CENTER FOR TECHNOLOGIES IN WATER AND WASTEWATER
Submission To Water Management Legislative Assembly Inquiry Conducted By The Natural Resource Management (Climate Change) Committee

ABOUT THE CENTRE

The Centre for Technology in Water and Wastewater (CTWW), at the University of Technology, Sydney undertakes research to ensure the sustainable management of our water resources in both urban and rural environments. The Centre's research activities expand within Australia as well as internationally.

The Centre links researchers, government, industry and community partners through its research programs, which include Energy Efficient Desalination Technologies, Decentralised Waste Water Treatment Technologies for Non-potable Reuse, Stormwater and Rainwater Harvesting, Membrane based Water and Wastewater Treatment

More information about the Centre and its current research projects can be found at: http://www.research.uts.edu.au/strengths/ctww/

PROJECTED CHANGES TO CLIMATE

Climate Change will have an adverse impact on water management, on a longer time scale. Rising sea levels will increase the frequency of flooding of low- lying coastal areas with adverse impacts on coastal water infrastructure. The intrusion of salt water into wetlands and aquifers will adversely impact on these systems. It is important not to overlook the likelihood that there will also be adverse impacts on water-related environmental values in inland waterway systems and water supply catchments. Changes to river flow patterns will adversely affect river health and necessitate a reassessment of the sustainability of water extraction patterns.

Potential impacts of climatic change in the areas related to water infrastructure are summarised in Table 1. These areas include water supply, water delivery systems, sewerage system, stormwater systems, floodplain and coastal management, and infrastructure such as dams and bridge.

Potential Risk Areas	
Water Supply	Reduced water supply due to decreased streamflows Reduced environmental condition of streams with associated implications for water harvesting in regulated and unregulated streams. Requirement for environmental flows to balance salt wedge intrusion into the river system Increased risk of bushfires in catchment areas with associated risk of decreased streamflow

* from CSIRO climate change reports

Potential Risk Areas	
Sewerage System	Increased incidence of sewer overflows due to increased rainfall intensity during storms Increased salinity levels in recycled water due to rising seawater levels Increased potential for corrosion and odours in the sewerage network caused by increased sewage concentration as a result of lower dry weather flows associated with water conservation, increasing ambient and seasonal temperatures, and longer travel times within the sewer network Potential implications for sewer mining Increased risk of pipe failure and collapse due to dry soil conditions
Stormwater Systems	Increased risk of flooding due to increased rainfall intensity during storms and changed boundary conditions due to higher sea water level Increased risk of damage to stormwater infrastructure and facilities (e.g. underground drains, levee banks, pump stations etc) due to higher peak flows
Receiving Waters	Reduced health of waterways due to changes in stream base flows Potential for water quality impact in estuaries due to increased concentration of pollutants entering bay (longer periods between runoff events and then high intensity events leads to concentrated pollutant runoff) and higher ambient bay water temperatures. Increased sedimentation in WSUD structures (wetlands) leading to frequent maintenance
Floodplain and Coastal Management	Increased frequency and severity of flood events are uncertain Increased flood related injuries and fatalities. Increased damage to flood risk property and infrastructure. Increased erosion of beaches and shore line recession. Undermining and collapse of structures near the shoreline beach including residential buildings, roads, sea walls, etc
Bridges, Dams and water related infrastrucuture	Increased erosion and undermining of bridge foundation leading to failure of bridges Increase of large floods and the consequent impacts on the integrity of dams walls.
Alternate Energy	CO_2 production from fossil fuel. Alternative energy is required. Biosolids as a source of renewable energy to provide energy for STPs and reuse plants Sludge disposal from wastewater treatment plants.

ADAPTION STRATEGIES

The Centre believed that one of the best adaptation strategy to climate change is the exploration of non-traditional water management options including 1) Decentralised water systems to cut down the replacement of ageing water infrastructure and energy cost due to pumping. 2) Energy recovery and use of alternative energy sources in water reuse and desalination practices.

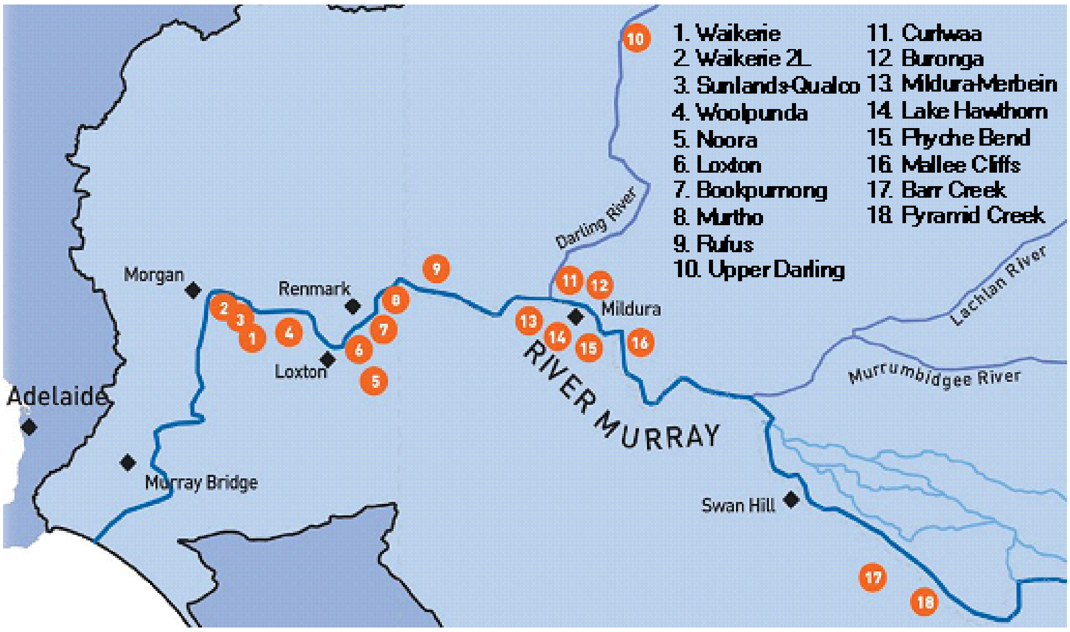
The water supply infrastructure of the future will inevitably be different from those of the past. Over the recent years, the Centre has been working on adapting water and wastewater technologies to lower their greenhouse gas (GPG) impact and reinforcing the link between energy production and water management by integrating water and waste water systems with alternative energy.

In this submission, we would like to highlight one of our current research interests in the area of water recovery from Salt Interception Schemes (SIS) along Southern NSW. The Centre is currently working on ways to modernize SIS, into productive source of water for inland NSW.

DESALINISATION OF SALINE GROUNDWATER

Since 1988, the States of NSW, Vic and SA together with the Commonwealth Government have funded the construction of salt interception works, which resulted in a reduction of 80 EC units at Morgan. To achieve this reduction, these salt interception works have together pumped about 55 000 megalitres of saline water from the water tables each year, resulting in about 550 000 tonnes of salt being kept out of the River Murray each year

In the Murray Basin, there are currently 12 operational SIS bore fields, another 3 approved for construction and a handful of smaller schemes under investigation (Figure 1) (Telfer et al., 2008). The intercepted saline groundwater is disposed of by evaporation and infiltration away from the river.



SIS location of the Murray River (MDBC, 2008)

To maintain Morgan salinity at 800 EC or less for 95 per cent of the time, for the life of the Basin Salinity Management Strategy (2015), a further reduction in salinity of about 100 EC at Morgan will have to be found by new engineering works. Desalination of saline groundwater for productive use, provides one such engineering option.

Scenario 1: Drinking water supply from saline groundwater

- Mildura's population is about 30,016. It is Victoria's biggest user of drinking water obtained from the Murray River. Households in the state's far north-western town used an average of 348 L per person per day in 2008 (NEWS, 2009). The total water consumption was 10.5 ML/d.
- With six SIS near Mildura namely Mallee Cliffs, Curlwaa, Buronga, Mildura-Merbein, Lake Hawthorn and Psyche Bend, totalling about 60 ML/d of groundwater pumped. The amount of drinking water volume after RO desalination provides sufficient drinking water and other purposes.

Scenario 2: Irrigation purpose in Mildura

- Mildura has the large sports and recreation complex which require large amount of water flow for the irrigation purpose. Irrigation for the above purposes can be replaced with the desalted water from a RO desalination plant.
- Water for the purpose of irrigation in the Midura area does not require the drinking water quality, which results in the significant decrease of the RO operating costs.
- This will provide extra dilution to the Murray River, rather than utilising the Murray River for the irrigation. This scenario could save up to more than 22,000 ML of irrigated water over 25 years.

Scenario 3: Direct dilution of the Murray River

- The Basin Salinity Management Strategy (2001-2015) has invested $60 M through many joint programs of SIS to decrease the salinity up to 61 EC at Morgan. However, it is still on-going challenge and such a target may not be achieved due to climate change and increasing severe drought.
- Direct dilution of the Murray River using the desalted water from saline groundwater is one of potential scenario to deliver 61 EC at Morgan.
- The Murray River discharges 750 kL/s (64 ML/d) at the Murray River Mouth, near the river port of Goolwa. Considering desalination from the 18 SIS locations, they produce 180 M/d of desalted water from saline groundwater. This will lead to 3 times dilution of the saline Murray River.
- The MDBA accounts for the majority of water trading activity in Australia. The most recent sales of water from the Murrumbidgee River allocations are $600/ML for temporary transfer (Leeton, 2009).

Extra benefits after desalination of saline groundwater

- Concentrated salts after RO membrane and distillation desalination can be easily recovered for the uses of table salt, swimming pools, the tanning industry, gypsum, bitterns (dust suppression), fertiliser and a de-icing agent.

Renewable energy

- Desalination has been regarded as a cost-intensive process due to high energy requirement. The cost of electricity has been assumed as $0.10/kWh. For RO units using power generators the cost of power is assumed to be $0.30/kWh based on a 3 kWh/L (assumed diesel cost of

$0.90/L). This high energy cost can be replaced by renewable energy such as wind powered desalination. The renewable energy will also minimise carbon emission.

OTHER BENEFITS

Desalination of brackish groundwater can also provide an alternative water supply to many other inland towns. For example Broken Hill currently relies on water supply mostly sourced (via pipeline) from the Menindee Lakes, a group of nine shallow lakes and the main water storage system on the Darling River. The Menindee Lakes are also a critical environmental and indigenous heritage asset.

To ensure at least eighteen months supply for high-security entitlement holders, such as Broken Hill, a total volume of about 270 GL must be kept in the Menindee Lakes to allow for high rates of evaporation and other transmission losses. The Menindee Lakes are subject to very high rates of evaporation, estimated to average up to 400 GL/year.

Desalination of brackish water offers a viable water supply option for Broken Hill with the benefits of reduced evaporation and transmission losses resulting from the significantly reduced need to store water at Menindee Lakes; generation of water savings for the greater Murray-Darling River basin which will contribute to economic development in the region; improved environment and the ecological health of the river; protection of the quality and security of water for existing users.

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