplies. Untreated water is provided in all of the five business sampled in the survey. And the legality of this is questioned.

The stated levels of satisfaction and concern of respondents may be a reflection of acceptance of the status quo with respect to private water supplies. This is an attitudinal issue and had been observed previously in workshop and discussions sessions in the Northern, Central and Western regions of the MDB. Behavioural change is needed to get people to accept that their water supplies could be a health risk. Council should make this a core community engagement and health promotion action for increasing resilience to changing climatic conditions.

Conclusion

The ***Water Quality Questionnaire Survey*** has provided BSC and the partners in the research collaboration with a better understanding of the dimension of the water quality issues being confronted on properties that are using private potable water supplies. Additionally, the results of the survey have shown that respondents may not be aware of the level of risks from untreated water and believe that their supplies are of a satisfactory standard and of no or little concern. These findings need to be conveyed to the rural community as part of the rationale for the water quality testing stage of the IRCC project.

Proposed approach for testing private household water supplies for bacteria

Broadly, two options are available for testing private household water supplies for bacteria.

In light of Covid-19 restrictions on accessing private properties SAG and PSC agreed that DIY test kits for bacteria could be used. This would be a two-step process. First, a direct mail out to rural properties would be used to invite residents to participate in the testing. Second, rural householders who agreed to participate would then be sent a testing kit with instructions on how to use it and report results to the Project Team. The second option would be for Council to conduct a water quality testing campaign of private supplies. Again, a mail out would be used to invite residents to participate. Collection instructions and bottles would be provided to residents with instructions where to bring in samples for testing.

In both cases there could be involvement of local schools in 'citizen science' activities to help raise awareness of issues and the need to test water quality with DIY kits. Such activities would include rural and remote properties and around the towns where there were private rainwater tanks.

Piloting approaches for improving the quality and quantity of private sources of supply

Piloting of water supply and quality demonstrations could be either through either organised site visits to individual properties or virtual visits using recorded information on the approaches and technology being used. Either way, direct personal contact is needed to engage with rural property holders who are willing to demonstrate the water management technologies and procedures that they are using to ensure that their water supplies are adequate and safe. Offers have already been made by rural property holders to be part of the piloting activity.

Water supply and quality demonstrations could be promoted and run virtually as the *BSC Safe Water Expo*. Several water industries companies have already indicated that they could be willing to be part of such an online initiative because it provides an ideal mechanism for them to bring their products to an identified market palace. This initiative needs further investigation by Council.

Environmental and Social Baselines

Purpose of the Baselines

Baselines encompassing biophysical, socio-economic and cultural conditions across the Shire are being established to provide a spatial and descriptive context for:

- projecting the possible effects of changing climatic conditions on:
    - production and conservation landscapes
    - natural surface drainage patterns and aquifer recharge zones
    - the quality of surface and ground water sources
    - rural population distribution and commercial enterprises
    - accessibility of households to surface and underground water sources
    - the adequacy and quality of household water supplies
- analysing responses of householders to the questionnaire survey with respect to existing and potential sources of surface and ground water supplies used on rural and remote properties
- reviewing the vulnerability of people on farms and grazing properties to possible health risks from poor quality water supplies
- proposing actions to increase resilience at the property scale and ensuring that household supplies are secure and safe

Approach to establishing the Baselines

Public base maps and satellite images are being used to produce a combination of vector (point, polyline, and polygonal) and rastar (imagery and gridded data) layers to illustrate and summarise regional physical, biological, social and cultural features for stakeholder communication and reporting. Baseline maps are to be included in the text and as Annex A to the Baselines Report.

Key layer's in the spatial information management system for the IRCC Project include:

- Locational attributes:

    - geographic extent of the Shire in a state wide context
    - relationship with major centres nearby
    - towns, villages and settlements
    - road network and airfields
    - key areas of cultural and historic significance

- Landform and landscape features highlighting:

    - key geomorphic elements (rivers, wetlands, floodplains, ephemeral lake systems, drylands, eroded breakaways, dunes)
    - drainage patterns
    - engineered alterations to wetlands

- Vegetation assemblages encompassing:

  - riverine and wetland vegetation
  - woody vegetation
  - dryland and saltpan vegetation

- Land uses including:

  - irrigated and dryland cropping
  - irrigated and dryland grazing
  - forest and conservation reserves
  - heritage areas and features
  - water storage infrastructure
  - access roads and tracks to surface water sources and borefields

A generalised distribution of private water resources will be mapped and provide:

- simplified location and boundaries of properties and sites of dwellings to ensure privacy is protected
- schematic representation of water sources and storage infrastructure using symbols (surface supplies, shallow wells, deep bores and rainwater tanks)
- indicative opportunities to enhance household supplies from surface and/or groundwater sources
- potential areas of health risk from blue green algae, bacterial contamination and floods

Projected changes to climatic conditions will be mapped and described at a regional scale as time series of layers from 2009 to 2069. These show projected seasonal changes in temperature (max, min), rainfall (summer, winter), number of days exceeding 35 degrees centigrade, and bushfire climates.

Acquisition of spatial information

Currently Balranald Shire Council (BSC) lacks the resources and capability to undertake geospatial mapping. To address this deficiency the mapping needed for Phase II has been contracted to SPAN-ILWS at CSU. The GIS layers could be provided either in ArcInfo or the freeware QGIS platform.

An opportunity exists for ILWS-CSU to work with BSC, the MDA, LGAs and public bodies in the Far West Region of NSW to lift their capacity in geospatial mapping. For example, having a range of mapping resources and talents, the NSW RFS may be interested in collaborating in this activity. Knowing the biophysical condition of land surfaces and the location and status of water sources on rural and remote properties may be of operational benefit for LGA based volunteers.

Developing the capability of these people to produce and use spatial imagery would be of benefit to drought impacted communities. To this end, professional and support staff in the organisations mentioned above could be encouraged to undertake CSU GIS courses or a graduate program in this field. Alternatively, a GIS course tightly focused on the needs of LGAs and regional organisations could be developed. This course could be delivered on line and intensively. And possibly in collaboration with the Country Universities Centre Far West in Broken Hill. Increasing resilience to climate change would provide a tight focus for GIS capacity building activities.

BSC Increasing Resilience to Climate Change (IRCC)
Project Status Report 02/21
Secure and Safe Domestic Water (SSDW) on Rural and Remote Properties
Draft for Discussion July 2021

1. Purposes

The purposes of this report are as follows.

- Review of the aim and objectives of the project in the light of COVID-19 restrictions in regard to:
    - framework and timeline
    - potential risks to project
    - environmental and social baselines
    - questionnaire survey and water testing

- Review project outcomes and KPIs
- Outline process for the documentation of health issues and risks relating to poor quality water supplies
- Discuss approach for the delivery of Phase III SSDW Pilot Project
- Provide a draft framework for the Phase IV Final Report

2. Project Aim and Objectives

To quote from the 2019 BSC proposal to NSW Department of Planning, Industry and Environment (DPIE) and Local Government NSW for project funding:

> *This project aims to identify and pilot measures to mitigate the risk of increasing temperatures and variable rainfall under climate change to the provision of adequate and safe private domestic water supplies for people on rural and remote properties in Balranald Shire. Rural properties are dependent on private domestic water supplies (rivers, farm dam's, aquifers, rainwater tanks) and are vulnerable to decreased adequacy and quality of supply. In the past year BSC has trucked water to some rural properties to maintain essential supplies for residents.*
>
> *This project will establish a baseline assessment of risk to human health, identify a range of solutions to improve water sanitation and water use efficiency, address barriers to adoption and monitor success, and develop a Secure and Safe Domestic Water (S&SDW) Program to ensure that the products of the project are disseminated in Balranald Shire, the Far West-and for NSW non-scheme water users generally.*

And that the objectives to be achieved to attain the aim are:

> *<u>Objective 1.</u> To build a sustainable institutional, local government and community-based partnership. Over two years, the collaboration would deliver and measure the effectiveness of engagement, education and community science activities that address the effects of climatic changes on the sufficiency and safety of domestic water supplies on rural and remote properties.*
>
> *<u>Objective 2</u>. To establish an 'environmental baseline' for domestic supplies on rural and remote properties. Within six months, to provide: a quantitative inventory of sources of supply and infrastructure at risk from changing climatic conditions; and qualitative information on attitudes and behavior of householders towards health risks.*

<u>Objective 3</u>. To develop and pilot a SSDW Program for rural and remote properties. Over eighteen months, this will address water adequacy and safety issues at properties identified as being at risk through the environmental baseline process. The program will embed community awareness, engagement, education and science and communications activities.

3. Delivery framework and timeline

As explained at the Zoom meeting on 20 May 21, Phases II and III of the amended Action Plan of 08/05/2021 (Attached) are being undertaken in parallel rather than sequentially. This is a practical response to the 2020 COVID -19 constraints on travel, broader community consultation and engagement, and householder participation. The approach was adopted to ensure that the November 2021 deadline for completion of the project can be achieved.

4. *Building a sustainable institutional, local government and community-based partnership*

The first objective of the project is: *To build a sustainable institutional, local government and community-based partnership.* Attainment of this ambitious objective has been difficult and to some extent this was anticipated due to the inherent research complexities and community engagement uncertainties with the project.

The potential risks to the project and the risk management listed below were identified by BSC in the 2019 bid for funding for project funding.

- *Lack of interest and engagement from stakeholders and institutional or organisational resistance impacting on project implementation. Innovative measures to reduce this risk include:*
    - *partnering with stakeholder groups and developing a participatory approach with a steering committee that includes end users*
    - *survey and focus group work to understand barriers to engagement and adoption in the initiation phase*
    - *technical challenges and issues relating to benchmarking, supporting field and social research and outcome monitoring being addressed collaboratively*

- *Sub-optimal scheduling of activities and scope creep disrupting the delivery of project products. Realistic scheduling, project management, and clear understanding of the roles and responsibilities of partners should reduce this risk. To this end:*

    - *Planning process will anticipate potential environmental contingences and optimise arrangements for undertaking water quality monitoring and questionnaire survey work.*
    - *WHS risks that could impact on personnel such as access to private properties, extreme heat and personal hydration will be assessed and mitigated.*
    - *Budget control and review processes will follow BSC practices and State government audit requirements.*

- *Machinery of government changes and protracted decision-making impacting on the delivery of the project.*

The achievement of Objective 1 has been affected by:

- Restrictions on community engagement and participation arising from the 2020-21 COVID 19 situation
- Changes in governance and project direction within BSC
- Unanticipated communications issues in the initiation phase
- Low level of interest ,commitment and support from stakeholders and institutions impacting on project implementation

5. Environmental and social baselines

The second objective of the project is *to establish an 'environmental baseline' for domestic supplies on rural and remote properties.* This objective has been achieved and the environmental and social baselines are being finalised as follows.

- The draft text of 20/11/2020 was circulated for review and has now been edited as a final version.
- Illustrative maps for the baselines report have been prepared by SPAN, CSU.
- Quantitative data has been extracted from the maps for:
    - vegetation coverage
    - water resources
    - land use categories
- Project metadata has been compiled.
- An initial project data base has been assembled.

6. Residents Questionnaire Survey of Water Sources, Treatment and Usage.

Objective 2 also requires that: *Within six months, to provide: a quantitative inventory of sources of supply and infrastructure at risk from changing climatic conditions; and qualitative information on attitudes and behavior of householders towards health risks.* The requirements of this Objective are delivered by: the questionnaire survey and accompanying water testing; and the water resources map and text in the environment baseline.

The questionnaire survey applied to domestic water use only and was focused on private supplies on rural and remote properties and rainwater tanks in Balranald and Euston. For the survey, domestic water means tap water supplied via plumbing fittings to homes for drinking, washing, cooking, laundry, sanitation, and other household uses. The survey was commenced in September 2020 and initial findings were provided in Status Report 01/21 in January 2021. The survey instrument and raw data from the responses are held in the BSC Project Data Base.

The initial plan was to conduct a survey following the community meetings and information sessions in early 2020. The questionnaire survey was to be distributed during these activities and sent out to rural properties in the Shire. Due to COVID 19, this methodology was not possible. Instead, copies of the questionnaire were to be posted to all rural and remote residents as an enclosure with the rates notice in September 2020. This was to include an addressed, reply paid envelope. Council experienced internal difficulties and it was not possible to send this material to rural rate payers.
Subsequently, the SAG recommended that the survey be emailed to all households. Unfortunately, the Shire could not provide a consolidated email list of rural rate payers. In the light of this difficulty, it was agreed to maximise responses by phoning all rural properties. This was done in the later months of 2020 and the results included in Status Report 01/21 dated 26 January 2021.

As agreed at the 20 May Zoom meeting, the Project Team continued trying to increase participation in the on-line questionnaire survey, and 'do-it-yourself' testing of household sources of drinking water for coliforms. This was progressed as follows.

- Members of the Steering Committee and Advisory Group again circulating emails through their networks seeking participation in the questionnaire survey and inviting people to request a text kit to screen their domestic water supply for bacteria. This resulted in six test kits being sent to householders.
- Furthering the 'citizen science' engagement with Year 11 students from the BCS by having them distribute the BSC invitation to their parents to participate in the survey and testing. This has resulted in additional surveys being submitted and some testing done.
- Letters emails and texts to survey respondents

The closing date for responses and requests was 20 July 21. Subsequently, the data in Status Report 01/21 are being updated.

Determining the number of households on rural properties in the Shire who are dependent on non-scheme supplies has been vexed. The 2016 ABS Census identified 156 people in as living outside towns and settlements in the Shire. On the assumption of between two and five persons per household this could equate to somewhere between 30 to 80 odd properties using private water supplies. This figure was viewed as being too low. To clarify the situation and help determine the number of households who could be involved in the questionnaire survey the Shire provided:

- A list of the addresses of rural properties that are sent rate notices
- A PDF of a Shire Business Phone Directory circa 2014

The Project Team then:

- Converted the directory into an excel spread sheet.
- Combined the directory with the list of addresses of rural properties
- Identified properties under a single property owner or manager
- Matched station information with the Directory
- Accessed white pages on-line to search for phone numbers
- Accessed privately supplied contact numbers and email addresses.

Using this process:

- 201 rural properties were identified in the Shire
- 162 had discreet ownership/occupancy
- 106 properties with contact details were detected and attempts were made to contact all by either email or telephone

Some properties were owned by the same family/company and only had one residence or one discreet water supply for all dwellings. Where there were residences on multiple properties, respondents were requested to fill in multiple surveys.

A total of 51 surveys have been submitted. Also, 16 do-it-yourself kits were requested for water testing and results have been provided by 6 .Some results are still outstanding.

7. Project outcomes and KPIs

The BSC IRCC SSDW initiative was envisaged as a demonstration project with the learnings and product of the 'pilot SSDW Program' being disseminated widely in the Murray Darling Basin and beyond.

From work undertaken to date the following outcomes have been achieved and the maps and descriptive information incorporated into the *Environmental and Social Baselines Report*.

- Spatial analysis of rural and remote properties in relation to regional surface and groundwater hydrology, range lands for graising sheep and cattle, dryland farming; and irrigation for pasture, crops, and horticulture
  kpi – GIS layers covering key parameters with property identities secured to ensure privacy is maintained).
- Publicly accessible climate change projection maps of Shire and region
  kpi – GIS layers developed from NSW and BoM resources

When the BSC IRCC Project Proposal was submitted in 2019 and the Action Plan was being formulated in early 2020, the on-ground outcomes of the survey driven component of the SSDW Program were optimistically expected to be as follows.

- New data set on quality and quantity of water sources and supplies available to rural landholders
  kpi – 60 accessible data set's available within a six-month timeframe at 60 locations
- Network of engaged rural landholders and stakeholders
  kpi –100 pilot households over project lifespan, 300 stakeholders in Balranald Shire engaged with the SSDW program over a five-year time-period
- Collated and analysed survey results on barriers and opportunities to change
  kpi – 200 survey respondents in first six months, 60 people involved in focus groups
- Dissemination of learnings through network/hub
  kpi – 3 000 hits on project Facebook in first year and 5 000 by end of funding period

Based on the difficulties encountered in engaging with householders on rural properties and the demographic analysis outlined above, these KPI's are now seen as unrealistic and need to be considerably revised downwards to reflect community engagement and water testing realities.

Specific improvements in the water efficiency and quality measured by metering and water quality parameters with a **kpi** of 100 litres /person/day, zero bacteria in supplies at pilot properties is achievable. Albeit with a lower number of participants than originally envisaged.

8. ***Health issues and risks relating to poor quality water supplies***

As stated above in the aim: *This project will establish a baseline assessment of risk to human health-.* In this context, one of the remaining tasks for Phase III is to:

Advise and assist Council with engaging with relevant health professionals to document current and potential levels of health issues and risks relating to poor quality water supplies

Specifically, the attached revised Action Plan of 20/09/2021 states that the baseline will:

- Report on numbers presenting to medical services with physical and psychological symptoms attributable to poor quality water and adequacy of supply.

  (Goal ***kpi – 50 percent reduction from baseline numbers***).

This task will entail re-establishing links with NSW Health to get an update on the policy setting and their position on the population/public health dimensions of the effects of changing climatic conditions with respect to:

- communities and individuals in Far West NSW
- demand for medial and related health services
- adequacy and quality of rural water supplies

NSW Health are a member of the Specialist Advisory Group (SAG) for the IRCC project but have unable to participate because of the additional workload created by the COVID situation. The Following information on safe water and health risks has been provided to the project by NSW Health and has been disseminated to residents in the Shire through the BSC Newsletter.

Document	Web URL
Private water supply guidelines	**http://www.health.nsw.gov.au/environment/water/Publications/private-water-supply-guidelines.pdf**
Rainwater tank information	**http://www.health.nsw.gov.au/environment/water/Documents/rainwater_tanks.pdf**
NSW Health *Naegleria fowleri* Fact Sheet	**https://www.health.nsw.gov.au/Infectious/factsheets/Pages/Naegleria-fowleri.aspx**

9. Phase III and the SSDW Pilot Project

Phase II required that 'opportunities and strategies for the Phase III SSDW Pilot Program be identified'. This task has been undertaken through:

- consultations with members of the steering committee and advisory group
- analysis of responses to the questionnaire survey to determine the main sources and level of treatment of water being used by rural households
- reviewing the testing results in the context of the sources being used
- material sourced from CLIMsystems, a NZ research company who provide climate change and related projections suited to LGA scale household applications
- product specifications from representatives of companies who provide household scale water treatment technologies

Based on work completed, the approach originally proposed in 2019 for the Phase III SSDW Pilot Program has been questioned. This is because far fewer properties would be involved in pilot/demonstration activities than originally envisaged for the following reasons.

- First, the demographic analysis used to determine the sample size for the survey found less households than were originally estimated.
- Second, the difficulties encountered in engaging with householders on rural properties due to COVD restrictions.
- Third, the levels of satisfaction householders had with their supplies.
- Fourthly, the low level of house holder participation in water testing despite repeated offers of a free test kit from Council.
- Fifthly, the survey responses reported very limited treatment of private household water supplies.

Possible underlying explanations for this situation will be addressed further in the final reporting process.

The fifth point made above indicates that currently there may not be a great deal of interest in measures aimed at ensuring that non-scheme water supplies are adequate and safe, and this situation needs to be reversed. In short, this confirms the need to continue community awareness, engagement, education and science, and communications activities with rural and town residents.

How the BSC IRCC SSDW pilot project could be undertaken is strongly influenced by physical environmental settings, socio-demographic conditions and personal attitudes and behaviour of residents toward climate change and related water issues. Steps to be taken to proactively complete this task are as follows.

1. Use questionnaire responses, water test results and baseline maps (topography, vegetation, water resources, land use) to identify 'demonstration properties' and obtain agreement for their participation in the pilot program. Ideally, they should be:

    - in one or other of the two broad climate classes delineated across the Shire by the Bureau of Meteorology and characterised as having: uniform rainfall; and wet winter and low summer rainfall.
    - householders who have found coliforms in their domestic water supplies and who are committed to rectifying the situation
    - in different biophysical and land use settings

2. Prepare a 'what-to-do now' sheet for households reporting bacteria in their water supplies to include (for example):

    - Advice on the potential health hazards posed by bacteria in domestic water supplies
    - Contacts for laboratories where further testing can be undertaken
    - NSW Health information on managing private household water supplies
    - Water treatment industry contacts if technology is needed to mitigate any water quality issues found with current sources of supply

3. Document and disseminate information from Shire scale climate change scenarios and modelling of rainwater harvesting for household tanks to demonstrate the risks from increasing temperatures and variable rainfall under climate change to the provision of adequate and safe private domestic water supplies for people on rural and remote properties.

4. Develop a *Safe Water Awareness Information Sheet* to be sent out to all households with rate notices. This will contain:

    - Advice on the potential health hazards posed by bacteria and other contaminants in domestic water supplies
    - A list of contacts for laboratories where water testing can be undertaken
    - NSW Health information on managing private household water supplies
    - Broad description of a range of water treatment approaches and technology for household application
    - A list of water industry contacts should consideration be given to proactively mitigate water quality issues

All tasks for Phase III of the project will be completed when the BSC Environmental and Social Baselines Report and the population health input are submitted.

10. Phase IV Final Report

The BSC IRCC project has focused on piloting methodology rather than providing definitive answers to research questions and solutions to identified climate change and secure and safe water issues on rural properties in the Shire. In short, the intention is to use the learnings from the BSC IRCC Pilot Program to explore and document topics such as (for example):

- Viable methods for determining sources, level of consumption, treatment used, and satisfaction with quality of household water supplies on rural properties
- Simple cost-effective processes to ensure that household water supplies on rural properties are adequate and safe

- Practical approaches for raising community awareness of the risks to the provision of adequate and safe private domestic water supplies arising from increasing temperatures and variable rainfall under climate change
- Communications methods that are suited to rural residents with poor or no access to web-based systems
- Research-based principles and guidelines to ensure that any long-term SSDW initiative aimed at ensuring private household water supplies are adequate and not a health risk is:
    - strongly championed and community led
    - citizen science informed
    - designed to have broader regional relevance
- Modelling systems that can be customised and maintained by users for the purpose of examining the impacts and adaptations to climate variability and change including extreme climatic events at rural Local Government and site-specific scales to assess the reliability of rainwater harvesting into tanks and dams

In this context, the broad framework for the Phase IV Final Report could be as follows.

1. Introduction

- Rationale for the project
- Aim and objectives
- Approach and methodology
- Acknowledgements

2. Project deliverables

- Action plan
- Communications strategy
- Environmental and Social Baseline Report
- Questionnaire survey and water testing
- SSDW Pilot Program

3. Discussion of findings

- Analysis of approach and methodology
- Raising awareness and community engagement
- Tools for increasing resilience
- Mitigating water adequacy and quality issues with private water supplies
- Attitudes and behaviour towards climate change and water issues
- Key lessons

4. Observations and conclusions

5. Recommendations

References

Annexures

11. Summing up

The BSC IRCC project aims to identify and pilot measures to mitigate the risk of increasing temperatures and variable rainfall under climate change to the provision of adequate and safe private domestic water supplies for people on rural and remote properties in Balranald Shire.

As a result of COVID constraints and governance matters within BSC it would be difficult to achieve Objective 1 and build a sustainable institutional, local government and community-based partnership in the timeframe for the project (ie completion in October 2012). Workable BSC support and enhanced capacity, a committed and engaged community, and adequate resources are essential ingredients to continue the initiative beyond the current funding.

The future of the IRCC SSDW initiative is uncertain. Governmentally, ensuring that private water supplies on rural properties or from rainwater tanks in towns are secure and safe is not the responsibility of Local Government. That said, BSC could continue to foster SSDW as a collaborative community-based partnership in the Shire and region along the following lines.

- Help to identify a committed leader who acknowledges the climate challenge and the need to increase community resilience to changing conditions
- Suggest local/regional organisations who could:
    - champion a SSDW initiative in Balranald Shire and beyond
    - activate public and private support and resources for focused action to ensure that private water supplies are adequate and healthy
- Assist in mobilising support for Balranald Central School (BCS) to catalysing and partner in delivering a long-term 'citizen science' activity involving all the schools the Shire and cross-border region
- Back using multi-media modes and community networks to disseminate ideas and information
- Recommend links to like-minded bodies such as the Five Rivers Festival to celebrate success

Objective2 to establish an 'environmental base line' for domestic supplies on rural and remote properties has been achieved and a baselines report prepared.

As outlined above, Objective 3 to develop and pilot a SSDW Program for rural and remote properties needs to be explored further. As worded, the objective stated that *over eighteen months, this will address water adequacy and safety issues at properties identified as being at risk through the environmental baseline process*. This is not realistic and will need to be revised.

Annex 3-F

Environmental Health Notes

Health Note 01. **Managing Private Water Supplies**

Health Note 02. **NSWHealth Rainwater Treatment Fact Sheet**

BSC IRCC SSDW PILOT PROGRAM

Health Note 01

Managing Private Water Supplies

Information Source

The information provided below on the potential health effects of poor-quality water and the management of private water supplies is taken directly from the NSW Health link:

https://www.health.nsw.gov.au/environment/water/Publications/private-water-supply-guidelines

Private water encompasses supplies from surface sources (rivers, creeks, dams, channels, lakes), bores (shallow and deep) and rainwater harvesting from roofs into tanks. These sources could be used on rural and remote properties or for commercial facilities such as farm/station stay enterprises and roadhouses. Rainwater tanks on properties in towns and settlements are also classed as private supplies.

Health Effects

Water contamination affects people in different ways. What causes a minor stomach 'upset' in some people can cause serious illness in others. In some cases, visitors can become sick after consuming water while people who use it regularly will remain healthy. The people most at risk of health effects from unsafe water are those with weakened immune systems such as the elderly, the very young, transplant recipients, dialysis patients, cancer patients, and some people with HIV and AIDS. People with skin wounds or burns may need to be careful about the quality of water in which they bathe.

Water can be contaminated with a wide range of disease-causing microorganisms such as Giardia, Cryptosporidium, Salmonella, Shigella, Campylobacter, some strains of Escherichia coli (E. coli), cyanobacteria (blue green algae), Rotavirus, Norovirus, and Hepatitis A virus, as well as many others. Most of these can cause diarrhoea, vomiting, or other gastrointestinal (gut) upsets. Some of them can also lead to more serious illnesses and even death.

The health effects from microorganisms generally occur quickly. Health effects from water contaminated with heavy metals or other chemicals may take much longer to become apparent. It is important that you ensure that the supply system is not contaminated with chemicals.

Disinfection kills most disease-causing microorganisms in water but does not remove or inactivate chemicals. Treatment other than disinfection may be necessary to manage chemicals that may present a risk to health.

Rainwater Tanks

If water from a rainwater tank is clear, has little taste or smell, is free from suspended material and comes from a well-maintained catchment (roof and gutters), it is unlikely to cause illness in most users. However, this is not a guarantee of safety as contamination is not always visible. To avoid or minimise water quality problems:

- Regularly clean the roof and gutters collecting rainwater to remove leaves, bird droppings and other organic matter. These can be a source of disease-causing microorganisms. They can also cause taste and odour problems or be a source of nutrients to promote the growth of microorganisms
- After a dry spell, divert water from the first rainfall using a first flush or bypass device. This reduces the amount of contaminants entering the tank
- Remove overhanging tree branches that may drop leaves into gutters
- Paint or remove any lead flashings used in the roof construction

- Install screens on tank inlets and overflows to prevent the entry of leaves and small animals. Check the screens regularly to prevent tanks becoming breeding sites for mosquitoes
- Tanks should be examined for build-up of sediments every two to three years or if sediments are seen in the water flow. Any build up needs to be removed (desludged) as sediments can be a source of contamination, tastes and odours. Sediment can be removed by siphoning the tank without emptying it, or by completely emptying the tank for a thorough clean
- Regularly inspect in-ground tanks to ensure that they do not become contaminated. Water that has flowed over or through the surrounding soil or ponded on the lid must not be allowed to enter the tank. Tanks must be kept in good condition. Lids and inspection openings must be sealed. Any nearby septic systems must be maintained and working effectively. Septic effluent must not be allowed to enter drinking water tanks due to the risk of contamination with disease causing microorganisms
- If the water supply has not been used for 24 hours or more and water has been stagnant in pipes, copper or lead can build up in the water. It is recommended that the pipes be flushed for a few minutes until fresh water flows through from the tank. Tanks built from different materials need to be treated differently during maintenance:
- Plastic tanks need to be anchored when empty
- Concrete tanks should not be allowed to dry out in case of cracking
- Tanks with a 'cone scour' base are easily cleaned by opening the cleaning outlet to allow the water to drain out with the sludge, then rinsing with a hose
- Small, flat-bottomed tanks can be drained, rinsed with a hose, and tilted to drain n In ground tanks need to be cleaned and refilled quickly in case of tank displacement from the ground. In some cases, when an in-ground tank is not weighted by water, tanks can be forced out of the ground. This is a particular risk if a tank is emptied after heavy rains, when the surrounding ground is waterlogged

Do-it-yourself tank cleaning presents several risks including working and using disinfectants in confined spaces, and access into and out of the tank. It is important to be aware of work health and safety guidelines and Codes of Practice (Part 4.3 of the NSW Work Health and Safety Regulation 2011 and Australian Standard AS2865:2009 Confined spaces).

For further advice on do-it-yourself tank cleaning, contact your local tank supplier or plumber. Professional tank cleaners are available in some areas (Check the yellow pages under tank cleaners). For further information please read Guidance on the Use of Rainwater Tanks (See Section 8 of the NSW Guidelines for reference documents).

Further information

The 2010 Commonwealth Government publication Guidance on use of rainwater tanks provides information on the range of potential hazards which can threaten water quality, preventative measures which can be used to stop these hazards from contaminating rainwater, straightforward monitoring and maintenance activities, and, where necessary, corrective actions. Also, it includes information on design and installation of rainwater tanks, as well as the potential of rainwater tanks to contribute to improved adequacy of private supplies and water conservation. See ---------**https://www1.health.gov.au/internet/main/publishing.nsf/Content/ohp-enhealth-raintank-cnt**

BSC IRCC SSDW PILOT PROGRAM

Health Note 02

NSWHealth Rainwater Treatment Fact Sheet

Introduction

Rainwater can be a suitable drinking water supply providing the rainwater is clear, has little taste or smell, is free from suspended material, comes from a well-maintained catchment (roof and gutters), and is stored in a clean and vermin proof tank. It is unlikely to cause illness in most users. However, this is not a guarantee of safety as contamination is not always visible.

It is important that rainwater tanks and associated plumbing, together with appropriate water treatment and disinfection systems are correctly selected, installed and regularly maintained in order to protect drinking water quality. Look for tanks, coatings and plumbing materials that have been tested for contact with drinking water to AS/NZS 4020:2005.

Refer to the *NSW Private Water Supply Guidelines* and the enHealth publication *Guidance on the Use of Rainwater Tanks* for more information on rainwater collection, hazards, maintenance and testing.

http://www.health.nsw.gov.au/environment/water/Documents/NSW-Private-Water-Supply-Guidelines.pdf

http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-enhealth-raintank-cnt.htm

Rainwater Health Risks

Rainwater needs to be free of disease causing microorganisms (bacteria, viruses and protozoa) and harmful levels of chemicals, to ensure a safe drinking water supply. Contamination of collected rainwater with disease causing microorganisms from birds and other animals poses the biggest risk to health.

Rainwater can be disinfected before consumption to remove disease causing microorganisms. However, disinfection does not remove chemicals and other treatment or management processes may be necessary to manage any chemicals that present a risk to health.

Lead may be present in rainwater systems due to leaching from roofing material such as flashing or roofing screw washers. It may also be present in some grades of PVC piping and in older solder and brass fittings. Look for PVC-U pipes and fittings certified to AS/NZS 1477 to ensure they do no present a lead leaching risk. Lead on the roof is best managed by removing the source of lead or painting over it, so that it cannot come in contact with water. Lead, copper or other metals that may leach from plumbing materials are best managed by flushing pipes for several minutes each morning.

Rainwater Treatment Systems

There are several methods for treating rainwater to remove any contaminants that may present a health risk and professional advice should be sought for the design and installation of an appropriate water treatment system. These treatment methods may include:

Filtration to remove particulate matter and some dissolved materials from water. There are many filtration devices available and microorganism and particle removal varies with the filter type. Water filters should not be necessary to maintain microbial, chemical or physical quality of rainwater if catchments and tanks are well maintained. Some filter systems will require a power supply.

UV disinfection by ultraviolet light irradiation (UV) is effective against most bacteria, viruses and protozoa. UV systems require relatively low maintenance, do not require the addition of chemicals and can include warning alarms to indicate equipment faults. Specialist UV chambers for treating rainwater are designed to provide a dosage of UV light at a given flow rate. UV systems are most effective when the water is clear and free of particles. Rainwater supplies may need to be filtered to ensure effective UV treatment. UV treatment does not remove chemicals from water. UV systems will require a power supply. Water that has been disinfected using UV should be used straight away, not stored in tanks.

Chlorine disinfection is a common form of disinfection that is effective against harmful bacteria, viruses and *Giardia*, but has limited effect against *Cryptosporidium*. See the *NSW Private Water Supply Guidelines* page 25 for guidance on manually chlorinating a rainwater tank.

Filtration Treatment Systems Include

Polypropylene & ceramic cartridge type filters can effectively treat water by removing sediment and bacteria, but will not remove viruses

Activated carbon filters are most effective in removing and/or reducing chemicals such as iron and hydrogen sulphide, objectionable tastes, odours and colour, but will not remove bacteria or viruses. NSF/ANSI Standard 42 refers to the removal of specific aesthetic or non-health-related contaminants (chlorine, taste, odour and particulates)

Micro/Ultra filtration membrane filters (0.1 - 0.01 micron) can effectively treat water by removing sediment and bacteria. Ultrafiltration membrane filters may also remove viruses. Installations should include a pre-filtration stage of 30 micron rating, an automatic filter backwash cleaning function and a suitable disposal method for the small amount of dirty backwash water from the filters. NSF/ANSI Standard 53 refers to the removal of specific health related contaminants

Reverse osmosis filters (0.001 micron) are the most sophisticated and are extremely efficient and effective for the removal of microorganisms and most residual chemicals from water. The filters produce a constant waste stream when operating, and usually need to be connected to a drain and power supply. Installations should include a pre-filtration stage of 5 micron rating, an automatic filter backwash cleaning function, and suitable disposal method for the waste stream and small amount of dirty backwash water from the filters. NSF/ANSI Standard 58 refers to the removal of total dissolved solids and other optional reduction claims.

Checklist for selection and purchasing a filtration system

- Determine the volume of water to be treated and ensure the filtration equipment has the capacity (e.g. litres/hour) to treat all the water needed. The smaller the micron size, the finer the filtration, the greater the reduction of the flow rate and available pressure through the filter, resulting in a higher frequency of maintenance

- Determine the type of filter required for any dirt or debris and/or chemicals of health concern present in the rainwater
- Determine any pre-filtration screening requirements, designed to remove larger solid particles to prevent fouling or clogging of the filter
- Ensure that the filtration system carries the WaterMark or Plumbing Safety Type Test Mark and it complies with at least one of the following standards, ANSI/NSF Standard 53 or AS/NZS4348. Filters being installed to remove a specific contaminant should have been tested to demonstrate their effectiveness against that contaminant
- Where the filtration equipment may be subject to normal water mains pressure (i.e. greater than 150 kPa) then the filtration equipment must comply with AS/NZS 3497.

Checklist for selection and purchasing a UV disinfection system

- Determine the volume of water to be treated and ensure the equipment has the capacity (e.g. litres/hour) to treat all the water needed
- It is equipped with a pre-filter to remove any dirt and debris that can either absorb or scatter the UV light. Generally a 20 micron filter is installed between the pump and the UV unit
- It is equipped with a second stage filter (1 micron) before the UV unit to reduce parasitic cysts such as *Cryptosporidium* and *Giardia* that are more resistant to UV light than bacteria and viruses
- It has a built in light sensor that can monitor the UV intensity, connected to an alarm system to alert the user in case of low UV level
- It has a safety control system that can shut off the water supply in case of a low UV level alarm or loss of power
- It is connected to a constant power supply of sufficient capacity to suit the system. The UV disinfection system carries the WaterMark or Plumbing Safety Type Test Mark and at least one of the following standards, ANSI/NSF Standard 55 Class A systems (40 mJ/cm^2), AS/NZS 3497 or AS/NZS 4348 and treatment classification level.

Checklist for selection and purchasing a chlorine disinfection system

- Determine the volume of water to be treated and ensure the equipment has the capacity (e.g. litres/hour) to treat all the water needed
- It is equipped with a pre-filter to remove any iron, manganese and other dirt and debris that can either absorb and/or deplete chlorine residual levels. Water for chlorine disinfection should have a turbidity of <1 NTU.
- Adequate post chlorine dosing detention time is available within the water supply system, typically at least 30 minutes is required to complete the disinfection process and ensure a minimum free residual chlorine level of 0.5 mg/L
- Includes a residual chlorine test kit to be used for regular monitoring (e.g. daily or weekly) of residual chlorine levels in the supplied drinking water
- The chlorine disinfection system carries the WaterMark or Plumbing Safety Type Test Mark and AS/NZS4348.

Annex 3-G

SimCLIM Climate Change Projections

and

Rainwater Harvesting Calculations

CMIP6 Seasonal and Annual Climate Change Parameters Including Model Uncertainties and CMIP5 Rainwater Tank Domestic Water Harvesting

Balranald Shire, NSW

Two types of analysis are provided for the Balranald Shire located in Western New South Wales, Australia.

The first is a seasonal assessment applying an ensemble of analyses of CMIP6 monthly GCM data. The second part explores the impact of climate change on rainwater harvesting for domestic use across four sites in the Shire.

As two sets of CMIP models were applied, they were chosen to be broadly similar. Thus, SSP2-4.5 and SSP5-8.5 were used for the monthly modelling, while rainwater tank analysis was limited to RCP 8.5.

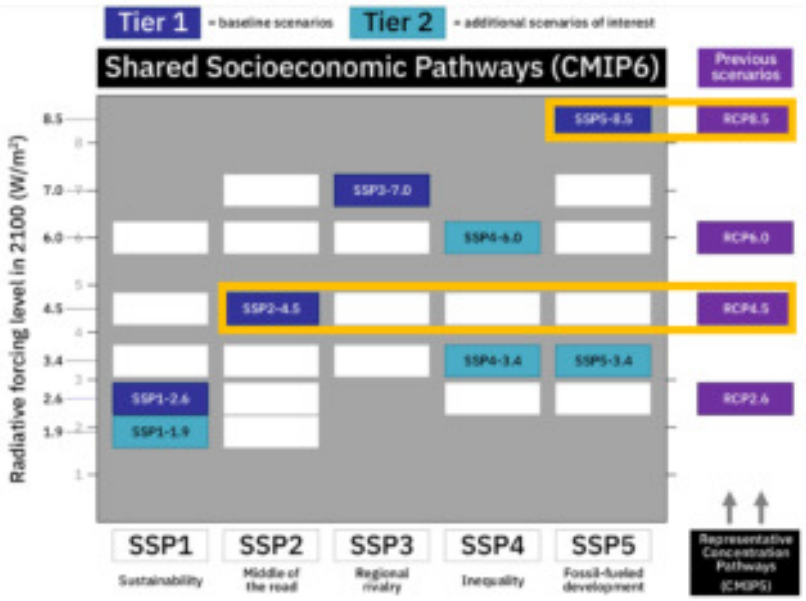


Figure 1: Overview of CMIP6 shared socioeconomic pathways (SSPs) compared with CMIP5 representative concentration pathways (RCPs) (Rojeli et al. 2018)

This initial report is limited to the presentation of model outputs. Additional time and effort are required to analyse the results and deeper analysis of the implications of the climate changes that could include further variable research to inform the Shire's sustainable and climate-resilient development.

Table 1: Balranald, Average Seasonal and Annual Mean Temperature Baseline (Celsius) and Changes (Celsius) - 50th Percentile (Brackets 5th and 95th Percentile).

Season	Year	SSP2-4.5	SSP5-8.5
DJF	Baseline	25.42	25.42
DJF	2050	1.37 (0.90, 1.96)	1.79 (1.18, 2.56)
DJF	2070	1.87 (1.24, 2.68)	2.92 (1.93, 4.19)
DJF	2090	2.10 (1.40, 3.01)	4.20 (2.78, 6.03)
MAM	Baseline	18.02	18.02
MAM	2050	1.28 (0.89, 1.72)	1.67 (1.17, 2.25)
MAM	2070	1.74 (1.22, 2.36)	2.72 (1.91, 3.68)
MAM	2090	1.96 (1.37, 2.65)	3.92 (2.75, 5.29)
JJA	Baseline	10.84	10.84
JJA	2050	1.04 (0.73, 1.38)	1.36 (0.96, 1.80)
JJA	2070	1.43 (1.00, 1.89)	2.23 (1.57, 2.94)
JJA	2090	1.60 (1.13, 2.12)	3.21 (2.26, 4.24)
SON	Baseline	18.17	18.17
SON	2050	1.28 (0.86, 1.68)	1.67 (1.13, 2.20)
SON	2070	1.75 (1.18, 2.31)	2.74 (1.85, 3.60)
SON	2090	1.97 (1.33, 2.59)	3.93 (2.66, 5.18)
ANN	Baseline	18.11	18.11
ANN	2050	1.24 (0.85, 1.69)	1.62 (1.11, 2.20)
ANN	2070	1.70 (1.16, 2.31)	2.65 (1.82, 3.60)
ANN	2090	1.91 (1.31, 2.59)	3.82 (2.61, 5.18)

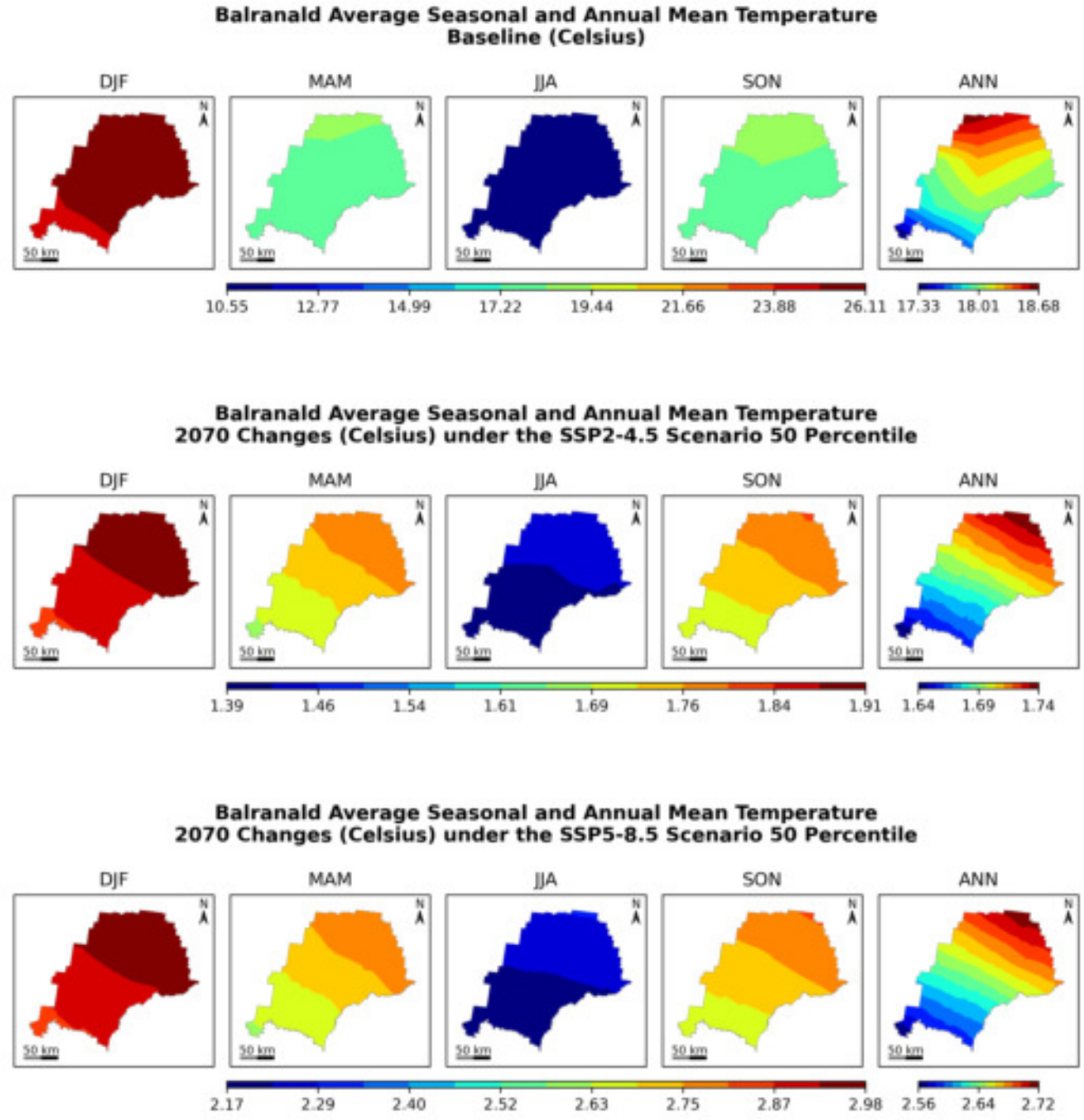


Figure 2: Balranald, Average Seasonal and Annual Mean Temperature Baseline (Celsius) and Changes (Celsius).

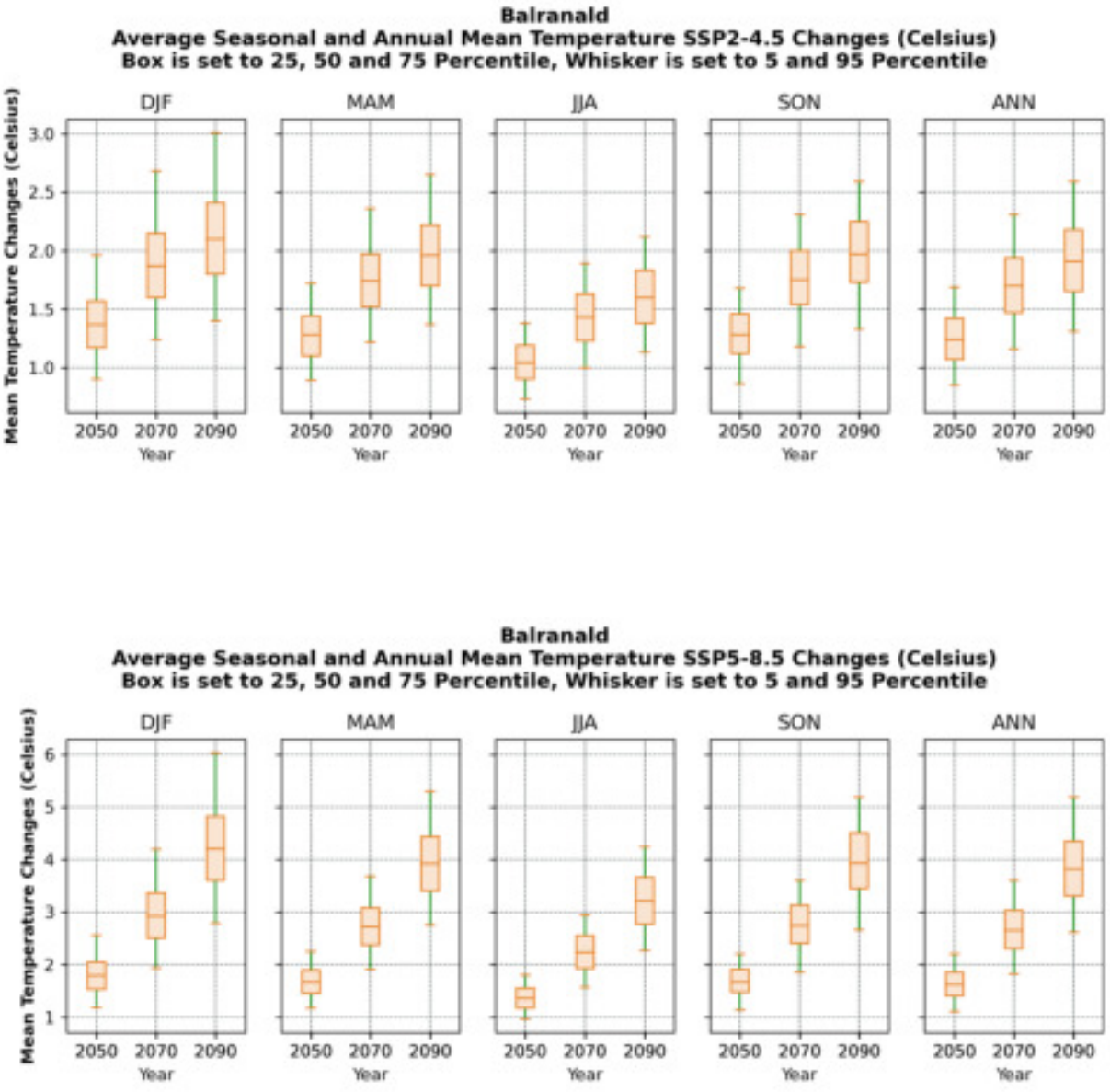


Figure 3: Balranald, Average Seasonal and Annual Mean Temperature Changes (Celsius).

Table 2: Balranald, Average Seasonal and Annual Maximum Temperature Baseline (Celsius) and Changes (Celsius) - 50th Percentile (Brackets 5th and 95th Percentile).

Season	Year	SSP2-4.5	SSP5-8.5
DJF	Baseline	33.63	33.63
DJF	2050	1.43 (0.89, 2.07)	1.86 (1.16, 2.71)
DJF	2070	1.95 (1.22, 2.83)	3.05 (1.90, 4.43)
DJF	2090	2.19 (1.37, 3.19)	4.38 (2.73, 6.37)
MAM	Baseline	25.42	25.42
MAM	2050	1.32 (0.89, 1.99)	1.72 (1.16, 2.60)
MAM	2070	1.80 (1.21, 2.72)	2.82 (1.90, 4.25)
MAM	2090	2.03 (1.36, 3.06)	4.06 (2.73, 6.12)
JJA	Baseline	17.10	17.10
JJA	2050	1.13 (0.79, 1.80)	1.48 (1.04, 2.35)
JJA	2070	1.55 (1.09, 2.47)	2.42 (1.70, 3.85)
JJA	2090	1.74 (1.22, 2.77)	3.48 (2.44, 5.54)
SON	Baseline	25.76	25.76
SON	2050	1.41 (0.89, 2.13)	1.85 (1.16, 2.78)
SON	2070	1.93 (1.22, 2.91)	3.02 (1.90, 4.54)
SON	2090	2.17 (1.36, 3.27)	4.34 (2.73, 6.54)
ANN	Baseline	25.48	25.48
ANN	2050	1.32 (0.86, 2.00)	1.73 (1.13, 2.61)
ANN	2070	1.81 (1.18, 2.73)	2.83 (1.85, 4.27)
ANN	2090	2.03 (1.33, 3.07)	4.06 (2.66, 6.14)

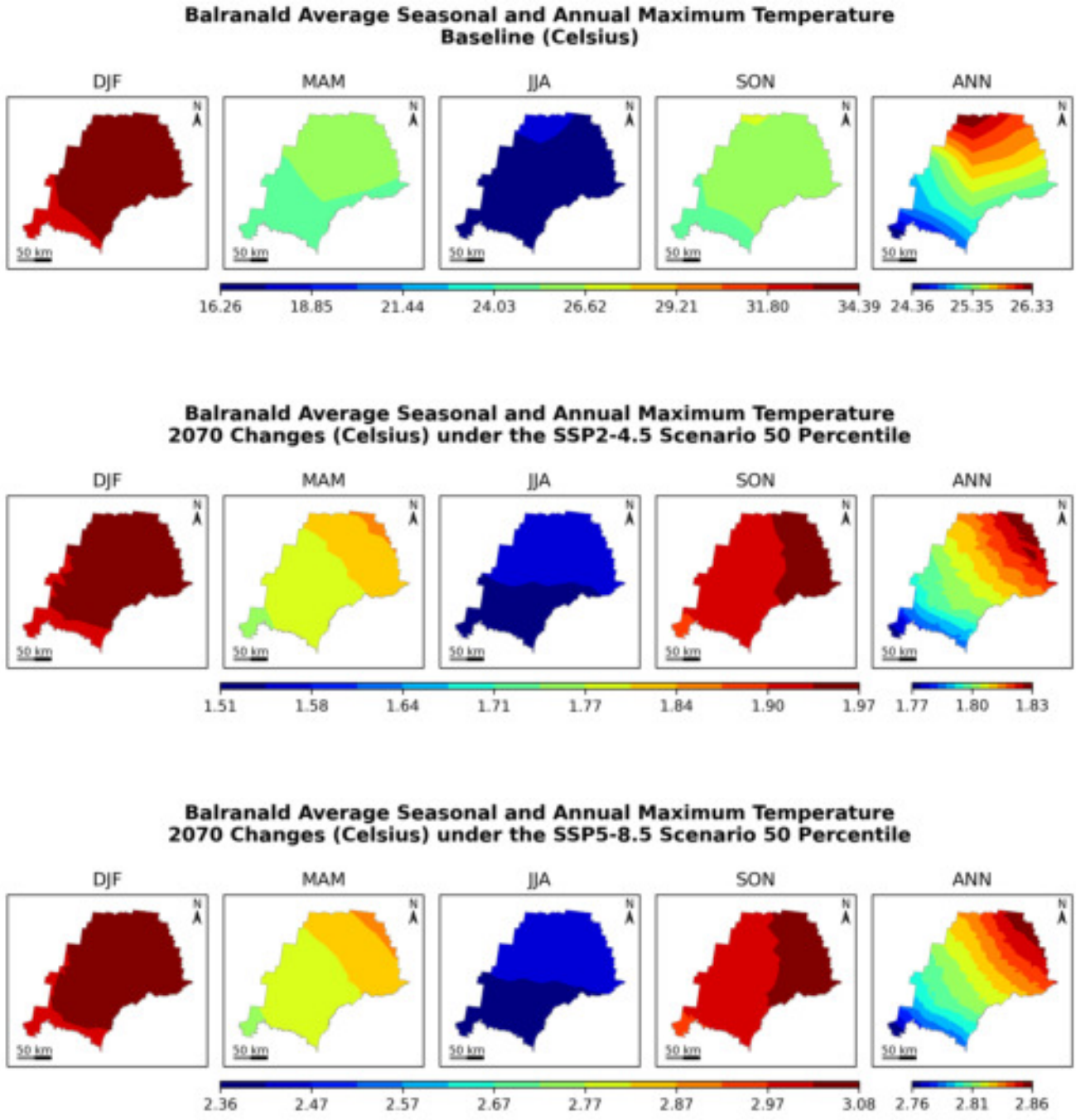


Figure 4: Balranald, Average Seasonal and Annual Maximum Temperature Baseline (Celsius) and Changes (Celsius).

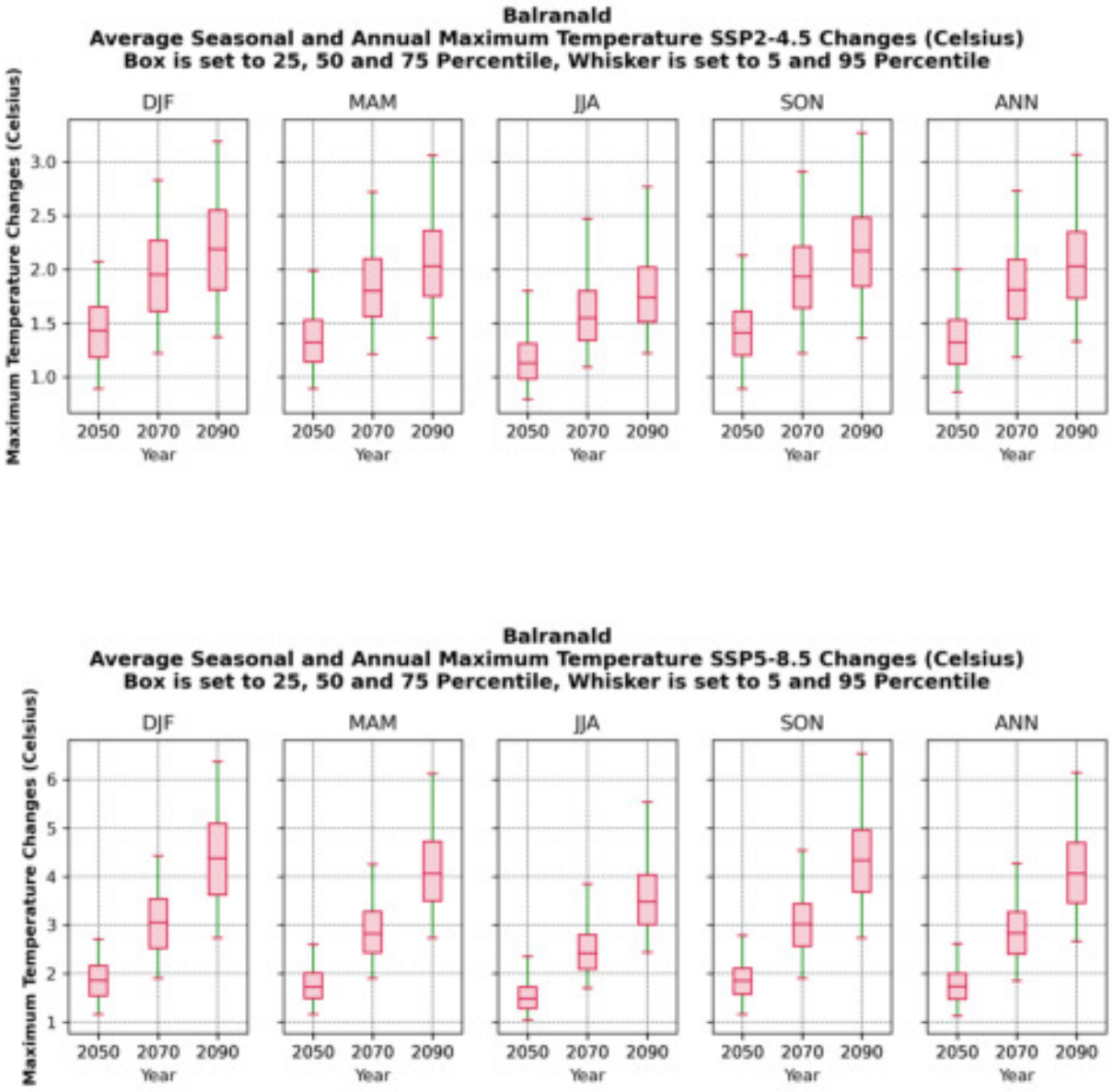


Figure 5: Balranald, Average Seasonal and Annual Maximum Temperature Changes (Celsius).

Table 3: Balranald, Average Seasonal and Annual Minimum Temperature Baseline (Celsius) and Changes (Celsius) - 50th Percentile (Brackets 5th and 95th Percentile).

Season	Year	SSP2-4.5	SSP5-8.5
DJF	Baseline	17.20	17.20
DJF	2050	1.35 (0.94, 1.91)	1.76 (1.23, 2.49)
DJF	2070	1.84 (1.29, 2.61)	2.88 (2.01, 4.08)
DJF	2090	2.07 (1.44, 2.93)	4.15 (2.89, 5.87)
MAM	Baseline	10.60	10.60
MAM	2050	1.29 (0.95, 1.74)	1.69 (1.24, 2.28)
MAM	2070	1.77 (1.30, 2.38)	2.76 (2.03, 3.73)
MAM	2090	1.98 (1.46, 2.68)	3.97 (2.92, 5.36)
JJA	Baseline	4.59	4.59
JJA	2050	0.98 (0.68, 1.30)	1.28 (0.89, 1.70)
JJA	2070	1.35 (0.93, 1.78)	2.10 (1.46, 2.78)
JJA	2090	1.51 (1.05, 2.00)	3.03 (2.10, 4.00)
SON	Baseline	10.22	10.22
SON	2050	1.21 (0.81, 1.62)	1.58 (1.05, 2.12)
SON	2070	1.66 (1.11, 2.22)	2.58 (1.73, 3.47)
SON	2090	1.86 (1.24, 2.49)	3.72 (2.48, 4.99)
ANN	Baseline	10.65	10.65
ANN	2050	1.21 (0.84, 1.64)	1.58 (1.10, 2.15)
ANN	2070	1.65 (1.16, 2.25)	2.58 (1.81, 3.51)
ANN	2090	1.86 (1.30, 2.53)	3.72 (2.60, 5.05)

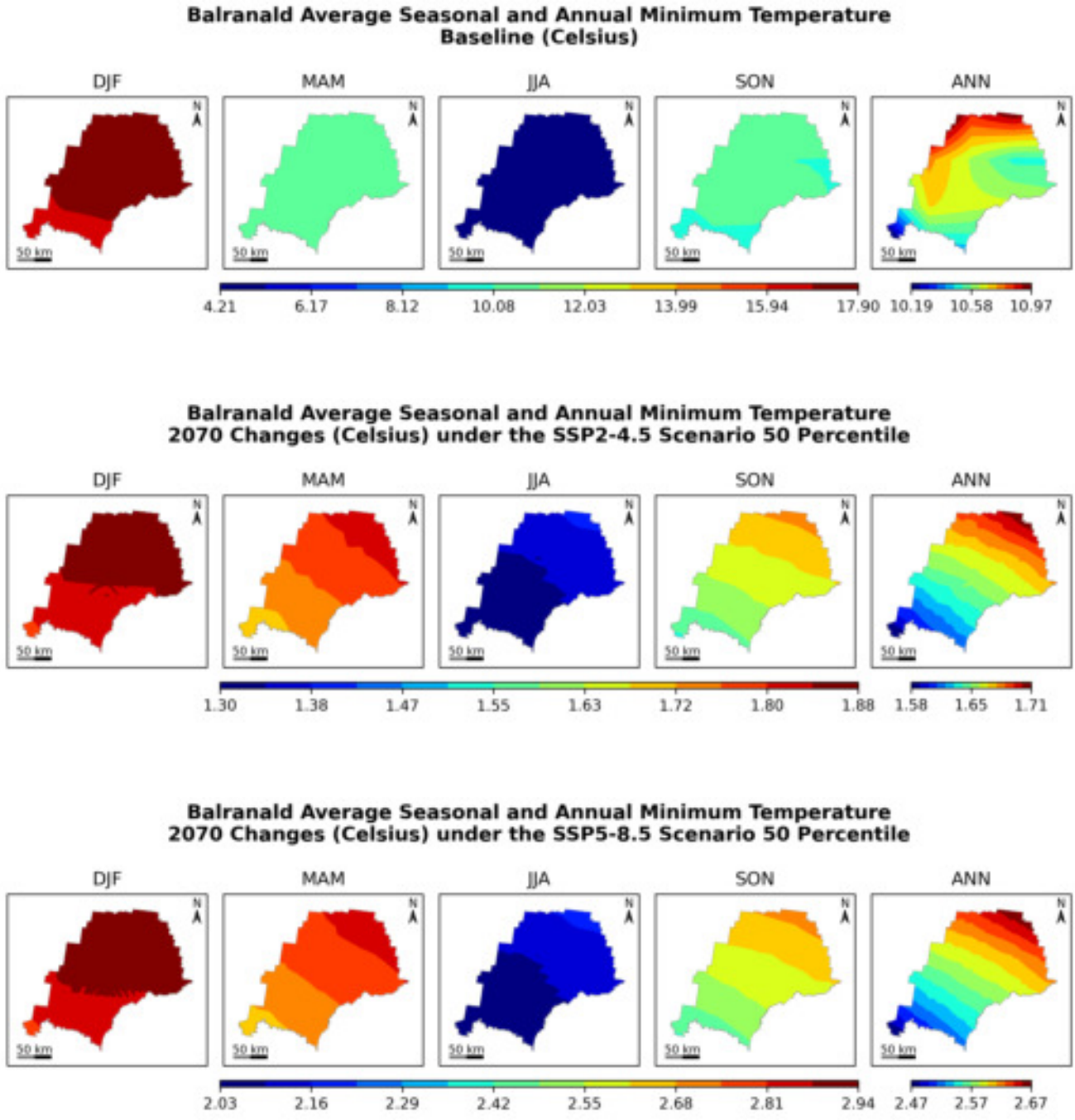
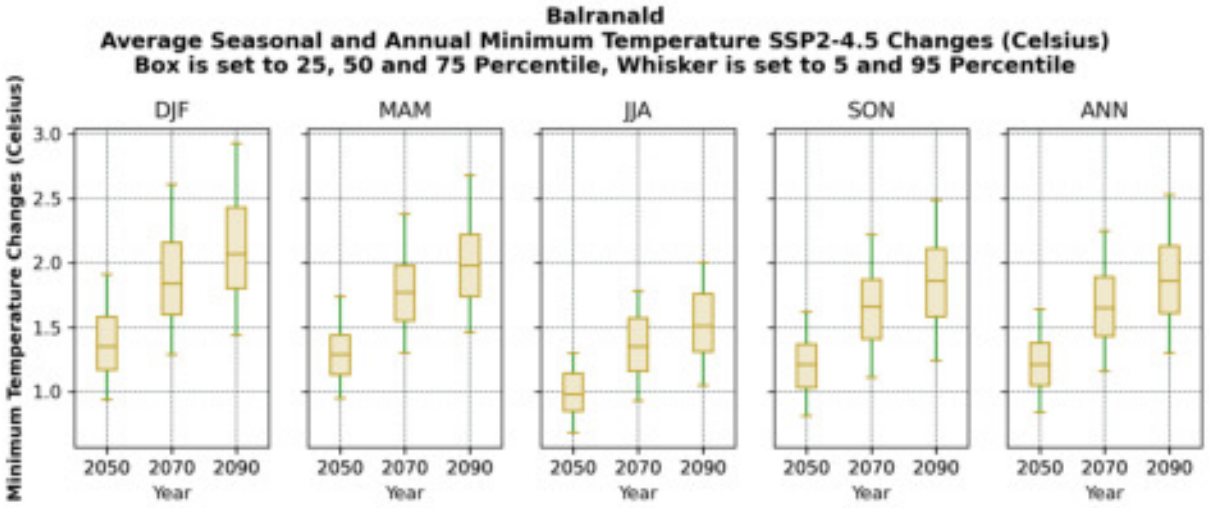


Figure 6: Balranald, Average Seasonal and Annual Minimum Temperature Baseline (Celsius) and Changes (Celsius).



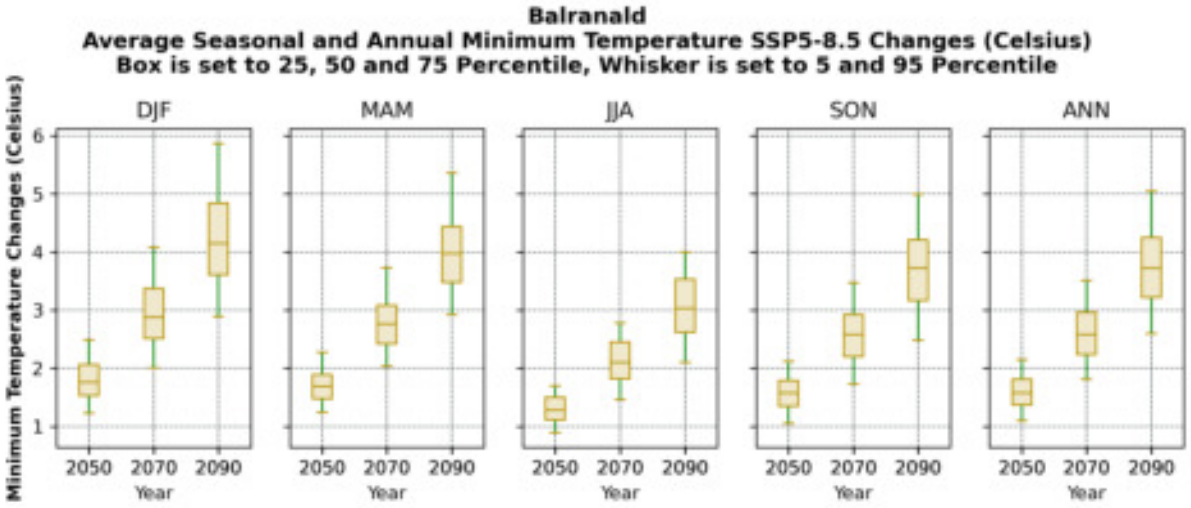


Figure 7: Balranald, Average Seasonal and Annual Minimum Temperature Changes (Celsius).

Table 4: Balranald, Average Seasonal and Annual Precipitation Baseline (mm) and Changes (%) - 50th Percentile (Brackets 5th and 95th Percentile).

Season	Year	SSP2-4.5	SSP5-8.5
DJF	Baseline	71.38	71.38
DJF	2050	0.91 (-21.27, 36.81)	1.19 (-27.82, 48.13)
DJF	2070	1.25 (-29.13, 50.40)	1.95 (-45.49, 78.71)
DJF	2090	1.40 (-32.73, 56.63)	2.81 (-65.46, 113.25)
MAM	Baseline	59.11	59.11
MAM	2050	1.55 (-22.43, 26.04)	2.02 (-29.33, 34.05)
MAM	2070	2.12 (-30.71, 35.65)	3.31 (-47.96, 55.68)
MAM	2090	2.38 (-34.50, 40.06)	4.76 (-69.01, 80.12)
JJA	Baseline	68.65	68.65
JJA	2050	-1.86 (-23.17, 20.44)	-2.42 (-30.29, 26.73)
JJA	2070	-2.54 (-31.72, 27.99)	-3.97 (-49.53, 43.71)
JJA	2090	-2.85 (-35.64, 31.45)	-5.71 (-71.27, 62.90)
SON	Baseline	76.18	76.18
SON	2050	-2.06 (-19.05, 32.99)	-2.69 (-24.91, 43.13)
SON	2070	-2.82 (-26.09, 45.16)	-4.40 (-40.74, 70.54)
SON	2090	-3.17 (-29.31, 50.75)	-6.34 (-58.62, 101.49)
ANN	Baseline	275.32	275.32
ANN	2050	-0.36 (-21.48, 29.07)	-0.48 (-28.09, 38.01)
ANN	2070	-0.50 (-29.41, 39.80)	-0.78 (-45.93, 62.16)
ANN	2090	-0.56 (-33.04, 44.72)	-1.12 (-66.09, 89.44)

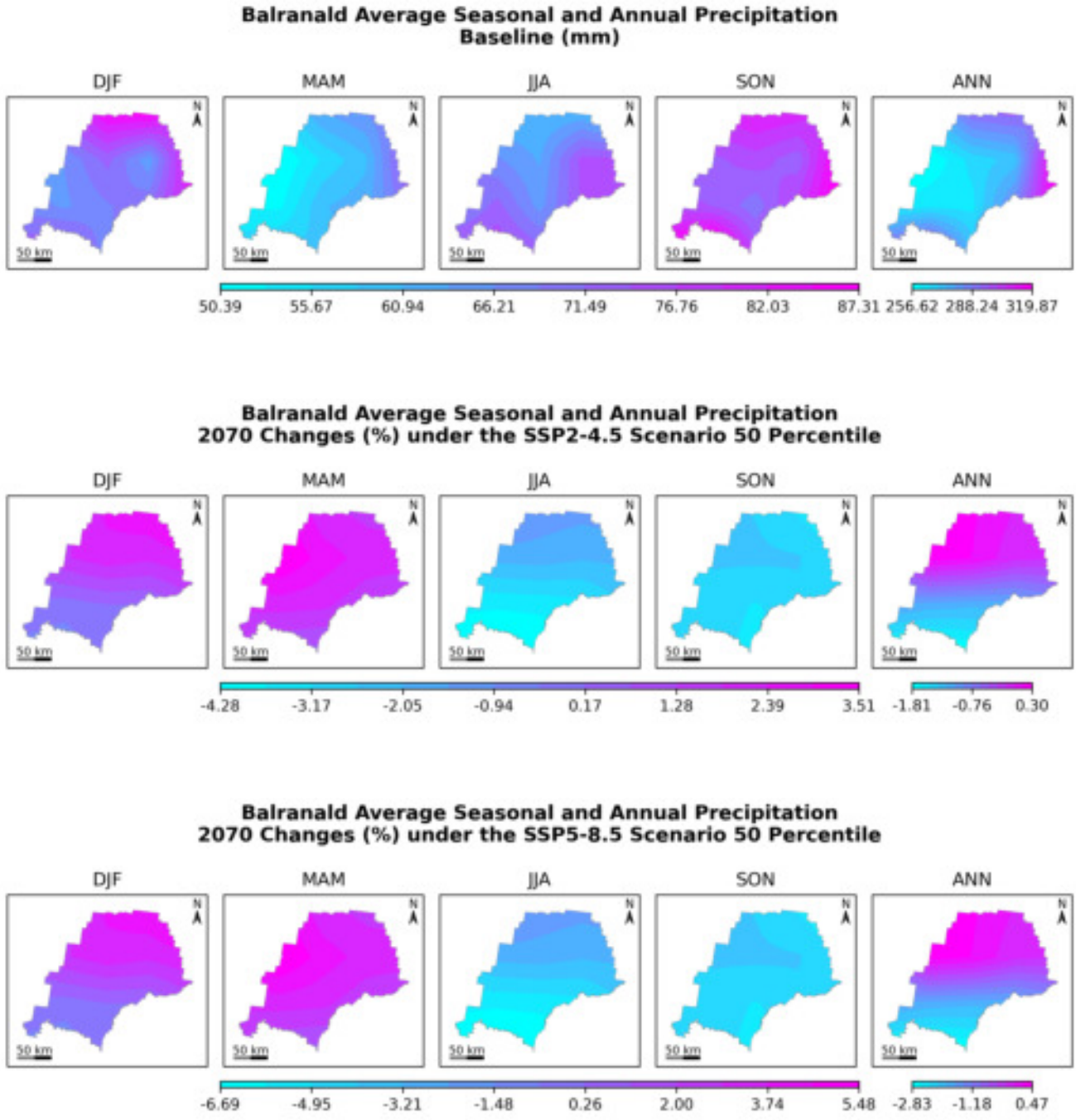


Figure 8: Balranald, Average Seasonal and Annual Precipitation Baseline (mm) and Changes (%).

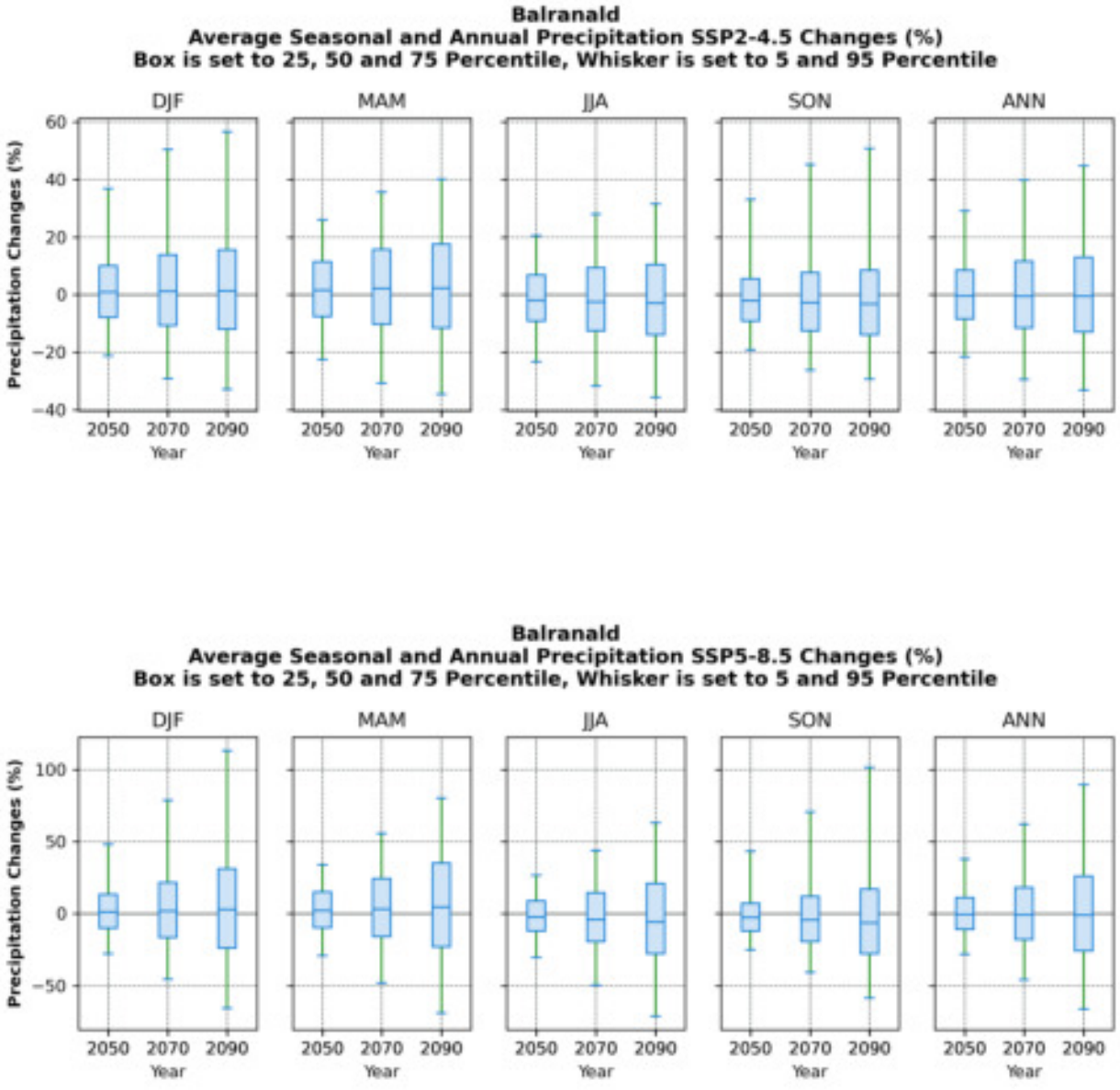


Figure 9: Balranald, Average Seasonal and Annual Precipitation Changes (%).

Table 5: Balranald, Average Seasonal and Annual Mean Wind Speed Baseline (m/s) and Changes (%) - 50th Percentile (Brackets 5th and 95th Percentile).

Season	Year	SSP2-4.5	SSP5-8.5
DJF	Baseline	3.62	3.62
DJF	2050	1.83 (-6.83, 10.81)	2.39 (-8.93, 14.14)
DJF	2070	2.50 (-9.35, 14.80)	3.91 (-14.60, 23.11)
DJF	2090	2.81 (-10.50, 16.63)	5.62 (-21.01, 33.26)
MAM	Baseline	3.13	3.13
MAM	2050	0.52 (-10.68, 12.42)	0.67 (-13.96, 16.24)
MAM	2070	0.70 (-14.62, 17.00)	1.10 (-22.83, 26.56)
MAM	2090	0.79 (-16.42, 19.11)	1.59 (-32.85, 38.21)
JJA	Baseline	2.93	2.93
JJA	2050	-2.34 (-13.93, 9.05)	-3.06 (-18.22, 11.83)
JJA	2070	-3.20 (-19.08, 12.39)	-5.01 (-29.79, 19.35)
JJA	2090	-3.60 (-21.44, 13.92)	-7.20 (-42.86, 27.84)
SON	Baseline	3.40	3.40
SON	2050	-0.93 (-10.70, 10.08)	-1.21 (-13.99, 13.18)
SON	2070	-1.27 (-14.65, 13.80)	-1.99 (-22.88, 21.55)
SON	2090	-1.43 (-16.46, 15.51)	-2.86 (-32.92, 31.01)
ANN	Baseline	3.27	3.27
ANN	2050	-0.23 (-10.53, 10.59)	-0.30 (-13.78, 13.85)
ANN	2070	-0.32 (-14.42, 14.50)	-0.50 (-22.53, 22.64)
ANN	2090	-0.36 (-16.21, 16.29)	-0.71 (-32.41, 32.58)

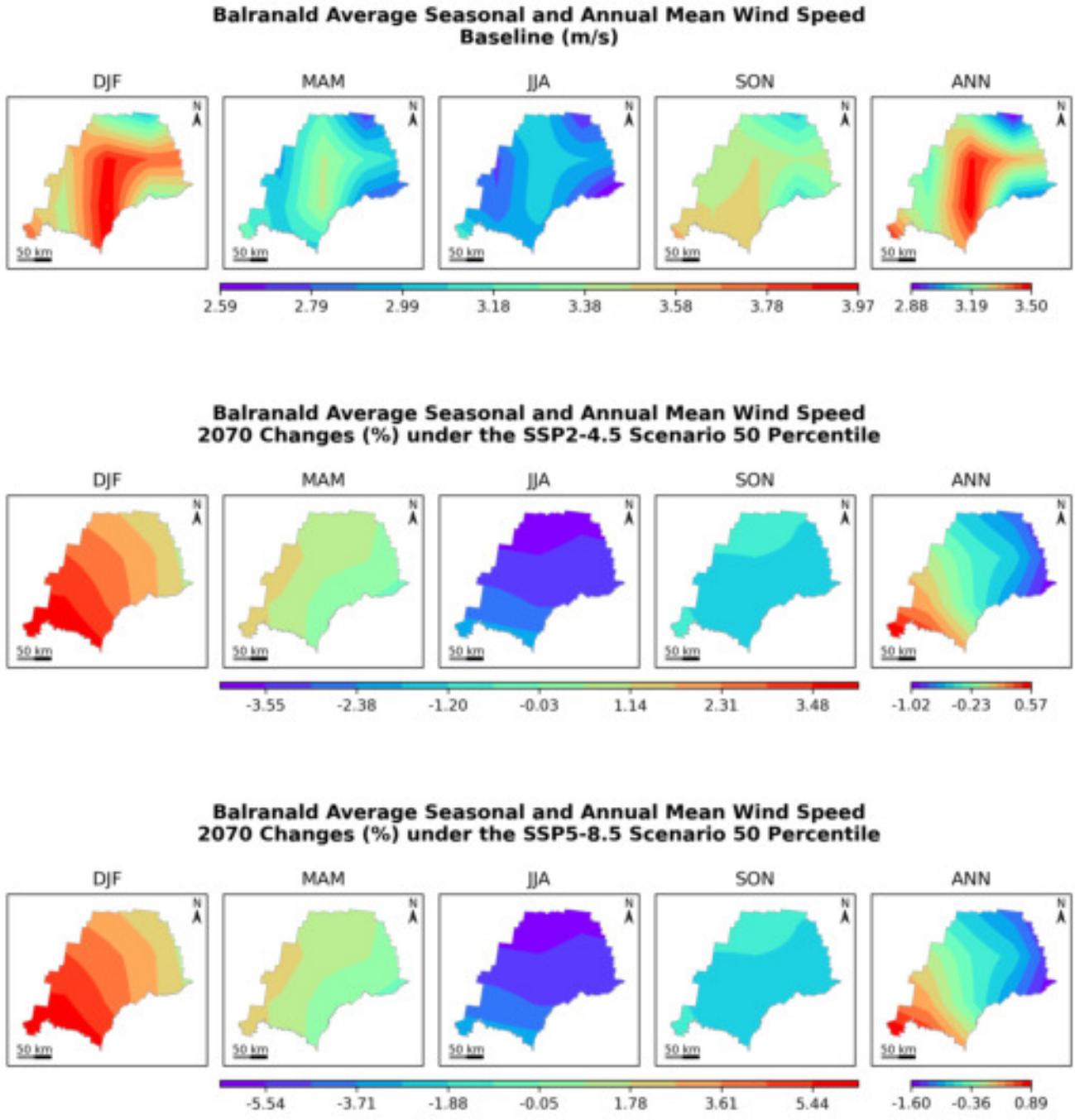


Figure 10: Balranald, Average Seasonal and Annual Mean Wind Speed Baseline (m/s) and Changes (%).

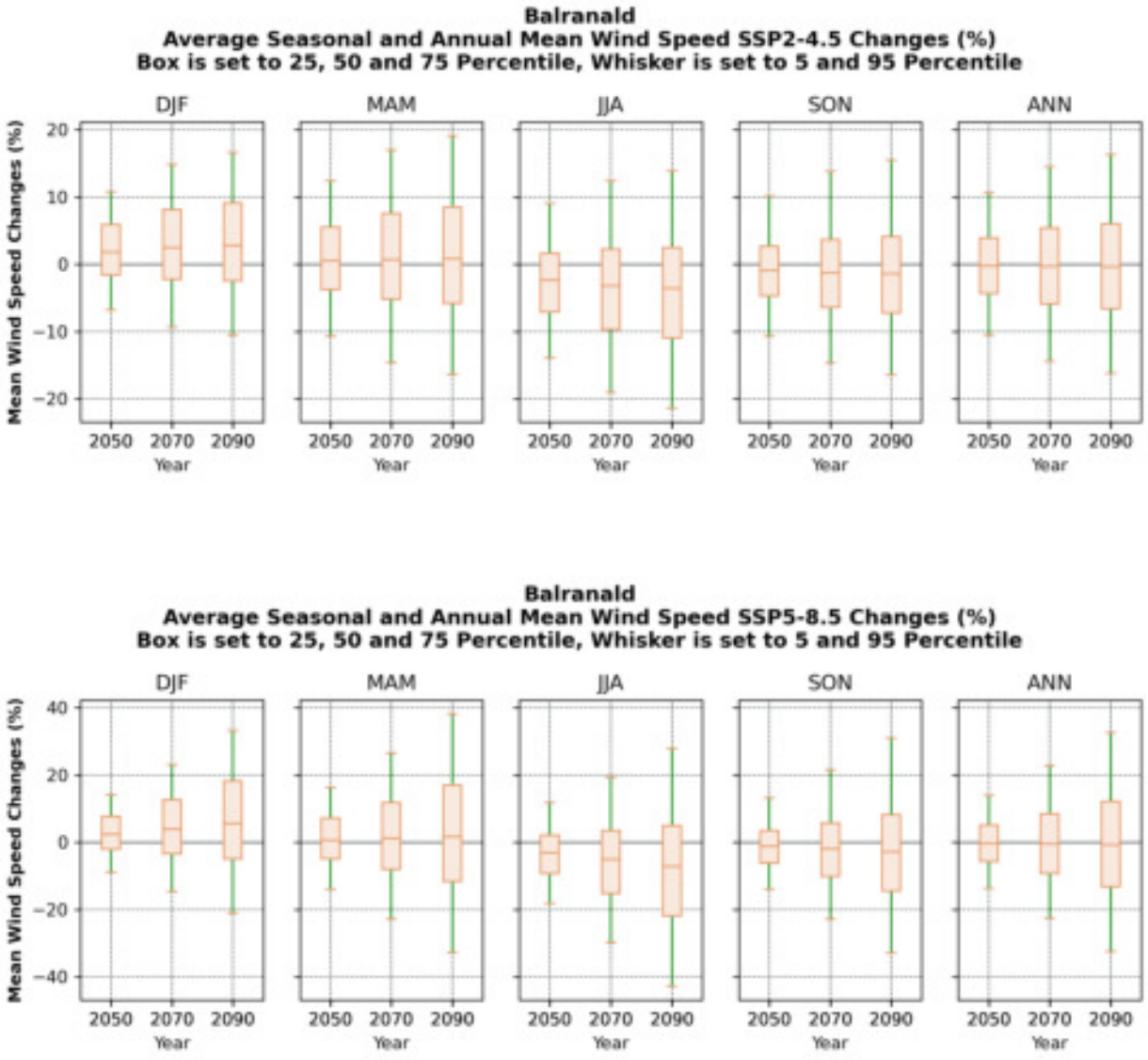
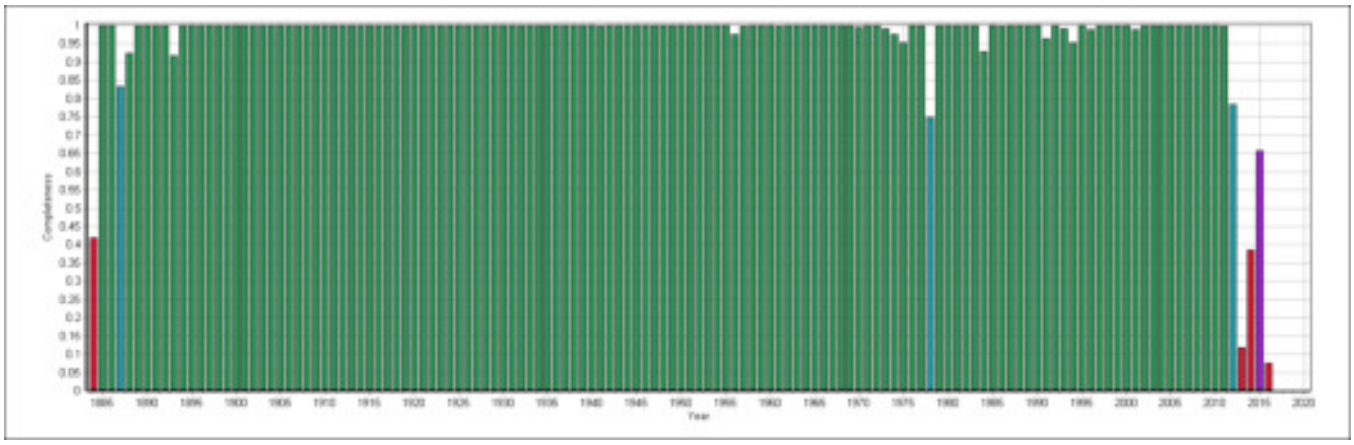


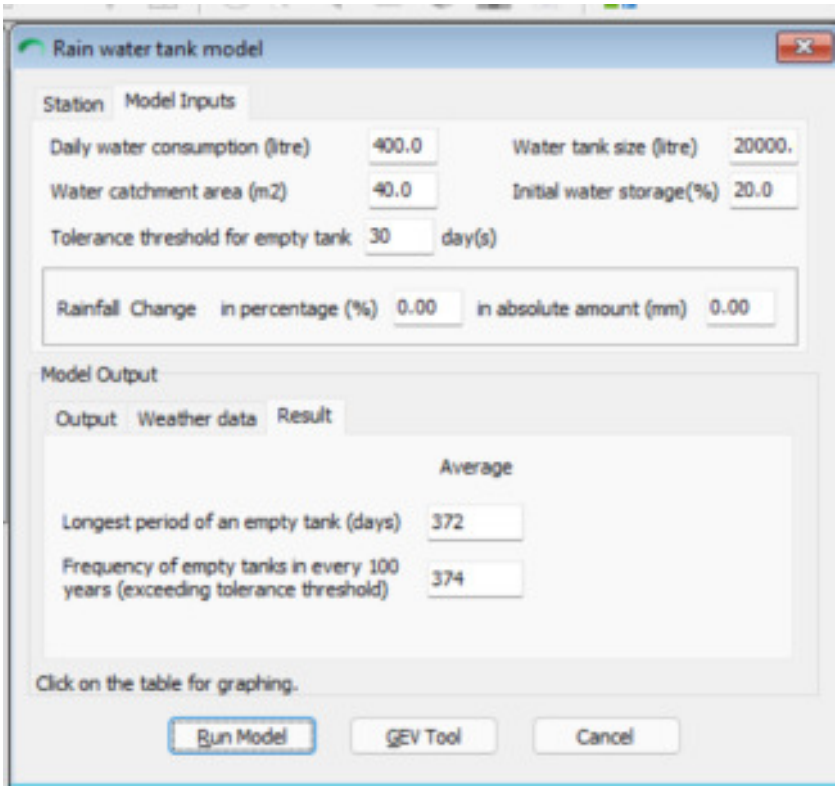
Figure 11: Balranald, Average Seasonal and Annual Mean Wind Speed Changes (%).

Data and Methods

Balranald Rd Ivanhoe
Roof catchment area 40m^2
Tank capacity 2x10kl
2 adults and 2 older children

Ivanhoe Post Office- completeness of record – 1885 to 2011 applied





Scenario: Four people, **100 litres** per person per day, **20,000 litre storage**, catchment **40m2**, initial storage 20 precent, tolerance of 30 days for an empty tank, RCP 8.5 medium scenario

Year	Longest Empty Tank (days)	Frequency of empty tank >30 days per 100 years
Baseline	Exceeds tolerance	Exceeds tolerance
2050	Exceeds tolerance	Exceeds tolerance
2070	Exceeds tolerance	Exceeds tolerance
2090	Exceeds tolerance	Exceeds tolerance

Scenario: Four people, **50 litres** per person per day, **40,000 litre storage**, catchment **80m2**, initial storage 20 precent, tolerance of 30 days for an empty tank, RCP 8.5 medium scenario

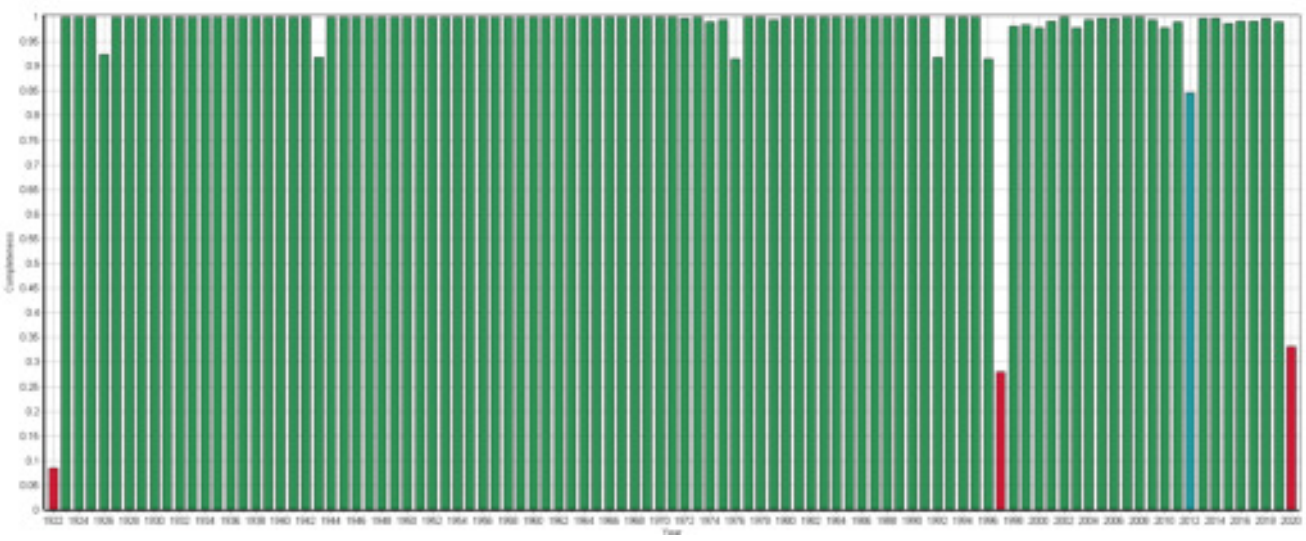
Year	Longest Empty Tank (days)	Frequency of empty tank >30 days per 100 years
Baseline	Exceeds tolerance	Exceeds tolerance
2050	Exceeds tolerance	Exceeds tolerance
2070	Exceeds tolerance	Exceeds tolerance
2090	Exceeds tolerance	Exceeds tolerance

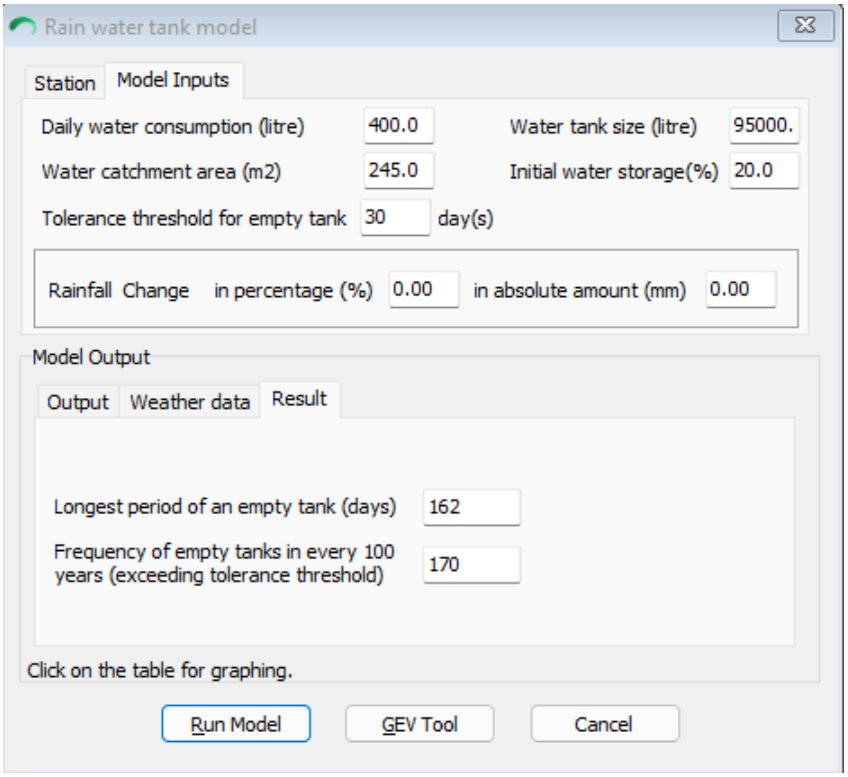
Rainwater Tank Rapid Assessments

Oxley Rd Balranald

Roof catchment areas	160m2 and 85m2
Tank capacity	2x45kl and 1x5kl

Ivanhoe Post Office- completeness of record – 1885 to 2011 applied





Scenario: Two people, **200 litres** per person per day, **95,000 litre** storage, catchment 245m2, initial storage 20 precent, tolerance of 30 days for an empty tank, RCP 8.5 medium scenario

Year	Longest Empty Tank (days)	Frequency of empty tank >30 days per 100 years
Baseline	162 Exceeds tolerance	170 Exceeds tolerance
2050	Exceeds tolerance	Exceeds tolerance
2070	Exceeds tolerance	Exceeds tolerance
2090	Exceeds tolerance	Exceeds tolerance

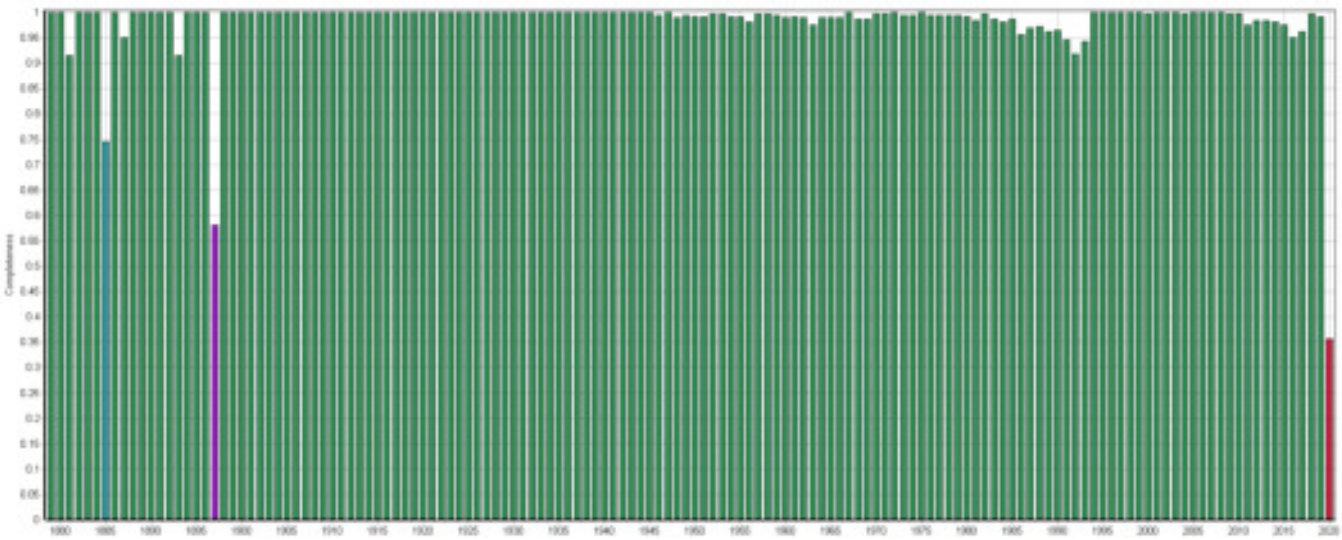
Scenario: Two people, **100 litres** per person per day, 95,000 litre storage, catchment 245m2, initial storage 20 precent, tolerance of 30 days for an empty tank, RCP 8.5 medium scenario

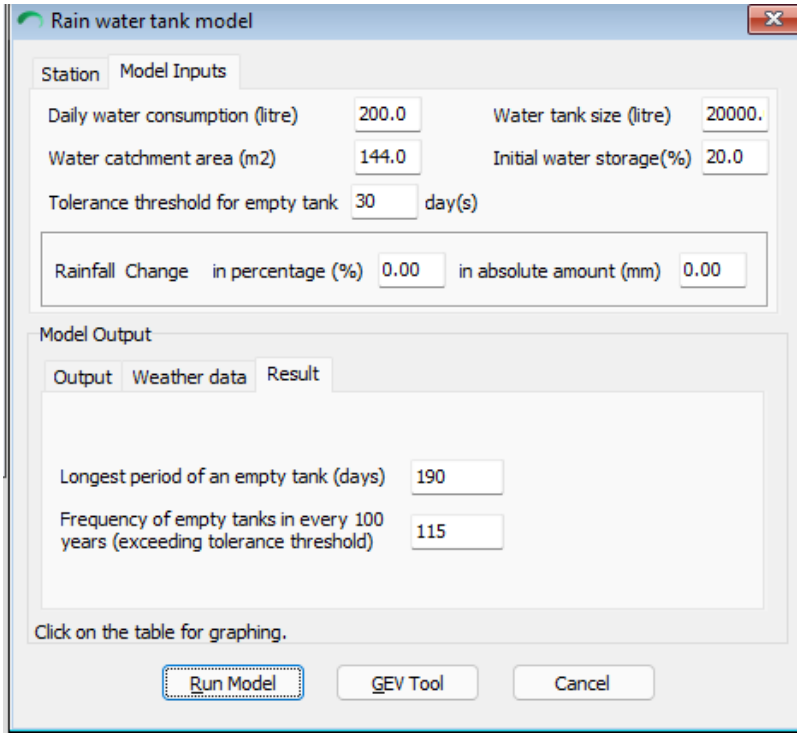
Year	Longest Empty Tank (days)	Frequency of empty tank >30 days per 100 years
Baseline	86 Exceeds tolerance	12
2050	Exceeds tolerance	15
2070	Exceeds tolerance	16
2090	Exceeds tolerance	18

Ivanhoe Rd Balranald

Roof catchment areas	3@48m2
Tank capacity	1x20kl

Balranald RSL - completeness of record – 1879 to 2019 applied





Scenario: Two people, **100 litres** per person per day, 20,000 litre storage, catchment 144m2, initial storage 20 precent, tolerance of 30 days for an empty tank, RCP 8.5 medium scenario

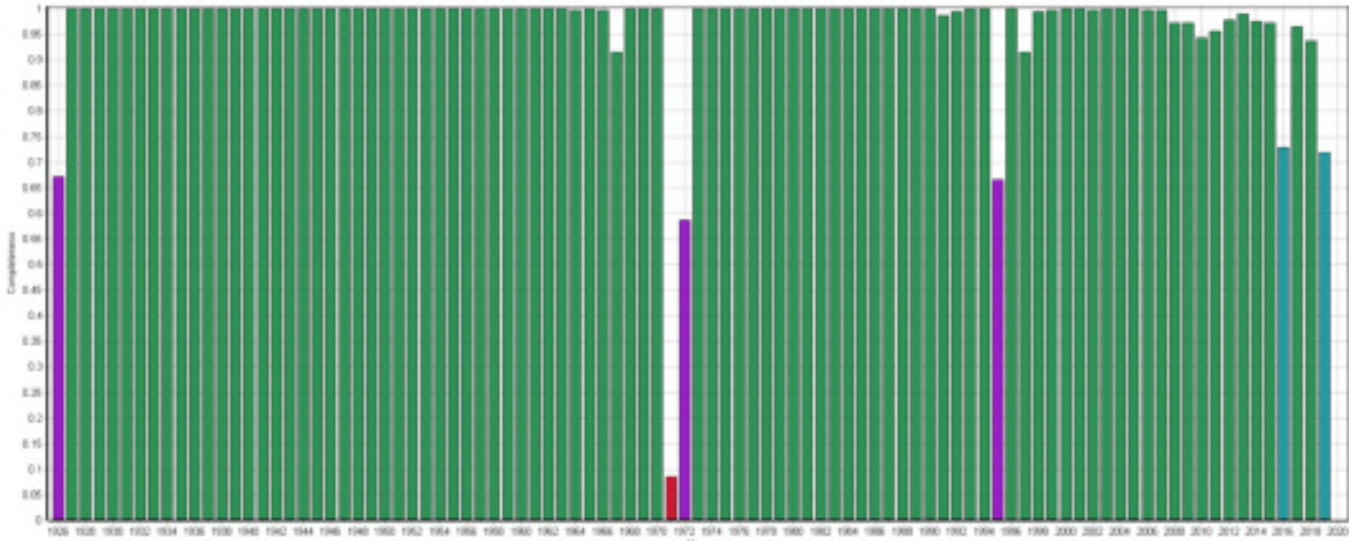
Year	Longest Empty Tank (days)	Frequency of empty tank >30 days per 100 years
Baseline	Exceeds tolerance	8
2050	Exceeds tolerance	Exceeds tolerance
2070	Exceeds tolerance	Exceeds tolerance
2090	Exceeds tolerance	Exceeds tolerance

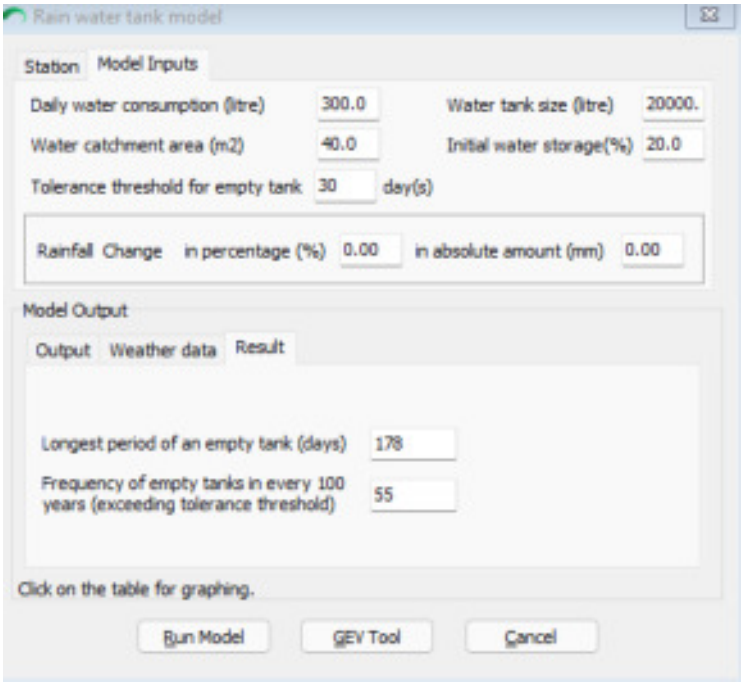
Scenario: Two people, **100 litres** per person per day, **40,000 litre storage**, **catchment 200m2**, initial storage 20 precent, tolerance of 30 days for an empty tank, RCP 8.5 medium scenario

Year	Longest Empty Tank (days)	Frequency of empty tank >30 days per 100 years
Baseline	Exceeds tolerance	40
2050	Exceeds tolerance	49
2070	Exceeds tolerance	52
2090	Exceeds tolerance	55

Thompson Rd Euston
Roof catchment area 40m2
Tank capacity 2x10kl
2 elderly adults.

Robinvale - completeness of record – 1927 to 2018 applied





Scenario: Two people, **150 litres** per person per day, **20,000 litre** storage, catchment 40m2, initial storage 20 precent, tolerance of 30 days for an empty tank, RCP 8.5 medium scenario

Year	Longest Empty Tank (days)	Frequency of empty tank >30 days per 100 years
Baseline	Exceeds tolerance	Exceeds tolerance
2050	Exceeds tolerance	Exceeds tolerance
2070	Exceeds tolerance	Exceeds tolerance
2090	Exceeds tolerance	Exceeds tolerance

Scenario: Two people, **100 litres** per person per day**, 30,000 litre** storage, catchment 40m2, initial storage 20 precent, tolerance of 30 days for an empty tank, RCP 8.5 medium scenario

Year	Longest Empty Tank (days)	Frequency of empty tank >30 days per 100 years
Baseline	Exceeds tolerance	Exceeds tolerance
2050	Exceeds tolerance	Exceeds tolerance
2070	Exceeds tolerance	Exceeds tolerance
2090	Exceeds tolerance	Exceeds tolerance

Appendix 1 CMIP6 Data and Methods

CMIP6 GCM List for monthly analysis: SSP2-4.5 and SSP5-8.5

GCM	lat	lon	SSP2-4.5	SSP5-8.5
ACCESS-CM2	144	192	ok	ok
ACCESS-ESM1-5	145	192	ok	ok
AWI-CM-1-1-MR	192	384	ok	ok
BCC-CSM2-MR	160	320	ok	ok
BCC-ESM1	64	128		
CAMS-CSM1-0	160	320	ok	ok
CAS-ESM2-0	196	360	ok	ok
CESM2	192	288	ok	ok
CESM2-WACCM	192	288	ok	ok
CIESM	192	288	ok	ok
CMCC-CM2-SR5	192	288	ok	ok
CMCC-ESM2	362	292	ok	ok
CNRM-CM6-1	128	256	ok	ok
CNRM-CM6-1-HR	360	720	ok	ok
CNRM-ESM2-1	128	256	ok	ok
CanESM5	64	128	ok	ok
CanESM5-CanOE	64	128	ok	ok
EC-Earth3	256	512	ok	ok
EC-Earth3-AerChem	256	512		
EC-Earth3-CC	256	512	ok	ok
EC-Earth3-Veg	256	512	ok	ok
EC-Earth3-Veg-LR	292	362	ok	ok
FGOALS-f3-L	180	288	ok	ok
FGOALS-g3	80	180	ok	ok
FIO-ESM-2-0	192	288	ok	ok
GFDL-CM4	180	360	ok	ok
GFDL-ESM4	180	288	ok	ok
GISS-E2-1-G	90	144	ok	ok
GISS-E2-1-H	90	144		
HadGEM3-GC31-LL	144	192	ok	ok
HadGEM3-GC31-MM	324	432		ok
IITM-ESM	94	192	ok	ok
INM-CM4-8	120	180	ok	ok
INM-CM5-0	120	180	ok	ok
IPSL-CM5A2-INCA	96	96		

IPSL-CM6A-LR	143	144	ok	ok
KACE-1-0-G	144	192	ok	ok
KIOST-ESM	96	192	ok	ok
MCM-UA-1-0	80	96	ok	ok
MIROC-ES2L	64	128	ok	ok
MIROC6	128	256	ok	ok
MPI-ESM-1-2-HAM	96	192		
MPI-ESM1-2-HR	192	384	ok	ok
MPI-ESM1-2-LR	96	192	ok	ok
MRI-ESM2-0	160	320	ok	ok
NESM3	96	192	ok	ok
NorESM2-LM	96	144	ok	ok
NorESM2-MM	192	288	ok	ok
TaiESM1	192	288	ok	ok
UKESM1-0-LL	144	192	ok	ok
Total			**44**	**45**

Methodologies:

Pattern Scaling Methodology for Monthly Variables

Pattern scaling approach is based on the theory that, firstly, a simple climate model can accurately represent the global responses of a GCM, even when the response is non-linear (Raper et al., 2001), and secondly, a wide range of climatic variables represented by a GCM are a linear function of the global annual mean temperature change represented by the same GCM at different spatial and/or temporal scales (Mitchell, 2003; Whetton et al., 2005). Scaling local trends by projections of global warming and comparing these to model projections will allow adaptation needs at the local and regional scale to be assessed. For example, pattern-scaled historical data can be compared with pattern scaling from GCMs.

Pattern scaling involves the following general steps (Lu and Hulme, 2002):

Step 1: Defining the 'master pattern' – a single GCM experiment run (or ideally an ensemble) with a corresponding SSP emissions scenario pattern for one climate variable, such as global mean temperature.

Step 2: Normalising the 'master pattern' - the climate change values for each individual grid cell in the 'master pattern' are normalised by subtracting the 'average' value for the global mean temperature (for that GCM experiment run) from each grid cell. This normalised pattern then represents the degree of warming in each grid cell, per degree global warming;

Step 3: Obtaining scalars – this derives the global warming values per grid cell in a climate pattern, for a time in the future for a given emissions scenario provided by IPCC AR6 report;

Step 4: Scaling the normalised pattern – the pattern of changes for the future time period can be produced by multiplying the normalised pattern in Step 2 by the respective scalar developed in Step 3.

Pattern scaling may be described as follows: for a given climate variable *V*, its anomaly ΔV^* for a particular grid cell (*i*), month (*j*) and year or period (*y*) under the scenarios of SSP2-4.5 and SSP5-8.5:

$$\Delta V^*_{yij} = \Delta T_y \cdot \Delta V'_{ij} \quad (1)$$

ΔT being the annual global mean temperature change.

The local change pattern value ($\Delta V'_{ij}$) was calculated from the GCM simulation anomaly (ΔV_{yij}) using linear least squares regression, that is, the slope of the fitted linear line.

$$\Delta V'_{ij} = \frac{\sum_{y=1}^{m} \Delta T_y \cdot \Delta V_{yij}}{\sum_{y=1}^{m} (\Delta T_y)^2} \quad (2)$$

where *m* is the number of future sample periods used, with a 10-year average as a period.

Pattern-scaling does not seem to be a very large source of error in constructing regional climate projections, even for extreme scenarios (Ruosteenoja et al., 2007). However, in applying pattern-scaling, two fundamental sources of error related to its underlying theory need to be addressed: 1) the non-linearity error: the local responses of climate variables, precipitation in particular, may not be inherently linear functions of the global mean temperature change; and 2) noise due to the internal variability of the GCM. Based on the pattern scaling theory, for a given GCM, the linear response change pattern of a climate variable to global mean temperature change represented by the GCM should be obtained from any one of its GHG emission simulation outputs.

Appendix 2 CMIP5 Data and Methods for Water Tank Assessment

1 Availability of GCM variables for Australia applied as an ensemble in rainwater tank modeling

	Model	Temp	Precip	SolRad	RelHum	Wind	SLR
1	ACCESS1.3	Yes	Yes	Yes	Yes	Yes	
2	ACCESS1.0	Yes	Yes	Yes	Yes	Yes	
3	BCC-CSM1-1	Yes	Yes		Yes	Yes	Yes
4	BCC-CSM1-1-m	Yes	Yes		Yes		Yes
5	BNU-ESM	Yes	Yes				
6	CanESM2	Yes	Yes	Yes	Yes	Yes	Yes
7	CCSM4	Yes	Yes	Yes	Yes		Yes
8	CESM1-BGC	Yes	Yes	Yes	Yes		
9	CESM1-CAM5	Yes	Yes	Yes	Yes		
10	CMCC-CM	Yes	Yes	Yes		Yes	Yes
11	CMCC-CMS	Yes	Yes	Yes		Yes	Yes
12	CNRM-CM5	Yes	Yes	Yes		Yes	Yes
13	CSIRO-Mk3-6-0	Yes	Yes	Yes	Yes	Yes	Yes
14	EC-EARTH	Yes	Yes			Yes	
15	FGOALS-g2	Yes	Yes				
16	FGOALS-s2	Yes	Yes				
17	GFDL-CM3	Yes	Yes	Yes	Yes	Yes	Yes
18	GFDL-ESM2G	Yes	Yes	Yes	Yes	Yes	Yes
19	GFDL-ESM2M	Yes	Yes	Yes	Yes	Yes	Yes
20	GISS-E2-H	Yes	Yes	Yes	Yes	Yes	
21	GISS-E2-H-CC	Yes	Yes	Yes	Yes	Yes	
22	GISS-E2-R	Yes	Yes	Yes	Yes	Yes	
23	GISS-E2-R-CC	Yes	Yes	Yes	Yes	Yes	
24	HADCM3	Yes	Yes	Yes	Yes	Yes	
25	HadGEM2-AO	Yes	Yes	Yes		Yes	
26	HadGEM2-CC	Yes	Yes	Yes	Yes	Yes	Yes
27	HadGEM2-ES	Yes	Yes	Yes	Yes	Yes	Yes
28	INMCM4	Yes	Yes	Yes	Yes	Yes	Yes
29	IPSL-CM5A-LR	Yes	Yes	Yes	Yes	Yes	

30	IPSL-CM5A-MR	Yes	Yes	Yes	Yes	Yes	
31	IPSL-CM5B-LR	Yes	Yes	Yes	Yes	Yes	
32	MIROC4H	Yes	Yes	Yes	Yes		
33	MIROC5	Yes	Yes	Yes	Yes	Yes	Yes
34	MIROC-ESM	Yes	Yes	Yes	Yes	Yes	Yes
35	MIROC-ESM-CHEM	Yes	Yes	Yes	Yes	Yes	Yes
36	MPI-ESM-LR	Yes	Yes	Yes		Yes	Yes
37	MPI-ESM-MR	Yes	Yes	Yes		Yes	Yes
38	MRI-CGCM3	Yes	Yes	Yes	Yes	Yes	Yes
39	NorESM1-M	Yes	Yes			Yes	Yes
40	NorESM1-ME	Yes	Yes				Yes

Table A.16 BOM_SDM data availability for Australia

1	ACCESS1-0	No. of variables
2	ACCESS1-3	4
3	BNU-ESM	4
4	CCSM4	4
5	CMCC-CMS	4
6	CNRM-CM5	4
7	CSIRO-Mk3-6-0	4
8	CanESM2	4
9	GFDL-ESM2G	4
10	GFDL-ESM2M	4
11	HadGEM2-CC	4
12	IPSL-CM5A-LR	4
13	IPSL-CM5A-MR	4
14	IPSL-CM5B-LR	4
15	MIROC-ESM	4
16	MIROC-ESM-CHEM	4
17	MIROC5	4
18	MPI-ESM-LR	4
19	MPI-ESM-MR	4
20	MRI-CGCM3	4
21	NorESM1-M	4

Rainwater Harvesting Calculations

Theoretical Rainwater Harvesting Yield & Demand Calculations
Ivanhoe, Balranald & Euston

Ivanhoe	**Roof area m2**	**100**	**200**	**300**	**400**	**500**
Yr av 305 mm	**Annual yield-litres**	**30,500**	**61,000**	**91,500**	**122,000**	**152,500**
Demand 400L per day	Annual demand - litres	146,000	146,000	146,000	146,000	146,000
	Surplus/deficit - litres	-115,500	-85,000	-54,500	-24,000	6,500
Demand 200L per day	Annual demand - litres	73,000	73,000	73,000	73,000	73,000
	Surplus/deficit - litres	-42,500	-12,000	18,500	49,000	79,500
Demand 100L per day	Annual demand - litres	36,500	36,500	36,500	36,500	36,500
	Surplus/deficit - litres	-6,000	24,500	55,000	85,500	116,000
Demand 50L per day	Annual demand - litres	18,250	18,250	18,250	18,250	18,250
	Surplus/deficit - litres	12,250	42,750	73,250	103,750	134,250

Balranald RSL	**Roof area m2**	**100**	**200**	**300**	**400**	**500**
Yr av 323 mm	**Annual yield-litres**	**32,300**	**64,600**	**96,900**	**129,200**	**161,500**
Demand 400L per day	Annual demand - litres	146,000	146,000	146,000	146,000	146,000
	Surplus/deficit - litres	-113,700	-81,400	-49,100	-16,800	15,500
Demand 200L per day	Annual demand - litres	73,000	73,000	73,000	73,000	73,000
	Surplus/deficit - litres	-40,700	-8,400	23,900	56,200	88,500
Demand 100L per day	Annual demand - litres	36,500	36,500	36,500	36,500	36,500
	Surplus/deficit - litres	-4,200	28,100	60,400	92,700	125,000
Demand 50L per day	Annual demand - litres	18,250	18,250	18,250	18,250	18,250
	Surplus/deficit - litres	14,050	46,350	78,650	110,950	143,250

Euston (Sunnyside)	**Roof area m2**	**100**	**200**	**300**	**400**	**500**
Yr av 292 mm	**Annual yield-litres**	**29,200**	**58,400**	**87,600**	**116,800**	**146,000**
Demand 400L per day	Annual demand - litres	146,000	146,000	146,000	146,000	146,000
	Surplus/deficit - litres	-116,800	-87,600	-58,400	-29,200	0
Demand 200L per day	Annual demand - litres	73,000	73,000	73,000	73,000	73,000
	Surplus/deficit - litres	-43,800	-14,600	14,600	43,800	73,000
Demand 100L per day	Annual demand - litres	36,500	36,500	36,500	36,500	36,500
	Surplus/deficit - litres	-7,300	21,900	51,100	80,300	109,500
Demand 50L per day	Annual demand - litres	18,250	18,250	18,250	18,250	18,250
	Surplus/deficit - litres	10,950	40,150	69,350	98,550	127,750

NOTES:

1. Demand of 400L/household/day is not feasible with roof/hard standing harvesting of less than 500m^2
2. Demand of 50L/household/day requires l00m^2 of roof to provide a positive year all around yield