

# Water Saving Initiatives

## Discussion Paper 5



## Water Saving Initiatives

Prepared for

REROC

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## List of Abbreviations

<b>CSIRO</b>	Commonwealth Scientific and Industrial Research Organisation
<b>DIY</b>	Do It Yourself
<b>ESD</b>	Ecologically Sustainable Development
<b>GWCC</b>	Goldenfields Water County Council
<b>IWCM</b>	Integrated Water Cycle Management
<b>LGA</b>	Local Government Area
<b>LWU</b>	Local Water Utilities
<b>MCA</b>	Multi-Criteria Analysis
<b>NOW</b>	NSW Office of Water
<b>NSW</b>	New South Wales
<b>NWI</b>	National Water Initiative
<b>PVOB</b>	Present Value of Options Benefit
<b>REROC</b>	Riverina Eastern Regional Organisation of Councils
<b>RWCC</b>	Riverina Water County Council
<b>SBC</b>	Strengthening Basin Communities
<b>STP</b>	Sewage Treatment Plant
<b>TDS</b>	Total Dissolved Solids
<b>WSUD</b>	Water Sensitive Urban Design

## 1.0 Introduction

### 1.1 Context of this Discussion Paper

This paper presents a series of water saving initiatives that could be implemented by industries and Local Government (LG) participating in the Strengthening Basin Communities (SBC) study within the Riverina Eastern Regional Organisation of Councils (REROC). This paper builds on the key findings of the other four papers prepared by AECOM (see Figure 1).

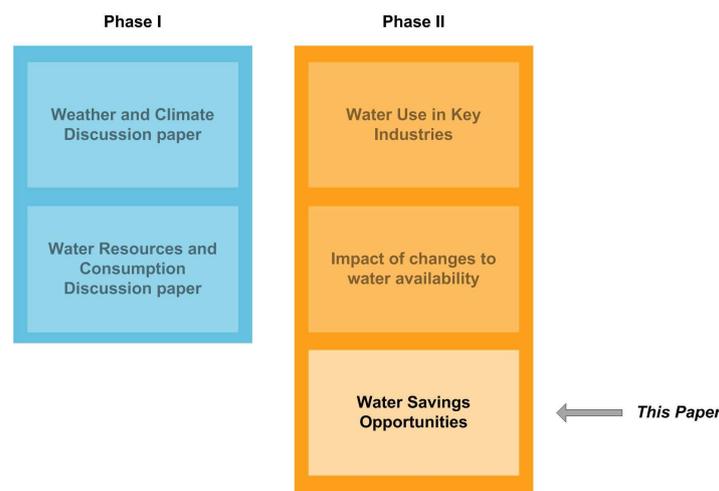


Figure 1 – Diagram showing where this paper fits in the overall REROC SBC project

### 1.2 Approach and Methodology

This paper is articulated around a series of water saving initiatives and options that could contribute to increased community resilience in the REROC region. These options and possible initiatives were drawn from stakeholder’s consultation undertaken by AECOM between during the project as well as additional literature review and best practice assessment provided by AECOM water team. Adaptation and Water Saving Needs

Based on the outcomes of Discussion Paper 1 to 4, and in consideration of how these changes might influence current industries and activities in the REROC region, the following keys aspects have been identified as areas for further investigation in developing adaptation strategies:

Areas for further consideration in developing adaptation and water saving strategies	
<b>Residential water program</b>	Over the long term, reductions in residential water usage will reduce the pressure on water supply, allowing a more efficient use of water per capita. Such measures also contribute to raise awareness within the community and improve adaptive capacity in the event of prolonged water shortages.
<b>Industry water program</b>	REROC present a number of industries dependant directly or indirectly on water resources for their business operations. As detailed in Paper 3, industries have quite different water intensity activities and varying needs in terms of water quantity and water quality. A series of water initiatives targeting REROC business and industries will help reducing their water consumption and further enhance their resilience to decrease in water availability.
<b>Community awareness</b>	With a varied population, it is important to understand the best methods of communicating adaptation and water security needs to the different REROC community groups. Consideration should be given to ways of communicating with different target groups (youth and young, elderly, rural and urban groups, etc.) about potential implications of climate change, and practical ways REROC, Councils and the community can work together to respond to these challenges.

<b>Areas for further consideration in developing adaptation and water saving strategies</b>	
<b>NSW Office of Water best practice guidelines</b>	The NSW Office of Water has encouraged best practice management of water supply and sewerage since the mid 1990s. The implementation of NOW recommendations achieves multiple outcomes from improved community's resilience to better efficiency of local water utilities (LWU).
<b>Diversification and increased security of water supply</b>	A secure and diversified water supply will contribute to the continuation of population and economic growth within the REROC region. Securing and diversifying supply also requires consideration of the population that currently (and in the future will) live outside of the reticulated network.
<b>STP Efficiency Improvement</b>	Through STP efficiency audits and implementation of measures to limit losses, the whole STP process should be improved to maximise the potential reuse volume.
<b>Climate change risk assessment</b>	Undertaking a climate change risk assessment will enable LGAs to identify which climate change risks are the most threatening for their assets.
<b>Regional Water Trading Forum</b>	A regional based water management planning framework will help the REROC region to address many of the water management challenges that its local governments and businesses are now facing.
<b>Economic Diversification</b>	As significant changes can be expected from reduced water availability and other socio-economic drivers, an understanding of the potential for economic diversification.

## 2.0 Water Saving and Adaptation for REROC

### 2.1 Overview of an Adaptation Strategy

A climate change adaptation strategy can be defined as “Actions in response to actual or projected climate change and impacts that lead to a reduction in risks or a realisation of benefits. A distinction can be made between a planned or anticipatory approach to adaptation (i.e. risk prevention) and an approach that relies on unplanned or reactive adjustments. The adaptation can be private or public”.

The adaptation strategy aims to (i) protect persons and assets by acting on public health and risk management, (ii) integrate the social dimension and avoid inequalities when facing risks, (iii) limit costs and take advantage of opportunities and (iv) preserve the natural environment.

Usually priority is given to “win-win” and “no-regrets” treatments. Win-win refers to measures that address the targeted climate change risks while also having other environmental, social or economic benefits. No-regrets refer to measures that should be taken anyway; regardless of whether climate change is an issue. Figure 2 highlights the key processes involved developing an adaptation strategy.

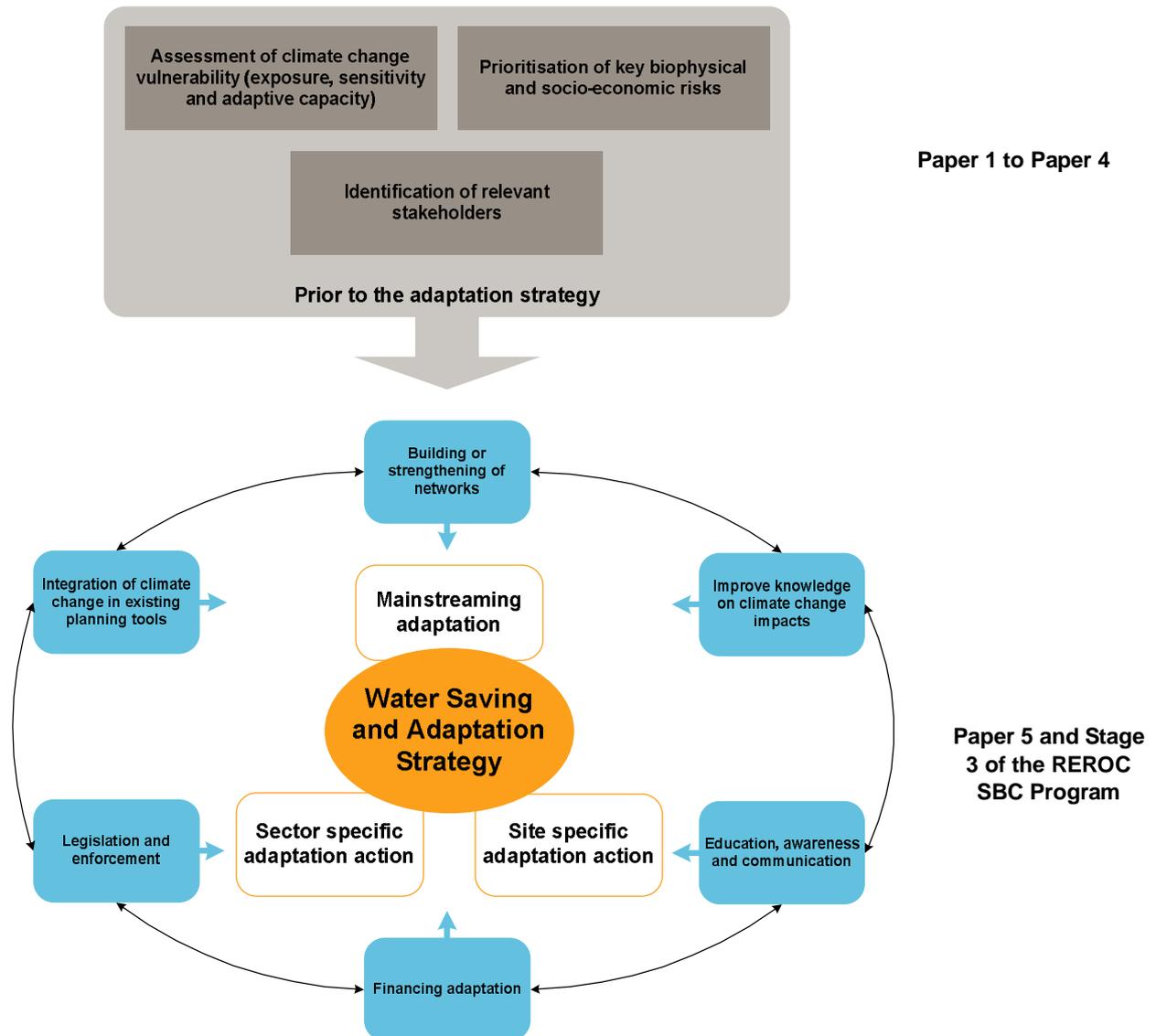
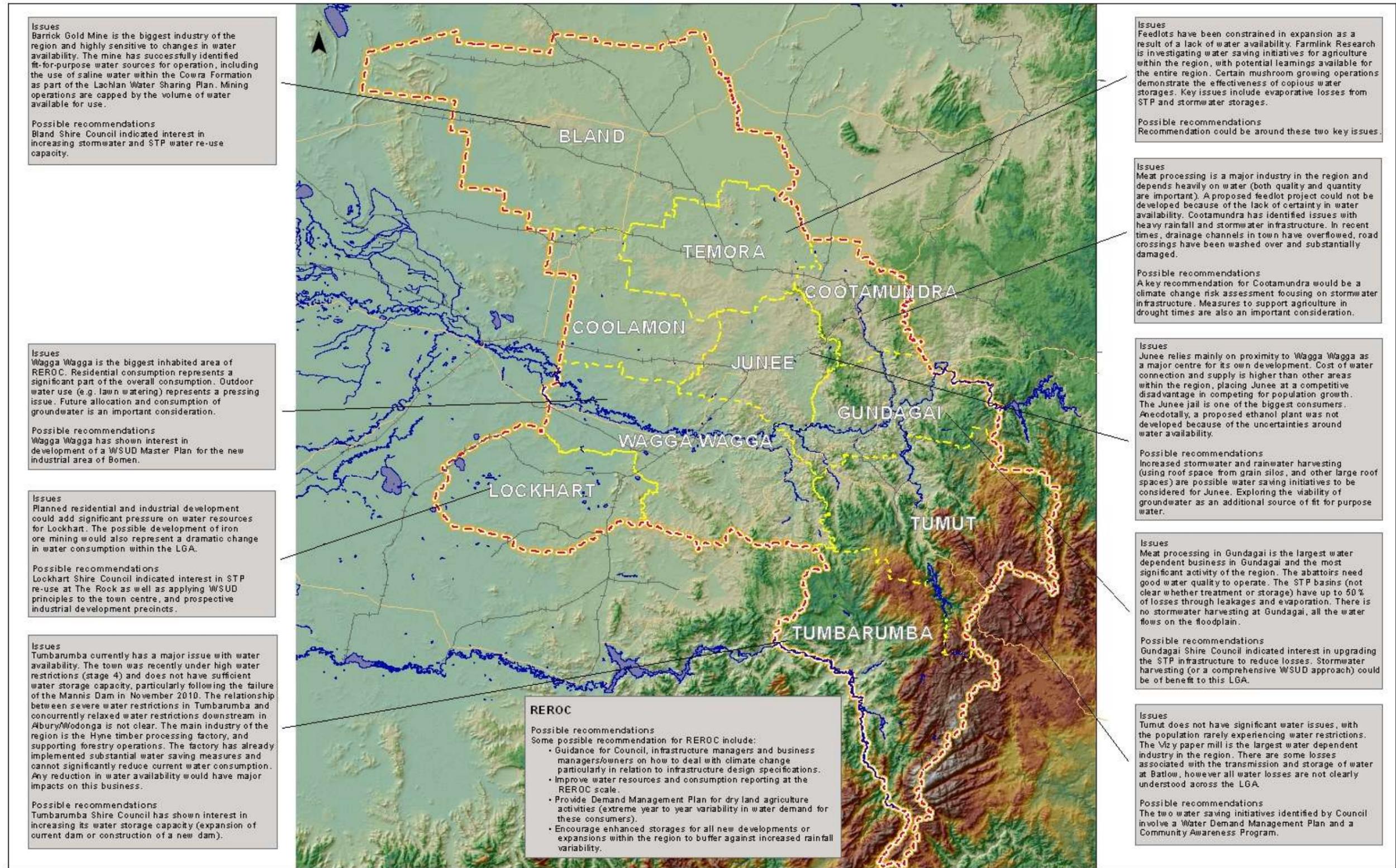


Figure 2 – Strategic axis for adaptation

## 2.2 Results of the Stakeholder's Consultation

The map below was prepared following stakeholders' consultation in the REROC region. The map presents some of the key issues by the participating LGAs as well as some of the possible recommendation suggested by the stakeholders consulted.



## 3.0 Detailed Initiatives Analysis

### 3.1 Residential Water Program

#### Residential Audit Program

##### Objective

1. Promote water awareness
2. Provide some data on households' consumption profiles
3. Identify water saving/efficiency opportunities

##### Description

Framed as a residential audit/household tune-up, it would involve a professional (plumber or specifically trained person) to perform an audit of household water using devices and activities. The audit would determine the consumption profile of the household and evaluate the current performance of the indoor and outdoor water use.

Audit forms as well as clear procedures will have to be developed to ensure that the data is recorded consistently for different households (ideally for different LGAs). Because external auditors would have to perform the audit, clear quality checking and ethics procedures should be in place.

The audit provides a number of benefits including increasing awareness of water efficiency, improved water efficiency and sources end use data specific to each LGA, which could enhance future planning. Typically a 10% to 15% uptake is assumed for these types of residential initiatives.

An alternative to this approach is to provide a kit for a "Do It Yourself" home audit. This kit would include audit forms and supporting materials to help the residents perform the audit on his/her property and report the results. Some resources need to be devoted to the analysis of the data collected through these DIY audits.

Office						
1	☐ Representative building(s) audited					
2	☐ Area (m2)					
3	☐ Estimated water use (k/year)					
4	☐ Water source					
5	☐ Overnight occupancy of building - including transient (bed nights pa)		Peak:			Min:
6	☐ Day time occupancy of building - including transient (FTE pa)					
	Taps	No	Approx L/use	Approx No use/day	Water source	Alternative water source?
7a	☐ No. of hand basins					
7b	☐ No of hand basin taps fitted with flow regulators/aerators					
7c	No. of other toilet taps (for cleaning, etc)					
7d	No. of other toilet taps with flow regulators/aerators					
7e	No. other internal taps (sinks, cleaning, drinking fountain, ice machine, eyewash, etc)					
7f	Proportion other indoor taps w/ flow regulators/aerators					

	Kitchen	No	Approx L/use	Approx No use/day	Water source	Alternative water source?
13a	☐ No. of dishwashers / glass washers					
13b	☐ Comment on dishwasher "star ratings"					
13c	☐ Dishwashers maintained, checked for efficiency (Y/N)?					
13d	☐ No. of kitchen sinks					
13e	☐ Proportion of kitchen sink taps fitted with flow regulators/aerators (%)					
	Showers	No	Approx L/use	Approx No use/day	Water source	Alternative water source?
14a	☐ No. of showers					
14b	☐ Proportion of showers fitted with flow restrictor heads (%)					
	Others	kL/year	Water source	Alternative water source?		
15	☐ Leaks/Others					

The uptake of both approaches can be further enhanced if the residential audit is associated with some form of benefits or if it is a compulsory step to access funding. For instance, the water audit could entitle the resident to a free efficient showerhead or enable access to rebate on rainwater tanks or water efficient appliances (link to initiatives described further in this document).

While such audits are targeting residential use the can also be performed on community buildings and Councils' offices (providing another opportunity to promote the initiative).

##### Implementation

The implementation for this aspect would be driven via the individual LGAs in coordination with REROC and the relevant LWUs.

## Residential Small Fixture and Rainwater Tank Program

### Objectives

1. Improve residential water efficiency in the home
2. Minimise water wastage through leak reduction
3. Increase community awareness of water efficiency
4. Reduce demand on potable water supply

### Description

This initiative would involve the replacement of indoor and outdoor water fixtures to improve current water consumption by installing water-efficient taps, showerheads, toilets and appliances as well as providing recommendations for smarter watering of outdoor areas.

Often taps and other water fixtures flow at excessive rates well above recommended best practice flows. There is a number of water saving devices on the market to reduce the amount of water discharged. For instance an old tap is likely to consume 20-25 litres/minute while an optimal flow restricted tap would consume around 6 litres/minute. Installing new and flow restricted tap usually result in a 20% decrease of water use for sinks and a 5% reduction in leaks. Indicative costs are up to \$100 per showerhead retrofitted and up to \$40 per tap retrofitted.

The small fixture program could include the installation of the following devices:

- Flow restricted taps;
- Spring loaded taps;
- Dual flush toilets (there are three types available with different water use ratios such as );
- Low flow urinals;
- No flow urinals;
- Flow restricted shower heads;
- Biannual replacement of toilet cistern valves;
- Review of appliance efficiency and replacements;
- Flow restricting devices in shower piping.

To maximise efficiency and reduce the complexity of the program a "retrofit kit" could be proposed for existing single family residential housing and would be installed by a Council approved plumber. The kit could contain a low-flow shower head, tap flow restrictors, and a cistern weight for older style toilets. Leaking taps would be repaired.



Another aspect of the program to be explored would be the requirement for every new residential development to fit a rainwater tank to supply water for toilet flushing, cold water to the washing machine and outdoor use. Rebate scheme could also be developed to increase the installation rate and use of water tanks for existing houses.

### Implementation

The implementation for this aspect would be driven via the individual LGAs in coordination with REROC and the relevant LWUs.

## Evaporative Cooling System Audit Program

### Objective

1. Promote water awareness
2. Identify water saving opportunities
3. Improve water efficiency

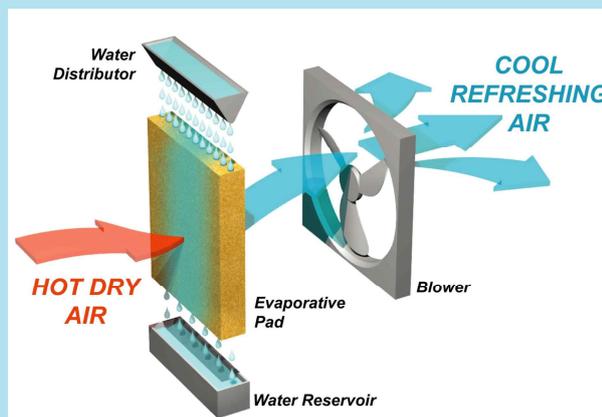
### Description

This initiative focus on an evaluation of the potential to replace existing air conditioning units with evaporative cooling units for both residential and non residential customers.

Additionally an audit of the existing cooling towers in each LGA. Cooling towers require 'make-up' water to replace losses which occur via the following processes:

- Evaporation – water is lost via evaporation which occurs as air passes over the water, removing the heat.
- Drift – water is lost as droplets of water are caught in the exhaust air from the towers.
- Bleed – once the Total Dissolved Solids (TDS) level in a cooling tower reaches a set point, water from the cooling tower basin is dumped and fresh water added to lower the TDS.
- Splash – water lost through splashing which occurs as water falls within the tower.
- Overflow – when the water level in the cooling tower basin exceeds a set point, water is dumped to sewer to prevent the basin from overflowing.
- Leakage – can occur in cooling towers if there is a problem with float valves or the structural integrity of the tower.

Typically 80-90% of the water entering the tower is lost by the processes above. An audit of the cooling towers would ensure that they have been maintained to the correct standards and that they are operating without excessive water losses.



### Implementation

The implementation for this aspect would be driven via the Local Councils. Funding to support this activity may be available under the Strengthening basin Communities program.

## 3.2 Industry water program

### Industry and Agriculture Water Audit Program

#### Objective

1. Promote water awareness
2. Identify water saving opportunities
3. Improve water efficiency

#### Description

Building on the Industry Water usage analysis already conducted as part of this study, the audit would provide greater insights into the current implementation of water management plans across REROC. Based on the survey results as conducted as part of this project less than 20% of water licence holder's surveyed had water management plans in place despite the expectation from 100% of respondents that water was an important or critical factor to their business operation.

The approach would entail:

- 1) Checklist development
- 2) Identification for a number of practical case studies critically assessing water use efficiency covering a range of industries
- 3) Development of Energy and Water Use Model for each case study
- 4) Database construction and analysis
- 5) Report
- 6) In-region presentation of the report and findings

This audit would also identify the needs for training in relation to water management planning within industry.

#### Implementation

The implementation for this aspect would be driven at a regional level by REROC in collaboration with LGAs and water utilities.

## Industry Water Management Planning Guides

### Objective

1. Promote water awareness
2. Share 'best practice'
3. Build capacity within the region to identify water saving opportunities
4. Improve water efficiency

### Description

This initiative would focus on the development of training materials for a variety of industries to develop best practice water management plans. At present less than 20% of the licence holders surveyed had undertaken any water planning activities despite their acknowledgment of the importance of water to their business and expectation that water will become more expensive and less secure.

For each of the audited industries (and key industries identified within paper 4) it is proposed develop a guideline for water management planning. The guideline would specify best practice water management and include:

- Identify key resources currently available
- Present best practices examples as drawn from water audits and research
- Provide outline of the key requirements for water management plan and the steps to take in its development
- Establish a regional forum and accessibility to resources available to support the plan development

Given the widely accepted understanding that water is likely to become scarcer and its importance too many industries, water management planning will become a key factor in successfully managing a business. By building capacity and preparedness within the region the overall resilience of the community is enhanced and the potential impact would be mitigated.

### Implementation

The implementation for this aspect would be driven at a regional level by REROC in collaboration with LGAs and water utilities.

### 3.3 Community awareness

#### Water Awareness Brochure

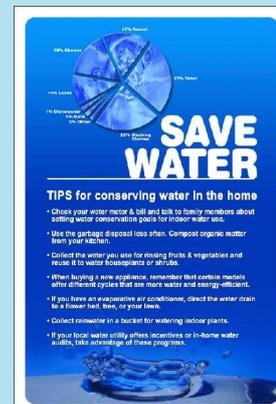
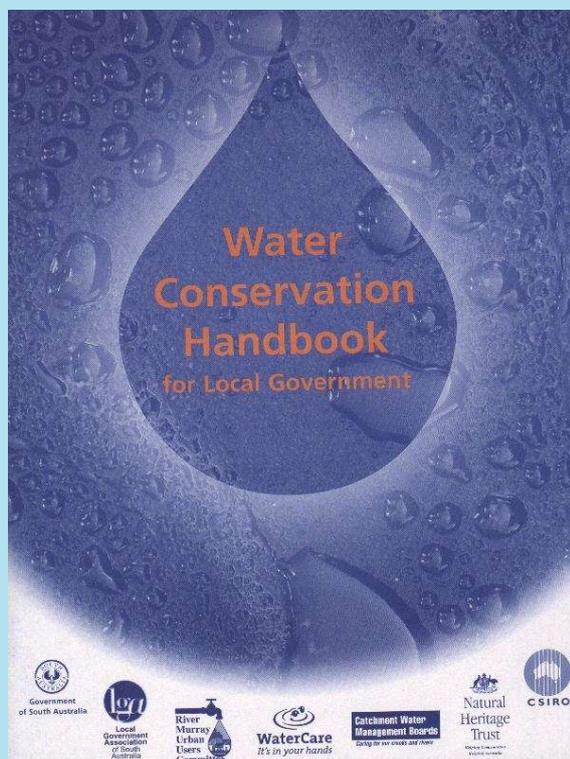
##### Objective

1. Provide REROC with a brochure to raise awareness among the community on water issues

##### Description

Preparing a water awareness brochure represents the simplest step in terms of raising awareness among the REROC community. The preparation of a single brochure would be associated with limited costs but would need to be general enough to capture different target groups (with less efficiency than target groups' specific document).

The brochure could present some of the key findings of the REROC SBC study and some key actions that can be implemented by individual households in terms of water saving measures. Examples of such brochures are provided below.



##### Implementation

This initiative should be managed and implemented by REROC with support from the different LGAs of the region. This approach of community awareness would require limited inputs from the individual LGA for dissemination and follow-up.

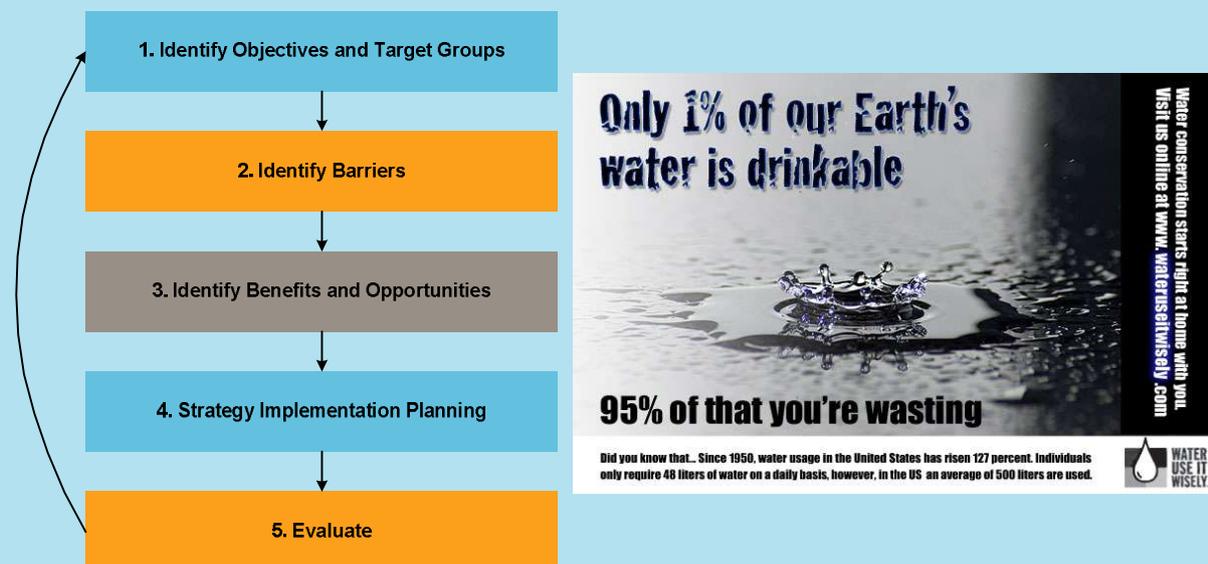
## Comprehensive Water Awareness Campaign

### Objective

1. Provide REROC and associated LGAs with a comprehensive strategy targeting different community groups
2. Addressing various objectives in terms of encouraging behaviour around water use and implementation/acceptance of initiatives

### Description

The step by step approach outline below should be followed first to develop the overall strategy underpinning the delivery of the water awareness campaign.



The objectives should be specific to a target group, measurable and achievable. Initially three target groups would be recommended: households, industries and dryland farmers. The identification of barriers will ensure that relevant strategies are in place to address the different types of subjective barriers (link to perception in the community and stakeholders) and objective barriers (linked to factual issues). The determination of benefits (associated with the general community, specific roles or individual) will help to refine the objectives and to find possible avenues to deliver some of the initiatives. The implementation planning covers the practical aspects of the strategy in terms of costing, schedule, articulation between the different actions/materials and more importantly who is responsible for the delivery. Finally, some form of evaluation should be considered to measure the success and shortfall of the awareness program.

The awareness program should be linked to some of the initiatives to maximise their efficiency. This is particularly relevant for the residential initiatives (e.g. water tank rebates, residential audits) and some of the industrial initiatives. The materials prepared should include a mix of posters, brochures and stickers presenting a common theme in terms of graphic layout.

It is suggested that the awareness campaign use existing communication channels in the LGA (such as local newsletter) rather than trying to develop stand alone channels.

### Implementation

This could be delivered by REROC but will require a minimum level of engagement from the LGA.

## 3.4 NSW Best Practice Guidelines for Water Supply and Sewerage

### 3.4.1 Description

The NSW Office of Water has encouraged best practice management of water supply and sewerage since 1995 (NOW, 2007). Best practice management is defined in the 'Best Practice Management of Water Supply and Sewerage Guidelines'. There are six elements to the guidelines (see Table 1 for details on the elements and corresponding deliverables).

**Table 1 – Elements and Deliverables for NOW Best Practice Guidelines**

Element	Deliverable
Strategic Business Planning	Strategic Business Plan and Financial Plan
Best Practice Pricing	Pricing that is in accordance with the guidelines.
Water Conservation	Demand Management Plan
Drought Management	Drought Management Plan
Performance Reporting	Annual performance reporting to the NSW Office of Water.
Integrated Water Cycle Management	Integrated Water Cycle Management Plan

The functions of the guidelines are to:

- Assist the Minister for Water Utilities to oversee the performance of Local Water Utilities (LWUs) and demonstrate compliance with relevant policies and legislation
- Define 'Best Practice' in the management of water supply and sewerage, according to the NSW Government and in a format that is consistent with the National Water Initiative (NWI)
- Enable the assessment of LWUs using the same criteria
- Enable benchmarking and comparison of LWUs
- Provide criteria for the payment of a dividend from the LWU's water supply and sewerage fund
- Provide criteria for financial assistance under the Country Towns Water Supply and Sewerage Program
- Encourage appropriate and efficient delivery of water and wastewater services
- Promote the efficient use of resources
- Aim to increase the resilience of LWUs and their communities in times of drought
- Support the long term sustainability of LWUs

### References

- DLWC (now NSW Office of Water), 2002, Demand Management Decision Support System.
- DLWC (now NSW Office of Water), 2002, Water Demand Trend Tracking and Climate Correction Model.
- NSW Office of Water (NOW), 2007, Best Practice Management of Water Supply and Sewerage Guidelines.

### 3.4.2 Applicability in REROC

Not all elements of the NOW Best Practice Guidelines are relevant for every water utility and LGA in REROC. Some LGAs and water utilities have already developed or area in the process of developing these plans and tools (see Table 2). See Paper 2 for details on the coverage of each Water County Council and LGAs.

Table 2 – Elements and Deliverables for NOW Bets Practice Guidelines

	Strategic Business Planning	Best Practice Pricing	Water Conservation	Drought Management	Performance Reporting	IWCM
<b>GWCC</b>	<b>X (Water) <i>Developed</i></b>	<b>X <i>Developed</i></b>	<b>X (in conjunction with relevant LGAs)</b>	<b>X (in conjunction with relevant LGAs) <i>Developed</i></b>	<b>X</b>	<b>X (in conjunction with relevant LGAs) <i>Developed</i></b>
<b>RWCC</b>	<b>X (Water)</b>	<b>X</b>	<b>X (in conjunction with relevant LGAs)</b>	<b>X (in conjunction with relevant LGAs)</b>	<b>X</b>	<b>X (in conjunction with relevant LGAs) <i>Draft under development</i></b>
<b>Bland Shire Council</b>	<b>X (Sewerage)</b>				<b>X</b>	
<b>Coolamon Shire Council</b>	<b>X (Sewerage)</b>				<b>X</b>	
<b>Temora Shire Council</b>	<b>X (Sewerage)</b>				<b>X</b>	
<b>Cootamundra Shire Council</b>	<b>X (Sewerage)</b>	<b>X</b>			<b>X</b>	
<b>Junee Shire Council</b>	<b>X (Sewerage)</b>				<b>X</b>	
<b>Wagga Wagga City Council</b>	<b>X (Sewerage)</b>				<b>X</b>	
<b>Lockhart Shire Council</b>	<b>X (Sewerage)</b>				<b>X</b>	
<b>Tumut Shire Council</b>	<b>X (Water and sewerage)</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
<b>Tumbarumba Shire Council</b>	<b>X (Water and sewerage)</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X <i>Draft under development</i></b>
<b>Gundagai Shire Council</b>	<b>X (Water and sewerage)</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>

## Strategic Business Planning

### Objective

1. Increase the accountability of LWUs (to both government and the community)
2. Improve the level of service offered by the LWU
3. Increase the efficiency of the LWU

### Description

Best Practice Strategic Business Planning involves the development of a Strategic Business Plan and Financial Plan. This is used as the key planning tool. Strategic business planning is a key process that will contribute to the financial viability of the LWU. It contributes to the overall effectiveness of the LWU and the ability to plan for and invest in water saving initiatives.

The Strategic Business Plan includes:

- Operating environment review – establishes the context for the water supply and sewerage business, including current and forecast customer servicing requirements and shareholder/regulatory requirements
- Asset Management Plan – including both capital works and operation and maintenance
- Key performance indicators – description of the customer service plan, level of service and human resources plan

The Financial Plan includes a description of how the LWU will finance the level of service that was agreed with the community (this includes finance for operation, maintenance and administration costs, capital augmentation costs, and dividends/tax-equivalents) and be commercially viable in the long term. The aim is for the LWU to provide the lowest Typical Residential Bill while being commercially viable.

## Best Practice Pricing

### Objectives

1. Facilitate consistency with the Australian Government's Strategic Framework for Water Reform, the National Competition Policy, the NWI and local government policy objectives
2. Develop transparent tariff structures and price levels
3. Recover the costs of service provision and receive a return on infrastructure capital
4. Send an appropriate 'pricing signal' to the community to encourage water use efficiency
5. Reflect the cost of water supply and sewerage services
6. Ensure that LWUs give regard to 'vulnerable' customers in price/tariff changes

### Description

Best Practice Pricing includes water supply pricing, sewerage pricing, liquid trade waste pricing, policy and approvals and developer charges. A description of each item is provided below:

#### Water Supply Pricing

The water supply usage charge must recover the costs that vary with demand in the long-term (known as the long-run marginal costs), such as water licence/extraction fees and associated externalities. Where an access charge is required, larger water consumers should pay according to their capacity requirements.

LWUs are encouraged to comply with six water supply pricing principles relating to the long run marginal cost, recovery of residential revenue, large residential water consumers, billing frequency, water access and water usage charges and cross subsidies.

#### Sewerage Pricing

Residential customers are to receive a uniform annual sewerage bill. Non-residential customers are to receive a sewer charge according to the estimated volume discharged to the sewerage system plus an access charge based on their sewer capacity requirements relative to residential customers.

#### Liquid Trade Waste Pricing, Policy and Approvals

A range of items constitute Best Practice in relation to liquid trade waste:

- Trade waste fees are to be in addition to any non-residential sewerage bill
- LWUs must carry out annual inspections of each trade waste customer
- Annual fees are to include the annual trade waste fee plus the cost associated with re-inspection
- Usage charges are to include (where relevant) pre-treatment, excess mass and industrial waste
- Large increases in trade waste fees must be phased in over three years by the LWU
- LWUs must adopt a liquid trade waste policy in accordance with the Liquid Trade Waste Management Guidelines

#### Developer Charges

LWUs are to charge developers a proportion of the up-front costs associated with servicing new developments or modified existing development. LWUs are to prepare a Development Servicing Plan in accordance with the Developer Charges Guidelines for Water Supply, Sewerage and Stormwater.

## Water Conservation

### Objective

1. Efficient use of water resources
2. Reduced capital and operating costs for the water and sewerage systems
3. Reduction in energy use
4. Improved environmental outcomes, in line with the requirements of the Water Management Act 2000 and the NWI
5. Long term sustainability of communities and the environment

### Description

Best Practice water conservation is facilitated through the development of a Demand Management Plan.

The precursor to developing a meaningful Demand Management Plan is demand monitoring (i.e. metering) for all customers (including customers in multi-unit dwellings, where cost effective) and daily recording of bulk water production. The Plan also includes detailed demand forecasting, which should be completed using the NOW's Water Demand Trend Tracking and Climate Correction Model (DLWC, 2002).

The NOW's Demand Management Decision Support System (DLWC, 2002) should then be used to assess of a range of water saving measures including permanent water saving measures, retrofit programs, rebates, building code programs (e.g. BASIX), water saving action plans for large water consumers, water pricing reform, community education, effluent and stormwater reuse and water loss reduction programs. A benefit/cost analysis is included in the assessment, then an investment schedule is developed for the adopted water saving plan. The final component to satisfy Best Practice is effective implementation, which includes demonstrated progress and review every 2 years to check that there is an appropriate balance between demand and supply side investment.

## Drought Management

### Objective

1. Uphold the LWU's responsibility to effectively manage the water supply during drought
2. Effective drought management contributes to the long term sustainability of the LWU and the community

### Description

Best Practice drought management involves the development of a Drought Management Plan. This includes:

- Documentation of water demand, rainfall, evaporation, past droughts (and their impact) and the existing water supply system (including water resources)
- Identification of water requirements/dependence/priority for various end uses, including the non-reticulated population
- Demand management options and restriction strategies (including the expected result of restrictions)
- Formulation of a schedule of suitable trigger points for the commencement of water restrictions
- Identification of supplementary/emergency water supplies (if required)
- The plan or approach for monitoring during drought
- Consideration of downstream impacts

Best Practice drought management also requires a media and public consultation strategy as well as consultation with government agencies.

## Performance Reporting

### Objective

1. Facilitate transparent and streamlined reporting to government and the community
2. Satisfy the requirements of the Australian Government's National Competition Policy and NWI
3. Assess the performance of a LWU against a range of key performance indicators
4. Review performance on an annual basis and progressively identify areas for improvement
5. Enable a LWU to benchmark against other similar LWUs
6. Enable a LWU to analyse trends over time
7. Assess compliance with Best Practice, and therefore whether the LWU has qualified to pay a dividend from the water supply and sewerage fund or receive financial assistance under the Country Towns Water Supply and Sewerage Program; the dividend or financial assistance can be used to invest in water saving initiatives

### Description

Best Practice performance reporting requires that LWUs collect a range of data relating to water supply and sewerage throughout the year, which must be reported to NOW by the 15<sup>th</sup> of September. LWUs log on to NOW's online portal and input their performance data for the previous water year.

In order for the performance reporting process to be meaningful, the LWU should then review their performance against the historical record and against other similar LWUs and set a plan for improvement.

## Integrated Water Cycle Management

### Objective

1. Strategic and integrated management of the water supply, sewerage and stormwater services at the catchment scale

### Description

Best Practice integrated water cycle management is achieved through the development of an Integrated Water Cycle Management Plan. IWCM Plans are to be developed in accordance with the guideline *Integrated Water Cycle Management for NSW Water Utilities* (DEUS, 2004).

The guideline describes the IWCM framework to identify and assess water management problems and formulate an appropriate water management response to manage the environmental, social and economic impacts. The Plan is to cover a minimum 30 year planning horizon and is completed in two phases:

- Phase 1 – IWCM Evaluation (broad identification of water management issues)
- Phase 2 – IWCM Strategy (further definition of water management issues and development of measures to address the issues)

The development of an IWCM Plan is to include consultation with water users, consent authorities, government agencies and the community. Solutions are to be monitored and reviewed every six years.

### 3.5 Diversification and Security of Water Supply and Storage

#### Identify the relative costs of reuse options compared to alternative sources

##### Objective

1. Understand the relative cost and certainty of water recycling options relative to other water supply options, including purchasing water in the open market for each LGA.
2. Ensure water security into the future in the most cost effective manner

##### Description

Undertake a detailed an assessment of the relative cost and certainty of water reuse options relative to other water supply options, including purchasing water in the open market. The methodology for this study component comprises the following steps.

1. Review of existing studies and information on potential potable and non-potable water supply options in each LGA.

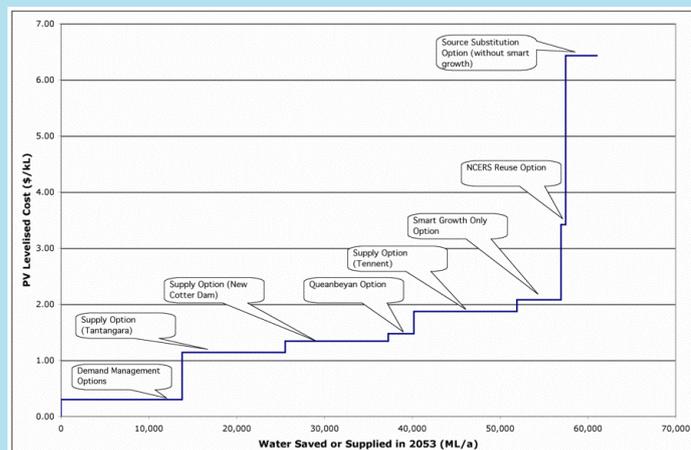
Identification and assessment of available supply options will be undertaken, covering:

2. Purchase of water in the open market

To determine the cost of purchasing water entitlements from the market, the likely purchase costs for various levels of supply reliability as part of a short term or medium term planning strategy can be assessed. For the purposes of assessing the relative cost of purchasing water in the open market, it is proposed to examine both the outright purchase of entitlements, and the value of the relevant water authorities entering into agreements with rural water participants that give the authority the right, but not the obligation, to purchase temporary water allocations. Such an agreement is known in the economic literature as a 'water options' contract. It would only be in the interests of the REROC water authorities to enter into water options contract where there would be a Present Value of Options Benefit (PVOB) from doing so.

In comparing alternative water supply options in an integrated planning context, various criteria may be used, including:

- Volume supplied
- Capital cost
- Operating cost
- Levelised cost
- Lead time
- Health, socio-economic and environmental feasibility and acceptance
- Reliability
- Degree of rain dependence thus potential diversification of risks
- Flexibility (ability to delay cost commitment)



Together, this information provides an understanding the role and cost of each of the above supply sources within an options planning framework that can help determine selection of portfolios with greater flexibility, and the avoidance of early major capital commitment while continuing to deliver adequate security. In particular, the estimated levelised costs of various options (or schemes) can be compared as shown above.

##### Implementation

The implementation for this aspect would be driven via the Local Councils and Water utilities. Funding to support this activity may be available under the Strengthening Basin Communities program.

## Non Potable Water Master Plans

### Objective

1. Identify water saving opportunities
2. Minimise the demand for potable water supply for lower order usage

### Description

Across Australia, water supply agencies are planning and implementing more integrated approaches to meet water demand of a growing population with less water. These approaches use a combination of existing water supply systems, water efficiency and alternative water supply options to balance supply and demand at the lowest net social cost. The focus on balancing supply and demand at lowest social cost recognises that need to provide a level of reliability at the lowest cost borne by the community.

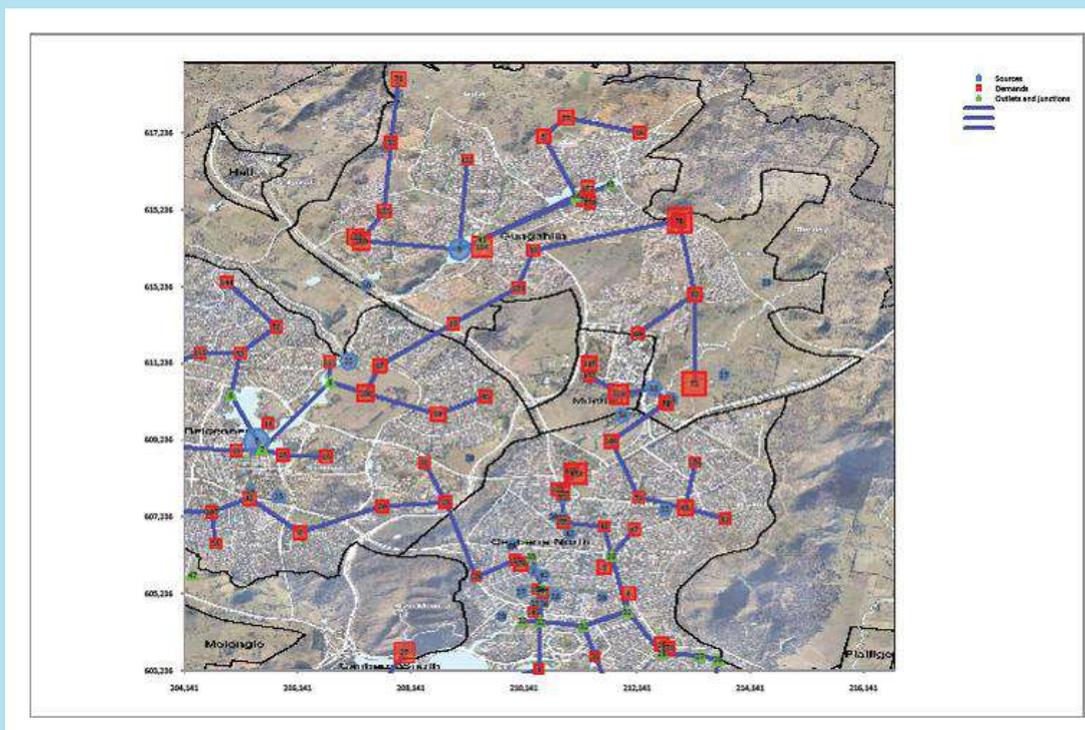
Integrated water resource planning recognises that no single water supply or water efficiency option will be sufficient to balance supply and demand on its own. Rather, achieving this balance will require a whole suite of options, including water-efficiency options (to conserve water and increase the efficiency of its use) and supplyside options (to increase the available supply of suitable water from various sources).

Integrated water resource planning attempts to identify the optimum set and sequencing of options to satisfy the water-related needs of the community at the lowest cost to society and the environment. This involves considering all direct and indirect costs and benefits (including social and environmental impacts) of the range of water management options available, and ranking them according to economic cost.

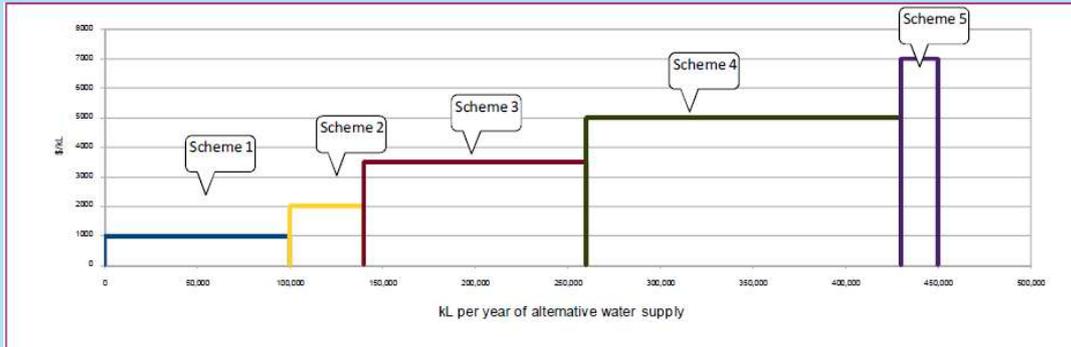
A range of measures then are available to meet demand for water related services, including:

- existing reticulated potable supply from surface and groundwater sources;
- improved efficiency of water use, freeing up water resources and therefore considered equivalent to supply in terms of satisfying demand for water related services; and
- source substitution and reuse, including supply from rainfall via roof or other sources of runoff and
- appropriately treated reclaimed effluent

An example of a non potable master plan developed with a model created by AECOM is provided below.



This model is then utilised to generate output for benchmarking costs for each of the potential schemes.



This modelling presents benefits in terms of understanding where each type of non potable water reuse project may be feasible and allows for greater flexibility in master planning processing for future development. This model can be utilised at a town, region or local industrial area scale.

**Implementation**

The implementation for this aspect would be driven via the Local Councils and water utilities.

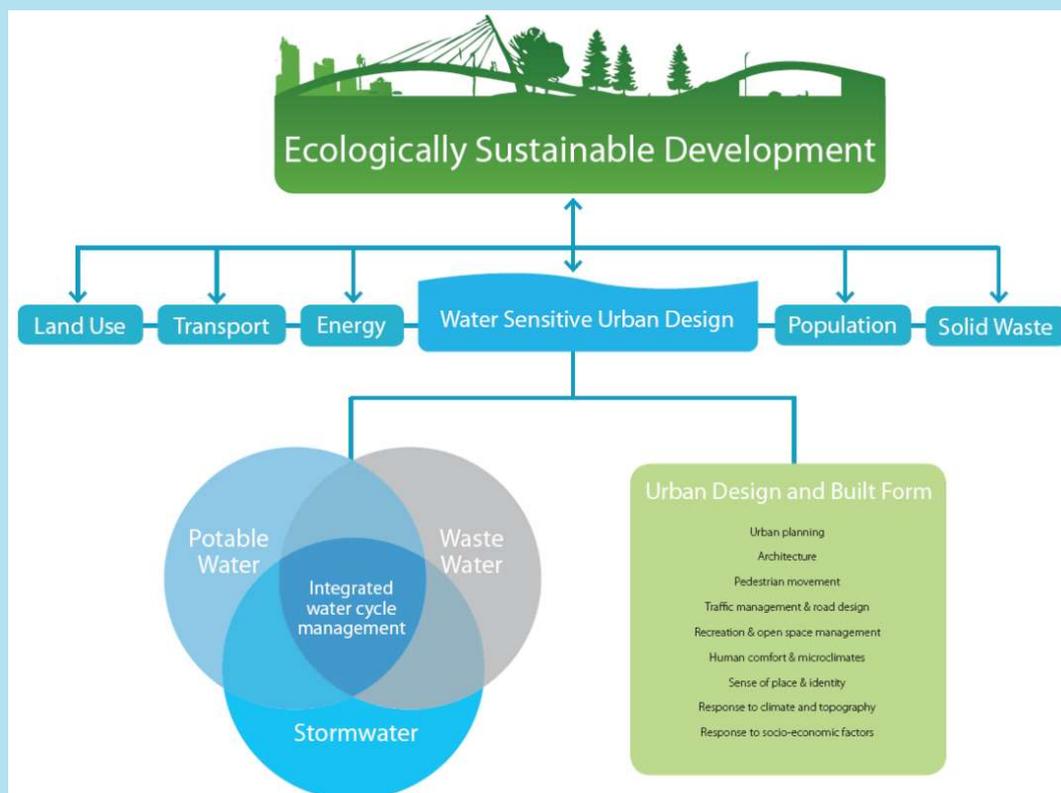
## Development of WSUD Guidelines for REROC LGAs

### Objective

1. Describe the general principles around Water Sensitive Urban Design (WSUD)
2. Provide guidance to help LGAs consider WSUD in their project

### Description

WSUD provides the platform to achieve the overarching Ecologically Sustainable Development (ESD) objectives as shown below.



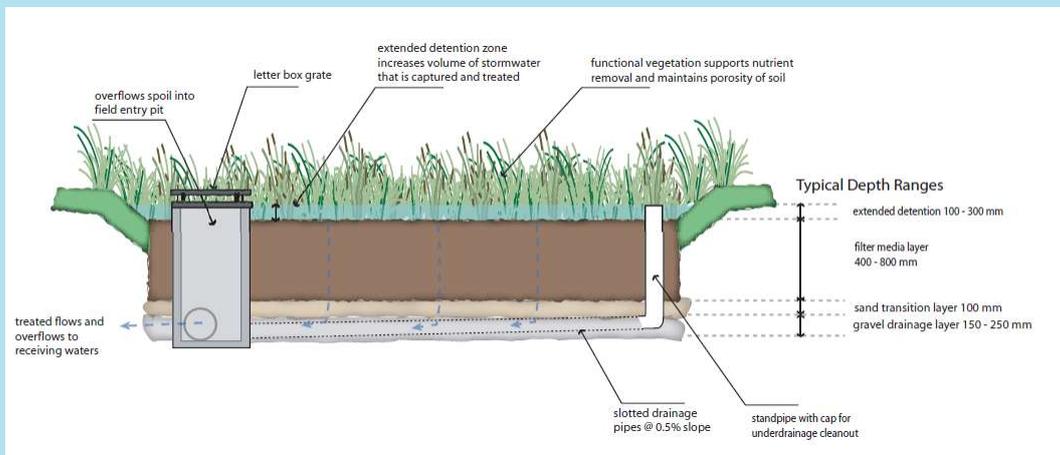
WSUD guidelines would typically address issues around water supply and demand with a strong focus on green infrastructure while also considering the risks associated with non-potable water sources.

The guidelines would include sections to guide practitioners on:

- Green Infrastructure Benefits
- Alternative Water Sources
- Risk Management
- Site Analysis and Water Balance Assessment
- End Use and Treatment Required

More detailed information would be developed for specific green infrastructure elements such as:

- Rainwater Tanks
- Stormwater Biofiltration
- Constructed Wetlands



**Typical Biofiltration System (Schematic Section and implementation in urban context)**

The guidelines would not provide detailed technical information but rather general description of the key WSUD fundamentals. The guidelines would be a relatively short document with a strong emphasis on graphic display of the information and easy to understand principles.

**Implementation**

The development of the WSUD guidelines should be managed and disseminated by REROC as it is not specific to any LGA.

## Development of a WSUD Strategy for Specific Areas

### Objective

1. Provide assessment of the WSUD potential for a site
2. Detail WSUD actions to be implemented

### Description

A detailed site analysis and water balance assessment would be the first step of the WSUD strategy. The following site characteristics should be considered as part of a detailed site analysis:

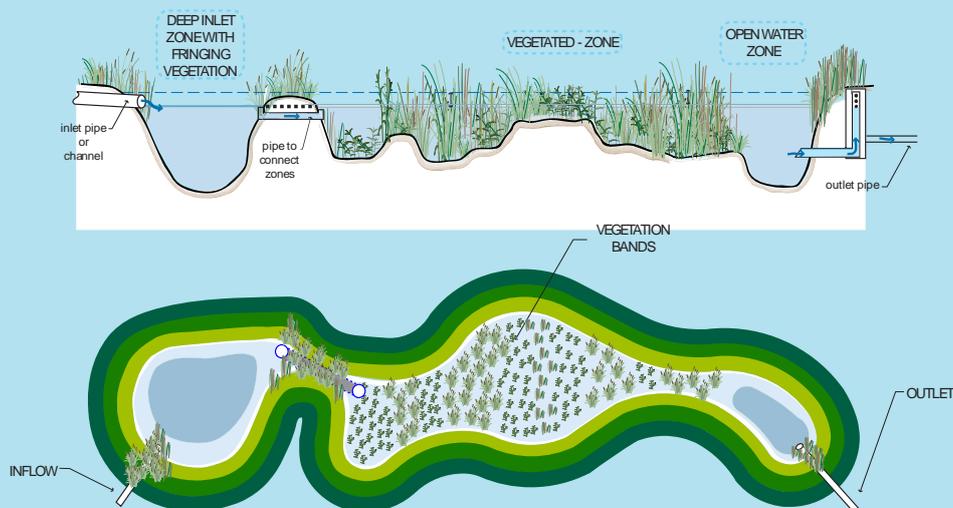
- **Climate** (i.e. rainfall - annual average, seasonal variation)
- **Topography** (i.e. steep slopes, vicinity to natural waterways)
- **Soils and geology** (i.e. suitability for infiltration)
- **Groundwater** (i.e. depth to water table)
- **Salinity** (i.e. acid sulphate soils)
- **Space** (i.e. potential areas for water treatment and storage)
- **Services** (i.e. conflicts with existing and proposed)
- **Environmental** (i.e. significant species)
- **Heritage** (i.e. retrofitting plumbing on heritage listed buildings).

Secondly an assessment of the end use and treatment required should include at least a general water breakdown in terms of:

- **Internal water use:** Drinking, showers, toilets and laundry;
- **External water use:** Irrigation, industrial plant, cooling towers, vehicle washdown;

And an assessment of the suitability of alternative water sources (rainwater, stormwater, groundwater and recycled water).

Finally the strategy should determine the right balance of green infrastructure such as constructed wetland (shown below) to be considered for the site as well as the monitoring, management and maintenance process to be implemented to ensure the long term efficiency of the WSUD measures.



### Implementation

This initiative should be implemented by LGAs or even business. Wagga Wagga City Council expressed interest in developing a WSUD strategy for Bomen industrial area.

### 3.6 STP Efficiency Improvement

#### STP Audit Program

##### Objective

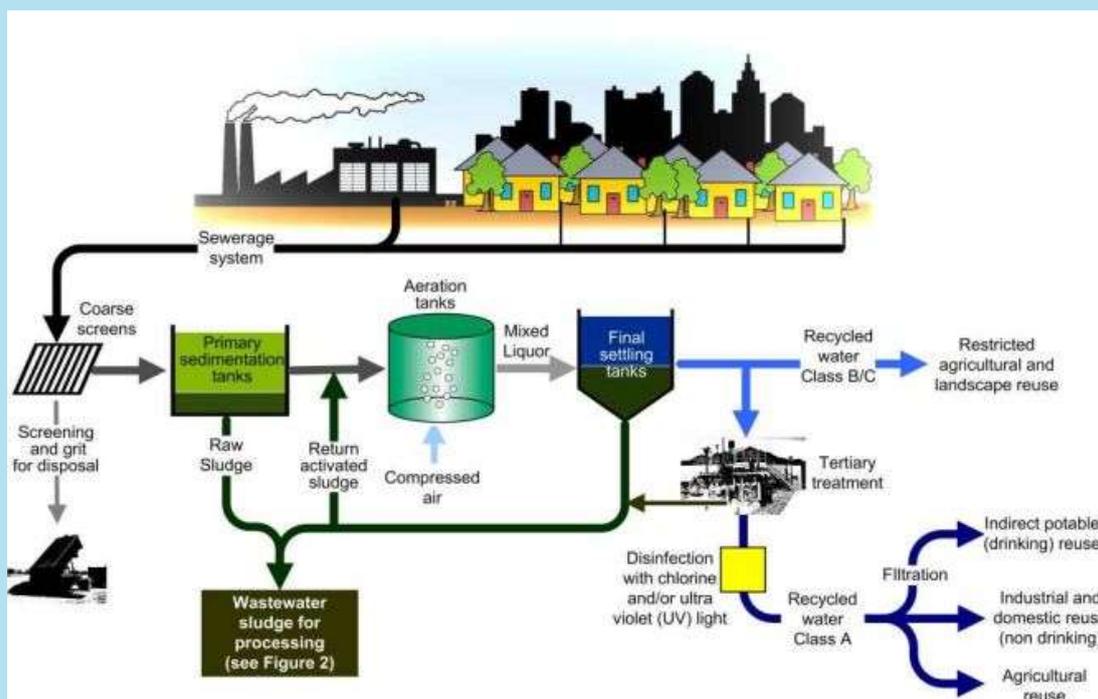
1. Identify water saving opportunities

##### Description

This project would review the Sewage Treatment Plant (STP) operations across LGAs within REROC to determine what volume of water losses may be preventable. Stakeholder interviews have indicated the current stock of STPs are up to 70 years old and losses in settling ponds through groundwater egress and evaporation are up to 60%.

This resource is relied upon particularly during drought to supply water to recreational facilities and minimise the usage of potable water supply. The social value of recreational facilities in regional centres is particularly important. It can also be used to maintain the aesthetic of the towns' parks and gardens, and reduce demand for potable water supplies.

For each LGA the STP facilities would be inspected and losses in each phase determined through analysis of existing monitoring records. The key loss pathways would be identified and options for mitigating such losses would be suggested for further assessment.



##### Implementation

The implementation for this aspect would be driven via the LGAs.

## Feasibility Study for STP water saving initiatives

### Objective

1. Maximise water available for beneficial reuse
2. Minimise water losses

### Description

The treated effluent from the sewerage treatment processes is a valuable resource particularly during drought periods. During the recent drought many areas saw this source become the prime water source for many sporting fields, parks and gardens. Losses through the system can be quite significant and amount up to 60% of the treated volume. A range of options exist for minimising losses from within the STP processes. The major loss points occur during the settlement phase and within storage ponds where water evaporates or is lost through groundwater egress. Key mitigation strategies to minimise this are:

- Lining of ponds with an impermeable barrier, and
- Providing coverage of the pond surface to mitigate evaporation.

A variety of alternatives exist for the implementation of the above strategies and this study would review and prioritise the most feasible for each LGA situation. The cost benefit would be identified in \$/KL of saved water and this could be used to seek funding from sources such as the federal SBC program.



### Implementation

The implementation for this aspect would be driven via the Local Councils.

### 3.7 Climate change risk assessment

#### Climate Change Risk Assessment for LGA's Assets

##### Objective

1. Identify risks brought by climate change to Council's assets.
2. Analyse the risks in terms of likelihood and consequences and determine which risks are the most threatening and which assets are the most at risk.
3. Consider implication for Council's asset and risks management systems.

##### Description

The risks to Council's assets associated with climate change would be analysed as a combination of the likelihood of the risk occurring and the consequences if this risks occurs. The risks would be classified in four risks classes and scored from 1 to 25 (see table below).

		Consequences				
		Insignificant (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
Likelihood	Almost certain (5)	Medium (5)	Medium (10)	High (15)	Extreme (20)	Extreme (25)
	Likely (4)	Low (4)	Medium (8)	High (12)	High (16)	Extreme (20)
	Possible (3)	Low (3)	Medium (6)	Medium (9)	High (12)	High (15)
	Unlikely (2)	Low (2)	Low (4)	Medium (6)	Medium (8)	Medium (10)
	Rare (1)	Low (1)	Low (2)	Low (3)	Low (4)	Medium (5)

A risk table would provide a description of the risks as well as the likelihood and consequences levels. Current control measures by the Council would also be documented. Several time horizons can be considered and would result in difference risk scores (see indicative example below).

Risk Title	Risk Rating 2030	Risk Rating 2070	Risk Description	Likelihood	Consequences
 Damage or loss of power generation facilities	Low (3)	Medium (6)	Damage or loss of power generation (diesel) through increased number of intense cyclones, higher storm surge and more intense flooding. However most power generation facilities are located on high ground.  <i>Moderate control from the Council as all power assets are owned and managed by Power and Water Corporation. The Council provides maintenance services.</i>	1 Rare by 2030.  2 Unlikely by 2070 due to more intense cyclone, significant sea level rise and increased height of storm surge.	3 Moderate by 2030 and 2070 due to damage or loss of power generation. Temporary loss of power to homes and other buildings, refrigeration, pumping, air conditioning and lighting.
 Damage or loss of power transmission and distribution	Medium (9)	High (12)	Damage or loss of power supply from storms damaging transmission and distribution assets. Currently all transmission lines are above ground and are likely to be damaged or destroyed during intense cyclones. Trees are generally cleared in the vicinity of the distribution stations.  <i>Moderate control from the Council as all power assets are owned and managed by Power and Water Corporation. The Council provides maintenance services.</i>	3 Possible by 2030.  4 Likely by 2070 due to more intense cyclone.	3 Moderate by 2030 and 2070 due to damage or loss of power generation. Temporary loss of power to homes and other buildings, refrigeration, pumping, air conditioning and lighting.

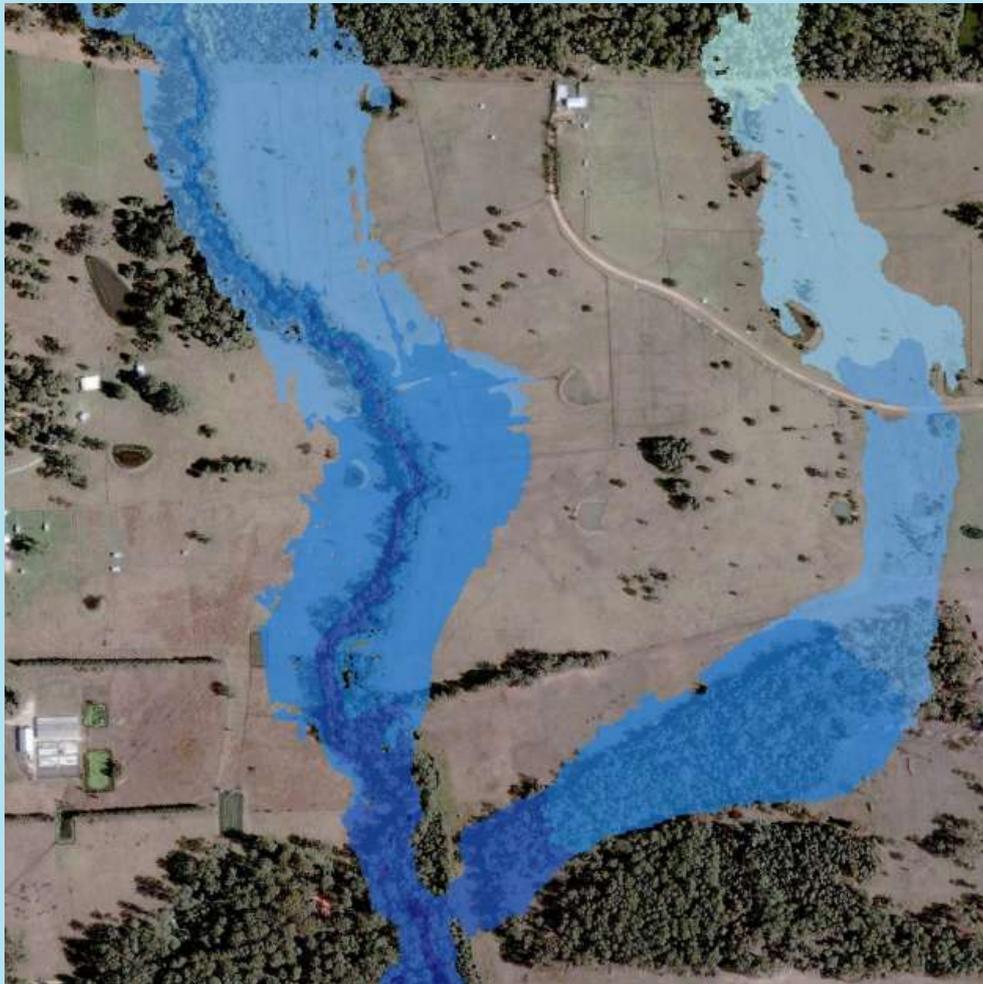
One of the outcomes of the risk assessment is a list of risks showing which ones are the most threatening (see indicative example below).

Classification	Risk	2030	2070
Water Resources	Water shortage	High	Extreme
Power Resources	Loss of electricity supply	Low	Medium
Buildings	Storm and sea level rise damage to buildings	High	Extreme
	Corrosion of buildings and facilities	Low	Medium

Before starting the risk assessment it is important to agree on the assets and time horizons to be considered. The risks considered would include both gradual changes (such as changes in air temperature and rainfall) and changes in extreme events pattern (e.g. extreme precipitation, bushfire, storms).

The risk assessment would typically involve the following steps: review of Council's existing assets and current asset management plans (including maintenance regime), review and sourcing of additional climate change information (gradual changes were analysed as part of the first phase of the REROC SBC project but not changes in extreme events), site visit, risk workshop with the Council and other stakeholders and drafting of the risk assessment.

Additionally some specific risks (such as the most threatening risks) can be further analysed and result in detailed scientific or engineering studies. For instance detailed flood modelling could be performed for areas of specific concern (see indicative example below).



Finally the key findings of the risk assessment can be considered in terms of implications and possible amendment of the Council's current asset management and risk management and potential risk reduction measures.

### **Implementation**

This option should be implemented at the LGA level. The climate change risk assessment will require some inputs from the Councils in terms of data and existing plans but will be mostly developed by an external consultant.

The Cootamundra Shire Council expressed strong interest in understanding the vulnerability of some of its assets to climate change including the stormwater drainage network and some of the roads regularly exposed to wash off from the local creek.

### 3.8 Regional Water Trading Forum

#### Water Management Planning Framework

##### Objective

1. Mitigate risk over water security
2. Maximise regional economic development through preparing and fostering a planning framework which seeks regional water management solutions as a collective body and responds to local issues and needs with its regional capacity

##### Description

A regional based water management planning framework will help the REROC region to address many of the water management challenges that its local governments and businesses are now facing such as how to manage volatility and the loss of growth opportunities such as with the inability to service new industries seeking investment in the region due to a lack of water security.

Primary producers face similar challenges, often finding the water trading market to be inefficient or inadequate to provide solutions to their needs. These producers need feedback and support from other sectors of the region so that they can make the best value of their resources, that is, productivity and earnings derivable from their land and water entitlements. In collaborating with other industry users, better strategies may be developed to improve water allocations, water pricing and supply security. For farmers, this can improve their financial viability.

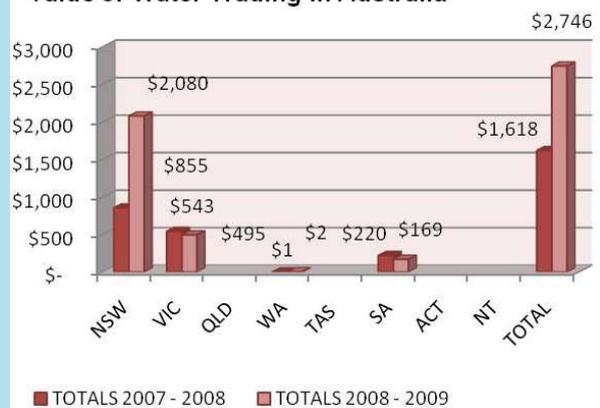
Process and programs that are currently being implemented by regional water authorities and primary producers include:

- Demand management plans;
- Water adaptation strategies including re-use opportunities;
- Water management plans; and
- Better planning and flexibility in regard to crop scheduling and selection.

The water planning framework would be based upon a number of principles which all share the common objective of using the region's aggregate water allocation in a more efficient and effective manner and in a way that brings benefit to the entire region. By providing the mechanism to facilitate knowledge of all water availability in the region, and to project its use, the planning framework would allow for the allocation of the pooled resources to those individual users who need it most.



Value of Water Trading in Australia



The framework would be collective and transparent and would allow for all users to clearly identify where increased allocations would be needed and where this allocation could be sourced from, thus mimicking a mini-market within the region. When looking outside the region, the framework would allow for the region to buy and sell water as a single entity, thus achieving greater economies of scale, allowing for greater cost efficiencies to be captured, and more easily facilitating temporary transfers of water if needed.

The benefits of developing this framework would be to increase the region's flexibility to respond to water allocation issues.

- Market performance would be improved through improved inter- and intraregional water trading data becomes available.
- Acting as a collective would lessen volatility, allow for the region to service the water needs to local government areas thus allowing for investment attraction of specific industries which they otherwise be unable to accommodate.
- Acting as a single entity allows for the region to solve local problems efficiently and to facilitate greater regional benefit. In assessing water adaptation strategies from a collective perspective, it is necessary to assess what the overall outcomes are for the entire region and to set objectives for the achievement of certain sustainability targets together.
- In seeking regional water management solutions as a collective body, local water management issues and deficiencies can be addressed with regional capacity.
- The region as a whole is better positioned to offer reliable water supply to potential new industries, many of which would include medium intensity users seeking secure supply and affordable water prices i.e. compared to that in capital cities or other major urban centres

#### **Implementation**

The development of this framework will require the cooperation of water utilities who, if not interested in formal amalgamations, should at least have shared services and integrated core operations which will allow for them to pool their services and capacities and to work as a regional authority.

### 3.9 Economic Diversification

#### Economic Diversification Strategy

##### Objective

1. Assess the potential for regional economy and its various industry sectors, and specifically the agricultural sector, to both diversify and adapt
2. Provide an overall strategy outlining what actions could be implemented to facilitate the transformation both the at the individual level (skills transfer) and at the business/sector level (diversification)

##### Description

Economic diversification is a long term, holistic process which requires all levels of government, industry and the community to be proactive.

The first steps are to identify the competitive and comparative advantages within the region and in the local government areas and to build upon or leverage these advantages to facilitate economic development and investment attraction. Processes necessary to identify these advantages include the development of a comprehensive industry and economic profile utilising qualitative and quantitative tools such as location quotient modelling, strategic asset assessments, cluster mapping and detailed stakeholder consultation.

Location quotients demonstrate the degree to which a local economy is specialised by examining the proportion of employment in an industry sector to a larger economy. The economy of a local government area can be compared to neighbouring councils or to the region as a whole; a regional economy can be compared to the state and national economy. Location quotient modelling identifies the strengths and weaknesses of the local economy and its natural comparative advantages.

Cluster mapping builds upon location quotient modelling by comparing the local industry employment against employment growth over time on a national and state level. This allows for the identification of growth opportunities in specific industry sectors where a competitive advantage already exists.

A strategic asset assessment builds further on the location quotients to identify additional competitive advantages by highlighting unique and specific assets in the region that can be leveraged for economic development. These assets can include: key transport infrastructure, geographic and environmental characteristics, skill set of the local or regional workforce, proximity to tertiary education facilities or scientific institutions or any other assets of the local economy that can provide opportunities for significant growth, when combined with other existing competitive advantages.

Compiling and assessing the data from these tools coupled with findings from detailed consultation process with local government and industry stakeholders allows for the identification of the regional and local competitive advantages that can be built upon to attract new industries and investment. By identifying what the region is good at, what strategic assets the region can be leveraged and what kind of new industries would be synergetic with the skill set of the workforce and existing industries, a more narrowly targeted program of investment attraction can be developed which over time can lead to the diversification of the economy, thus contributing to its sustainability.

##### Implementation

REROC LGAs would need to work closely with state and national agencies to develop policy that fosters innovation, promotes transference of skills to higher value add, knowledge based economic development. The private sector and the community need to embrace the notion that the diversification of the economy and the gradual shift to higher value add activities will lead to greater sustainability of the regional economy and strengthen their community. This initiative could be promoted and managed by REROC.