Alternative water supply options for the Hunter and Central Coast Regions of NSW

March 2007

Prepared by:

SUSTAINABLE WATER SOLUTIONS Pty Ltd

This page is left blank intentionally

Document History & Status

Issue	Revision	Author	Issued to	Date	Reviewed by	Approved for release
1	1	CE		15/02/07		
1	2	CE		19/02/07	CS	
1	3	CE		22/02/07	CS	CE
1	4	CE		24/02/07		
1	5	CE	Client	01/03/07		CE
2	a	CE	CS	04/03/07		
2	b	CE	Client	06/03/07		CE

Charles Essery
Managing Director
6th March 2007

Created By: C. Essery
File Name:
Project Manager C Essery
Client Organisation "No Tillegra Dam Group"
Name of Project Tillegra alternative options report.
Name of Document: Alternative water supply options report for the Hunter and Central Coast regions of NSW
Document Version: Tillegra paper 2vb
Project Number: SWS_20078

CONFIDENTIAL

sustainable water solutions pty ltd
PO Box 232, Brooklyn,
Sydney, NSW 2083,
Australia.
ABN 48 107 167 457
Phone (++612) 9985 8472
Fax (++612) 9985 8471
www.swspl.com.au

Overview of sustainable water supplies for the Hunter and Central Coast regions, without the construction of a new dam at Tillegra, on the Upper Williams River

Prepared by
Dr Charles I Essery
Sustainable Water Solutions Pty Ltd
on behalf of the "Say No to Tillegra Dam" group

Traditionally, urban areas have only survived and grown through investment in water infrastructure, i.e. dams located in distant rural areas and the associated water pipes, sewers and waste water treatment plants.

In the case of The Hunter, the Williams River has two dams (Chichester and Grahamstown) which, combined with extensive groundwater supplies, can provide a secure water supply more than 10% above the current demand. In contrast, Sydney's normal water supply has a security level that is 10% lower than current demand. To date, the Hunter region has invested in this traditional approach to meet it current demand. But what about future demand for water over the next century?

Many of our capital cities, in particular Brisbane, Sydney and Perth, do not have excess water supply. These cities are investing heavily in solutions such as desalination (Sydney, Perth) or the more resource efficient solution of recycling (Brisbane). Dams are rarely built now, for three main reasons:

- they are expensive to build and have significant environmental costs;
- Most of the "best" sites have already been used; and
- Modern technology and improved engineering have made alternative practices such as rainwater harvesting in cities, recycling (either seawater or effluent) and water conservation more attractive and cost effective.

Over the last 5 years, both the Hunter Water Corporation (HWC) and Gosford & Wyong Water Authority (GWWA) have studied their water resource needs, yet none on these studies recommended Tillegra Dam. Equally so, neither organisation has seriously embraced the value and need for improved urban water harvesting and recycling.

The fast-tracking of a new dam at Tillegra on the Upper Williams River ignores these advances in thinking and represents a decision that is economically, environmentally and socially flawed.

Background information on the water supply for the region

The Hunter Valley has an abundant supply of rainfall and extensive reliable groundwater supplies. Its current yield is 79 billion litres per year and consumption is at circa 72 billion litres per year. The Hunter does very little recycling (4%) and only 0.1% percent of households have rainwater tanks.

The sudden move to build the Tillegra dam suggests a hurried and somewhat ill-considered approach to developing a sustainable and cost-effective future for water in the Hunter Valley. The motivation for this move actually stems from outside the Hunter, through the extensive population growth of the Central Coast, and the NSW Government's policy resistance to the obvious solution of recycling existing supply.

The Central Coast water supply is the responsibility of the Gosford Wyong Water Authority (GWWA). Currently this region has a dam at Mangrove, groundwater supplies and is building transfer pipes from Mardi Creek to boost supply. Four small desalination plants are being built as a contingency measure. Like the Hunter, rainwater tank usage is low (3.6% percent). However, the water authority now recycles 5.5% of its effluent for recycling at a number of golf courses and landscaping projects.

Tillegra Dam is intended to become the source of water for the Central Coast, fed by a new network of pipe lines which will cross the Hunter Valley from north to south.

Impact on the Hunter

Population growth on the Central Coast has forged a permanent connection to the Hunter region and is forcing Hunter Water Corporation (HWC) to augment it water supplies some ten years before it is required for the people of the Hunter Valley. By committing to Tillegra Dam, the Hunter's opportunities to develop and implement other measures such as urban water harvesting and recycling will be hampered, due to the massive investment required to build the dam.

Although Tillegra Dam is not required to meet the needs of water consumers in the Hunter Valley, it is the Hunter Valley consumers whose water rates and usage charges will rise to pay for the construction and maintenance of this new infrastructure. The exact costs are unknown as HWC has not submitted its pricing changes to the Independent Pricing and Regulatory Tribunal (IPART). However, when infrastructure of this magnitude is introduced into a water authority, it is not uncommon for water rates to increase between 25-50%.

In addition, the dam location is on a geological fault and will require significant and costly strengthening measures to ensure that the dam is safe and will not breach during a flood or seismic event.

HWC has not (as yet) released it geotechnical reviews and until these can be reviewed and verified, the project is still classed as an investigation - yet it is being announced as a "*fait-*

accompli". This is premature, as significant costs (often tripling the original cost estimates) may be required to build a safe dam in such a complex geological region.

In the flooded dam area, 90 families, their associated farms and culture would be a localised casualty to enable the transfer of water from Hunter to Gosford/Wyong. This cost is being dismissed by the government as negligible, yet from experience in over 300 water and wastewater projects in NSW, this lack of management is unheard off and may prove a major strategic mistake for the government and HWC. Community acceptance and fairness dominate all water resource projects. These projects are built to last for centuries and alter communities dramatically. As such, community consultation and evaluation can not be dismissed.

Elements of the water cycle that can be accessed

In urban areas, the traditional approach to water cycle management generally involves harvesting, water treatment to a high standard, discharge of wastewater to the sewerage reticulation system, wastewater treatment to a high standard and discharge into the environment (rivers, ocean or land).

This approach has been shown to be an inefficient use of natural resources and also to be detrimental to the environment. Under the current linear approach, water is used once and discarded, despite the significant effort and infrastructure that has been used to collect and transport the water to urban users. In extracting this water, catchments and rivers are permanently impacted, while the discharge of low-medium quality effluent remains a very significant environmental issue for communities.

Currently both the Hunter and Central Coast regions operate very traditional water supply and wastewater systems. These systems:

- harvest and store catchment runoff (approx 85% of supply);
- access localised groundwater (approx 15% of supply)
- discharge the treated wastewater to local creeks or oceans (about 95%); and
- undertake some limited wastewater recycling (approx 4% in Hunter and 6% in the Central Coast).

In addition, the Central Coast is experimenting with 4 temporary seawater recycling plants.

A basic summary of the water systems of the two regions in summarized in **Table 1.** Neither organizations have this information readily available on their web-site and hence much of this information has been gathered from external agencies

Table 1 Summary of water supplies and potential sources for growth in demand.

Attribute	Hunter Water Corporation	Gosford & Wyong Water Authority
Properties served (2006)	213,913	125,200
Population served (2006)	517,403	305,000
Catchment area (km^2)	7300	723
Per capita consumption (lires/day)	350	329
No. of Storage dams	3	3 plus 3 weirs
Volume of water consumed per annum (billion Litres)	73	33[1]
No, of Wastewater Treatment plants	17	7
Volume of Waste water discharge per annum (billion litres)	66	27
% of wastewater recycled	4%	5.5%
No. of Rain tank rebates (% figures in bracket italics)	250 (*0.05%*)[2]	4500 (*3.6%*)

[1] *These yields are taken from the GWWA water plan 2050. They seem optimistic and given the moves towards desalination and the sudden need for Tillegra.*
[2] *Numbers based on 2006 annual report, despite unsuccessful request from Hunter Water for up-to date numbers.*

The majority of Australia's water industry is developed around the linear model of collecting, storing, treating, distributing, and then discharging the water. As such the main management focus has been on improving the performance and efficiency of demand and waste management.

The discharged water is often at a quality that is less than the source water. Very little water is reused or recycled, very little rainfall or stormwater is captured and used in the urban scene, and opportunities to deliver water that matches the needs of the user are continually missed. As a result per capita usage of water is high and it is difficult to store sufficient water to provide a secure supply during drought periods.

This situation is summarised in **Figure 1.**

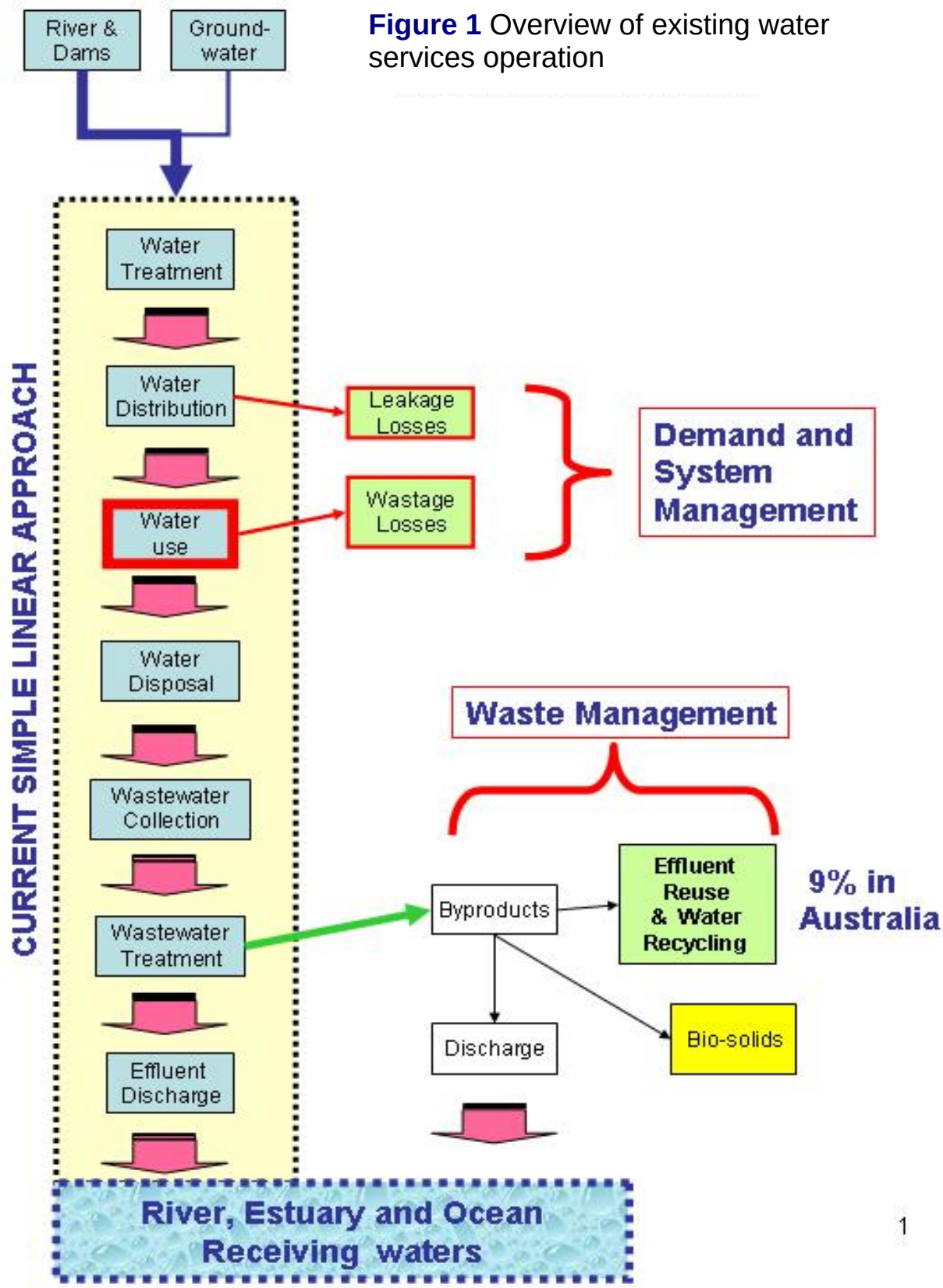


Figure 1 Overview of existing water services operation

In recent years, supply shortages, increasing environmental standards, new technology and climate change, have driven management and technology within the Australian Water Industry (AWI) to balance supply and demand. In turn, this has highlighted the importance of consumer/market demand management along with a greater emphasis on the management and engineering of water cycles.

In other countries and some locations within Australia where water is scarce, authorities have adopted recycling of water to augment supply, reused water to reduce discharge impacts and in some cases offered dual reticulation supplies. This is what has become known as sustainable water cycle management.

Under this approach, there is the potential to move from simple extraction of water and supply of limited services, to an industry that offers a range of targeted products appropriate to differentiated community requirements.

This approach involves integrating the use of the elements of the water cycle (surface and ground water, stormwater and wastewater) to maximise efficiencies, match water qualities to need/usage, and to reduce pollution. Sustainable water cycle management involves:-

- Management of traditional water supply, wastewater infrastructure and all the associated management/technical services that currently exist;
- Management and development of new water sources that are currently unused e.g. urban stormwater, rainwater and new water sources;
- Introduction of new infrastructure and management systems that can integrate and maximise opportunities for water cycle management e.g. recycling plants and the infrastructure to supply multiple grades and service levels to consumers; and
- Consideration of ecological, planning, economic, health risk and community requirements in the development of water cycle service access and use charges.

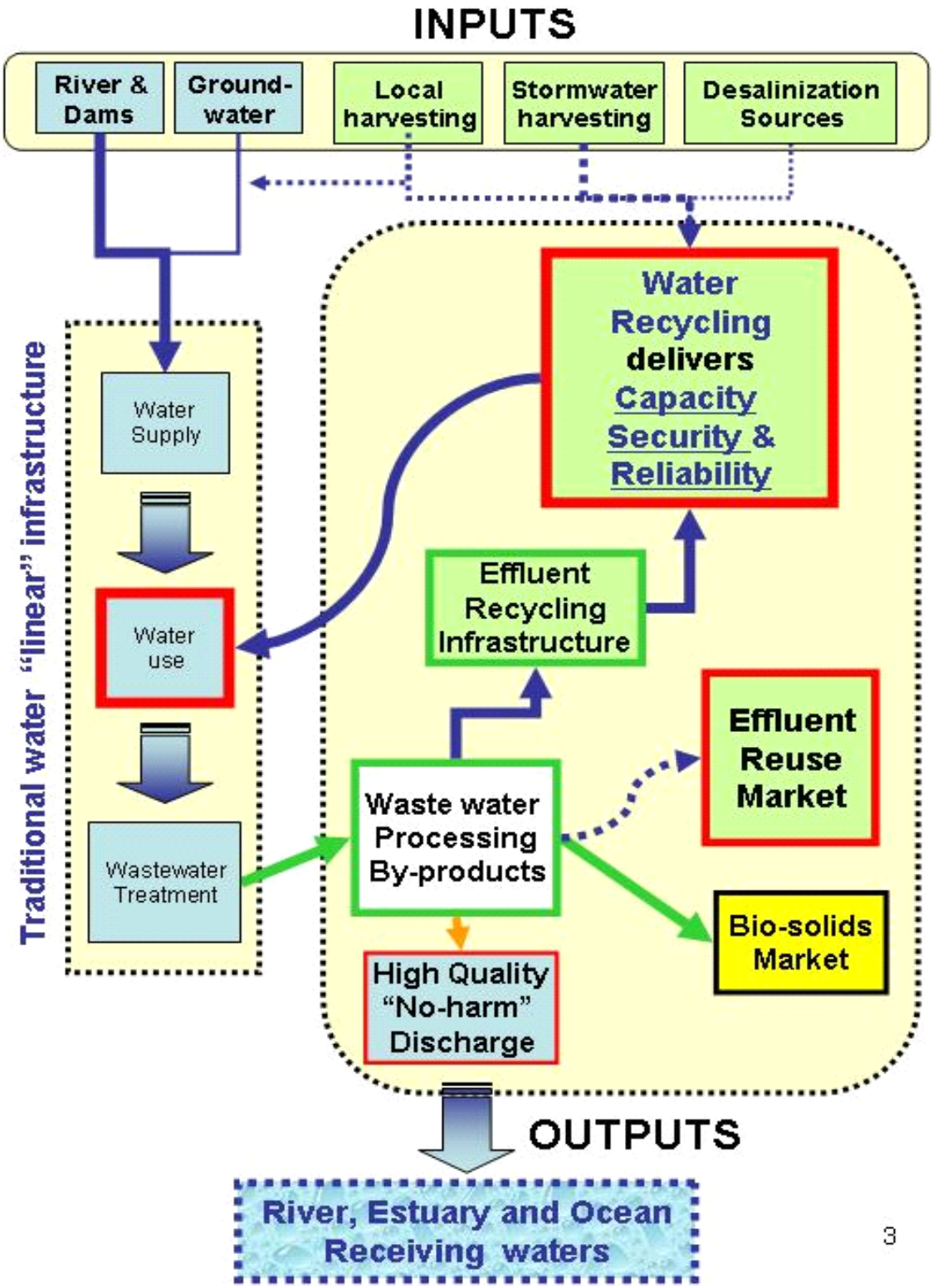
Water services are fundamental to any urban or rural community. The challenge for yesterday's 19th/20th century water utilities and resource managers is to provide a 21st century suite of solutions to ensure that water services do not become a limiting factor on community development.

A sustainable water supply needs two basic elements:

1. a secure supply of raw water from any source; and
2. a means by which the services that rely on that water can discharge their waste sustainably and safely.

Delivering this simple solution needs planning, appropriate investment and understanding of how our water cycle underpins every aspect of our society. **Figure 2** offers an overview of how our urban water cycle should be managed. This does not include the interactions with environmental requirements, but does illustrate where our urban water services need to mesh with the natural water cycle.

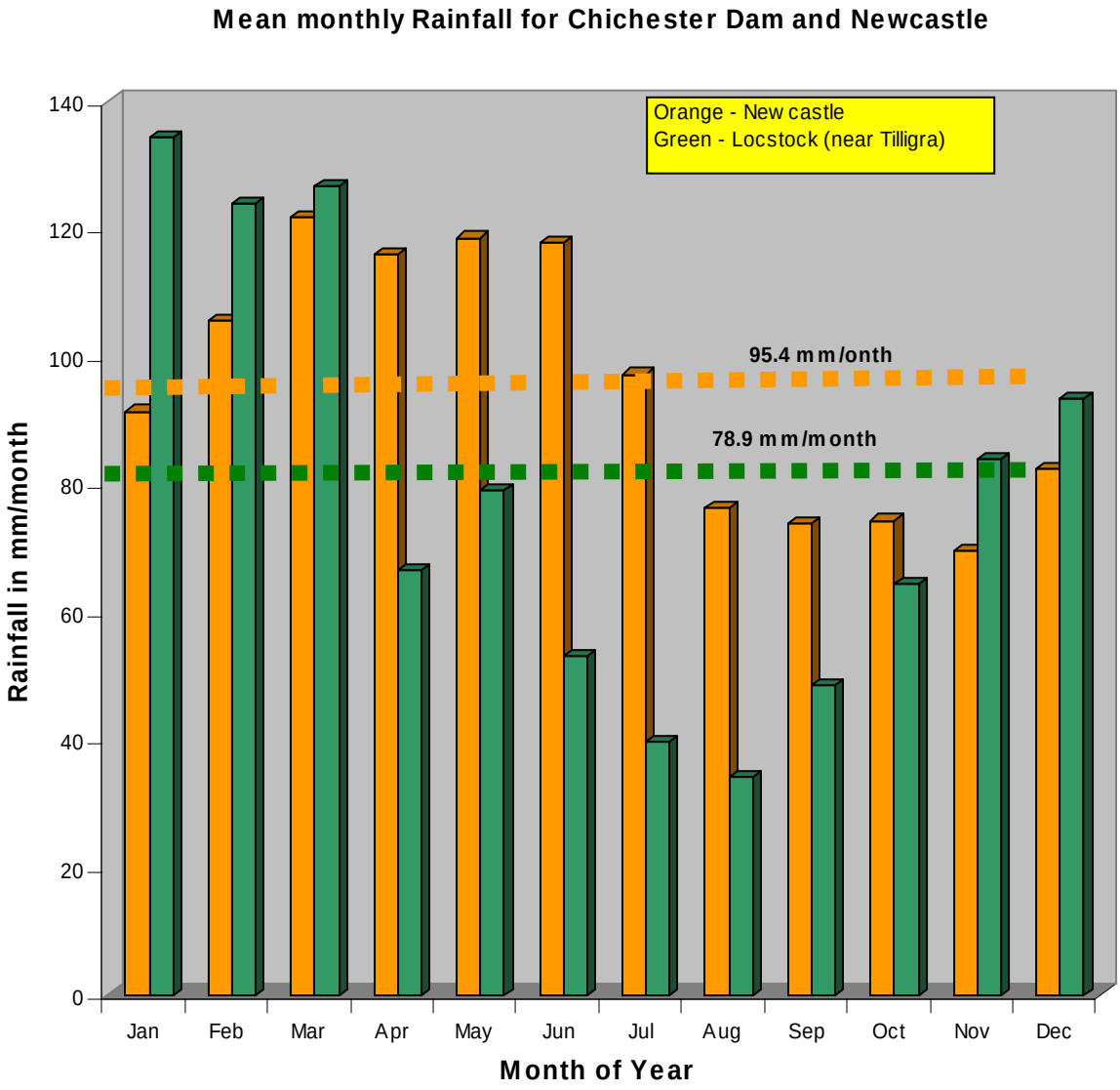
Figure 2 Overview of how the water cycle could be operated in the future



Rainfall Harvesting

Rainwater tanks were common in urban environments across Australia until the establishment of large water utilities with their centralized storage dams and distribution systems. Upon building these storages, legislation and planning rules were altered to encourage citizens to remove rainwater tanks and connect to the new safe drinking water supplies offered by the new water authorities. This remained the case in Newcastle and Sydney until the mid 1990s when legislation was altered to allow consumers to opt out of being connected to water authorities' drinking water supply.

Figure 3. Summary of Hunter Valley rainfall means and monthly variability.



The message portrayed by the established bureaucracies was that rainwater tanks were unreliable and unsafe. Throughout this period, country towns and cities like Adelaide survived on rainwater for most purposes, including drinking. In the last few years, all Australian health and utility government departments have introduced guidelines and advice on the value of rainwater tanks.

So after all the expense, construction, health reviews and changes in legislation, rainwater is now firmly back on the agenda for Australian consumers, but it is clearly not on the agenda of water utilities who fear a loss in income (a typical 5,000 tank can reduce water consumption between 25-50%). Like all retailers, water utilities do not like competition, particularly when they are the monopoly supplier for urban water services.

The Hunter Valley, like most east coast regions, has an abundance of water. **Figure 3** summarizes the rainfall for both the urban area of Newcastle and that at Locstock Dam (near the proposed Tillegra dam site).

A number of points arise from this summary. Firstly Newcastle (where the water is used) actually receives about 20% more rainfall than the proposed dam site. Secondly, rainfall is less variable in the cities and hence rainwater tanks in city areas receive a more consistent refill from rainfall than the proposed catchment area of Tillegra Dam. In addition, the number of days when rain falls in Newcastle is less variable and hence more consistent than the Tillegra region.

The Government itself has produced a model that is available to water utilities and councils to predict the water available form rainwater tanks. For a small to average sized house in Newcastle, a single 5,000 litre tank (2m high by 1.8 m diameter) can generate reliably 95,000 litres per year, or approximately half the typical water consumption. Should larger individual tanks or community tanks be installed, the percentage volume and reliability can increase significantly.

So rainwater harvesting is ideally suited to Newcastle and indeed virtually all east coast towns and cities, including the Central Coast area and Sydney.

Some groups have argued against rainwater tanks on health grounds, and hence encouraged people to connect to the “safe” treated drinking water supplies. This sounds plausible, but when one examines the facts from health studies, there is no difference in water consumers’ health based on drinking from either rainwater tanks or the traditional drinking water supply.

One interesting development on rainwater tanks has been the dramatic change in attitude to rainwater tank safety and plumbing. The NSW Government’s own regulatory body (the Committee for Uniformity in Plumbing and Drainage Regulation, CUPDR), in its own code/guideline, now permits plumbers to link rainwater tanks directly into the household water supply, where the rainwater can mix freely with the drinking water supplied by a water authority. If rainwater were potentially harmful, then the conservative plumbing regulations would not have permitted this interconnection.

However, some people may not wish to use rainwater for drinking. Remember that only a fraction of the water we use is drunk or used for cooking (typically 5-10%). The rest of our usage can use rainwater. Through simple modification of household plumbing, the rainwater tank can be connected to the toilet (approximately 20% of our consumption), laundry (15-20% and our hot water supply (10-15%). This would leave our drinking water, cold water usage inside the house, and external uses to be supplied from either the traditional drinking water supply or recycled water sources.

The Hunter Valley and Central Coast regions, with over 300,000 households, have the potential to gather nearly 30 gigalitres of rainwater per year or circa 28% of current demand. By implementing a 5000 litre (on average) rainwater tank for every household, the region would be able to meet its growth in water demand to beyond 2035. This being the case, such a move towards rainwater tanks would not need to occur instantly, but could occur over a 15-20 year period.

Stormwater Harvesting

Rainwater refers to the water that can be harvested from roof tops. Stormwater is the other 66-75% of rainwater that falls on gardens, lawns, parklands and roads. Traditionally, engineers and planners dislike this water due to the need to build expensive drainage networks that must discharge this excess water into oceans. When this system fails (which most do once every 1-2 years) flooding occurs and the damage and inconvenience are often reflected in criticism of the engineers and planners.

As in the case of water supply and sewerage system planning, the techniques used are those derived in the 19th Century. In recent years, some moves have been made to adopt "water sensitive urban design" which tries to retain the water and slowly release it back to the environment. From a water perspective, this has the added benefit of reducing irrigation demand but does not take full advantage of the extensive resource capacity for storing the excess stormwater and reusing or recycling it.

Unlike rainwater, stormwater is not clean and contains pollution form several sources such as:

- leaf litter and debris
- rubbish dropped by citizens
- cigarette butts
- oil and brake dust from vehicles; and
- overflows from leaking sewerage systems.

Just like wastewater that enters our wastewater treatment plants, this stormwater can be treated to various levels. If the sediment and debris are removed using gross pollutant traps, the water can then be used for irrigation and other uses where nutrient levels are not an issue. If treated further to reduce nutrients and bacteria, it can be used for all non-potable uses for example air conditioning, watering recreation areas, and non-food based industries.

Beyond this non-potable use, stormwater can be purified by advanced water treatment processes (micro filtration and reverse osmosis) to in excess of drinking water standards. Stormwater harvesting (like effluent recycling) still suffers from misinformation from certain

politicians and those who wish to bolster the need for traditional water supplies. Stormwater is in fact the same water that is collected in our dams. In the case of dams, this stormwater from towns is mixed with stormwater from farms, forests and pastures where animals graze and defecate. So the next time someone asks if you would drink recycled effluent or recycled stormwater compared to traditional drinking water (stormwater from our catchments) think before you answer…because it's all the same thing.

While the debate on mixing recycled water into our drinking water supplies is very current, the debate on treated stormwater being sent back into our drinking water supply is just beginning.

The volume of rainwater that can be collected in an urban area is very much dependent on local factors. To date, no studies have been undertaken to assess the extent and variability of stormwater runoff at the scale of our cities, so any estimates must be based on the "typical" conditions found in our east coast cities and towns. Based on:-

- an annual rainfall of 1100mm of the type and duration found in Newcastle; and
- the percentage land use cover by non roof-top impervious areas and semi- pervious parklands .
-

the Hunter and Central Coast have the combined capacity to deliver between 35-40 GL/year, which represents about 35% of existing demand.

As in the case of rainwater, this could extend the region's water supply to beyond the 2035 demand forecasts. Alternatively, if combined with rainwater, the region would have a sustainable water supply beyond 2050.

Recycling of wastewater/effluent non-potable use

When we flush the toilet, have a shower, wash our clothes or dishes, this wastewater (99% water, 1% waste) disappears through the sewerage system towards wastewater treatment plants in both the Hunter and Central Coast region. From these plants about 99% of that 1% is removed, dried and provided to farms, market gardens and garden centres for fertilizer… sensible recycling of our waste. But what of the water we used to transport our waste away form our homes to the treatment plants, which is 99.9% drinking water? In most cases we waste it. On average, Australia recycles 9% of its water, and this region only 4%, while the rest is returned to creeks, estuaries or oceans, never to be used again, despite a lot of expensive collection and treatment.

In periods of plentiful rainfall, most urban communities have little concern about this "hidden waste stream". We all like to enjoy water, food and beverages above the waist, but when it comes to the inevitable outcomes, below the waist, we become very shy.

In periods of drought (which affect the East Coast of Australia on 10 and 50 year cycles), we are forced to focus on water supply. Restrictions are imposed on water use, gardens wither and in the past, our water utilities have commenced on the path of building more or bigger dams. This is a traditional approach for Australian water authorities, because new dam sites

have usually been available. However, by the 1990s most of the good dam sites had been used and only the secondary, non-optimal sites remain. Tillegra is such a dam.

In addition to rainwater and stormwater harvesting, we should be recycling the well treated water we freely and consistently discharge from our wastewater treatment plants. 75-80% of all water we buy from water utilities gets discharged from the wastewater treatment plants. In the case of the Hunter and Central Coast region that represents nearly 80 GL/yr, more than the size of the proposed new dam at Tillegra.

With suitable treatment, this 80GL of water (which in basic terms is crystal clear, disinfected and hence harmless, but contains nutrients) can be used to meet requirements such as:

- irrigation to support market gardens and farms,
- environmental flows to improve the condition of our rivers (which we have dramatically reduced by building dams);
- urban irrigation; and
- non-food related industry uses (steel, manufacturing, cooling).

While this 80 GL/yr "windfall" of excess water seems attractive, it does have limitations. If used for non-potable uses, such water can only be supplied by a second set of pipes. Where major industry dominates, such "trunk pipelines" are economically viable, but the cost and practicality of recreating a "dual reticulation" system for all city users becomes marginal. There are examples of small communities of less than 10,000 people being served by such systems, but only a few have been demonstrated to be viable from an economic perspective.

In this region, non-potable water supply is likely to be limited to major consumers such as:-

- heavy industry;
- mines power stations;
- major CBD businesses;
- government facilities;
- legislated environmental flows;
- near urban market gardens and farms;
- parklands.

These are unlikely to exceed 50% of the available flows. Therefore, a more realistic market for this quality of water is likely to be 50% of that available, namely 40GL/yr.

Based on a non-potable reuse market of approximately 40 GL/year, this could supply about 40% of existing demand. Again, like rainwater harvesting and stormwater harvesting, this source alone could extend the region's water supply to beyond the 2035 demand forecasts. Alternatively, if combined with rainwater and stormwater, the region would have a sustainable water supply beyond 2070.

Recycling of waste water back into the raw water supply (indirect potable)

Over the last century, cities and major regional towns have developed centralised water supply and discharge-orientated wastewater treatment. This is the "suck-in, use once, spit-

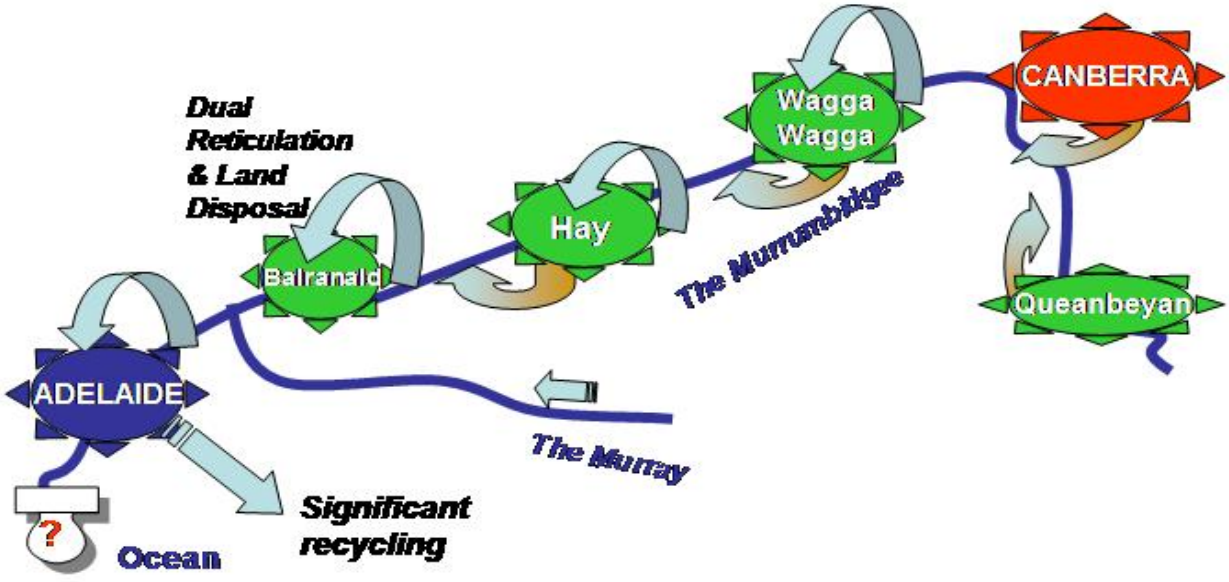
out" approach to urban water supply. It worked in the 19th century, but has long since been abandoned by most urban water supplies. In Europe, water is used, recycled and used again. In Australia this occurs by what is termed i*ncidental or unplanned*" recycling, but few Governments acknowledge that this is happening.

The reality is that we all drink recycled water from Darwin to Hobart and from Perth to Newcastle. Water management and appropriate treatment technologies in appropriate localised distribution are the fundamental issues that need to be addressed. The rest of the world knows this, has developed technologies to achieve it, and abides by its reliability.

Politicians and media in Australia are discussing an issue that is settled and closed. Recycled water treated by well established robust technology (all of which is biological by nature and design) is safer than the drinking water we currently accept from our water utilities.

In both the Hunter and Central Coast region, waste water treatment plants can deliver up to 80 GL/yr of water which can be treated to either non-potable or potable quality. This water already forms a base supply for cities across the world, is perfectly safe, and even more reliable than rainwater. **Figure 4** gives an example of how this occurs in one of Australia's river systems.

Figure 4 Indirect potable recycling from Canberra to Adelaide along the Murrumbidgee



Options to deliver sustainable, secure and safe water supplies to the Hunter and Central Coast.

The Hunter region is growing and will need to plan for the future when its own demand and the growing demand from the Central Coast start to erode its current excess capacity. At its current growth rate, the Hunter will need to have planned and delivered a means of securing its water supply by 2015.

Given its relatively low industrial recycling, lack of stormwater harvesting, low use of rainwater tanks and no plans for potable recycling (like that proposed by the Queensland Government and recommended by the NSW Opposition), it is more cost effective and less damaging to the environment to pursue these measures in the first instance, rather than committing to the construction of a new dam.

The strategy being adopted by the NSW Government to overcome its poor planning over the last 10 years is to link the Hunter and Central Coast via a pipeline. In theory this is a two way pipeline, although it is likely to be a one way operation, given the Hunter's excess capacity.

Like the Hunter, the Central Coast has relatively low industrial recycling, lacks significant stormwater harvesting, has a low uptake on rain tanks and no plans for potable recycling. The Central Coast (GWWA) did extensive planning studies over the last three years and has identified the need to upgrade its existing dams, infrastructure and transfer pipes.

Unlike the Hunter, the Central Coast is now in a water crisis, and has commissioned 4 small desalination plants to assist future drought water supplies. To date it has rejected building a $75m permanent desalination plant.

Table 2 summarizes the opportunities for a sustainable approach to developing the future water supplies for both the Hunter and Central Coast regions. In essence, both regions clearly have adequate water supplies to meet their demand for the foreseeable future without the need for a new dam at Tillegra.

The adoption of rainwater, stormwater, non-potable and potable recycling need to be considered before a dam is built at Tillegra for either region's water supply. In addition, benefits of the alternatives need to be evaluated. Rainwater and stormwater harvesting reduce flooding and the need for expensive drainage systems. Recycling ensures that the waste products form our treatment plants are thoroughly removed and hence no longer pollute waterways and beaches.

By adopting rainwater harvesting and recycling, both regions could achieve extremely secure and safe water supplies, combined with dramatically less water pollution. By building a new dam, the culture of consuming more while recycling less will continue and the next time growth exceeds demand (say 25 years' time), where will the next dam by built?

Table 2 Summary of water supplies and potential sources for growth in demand.

Attribute	Hunter Water Corporation	Gosford & Wyong Water Authority
Properties served (2006)	213,913	125,200
Population served (2006)	517,403	305,000
Catchment area (km^2)	7300	723
Per capita consumption (lires/day)	350	329
Secure Yield (GL/year)	79	40[1]
Current demand (GL/yr)	73	33
Projected demand (GL/yr) ➢ **Hunter for 2020** ➢ **Central Cost for 2050**	 84 -	 - 48-55
Time for upgrades to water supply	2015-2020	2010-2015
No. of Rain tank rebates (% figures in bracket italics)	130[2] (*0.05%*)	4500 (*3.6%*)
Alternate Sources yield (max.) • *Rainwater* • *Stormwater* • *Recycled (non potable)* • *Recycled (potable)*	 • 18 • 24 • 28 • 22	 • 10 • 13 • 14 • 9
Total alternative sources yield	**92 GL/yr**	**45 GL/yr**
	137 GL/yr for both regions	
Total source from Tillegra	**66 GL/yr** for both regions	

[1] *These yields are taken form the GWWA water plan 2050. They seem optimistic and given the moves towards desalination and the sudden need for Tillegra..*
[2] *Numbers based on 2006 annual report, despite unsuccessful request from Hunter Water for up-to date numbers.*

In 2003, HWC undertook an Integrated Water Cycle Study and this clearly showed that the Tillegra dam was not a favourable option for the future water resource planning of the region. In 2006, the GWWA completed an extensive (11 volume) and expensive ($500,000 +) study of the options to secure Central Coast's water supply. This study identified that the historical average surface water yield in the main surface waters was 176 GL/yr, or more than 5 times the current urban demand. The June 2006 studies included a range of engineering solutions which involved new transfer and additional "off-stream" storages. The combination of these measures could secure the region's water supply of 55GL/yr to 2050 using a "60% access regime" to the water available in surface waters. These extensive reports did not consider the need for Tillegra and did not investigate extensive rainwater, stormwater harvesting, non-potable recycling or indirect potable recycling.

Interestingly, when a preliminary working draft was released in December 2006, this summary document included a Tillegra Dam option. The Tillegra option information was clearly a last minute addition, as is indicated by the lack of financial costings and details. As eleven of the other options had been evaluated on such financial information, it is difficult to understand how the community can evaluate the Tillegra scheme against the alternative options.

The logical approach- "*use what you have, before you exploit others*".

Dam building is a time consuming process which, once started, is almost unstoppable. To build Tillegra could take between 7 and 12 years, depending on the amount of work required to stabilize the underlying geology. Before embarking on such a venture, both the consumers of Hunter Water Corporation and Gosford/Wyong Water Authority need to be sure that the vast array of other options have been considered and in most cases adopted before a dam is built.

Remember, Sydney has rejected building a dam at Welcome Reef or on the Colo River. It should be recycling, but is instead embracing desalination.

So what are the alternatives to Tillegra for both the Hunter and Central Coast regions? Quite simply, both regions appear focused on the traditional "*suck-in - use once - spit out* " mentality towards water supply and have not seriously attempted to engage with the modern approaches to urban water harvesting and recycling.

In addition, HWC is ignoring planned infrastructure augmentations such as at Locstock Dam and the Stage 3 Grahamstown upgrade, both of which could be used to support growth for the Hunter Valley and Central Coast. The GWWA's recent 2006 studies have shown that infrastructure improvements at a considerably smaller cost ($100-200m) than that of the then "undefined" Tillegra Dam option.

There are a number of hydrological and geological failings of the Tillegra dam site, and combined with the lack of action in recycling and urban water harvesting, attempts at justifying the requirement, location or cost-effectiveness of this dam do not stack up.

The development of improved or new water infrastructure in any urban area requires extensive, time-consuming studies which require significant community consultation with those who are impacted and those who will ultimately have to pay for the infrastructure and the water it delivers.

The strategic being adopted by the NSW Government to overcome its poor planning over the last 10 years is to link the Hunter and Central Coast via a pipeline. In theory this is a two way pipeline, although it is likely to be a one way operation, given Hunter's excess capacity.

However, the Hunter region is growing and will need to plan for the future when its own demand and the growing demand from the Central coast start to erode its current excess capacity. At its current growth rate, the Hunter will need to have planned and delivered a

means of securing its water supply by 2015. Given the region's relatively low industrial recycling, lack of stormwater harvesting, low use of rainwater tanks and no plans for potable recycling (like that embraced by the Queensland Government and the NSW Opposition), a new dam is not justified based on cost and impacts.

Like the Hunter, the Central Coast has relatively low industrial recycling, lacks significant stormwater harvesting, has a low uptake on rain tanks and no plans for potable recycling. The Central Coast (GWWA) did extensive planning studies over the last 3 years and has identified the need to upgrade its existing dams infrastructure and transfer pipes. Unlike the Hunter, the Central coast is now in crisis, and has commissioned 4 small desalination plants to assist future drought water supplies. To date it has rejected building a $75m permanent desalination plant.

The adoption of rainwater, stormwater, non-potable and potable recycling need to be considered before a dam is built at Tillegra for either regions water supply. In addition, benefits of the alternatives need to be evaluated. Rainwater and stormwater harvesting reduces flooding and the need for expensive drainage systems. Recycling ensures that the waste products form our treatment plants is thoroughly removed and hence no longer pollutes water ways and beaches.

By adopting rainwater harvesting and recycling both regions could achieve extremely secure and safe water supplies, combined with dramatically less water pollution. By building a new dam, the culture of consuming more, while recycling less will continue and the next time growth exceeds demand (say 25 years time) where will the next dam by built.?

Summary

Both the Hunter and Central Coast have an abundance of water. The Government's move to connect both via an expensive major water supply pipeline illustrates that both the Hunter is being used to support the Central Coast. There is no reason why both regions should not be inter-dependent, provided the true costs to each region are transparent.

Currently, the Central Coast has underinvested in infrastructure to harvest the water needed by its rapid growth. In contrast, the Hunter has an excess of water. It now apparent that the Central Coast's lack of investment is to be met by the Hunter's current excess of water and the new dam at Tillegra.

All regions with requiring water should share water in times of storage/stress, such as droughts, but the building of Tillegra is an illogical response. The dam:

- is unnecessary
- economically very expensive
- would destroy rich and fertile land
- demonstrate the decision-makers' total ignorance of what is needed for a secure and sustainable development

Without a dam, the Hunter and Central Coast regions can deliver a combination of:

- rainwater harvesting (28 Gl/yr);
- stormwater harvesting (37 Gl/yr);
- recycled water for non potable use (42 Gl/yr); or
- recycled water for indirect potable use(31 Gl/yr).

In essence, these regions can deliver an additional 137Gl/yr above the existing 106 Gl/yr supply, i.e. ***more than 150% on top of the existing water supply.***

In addition to the already investigated water transfer and augmentation of existing storages, the Hunter and Central Coast region can become virtually "drought- proofed". Under a sustainable water plan, water restrictions would be a thing of the past, drastic measures like expensive new dams or desalination plants would be unnecessary and as an added bonus, the creeks and rivers would be healthier due to improved environmental flows and even reduced extractions.

The options are clear, regional cities need to decide whether they exploit distant catchment areas that are managed by hard working farming communities or embrace what the rest of the world does, i.e. manage the water we have. Irrespective of the persuasion of politicians, activists or general consumers, the decision to build a dam at short notice seems illogical.

If rainwater remains below average

- For the next 3 years - then efficient rainwater harvesting and recycling is attractive.
- For the next 6 years - then efficient rainwater harvesting and recycling is very attractive.
- For the next 9 years - then the dam at Tillegra will be built, but empty (six to ten years to fill is the Gosford/Wyong Water plan estimate);

Alternatively, in next 5-10 years, the regions can harvest twice as much from the water that falls on urban catchments plus it can reuse and recycle all the high quality wastewater we discharge into rivers and oceans.

If water does not fill the Hunter and Central Coast rivers, storages and dams, recycling at all levels will be the logical option. And if these dams fill, then the communities of both regions will need to examine, debate and decide how to make the region less dependent on the natural variability that the Australian climate delivers – preferably by recycling and urban water harvetsing, rather than desalination plants or new dams.

This page is left blank intentionally

Water Management Services

- *Integrated & sustainable water cycle managment*
- *Demand management & water conservation*
- *Reuse, rainwater, storm water planning & management*
- *Water cycle audit*
- *Catchment & system modeling*

Planning & Reporting

- *Strategic & business planning*
- *IWCM & Scenario planning*
- *Catchment planning*
- *Policy & regulation performance planning, evaluation & reporting*
- *Triple bottom line performance & reporting*

Environmental Services

- *Environmental audits, monitoring & planning*
- *Pollution management strategies*
- *Stakeholder management*

Specialist Services

- *Expert advice & business reviews*
- *Project management & procurement*
- *Risk analysis & assessment*
- *GIS & remote sensing analysis*
- *Contracted R&D*

sustainable water solutions Pty Ltd
PO Box 232, Brooklyn
Sydney, NSW 2083,
Australia
Phone (++612) 9985 8472
Fax (++612) 9985 8471
www.swspl.com.au