# *Role of Irrigation in Urban Water Conservation: Opportunities and Challenges*

***B. Maheshwari and G. Connellan (Editors)***

CRC AUSTRALIA

Cooperative Research Centre for
IRRIGATION FUTURES

# *Role of Irrigation in Urban Water Conservation: Opportunities and Challenges*

***Proceedings of the National Workshop***

***B. Maheshwari and G. Connellan (Editors)***

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# ORGANISING COMMITTEE

The Workshop was initiated and organised by the CRC Irrigation Futures. Organising Committee Members included:

- Associate Professor Basant Maheshwari, Zone Leader (Urban Irrigation and Reuse) CRC IF/ UWS,
- Mr Geoff Connellan, Urban Zone, CRC IF, University of Melbourne (Burnley Campus),
- Mr Matthew Durack, CEO, CRC IF,
- Mr Jolyon Burnett, CEO, IAA and
- Dr. Sally MacKinnon, Communication Manger, CRC IF.

The workshop was facilitated by Associate Professor Roger Packham, UWS. This document was peer reviewed and edited by the members of the organising committee.

# ACKNOWLEDGEMENTS

We sincerely acknowledge the help of Horticulture Australia Limited for allowing us to hold this workshop at their premises. In particular, we thank Nina Phanekham for her help in organising hotel accommodation, morning and afternoon teas, lunches and dinner. We also wish to acknowledge the Irrigation Association of Australia for their support in the planning of this workshop.

*Basant Maheshwari* *Geoff Connellan*

# FOREWORD

Recent dry conditions have highlighted the low reserve capacity of our urban water supply infrastructure and have galvanised discussion on issues such as desalination, waste water reuse and storm water retention. Urban water use efficiency programs have up to this point focused around internal water use and the implementation of dual flush toilet systems, low flow shower heads and water use efficient rating systems for white goods.

Programs to reduce outdoor water use have until this time focused around "Demand Management" policies primarily associated with restrictions in time and type of use and to a lesser extent application system design, installation and management.

This workshop sponsored by the CRC for Irrigation Futures is one of the first major national events to recognise "Urban Irrigation" as a discrete activity worthy of specific investigation and management. In some situations "Urban Irrigation" may represent up to 50% of total household water use. As yet in Australia we have a very poor understanding of actual usage patterns and even less idea on how to optimise the value of this activity and minimise the water use associated with it.

Water Use Efficiency is now a critical issue within any agricultural irrigation environment. The capacity of the urban sector to "Measure, Monitor and Manage" the performance of its irrigation activities is the key topic of discussion in these workshop proceedings.

The CRC for Irrigation Futures is committed to improving the efficiency, profitability and sustainability of irrigation systems Australia wide. We are proud to have initiated this event and look forward to working with all of the industry groups involved to seek a better future for this critical component of our urban quality of life.

*Matthew Durack*

*CEO, CRC for Irrigation Futures*

# EXECUTIVE SUMMARY

This workshop was one of the first major national forums to address urban irrigation issues at a range of levels. The participants in the workshop were drawn from the science, research, government, water utility, university, industry communities.

The main aim of the workshop was to review the national context of urban irrigation addressing national policy, local government/water utility policies and practices, demand management, drought and climate change issues, use and impact of outdoor water use restrictions and impacts of changing urban irrigation scenarios on business and industry. The workshop also aimed to bring together diverse interests and stakeholders to develop collaborative strategies that address achievable sustainable outdoor water use for urban environments. The workshop focussed on domestic, commercial and municipal outdoor water use for irrigation.

The workshop was designed around an experiential learning cycle, asking the following questions in each of the four phases of the cycle:

- Diverging - What is there?
- Assimilating - What does it mean?
- Converging - What might we do?
- Accommodating - How will we do it?

Day one of the workshop dealt with the first two stages, diverging and assimilating, in what might collectively be called ***finding out*** *(*presentations by different stakeholders). Day two then dealt with the second two stages, converging and accommodating, collectively called ***taking action*** (group work).

There were a number of presentations to provide a broad overview on how urban irrigation fits in with 'whole-of-the cycle' water management and how it affects the sustainability of urban irrigation and businesses connected with it. In particular, the areas covered during the presentations included the context of the National Water Initiative (NWI), how water authorities are managing urban irrigation, the role of technology to improve urban irrigation practices and successes and limitations of some of the water conservation measures and strategies in different urban centres. Some key points highlighted during the presentations and discussions that followed included:

- Diversity of urban irrigation stakeholders and the need for greater collaboration to influence policy, undertake research, provide relevant and effective education and training and effect behaviour change.
- Acknowledgement of lessons and innovations in sustainable irrigation in the rural sector and the potential to adapt many of these to the urban sector.
- Local government/water utility long-term use of outdoor water restrictions as a key tool in the demand management/water conservation tool box. This has had a very negative impact on irrigation equipment manufacturers,

businesses involved in the supply and sales irrigation products, the nursery and garden industry and turf and horticultural industries – all major contributors to the Australian economy. The water restriction approach has also impacted negatively on the amenity of cities, regional centres and towns in aspects as diverse as tourism, sport and recreation.

- Impact of long-term drought and acknowledgement of climate change and reduction in water sources and resources by local government and water utilities.
- National Water Initiative has identified urban irrigation to be an important element for water resources management in Australia, and the NWI is a potential source of funding for collaborative research, education and training activity.

Twenty key issues of importance to urban irrigation were identified by the forum. Out of these issues, four were examined in detail for developing action plans by considering goals for situation improvement, barriers, responsibility, resources required, and performance measurement. These four issues were:

(i) There are no reliable data available on water requirements of different plants suitable for urban landscapes under a range of climatic situations in Australia.

(ii) We need a national approach that facilitates integration and transferability of credible expertise, standards and recognition by all players in the urban irrigation sector.

(iii) We need a national approach to urban irrigation issues for providing better resources to support consistent, strategic and long-term R&D leading to a critical mass of expertise and data collection.

(iv) We know we can deliver much better technology in irrigation management, but there is a need to bring all the science (engineering, agronomy and social) together and change value perceptions amongst urban irrigators to achieve more efficient water use.

Key outcomes and consensus achieved through the workshop include:

- A national perspective on urban irrigation issues and challenges was achieved, particularly related to water conservation strategies being implemented in different capital cities and the impacts of drought on irrigators and industries associated with urban landscapes.
- There is a need to establish appropriate technical, social and economic indices that will define irrigation efficiency in the urban context, since the efficiency indices used in agricultural irrigation are often not very meaningful in urban contexts.
- There is a lack of comprehensive and reliable information on urban irrigation practice and technology, particularly on how much water is used for outdoor irrigation, how effective are different irrigation methods and products and the factors that impact on irrigation water use.

- The forum recognised that solutions for urban irrigation issues need to be developed not only in a technical context but also in social, economic and political contexts.
- Partnerships and relationships were created for collaboration among urban water authorities, research organizations, industry associations and irrigation manufacturers to tackle key issues identified during the workshop. The participants in the forum also agreed on priorities and action plans developed during the workshops and committed to work together to facilitate urban irrigation research and development at the national level. The CRC IF has an important role in providing leadership in the science required to develop sustainable solutions in urban irrigation.
- A number of possible technical strategies and solutions that have potential to improve urban irrigation efficiency and reduce irrigation water use up to 30% have been identified for further action.
- Key research areas for sustainable urban irrigation, particularly to develop irrigation systems and practices that are cost effective and based on sound scientific principles have been identified.
- A working group/committee was formed to assist in the development of a collaborative organisation which will enable ongoing planning, research and development activities, education and training development, and policy input and development at the national level.

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# 1. URBAN IRRIGATION RESEARCH AT THE COOPERATIVE RESEARCH CENTRE FOR IRRIGATION FUTURES

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The CRC for Irrigation Futures is committed to improvements in the efficiency, profitability and sustainability of irrigation activities Australia wide across all industry sectors.

Urban irrigation represents a critical opportunity for the CRC IF to not only achieve its overall mission objectives but also to share complementary knowledge, opportunity and understanding between all irrigators.

Our current investor base does not include organisations with a specific stake in these outcomes but they have recognised the importance of this sector through the establishment of an Urban Zone Leadership Program within the CRC IF headed up by Basant Maheshwari from UWS and supported by researchers across Australia.

In order to achieve a mandate and the resources to create a critical mass of activity in this area, we will need to partner with key organisations such as the IAA, NGIA, and WSAA and state and federal departments as well as the large private sector service and supply industry already active in this sector.

Irrigation involves the application of water to the root zone of a plant for a particular purpose. In agriculture this purpose is primarily economic and as such the outputs of irrigation and the measurement of irrigation efficiency are self evident. Within an urban context the output is less defined. This highlights a critical area of research as without an objective measure of output it is impossible to develop critical indices of efficiency.

Urban Irrigation is not just a discretionary activity undertaken by individuals. The provision of “Green” urban environments represents a critical urban competitive advantage which if lost by towns, cities, states or even nations could significantly reduce their attractiveness and ultimate economic performance in a global sense. Urban irrigation is an essential part of providing ‘Quality of Life’ within an urban context.

Great improvements have been made in irrigation efficiency in an agricultural context and in urban sectors. These improvements have been achieved through the use of technology, through a better understanding of the outputs required and importantly through the implementation of policy which harnesses the appropriate economic and social drivers active in the sector.

It is clear that work will be required in all these areas in the urban context. The CRC IF has a broad research base incorporating Technology and Practice, Sustainability and Policy and Planning for Change research discipline areas. Along with our core commitment to awareness raising and capacity development through education and training we believe we have much to offer the Urban Irrigation dependent industries and communities.

*****

# 2. OVERVIEW OF WATER RESOURCE MANAGEMENT IN AUSTRALIA

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## Drivers for Water Reforms

The main factors driving the water reform agenda in Australia are:

- Climate variability and change
- Population growth
- Healthy waterways
- Sustainability
- Integrated urban water management
- Impact of stormwater on receiving waters

## Climate

The effect of climate change on stream inflow to Lake Burragorang (Warragamba Dam) is captured well in the graphs of catchment rainfall and stream inflow over the past 90 years. Lake Burragorang is the largest urban water supply in Australia, accounting for about 80 per cent of the water supply to the Sydney region. Since its construction between 1948 and 1960, the 7 year average rainfall over the catchment and inflow into the dam have been declining to levels that appear to be more consistent with pre 1948 averages.

The effect of climate change on Perth's catchments has been even more dramatic. A graph of metro stream inflow shows that the long-term stream inflows for 1911-1974 which averaged 338 GL/Yr have reduced to 167 GL/Yr for the period 1975-2000.

The impact of reduced rainfall is amplified in the run-off characteristics. The corresponding rainfall graphs would show a decrease of only 12%, resulting in a halving of the average run-off. Assuming that (i) climate change will reduce runoff into surface catchments by 25%; (ii) the mandatory Water Efficiency Labelling Scheme will result in 80% take-up of AAAA washing machines and AAA shower heads; (iii) water conservation programs will achieve 7% ongoing reductions; and (iv) from 2005, 25% of all new green field developments will have a dual water supply system supplying non-drinking (recycled) water for garden and toilet flushing water, then by 2030 a total water deficit of between 800-1000GL will exist across the major urban centres of Australia.

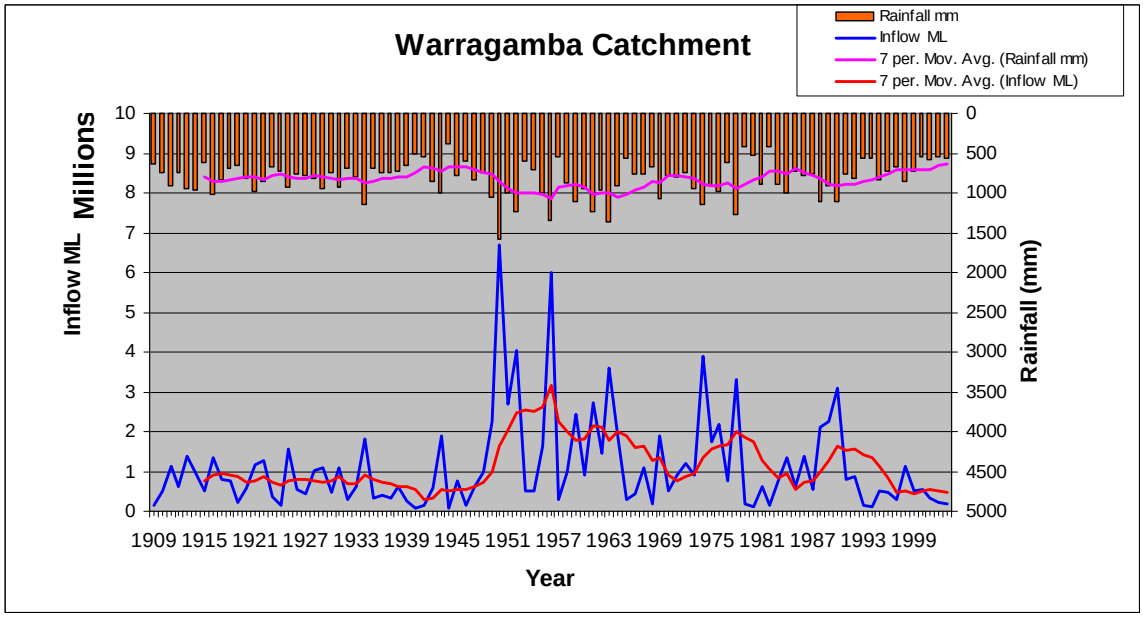



*Figure 2.1. Effect of climate change on runoff in Warragamba Catchment., Sydney during1909-2003*

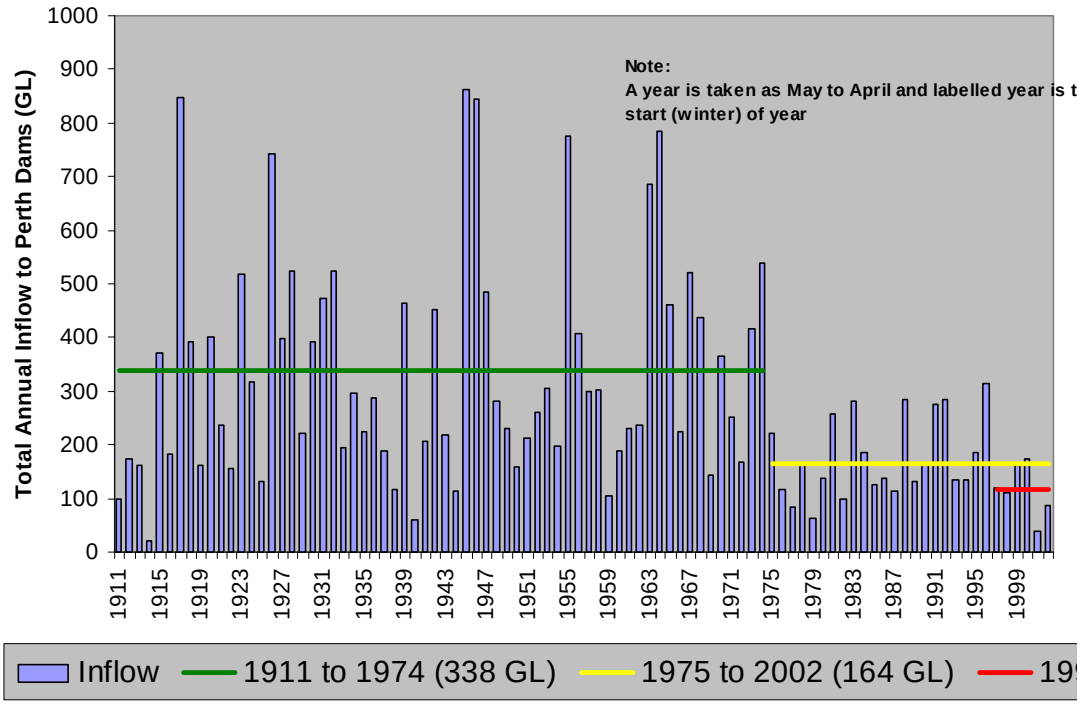
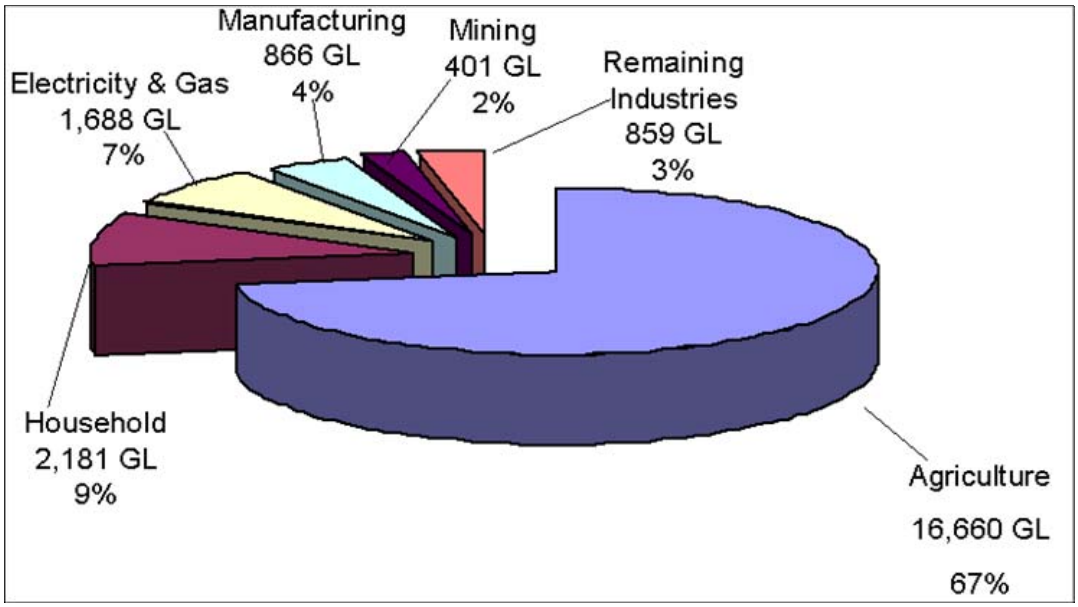



*Figure 2.2. Climate Effect on Runoff Perth for 1911 - 2003*

## Water Usage

Figure 2.3 shows that agriculture is the main user of water in Australia. Manufacturing (4%) plus remaining industries 2% plus households 9% means that approximately 15% of all water is used in urban areas.

Households are the main consumer of urban water and this is why water conservation programs target household use, particularly use external to the home. Technological improvements have largely driven improvements inside the home with the introduction of dual flush cisterns in the 1980's and the progressive reduction of flushing volumes from 13/6.5 L to 4.5/3 L over the past 25 years being responsible for most of the savings.




Ref – ABS Water Account 2000-01

*Figure 2.3. Water use in Australia.*

Even though these are average figures for all of Australia, it demonstrates the importance of efficient outdoor use of water.

Not surprisingly Melbourne and Sydney use the most water, but per capita consumption across Australia varies quite significantly. Sydney, Melbourne and the Gold Coast are in the lowest band because of the high number of people living in apartments, whereas Darwin is the highest because of the large blocks of land, the long dry period and the fact that there are no water shortages and people do not feel compelled to be careful in their use of water.

External use varies across the States and Territories varies markedly. The variations reflect factors such as soil (Perth is partly built on sandy coastal soils), climate (SA, WA and the ACT have long hot summers), housing types (Sydney and Melbourne have lots of apartments) and social conditions (people love their gardens and in northern Australia wish to enjoy a tropical lifestyle).

## Water Pricing

The price of water and how water usage charges are levied varies across Australia. Inclining block tariffs in place in Adelaide, Melbourne, Perth and Canberra are targeted at the more discretionary use of water outside the home. In the National Water Initiative, the country towns have to progressively move to full cost recovery pricing. The key message is that water used external to the home is going to become more expensive, hence the need for people to understand how to water their gardens wisely.

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# 3. URBAN IRRIGATION: UNDERSTANDING ISSUES AND RESEARCH NEEDS

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## Background

Urbanisation in cities, particularly in our capital cities, is creating immense pressure on water resources through increased water consumption and effluent generation. Water authorities, city councils and other related organisations are now increasingly realising that water supplies are being stretched to the limit and that there is a need to dispose of effluent in an environmentally sensitive manner. Without efficient urban irrigation and proper water reuse, we will have to make huge investments in new dams (if dams are at all possible to construct) to cope with growing urban water demand.

Irrigated peri-urban agriculture around the urban centres is very important in producing fresh vegetables, fruits, turf and many other farm produce for a large urban population. It is over a billion dollar industry nationally and its contribution to the overall economy is huge. This industry will only survive if urban irrigation in the future becomes more efficient and huge volumes of effluent generated in our cities is reused sustainably.

There is widespread recognition and the need to urgently develop strategies to cope with the looming urban water crisis. This presents a unique opportunity for research organisations (e.g., CRC IF and CSIRO), water authorities, city councils, parks and golf course operators and other relevant organisations to work in partnerships for a common goal of efficient water use. These partnerships are important for a better understanding of the art, science and practice of urban irrigation and developing strategies and tools that will sustain urban catchments.

## Characteristics of Urban Irrigation

Although both urban and agricultural irrigations are about applying water to plants, yet there are some key differences that need to be understood in the context of urban irrigation. Some key characteristics of urban irrigation are summarised as follow:

- Productivity of water in urban irrigation has been difficult to assess.
- Urban irrigation is for maintaining green environment in urban areas and has direct impact on quality of life and well being of people in those areas.
- Over-watering or irrigation runoff (water flowing down the drain) from residential areas is frequently observed.

- Some of the technical, social, cultural, political and economic issues of urban irrigation are quite different when compared with agricultural irrigation.
- The practice of urban irrigation tends to be more art than science.
- It is a small scale operation with a large number of irrigators whose skills, attitudes and practices are quite variable and complex.
- Urban irrigation is often surrounded by significant irrigated agriculture and horticulture at the urban fringe.
- Large volumes of water are used to irrigate nurseries, cut-flowers and small vegetable farms in urban areas (e.g., 30,000 ML per year is used in Sydney).
- There is an intense competition for water among different users in urban catchments.
- Many urban irrigators are willing to adopt new technology or practices, but there is relatively low level of extension effort by water authorities.
- For some people, the cost of water is probably not an issue, but the green environment is important to them.
- Cost of irrigation system hardware and complexity of irrigators are important considerations in improving the effectiveness of urban irrigation practice.

## Urban Irrigation and Water Use

Urban irrigation not only includes irrigation of lawns, home gardens, parks and golf courses but also includes irrigation of nurseries, farms growing cut-flowers and small vegetable farms. A significant volume of high quality, drinking water is used for urban irrigation. Reliable data on the volumes of water used for urban irrigation are scarce. However, depending upon the local conditions, between 10 and 50% of the total water consumption may account for urban irrigation. For example, out of 630 GL delivered annually to consumers in Sydney Area (SWC, 2004), the water use for urban irrigation is likely to be more than 63 GL. The use of effluent for any of the above irrigation applications is currently negligible.

## Irrigation Issues in Urban Context

Irrigation in urban catchments includes urban irrigation as well as irrigation for peri-urban agriculture (includes horticultural enterprises). Water supply for cities and towns and that for peri-urban agriculture are in direct competition with one another, and invariably the former takes higher priority in terms of the total water allocation in a catchment. Any saving in water through more efficient urban irrigation and the use of effluent and rainwater will mean less pressure on the available water resources in a catchment. The saving in water is also required to cope with growing water demand resulting from the ever increasing population of Australian cities.

Water scarcity in urban areas is leading to restrictions on water use for irrigation and so strategies are required to conserve water. In view of this scarcity, it is not clear how the various technical, social, cultural, political and economic factors

interact in the urban context, or where the best opportunities exist to save and reuse water.

Most cities and major towns in Australia support a significant irrigation industry on the peri-urban fringe. In Sydney, for example, the vegetable, nursery, cut flower, fruit and turf industries have a combined farm gate value of over $500 million per year (NSW Agriculture, 2002). This substantial industry is in strong competition with urban users, and there is both an urgent need and a clear opportunity to consolidate the future of these irrigation industries by improving both their irrigation efficiency and that of their urban competitors. Many irrigators in the Hawkesbury-Nepean Catchment are at the brink of going out of business due to water shortage created by increasing urban water demand.

Urban irrigation practices are often not based on sound understanding of soil-water-plant relationships. Community education, practical irrigation scheduling tools (gadgets, software and web-based solutions), the use of water-sensitive urban design and site specific information for improving urban irrigation practice can play an important role in the 'whole-of-the-water cycle' management in urban areas.

When compared with rural irrigation, some of the socio-economic, cultural and political issues related to urban irrigation are quite different. So, we need to invest in specific research programs and projects that explicitly take into account the above differences. Also, urban irrigation and water reuse research issues need to be dealt within the context of an urban catchment that has both urban and rural irrigators.

Inefficient urban irrigation is also a major cause of urban salinity in many parts of Australia. Frequent and unnecessary watering of gardens accelerates the rate at which the water table rises and leads to salinity. The costs to the community due to urban salinity are enormous. For example, the reconstruction of just one street in a town block could cost $300,000 (not adding to that the effects on house and land values and other infrastructure costs). There is a need to develop technical solutions and strategies for community education to reduce rising water tables in urban area.

## Opportunities for Research and Development

There is a huge opportunity to work with city councils, water authorities, golf course operators and communities to understand the issues and options for urban irrigation. In particular, we need research efforts for developing strategies that will increase efficiency of urban irrigation (in partnership with city councils, water authorities and others) through community education and the development of location specific guides and devices for irrigation scheduling. Other issues or questions that require research in urban irrigation may include:

- How much water is available in urban catchment for urban irrigation and peri-urban agriculture? How is it used (includes technical, social, economical, psychological and policy issues)? Where are the opportunities for more efficient water use and reuse?

- How much water is being used in different parts of urban irrigation sector?
- Are the irrigation systems properly designed and operated?
- How efficient are the existing urban irrigation systems?
- How much water is applied in excess of the plants requirements? How much of this excess or wastage can be reduced by simple measures?
- Many smart irrigation products (e.g., rain sensors) and practices are available to potentially save water, but there is little understanding as to how effective they are in 'real-world' situations.
- What real opportunities are there to encourage improved irrigation efficiency?
- How effective are the current strategies (e.g., water restrictions) being used by water authorities?
- What strategies can be implemented to make urban irrigation more efficient in the medium to long-term?
- How much water can we afford for urban irrigation activities in the future?
- How do we define the efficiency of urban irrigation?

## Looking into the Future

A range of water-efficient technologies and practices are now available for urban irrigators to use. In the recent years, public awareness and support for water conservation has increased. Also, the State and Federal governments are seeking alternative solutions for urban water resource management. These provide valuable opportunities to develop solutions and strategies that will make urban irrigation more sustainable. We may also need to examine opportunities that will help improve irrigation management via the whole urban water cycle and develop ways that will reduce dependence from traditional water sources.

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# 4. DEVELOPING IRRIGATION TECHNOLOGY SOLUTIONS

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## Improved Efficiency Opportunities

There is a real opportunity to achieve improvements in irrigation efficiency through the wider adoption of technology. It is commonly suggested that water savings in the order of 30% or more, can readily be gained in urban areas. The challenge is to achieve better utilisation of current and developing technology, so that the potential for high irrigation efficiency can be realised.

As a first step, it is essential to have a thorough understanding of urban irrigation. Comprehensive data on the irrigation technology in use, irrigation practices and effectiveness of the various conservation strategies is required.

### Major Potable Water Reduction Options

Achieving a reduction in dependence on potable water supplies is a current high priority for all urban water managers. There are basically two major options:

i. Obtain alternative supplies to replace existing potable water, and
ii. Implement Demand Management programs

Within the Demand Management area, there are several irrigation related approaches:

- Reduce irrigated area – including turning off irrigation and installing hard surface landscapes
- Use more water efficient species eg. warm season grasses
- Manage existing landscapes with less water eg, some level of water stress
- Pursue higher irrigation efficiency

The first three of these approaches highlights the need for horticultural expertise in developing water use efficiency solutions.

## Efficiency and Technology

### Urban Irrigation Efficiency

Urban irrigation presents a particular challenge, in terms of defining efficiency, as the outputs are not yields but vegetation of a desired quality or performance standard.

The amount of water applied to irrigated areas will largely determine the condition and quality of turf and landscapes. Lush, high growth, generally requires more water than moderate growth. Urban irrigation efficiency needs to be expressed in terms of the quality or performance level of the vegetation and the amount of water applied. The required performance level of irrigated vegetation can be linked to a Crop Factor value for the vegetation and the performance standards (Connellan, 2004). Defining urban irrigation efficiency is a priority.

**Why Urban Landscapes are an Efficiency Challenge**

Achieving high efficiency in urban irrigation is not straight forward. There are some characteristics and constraints that can hinder the achievement of high efficiency. They include:

- Vegetation with shallow root systems – often only 100 mm deep for turf
- Multiple plant species of varying water requirements in close proximity
- Diverse plant architecture – effective application difficult
- Highly variable soils
- Highly variable microclimates
- Variable hydraulic supply and operating conditions

High Irrigation Efficiency is dependent on achieving both a high efficiency of application (Application Efficiency) of water and the irrigation system being managed to reflect the site, the soil and the weather conditions (Scheduling Efficiency). Much technology already exists to aid urban irrigators.

**Technology and High Application Efficiency Examples**

- High uniformity of application sprinklers
- High uniformity, low precipitation rate sprays for small turf areas
- Subsurface drip for turf and landscapes
- Robust micro-irrigation for landscape areas
- Pressure compensated spray emitters for landscapes

**Technology and High Scheduling Efficiency Examples**

- Weather stations and weather services providing ET data
- Soil Moisture Sensors
- Rain sensors and switches
- Water conservation irrigation controllers
- Centralised control and wireless communications
- Flow monitoring and electronic precision metering

The watering of grass is the single biggest user of potable water in urban areas. High efficiency for this crop is strongly dependent on high uniformity of application and scheduling of irrigation to match daily weather conditions. It is a technology intensive process.

### Realising the Potential

It is very important to not only understand the science of the technology but also the social aspects of the use of the technology. It will be necessary to overcome barriers to adoption in order to realise the full potential of the available technologies. Soil moisture sensors have promised a lot in recent decades; however their adoption has been very poor in the urban sector. There needs to be research into understanding the reasons for adoption (or not) of irrigation technologies.

## Irrigation Performance Benchmarking

The performance of urban irrigation systems is generally not well understood in quantitative terms. Currently there is a focus on “water savings” and total volumes of water used. These measures are of very limited value in describing how well irrigation is being carried out at a site. It is important for the irrigation industry and the community in general to have nationally recognised performance indicators available that accurately describe the efficiency and standard of current water management practices.

Encouraging a culture of auditing of irrigation systems is potentially the most powerful tool in facilitating the adoption of irrigation technology. An audit focuses attention on the performance of the irrigation system and in particular on the hardware.

The Distribution Uniformity Coefficient (DU) should be prominently promoted as the appropriate measure for uniformity of application. The minimum standard of DU > 75% is a useful guide however there are situations when other reference values should be used. (Connellan, 2004)

The development of a nationally recognised performance benchmarking system would be a powerful tool in identifying opportunities for improvement in irrigation and focus attention on the value of the technology.

## The Future

Clearly technology has the potential to deliver significant efficiency gains for urban irrigation. At the moment there is a lack of a thorough understanding of many issues surrounding irrigation technology and its current role in urban water consumption. This needs to be rectified.

A greater focus on performance evaluation of irrigation systems, not only in terms of efficiency of water application but also irrigation management, will provide a

major incentive to deliver water more efficiently and in the process encourage better utilisation of technology.

The pursuit of sustainable urban irrigation needs to be a multi–disciplinary approach including irrigation, horticultural and social science expertise.

In the future, it is likely to a case of high efficiency irrigation, using the appropriate technology, or not irrigating at all.

**Reference**

Connellan, G. J., 2004. Evaluating the performance of urban irrigation, Proceedings of NZWWA Conference, Christchurch, October.

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# 5. BUILDING GARDEN AND GREEN INDUSTRY PARTNERSHIPS DURING TIMES OF CLIMATE CHANGE - THE WESTERN AUSTRALIAN EXPERIENCE

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## Summary

The winter of 2001 delivered the lowest runoff since 1914 into the hills reservoirs which supply 50% of the potable water requirements for consumers connected to the Integrated Water Supply System (IWSS). This situation was exasperated by the winter of 2004 which resulted in the lowest Perth rainfall for 27 years. To ensure continuity of supply for the summer 01/02 and beyond the Water Corporation determined that there was a need to reduce consumption by 45GL a year. Normal unrestricted consumption across all sectors (residential, commercial and industrial) is approximately 300GL so the savings required were significant.

The equation was simple. However, success would require a change in watering behaviour from 1.5 million consumers, many of whom had no experience of water restrictions and whose reaction to demands to limit their use of water was unknown.

## Introduction

To fully understand the potential a positive communication strategy can have on demand in an urban water supply system, it is vital to have an appreciation of both the political and social environment within which the message must be delivered.

### Political

In Western Australia, the Water Agencies (Powers) Act 1984 gives the Minister the power to make certain By-laws.

> *Stage 1 is the permanent state-wide ban on the use of sprinklers between the hours of 9a.m. and 6p.m. This ban has been in place in the Perth Metropolitan area since 1994 and was extended state-wide in 1998 to include all of the 113 independent and regional schemes operated by the Water Corporation. The limitations on water use increase with the various restriction stages, with the most severe being Stage 7 prohibiting all outside use.*

### Social

The West Australian community had little or no experience in dealing with situations where restrictions on water use are required. In fact, many

communities have no experience of restrictions and the major population centre in Perth last endured restrictions in 1977 / 78.

**Restrictions of September 2001**

During 2001 the south west corner of Western Australia and the agricultural areas experienced the driest start to a winter on record and this followed the driest summer on record. In a normal year inflows to the surface storages would supply about 50% of the water delivered to the integrated system with groundwater abstraction accounting for the other 50%. In 2001 these inflows were the lowest since 1914. With storage levels in the 9 major surface storages at critically low levels, Stage 4 restrictions were imposed from 8 September 2001. This limited the use of sprinkler systems to two days per week.

The Water Corporation had determined that there was a need to save 45GL of water from an unrestricted annual demand of 300 GL (i.e. 15% across all water use sectors) if storages were to stay above 100GL (or 17% capacity) by the end of summer. The 100GL was determined as the minimum operational storage that could be achieved without compromising water quality criteria.

Given that 70% of the water delivered into this system is consumed by the residential sector and half of this is used to irrigate gardens there is limited scope to make reductions in commercial, industrial and institutional water use, there was a requirement to actually effect a reduction of over 20% in the residential sector if the 45GL saving was to be achieved.

## What Did We Know?

Our research had shown that our customers greatly valued their gardens and would not respond well to putting them at risk or to be simply told to use less water without being offered advice on how this might be achieved.

The Corporation had developed a strong association with the key garden/green industry groups over many years and was therefore acutely aware of the potentially disastrous consequences of a total sprinkler ban on these businesses. The industry servicing the residential garden sector had matured since the 1977/78 restrictions and the imposition of a total sprinkler ban would have ravaged an important component of the local economy.

## How Did We Communicate?

The major communication elements targeted the key stakeholders:

- Community
- Political
- Media
- Garden/green industry

- Commercial/industrial sector

**The Community**

The communication campaign had one primary objective, which was to achieve the 45GL saving and thereby avoid the need for a total sprinkler ban. To achieve this, the Corporation determined that the campaign needed to be multi-faceted. It needed to:

- maintain support from stakeholders and garden/green industry groups:
- inform the community of the logistical arrangements;
- maintain the community's support for restrictions;
- build community support for water conservation measures and engage them openly in the debate on water issues; and
- retain the community's confidence in the Corporation as a water service provider.

The media campaign was both strategic and informational and had the prime objective of prompting behavioural change in people who were over-watering lawns and gardens, knowingly or unknowingly. The secondary objective was to prompt everyone to think generally about how they were using water especially outside the home.

The Corporation also set up a helpline to assist with enquiries and requests for information from the community. These enquiries were wide ranging and included such things as clarification on watering days, whether the restrictions applied to garden bore users, requests for exemptions which were available for short periods of time if consumers were establishing new lawns or gardens and reports of breaches of the restrictions from community members

**The Political Environment**

The need to impose restrictions on water use was understandably a sensitive political issue. Because of the high level of community interest, our elected representatives were always going to be challenged on the issue by their constituents. It was recognised in the early stages of preparation that they needed to be provided with as much detailed information as possible if they were going to feel comfortable to discuss the issue objectively.

**The Media**

The Corporation determined at the outset that it needed to be highly visible in the media. The imposition of restrictions was always going to generate significant media comment and public debate through the media.

The water situation in the state, and particularly in Perth, was newsworthy and the Corporation adopted a very deliberate policy of always making the spokesperson available to both electronic and print media.

The electronic media understandably focussed on the issue of the day and the news segments became important opportunities to reinforce the themes that were running in the paid advertising campaigns at that time.

**Garden/Green Industry**

The industries most affected by any form of restrictions would be the garden/green industries. This was a collective of industries that included irrigation specialists, bore drilling contractors, nurseries, turf growers and lawn mowing contractors.

The Corporation had a long-standing working relationship with these industries and had collaborated in the past on water conservation campaigns. However, restrictions, and particularly the possibility of a total sprinkler ban, represented a very real threat to their livelihoods.

In recognising this, the Corporation established a Garden Industry Reference Group as soon as it became apparent that some form of restriction would be inevitable. This group was established with the aim of exchanging views and information, and co-ordinating community education efforts. From the Corporations perspective it was important for these industries to remain “on-side” even in the face of what was undeniably a major threat to them.

The Corporation presented this group with information on its planned communications campaign and regularly sought their input and integrated suggestions into the messages conveyed. Point of sale material was also developed and distributed to retail outlets and the Corporation sponsored trade and consumer events which supported these industries.

Key messages were delivered through public presentations at nurseries (which were jointly promoted), Home and Garden shows and by sponsoring segments on TV garden shows.

These presentations were designed to

- inform the garden enthusiast of the facts as they related to the water issue,
- inform the community in general of the plans in place for future water source development, and
- instil confidence in this section of the community that it was possible to maintain an attractive garden both now and into the future.

The Corporation also recognised that these businesses and their staff would be in contact with our customers. It was very much in our interest to ensure that they were in possession of some of the high level facts about water source planning like the merits or otherwise of a Kimberley pipeline, the extreme winter event in 2001 and the number of source options we have in this State. Technical briefings were delivered on request to staff at individual businesses.

**Commercial/Industrial sector**

The restrictions regime that was put in place clearly targeted garden use but also extended to discretionary use in industry.

There was much public comment about the need for industry to show restraint in the face of the restrictions. The Corporation worked closely with industries most under scrutiny from the public like the building industry, the used car industry and the construction industry.

Work with the Housing Industry Association resulted in a publicity campaign to reduce water wastage on new housing construction sites. The Corporation also encouraged the Motor Trades Association to develop and implement an industry code of practice on water use in car yards.

With a high level of public scrutiny on industry use of water, the Corporation also responded to many requests for specific briefings from industry designed to more fully inform them of the facts of the current situation and the Corporation's plans for the future. The heavy construction industries, particularly road and subdivision work, were constantly targeted by the community for their poor conservation practices.

## Conclusions

How do we assess the effectiveness of the campaign? Satisfying the primary objective, which was to save 45 GL of water, is the obvious measure of success. However, there are a number of less obvious indicators that are also powerful measures.

- A garden/green industry that recognises the need to re-focus their businesses
- A high degree of compliance by the community with the restriction regime; and
- A community that still supports restrictions, entering into the fourth summer support for restrictions is running at 90+%.

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# 6. WATER CONSERVATION IN URBAN LANDSCAPE - ISSUES, CHALLENGES AND OPPORTUNITIES IN MELBOURNE.

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### *Extent of Irrigation Usage*

Depending on weather conditions the irrigation season in Melbourne can begin anytime between September and November and run through to early April or May. The weekly usage in Figure 5.1 demonstrates the impact of irrigation on Yarra Valley Water's usage. Base usage of around 3,000 ML per week can rise to over 6,000 ML during the height of summer.

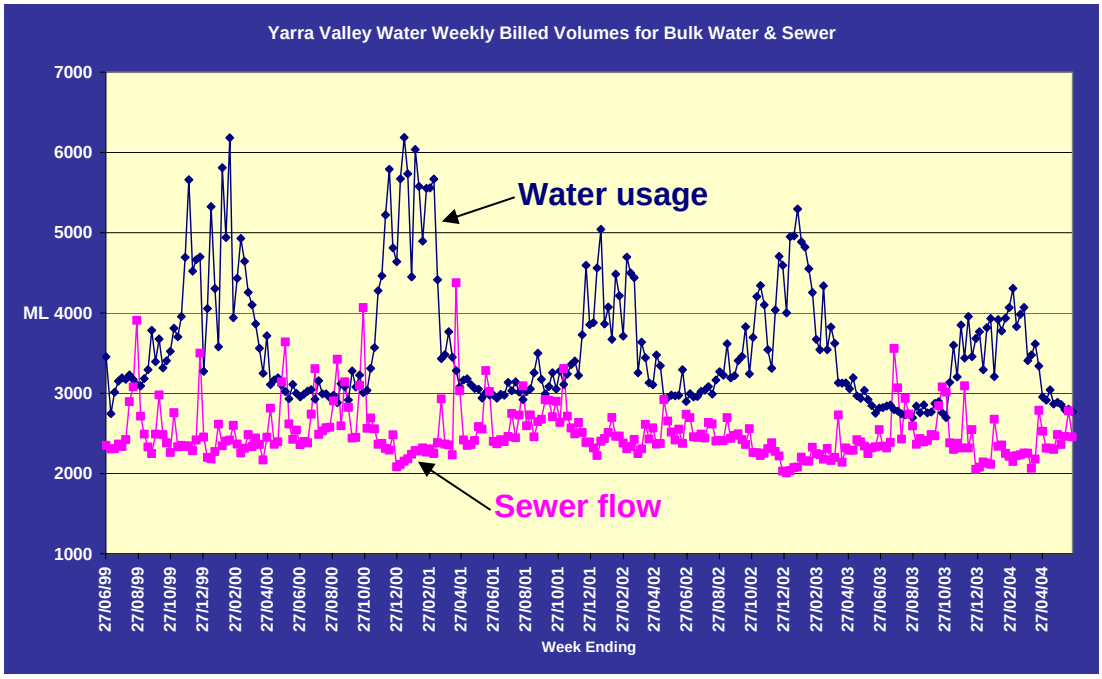


*Figure 5.1. Water usage and sewer flow patterns at different weeks during 1999-2004 period.*

In Melbourne irrigation can account for between 15% and 20% of total usage depending on weather conditions. Around 80% of water used for irrigation occurs in the residential sector. Despite common reports that garden usage makes up anywhere from 35% to 50% of residential usage, analysis based on the usage patterns shown in the chart above, in conjunction with analysis of quarterly billing data, indicates that on average 25% of annual usage occurs in the garden.

## Water Conservation Strategies for Irrigation

### Regulation

The Victorian State Government is intending to implement permanent water savings measures (PWSM) possibly in December 2004. The key aspects of these measures relate to irrigation and are intended to promote the "responsible water use" message.

PWSM would mandate that irrigation with sprinklers can be undertaken only between specified times, for example automatic systems could only be operated between 10pm and 10am. It would also be mandatory for all new automatic sprinkler systems to be fitted with either rain shut off devices or moisture sensors.

PWSM are not expected to make a great deal of difference to usage with perhaps only a 1% to 2% reduction. However they would potentially provide indirect benefits as a permanent reminder to the community that water should be used responsibly.

### Price

From 1st October the Melbourne retailers introduced block tariffs for residential customers. Consumption below 40KL per quarter is charged at $0.75/KL, 40 to 80 KL at $0.88/KL and consumption over 80 KL at $1.30/KL. This last block tariff is targeted predominantly at irrigation use.

### Behavioural Change

For the residential sector the predominant strategy is to educate the community to bring about behavioural change. A major element of the education program will be the Our Water Our Future (OWOF) Water Saver Garden Centre Program.

The intent of the program is to provide consistent messages to the community (regarding garden design, plant and turf selection, water application and mulching) through the training of all garden centre and nursery staff who have contact with customers. The OWOF Water Saver Garden Centres will be accredited and receive point of sale material.

### Water Management Plans

In October 2002 the Victorian Government's blueprint[1] for the sustainable management of Melbourne's water supply recommended that the Melbourne water industry work with Local Government and other major open space managers to develop integrated Water Management Plans (WMP).

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[1] 21st Century Melbourne: a WaterSmart City, Final Report, October 2002.

The Melbourne retailers have developed a partnership with the International Council for Local Environmental Initiatives (ICLEI) to facilitate the development of these WMPs. The ICLEI Water Campaign provides a strategic milestone based framework designed to assist councils and their communities to reduce water consumption.

An additional $300,000 program involving a partnership between Melbourne Water and the Municipal Association of Victoria provides grants of $10,000 to participating councils. These grants are to help the councils develop Sustainable Water Use Plans that work towards reducing demand, promoting reuse and improving stormwater quality.

## Goals for Irrigation

The above strategies are designed to contribute to Melbourne's adopted water conservation target of a 15% reduction in per capita consumption by 2010[2]. The savings that result from the above strategies are guesswork at best. Often there is no hard data on what savings can be expected to result from various initiatives. Consequently the capability to monitor program effectiveness is an issue.

For local councils and open space managers the outcomes from WMPs will provide valuable insights into what measures are most feasible and effective in reducing usage. It is important that the retailers are involved and provide guidance to ensure that the WMPs also provide an effective mechanism for the prioritising and costing of alternative measures.

For the residential sector there is still much to learn about garden irrigation. The individual contributions from drip systems, drought tolerant species, mulching, tap timers, rain sensors and so on are still a matter of conjecture. Consequently it is not evident what water an "efficient" garden should use. A research program involving the permanent separate metering of outdoor usage in at least 300 homes across Melbourne would provide a valuable data set to assist with the ranking and prioritising of irrigation conservation initiatives.

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[2] Based on the average demand of the 1990s.

# 7. WATER CONSERVATION IN URBAN LANDSCAPES - THE ROLE OF THE NURSERY AND GARDEN INDUSTRY

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The Nursery and Garden Industry (NGIA) is the peak industry group representing Australia's vibrant and diversified nursery and gardens industry. The Association represents all those that grow plants for gardens and amenity horticulture and the many and varied retail outlets that sell them. With over 20,000 businesses, more than 60,000 employees and annual retail sales in excess of $5.7 billion, gardens and gardening is a 'big business'.

The position of 'Program Manager- Water' was created to assist the industry in identifying and responding to the various issues that make up 'water' and the impact these are having on the industry.

With the increased focus on urban water issues in the National Water Initiative and the increasing pressure of growing cities on urban water supplies, the area of outdoor water use is frequently identified as a primary target for water conservation strategies.

In particular, the wide spread use of water restrictions in response to the on-going drought has had a significant impact on the industry nationally. This is due to a decline in retail sales as well as through the flow-on effect this has on the producers of plants, associated industries (e.g., potting medium and other garden products), and associated professionals (e.g., garden maintenance and landscaping). It also highlights the currently under-utilised opportunity that exists for the industry to play a vital role in educating and influencing gardeners about outdoor water conservation.

As a result of day-to-day contact with garden consumers and via market research into gardener's behaviour (as well their attitudes and responses to water restrictions) the nursery and garden industry is well placed to develop and deliver a wide range of urban water conservation programs. In fact a number of examples of existing nursery and garden centre water conservation initiatives illustrate the potential role the industry could have in the future.

Water as an issue is made up of an extremely wide range of issues and concerns, many of which present significant challenges for the nursery and garden industry. Some of the key areas that NGIA has identified in its water program are:

- Impact of Urban Water Conservations Measures and on-going demand management strategies,

- Effect of consumer attitudes to and understanding of gardens and garden water use,
- Inconsistency about best practice garden water use both from water authorities/government and the industry,
- Water availability and use for industry (as a requirement for plant production and maintenance), including the impact of restrictions on businesses and the opportunity to access alternative water supplies in urban areas, and
- Lack of opportunity to adapt and respond to change, due to limited consultation, poor impact assessment in some cases, and a low involvement in decision making processes.

However, for each of these issues and challenges, there are opportunities to move forward. As an industry we offer:

- Direct contact with the target audience. We interact with them about water at the time they are making garden decisions,
- An understanding of garden consumers, and the ability to transfer information about water use in the garden in a practical and non-threatening manner,
- Expertise in best practice water use for gardens and amenity horticulture,
- Experience in improving irrigation and water use efficiency, and a framework on which to build further improvements, and
- A unique position as the place where consumers want to go to get advice and information about there gardening practices.

In particular, we see that through partnerships with the other stakeholders involved the nursery and garden industry has an important role to play in urban water conservation.

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# 8. WATER CONSERVATION IN URBAN LANDSCAPES - EXAMPLES OF INITIATIVES AND OPPORTUNITIES

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## Urban Irrigation

Use of water for urban irrigation, including nurseries, domestic and public gardens, recreational sports grounds and golf courses, generates significant social and economic benefits (Table 8.1). Gardening and sporting pursuits rate highly on society's list of leisure activities, and the supporting industries for these pursuits are viable and justified economic sectors generating significant multipliers for wealth and employment. The Australian Garden Market monitor reports retail sales of $5.7 billion.

*Table 8.1. Economic value of urban irrigation industry in Australia.*

| Total Garden all Distribution Channels<br>Year Ending June 30 2003 | | | |
|---|---|---|---|
| Distribution Channel | Market Share | +/- LY | Market Value ($'000) |
| Landscapers | 25.0% | 15.4% | $ 1,429,895 |
| Local Govt & Sports | 1.8% | 3.8% | $ 102,269 |
| Revegetation | 1.7% | 4.2% | $ 94,943 |
| Plant Hire | 1.3% | 4.9% | $ 75,560 |
| Garden Services | 8.4% | 2.7% | $ 482,895 |
| Retail Nursery | 18.1% | -2.8% | $ 1,035,249 |
| Discount Dept Store | 5.1% | 9.3% | $ 288,745 |
| Garden Supplies | 16.5% | 4.0% | $ 945,010 |
| Hardware | 16.4% | 3.7% | $ 939,939 |
| Mail order & E-comm | 0.5% | 2.5% | $ 27,374 |
| Markets | 0.2% | 4.9% | $ 12,428 |
| Supermarkets | 2.3% | 7.9% | $ 130,443 |
| Wholesale Direct | 0.7% | 0.5% | $ 40,295 |
| Propagators | 1.9% | 2.0% | $ 109,701 |
| **Total** | | **5.4%** | **$ 5,714,745** |

Garden Market Monitor Table 2 RETAILworks

Australians' water use habits are coming under increasing scrutiny, due mainly to the dual factors of diminishing supply and increasing population. Demographics will continue to shift towards an older population with time to devote to outdoor leisure activities, including gardening and sports recreation. By many accounts, the climate in southern Australia is likely to become warmer and dryer. All these factors will have significant impact on urban irrigation.

## Water Conservation vs. Water Restrictions

Much is being done to improve water use efficiency across the urban irrigation industry. Horticulture Australia, for example, has invested more than $1.5 million in areas such as best management guidelines for recycled water use in nurseries, customer attitude surveys, evaluation of sprinklers and moisture sensors, and evaluating the response of various turf grass varieties to temperature and moisture stress (Table 8.2)

Water authorities rely on outright garden usage bans, or alternate day hosing or buckets, to curb demand during dry times. Urban irrigation bears the brunt of harsh water restrictions, our current restrictions need to change so that efficient and legitimate uses of water are not unduly penalised and that conservation investments and faith are not jeopardised, threatened or lost.

For example, the cities of Bendigo and Goulburn in regional Victoria and NSW are presently on extreme restrictions, banning lawn watering and seriously limiting outdoor use of water. A lot of investment is being lost as turf and gardens die. Meanwhile, efficient water use equipment lies idle but inefficient hose and bucket watering has been required.

Should not an accredited efficiently designed and operated subsurface drip system be encouraged when compared to alternate day bucket watering? Sales of sprinkler systems in Bendigo have dropped by 90% in the past three years, contributing to local and regional economic hardship and reducing long-term water conservation.

## Urban Irrigation –Future Research Needs

There is no doubt that alternative water sources will need to be developed. Recycling and stormwater harvesting can occur both at the household scale and regional scale. Public perception of risk needs to be addressed. Developing and encouraging alternative water sources is a key research and education need for the CRC IF.

Urban water authorities under the National Water Initiative will be implementing demand management programs and step (rising block) pricing for water (as is being introduced in Victoria, where the marginal cost of water increases with usage). The focus has been on reducing outdoor residential water use, which is only about 20% of total urban use (ATSE Report on Water Recycling 2004). Other industrial use appears to be much less affected. Policies that enable water restrictions to be borne by all users and/or enable water trade should be looked at.

Therefore, the CRC IF should look how water authority’s policies can achieve reductions in water use that are effective for both short term needs and long term conservation.

Table 8.2. Current research projects funded by Horticulture Australia Limited.

| Title | FName | LName | Organisation |
|---|---|---|---|
| Development and evaluation of new test for water retention efficiency of potting media | Geoff | Cresswell | Cresswell Horticultural Services |
| Audit and gap analysis of nursery waste-water research and communication | Victoria | Lane | GrowSearch Australia Qld. Horticulture Institute |
| Researching consumer attitudes to water usage | David | Gordon | Nursery and Garden Industry, Victoria |
| Consumer Research in Relation to Garden Water Attitudes and Practices | Richard | de Vos | Nursery & Garden Industry, Australia |
| Past, Current and Planned Activity by Water Authorities and Others | Richard | de Vos | Nursery & Garden Industry, Australia |
| National workshop on nursery runoff and water quality | Richard | De Vos | HRDC |
| Nursery irrigation, drainage and recycling | Ian | Atkinson | NSW Agriculture |
| Development of recycled water systems for Australian nurseries | Liz | James | Agriculture Victoria |
| Improving nursery irrigation, drainage and re-cycling practices with training workshops | Chris | Rolfe | NSW Agriculture |
| Monitoring and treatment of recycled water for nursery and floriculture production | David | Beardsell | Agriculture Victoria |
| Nursery Industry Water Management Best Practice Guidelines - Development of a national water use strategy for the nursery industry | Ian | Atkinson | Nursery Industry Association of Australia |
| Commercial adoption of efficient irrigation & fertiliser strategies for containerised nursery plants (cont'd NY525) | David | Huett | NSW Agriculture |
| Evaluate and extend nursery irrigation, drainage and recycling practices as set out in WATERWORKS program | Chris | Rolfe | NSW Agriculture |
| Evaluation of irrigation sprinklers for the Nursery Industry | Ailsa | Willis | Australian Irrigation Technology Centre |
| Constructed wetlands to reduce nutrient and pathogen loads in recycled nursery water | David | Huett | NSW Agriculture |
| Demonstration of water management best practice in retail nurseries | Chris | Rolfe | NSW Agriculture |
| Water use studies and implications for management of subtropical C4 turfgrasses in dryland and irrigated urban open space | Chris | Menzel | QLD Department of Primary Industries and Fisheries |
| Assessment of the uniformity of automatic golf green irrigation systems | Phillip | Ford | Watertight Horticulture and Turf |
| Evaluation of a soil moisture sensor to reduce water use and nutrient leaching in turf | Tim | Colmer | University Of Western Australia |
| The range of adaptation of turf types of couch grass to temperature, light & water stress | Peter | Martin | University of Sydney |
| Turf irrigation and nutrient study - Stage 2 | John | Yeates | AGC Woodward-Clyde Pty Ltd |
| Preliminary survey of water quality in water bodies on NSW golf courses (cont'd TU9601) | Jyri | Kaapro | Turfgrass Technology Pty Ltd |
| Reducing water use by turf grasses in a Mediterranean environment: evaluation of diverse species (cont'd TU9602) | Tim | Colmer | University of Western Australia |
| Preliminary survey of water quality in water bodies on NSW golf courses (cont'd TU601) | Jyri | Kaapro | Turfgrass Technology Pty Ltd |
| Reducing water use by turf grasses in a Mediterranean environment: evaluation of diverse species (cont'd TU602) | Tim | Colmer | University of Western Australia |
| Water Management on Golf Courses Workshop Series | Euan | Laird | Australian Golf Course Superintendents Association |
| Quantitative analysis of the effects of the use of effluent water on turf | John | Neylan | AGCSATech |

These programs will increase the need for more efficient water use technologies both inside and outside the home. Some examples of outcomes through these programs may include:

- Better-educated gardeners will design water efficient gardens, select appropriate plants and install efficient watering systems.

- Encourage high-density development, with small gardens and lawns to potentially reduce water use per household, and offset to some extent population growth.

These areas are another research and education need for the CRC IF. We welcome the opportunity to develop a coordinated approach to these needs.

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# 9. WATER USE EFFICIENCY IN PUBLIC OPEN SPACES

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## Background

There has been no public open space water use efficiency research undertaken in Queensland except for some limited trials undertaken by Broomhall and Menzell (2002) into the ability of some grasses to tolerate drought conditions in containers. Most of the pot levy funds collected by the nursery industry on behalf on Queensland's Lifestyle Amenity Horticulture Industry have been devoted specifically to the nursery sector. Subsequently the $223 million plus Grounds Maintenance industry has not collected comprehensive statistics regarding the current water use practices of this sector. However, it may be seen that there is considerable potential to increase current water use efficiency by up to 160% through education and training. This potential takes on increased urgency given that the economic and community demand drivers that are leading to increased irrigation installations under current understandings.

Holistic approaches to landscape construction, maintenance and management as it affects water use efficiency needs to be promoted to provide appropriate contextual settings for water conservation. There is also a potential to increase the use of recycled water given that so much of the public open space infrastructure is relatively close to water treatment stations.

Sustainable public open space improvements and increased water use efficiencies will not occur without a well targeted and customised education and training program. Training should be nationally accredited and delivered by educators that have successfully constructed, managed and maintained public open space. Given the current poor advice for public open space development leading to many of the current inefficiencies, there is a compelling case to exclude academics, researchers and ex-greenkeepers who do not have substantial *"hands on"* experience in public open space development, from anything but secondary responsibility for delivery of curator training.

## Research Issues

Key research areas identified to achieve improved efficiencies in public open spaces are:

- Industry wide benchmarking of current water use habits needs to be undertaken to more appropriately understand wider industry perceptions.
- Definitive research needs to be undertaken across the various sub-sectors to determine survival and optimum plant water requirements in a range of demand driven situations from sports fields to streetscapes to resorts.

- Soil-water-plant relationships in a range of Lifestyles horticulture settings from wet tropics to arid zone to humid subtropics need research to determine holistic resource requirements.
- Water delivery mechanisms require cost effective whole of life examination to assist decision making in selecting irrigation systems that maximise water use efficiency.
- The existing effects of short, medium and long term sodium build up in soils from recycled water application requires detailed examination.
- The effect of macronutrient (especially nitrogen and phosphorous) loadings from recycled water upon a range of indigenous plant species in a range of soil types requires objective examination.
- The whole of life cost / whole of use effectiveness of recycled water infrastructure costs need reviewing with a waste to an asset underpinning philosophy.
- Alternative on site water harvesting and recycling methods require further investigation.

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# 10. IRRIGATION SCHEDULING WITH MEASUREMENT AND CONTROL - SET AND FORGET OR LIVE AND LEARN

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This talk draws from experience in scheduling irrigation to sports ovals and home gardens in Canberra. The ACT government spends over $2 million a year on water for ovals and parks. The price of water has almost doubled in a decade and it continues to rise. Even if the community was willing to pay, mandatory stage 3 water restrictions mean that the water is just not there; government, like the rest of the community has to cut usage by 40%.

There are two choices for getting irrigation more accurate; prediction and measurement. The prediction method, used in the ACT, involves the use of reference evapotranspiration modified by crop factors. The benefit of prediction is that the data is easy to get and irrigation is kept within broad, but thermodynamically reasonable limits. The downside is that errors are cumulative - the grass might be green but there is no feedback to alert the manager to over-irrigation. Intensive soil water content monitoring on Canberra ovals revealed that much more water was draining past the root zone than the computer model predicted.

The benefit of measurement is that you know exactly what is happening, but it is bedeviled by soil variability, irrigation non-uniformity, the cost of equipment and the time and expertise needed to interpret it. However, if a monitoring tool could override an irrigation controller when the soil was too wet and/or shut the irrigation down when the water reached a given depth, the system could run automatically - set and forget. Such systems have been shown to work well, at least under experimental conditions.

The seductive idea of set and forget relies on finding a representative spot in a field to monitor water and a sensor that is accurate and robust in the long term. Both can be elusive. Those who prefer experience or prediction methods might feel it is better to be roughly right than precisely wrong.

Although set and forget remains a goal to aspire to, we have been pioneering learning-based approaches. The learning based approach is based around a simple wetting front detector that tells the manger if water moved past a certain depth. The methodology requires the operator to formalize their mental model of what exactly they are trying to do, and the wetting front detector gives a yes/no response to whether the aim was achieved. The detector response stimulates the operator to refine or reevaluate their model and sets them on a path to find out what they need to know.

If there is room to improve irrigation on ovals, where reference evaporation, rooting depth, rainfall and irrigation amounts are measured by trained practitioners, one can only wonder how efficiently the average backyard lawn is irrigated. And if a sprinkler system is hard to manage, for which there are visual cues for how well it is performing, what would be the situation for drip systems? Ultimately technology may turn the taps on an off according to the needs of the garden or oval. In the meantime the cities are full of irrigators who work the taps; for a while a least learning based approaches might be the way to reach them.

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# 11. WATER CONSERVATION IN THE URBAN LANDSCAPE SMART IRRIGATION CONTROLLER – A CASE STUDY

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## Background

The automatic sprinkler system has developed as a “must have” home appliance.

The Water Corporation of WA audited water usage statistics showing that approximately half of the water consumed in the households of Perth is used in watering the garden. As water has become more precious, the use of water for garden watering has come under attack. Initially, the simple approach was to prohibit the use of the automatic sprinkler system.

However, this situation is not sustainable because homeowners have a right to develop and sustain a quality garden and home environment. The garden is an integral part of the architecture and indeed lifestyle in the twenty-first century.

Technology is now offering a solution to the conundrum of how to have a beautiful garden or landscape while saving considerable water by eliminating over watering and waste. In Perth, 53% of household water consumption is used in garden watering. Research by The University of Western Australia shows if watering can be matched to the evaporation rate, *half* of this water can be saved.

Irrigation controllers are only clocks. They are usually ‘set’ for the most severe watering requirements or legislated applications. Once set, they just keep on watering. No one monitors them or keeps a watch on them. Very few are re-programmed in times of lower demand. Some are not even turned off in winter!

## Smart Irrigation Controller

Holman Industries recognized the need for a SMART irrigation controller some six years ago. With assistance of an R&D start grant, the Company invested over $1million to build an advanced irrigation controller that would: -

- Take account of changing environmental conditions,
- Automatically water at a frequency that matches demand and turns off when it is raining,
- Maintain correct soil moisture to attain healthy growing conditions, and
- The system is affordable by urban irrigators.

The resultant WaterSmart™ control system utilizes a ceramic soil moisture sensor to allow programmed watering cycles to be shut down when adequate soil

moisture exists. The system has had two years independent testing by The University of Western Australia (with the support of HAL). The results showed water saving of 50% on conventional watering regimes. A bonus result was that the WaterSmart™ system eliminated nutrient leaching.

Despite having a proven product and investing a significant amount of money in marketing and promotion, sales have been very slow. Some of the reasons for this include:

- There is not enough financial benefit to justify the extra cost of the WaterSmart™ control system. The price of water is too low!
- Government regulation has prevented the system use! If you are only allowed to water two days per week (Perth) or not at all (Melbourne and Sydney) why install this system?

## A Catch 22!

To encourage the uptake of SMART watering systems, an all-of -industry approach to promotion is required. The Irrigation Association and water suppliers, and indeed Government, must create an environment where the public are encouraged to invest in better technology.

Key issues are: -

- Cost of water (particularly marginal or excess use) must be increased.
- Purchaser rebates must be introduced.
- Water restrictions must be varied if users invest in proven technology.

## Conclusions

The WaterSmart™ control technology has been proven to save up to 50% of water while maintaining a healthy, quality landscape.

The system works by eliminating over-watering and continuously rescheduling the automatic clock to allow for the environmental conditions and landscape demand for water. Because no over-watering exists, nutrient leaching is also eliminated.

To allow this type of proven control system to be successfully introduced into the market, the authorities must introduce incentives in the form of rebates and vary the water restriction regimes if the WaterSmart™ technology is used. The cost of excess water must also be increased to provide an economic reason for users to save water.

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# 12. WATER CONSERVATION IN URBAN LANDSCAPES – ISSUES AND CHALLENGES FOR IRRIGATION EQUIPMENT MANUFACTURERS

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This presentation is based on limited (by preparation time) conversations with industry manufacturers, none of which are represented at this workshop. While data differs, the fact remains that nationally, outside use is a large component of all domestic water consumed.

Irrigation manufacturers note that almost all water authorities have focussed on internal water use reduction via technology (low use showers, toilets and washing machines) and that external water reductions have had little technology promoted. Most external programs are based on regulation or publicity and appeal to behavioural rather than technology improvements.

There is real industry cynicism about this. Many believe that water authorities with revenue directly related to water volumes but with large costs related to sewerage (non volume related revenue) are focusing on internal reductions to reduce their sewer processing costs and to offset decreasing water revenue. There is a widespread view that someone other than water authorities should lead public programs.

External water use is generally to create an amenity level that is difficult to subjectively measure.

Domestic irrigation practices are generally appalling and are rarely based on the professional advice available. The application of good science for domestic situations is minimal, especially compared with professional precision agricultural irrigation. Domestic systems appear to be bought almost entirely on price and for convenience rather than for greater efficiency.

Because the industry is focussed on low cost products sold through low margin mass market outlets there is little interest (or margin) in providing better products and better advice. Unless the public perception of appropriate costs and value changes dramatically, this will prevent the development, sale and support of systems that can approach good irrigation practice.

Form our experience and that of others we see savings of at least 25% and often 80% if good practices based on plant water requirements are implemented. Good systems – designs based on soil types, terrain, shading, uniform coverage, appropriate plant selection, evapotranspiration, along with good monitoring and control systems will easily outperform hand watering efficiencies and can maintain better gardens.

The investment in doing this well will be higher than current domestic systems but still substantially less than the amounts spent on other garden improvements such as paving and plants. Eventually these systems will be the only way to maintain the levels of amenity required.

Achieving changes in understanding and adoption of improved systems will require a full range of changes including education, regulation, price and tax incentives and support for research. Urban irrigation industry is willing to work with others to achieve these goals, but companies will want to see the potential for future business success if they are to invest in this market.

In summary the main issues are:

- Need an external not just an internal focus – including education and awareness programs.
- Perception that water authorities have too great a conflict of interest to be the promoters of water savings – we must deal with this!
- Science has not yet defined urban best practice and we have fragmented (and minimal) R&D. We can bring some agriculture knowledge to this to fast-track!
- Current market for irrigation systems is at very low cost end. Need to re-educate market to pay more for greater benefits. Businesses will not invest in suitable products at current market returns.
- Need to develop a much more competent domestic irrigation supply and services sector.

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# 13. WORKSHOP OUTCOMES TO FIVE KEY QUESTIONS

## The Five Key Questions

(i) What are the achievable goals for urban irrigation's contribution to permanent water conservation measures?

(ii) What are the advantages and disadvantages of moving towards a nationally coordinated approach to urban water conservation?

(iii) How do we define and measure effectiveness of urban irrigation in both domestic and commercial situations?

(iv) What can be done to assist the adoption of best practice urban irrigation in domestic, public open spaces and commercial situations?

(v) What strategies will be needed for sustaining urban irrigation in the future and what further research & development is needed to for this?

## Issues Identified with the Conversation Mapping on the Five Questions

### Q.1. What are the achievable goals for urban irrigation's contribution to permanent water conservation measures?

***Issue 1 – Plant water use***

- What are the water requirements of different garden plants (native, exotic and turf)?
- We need local data through measurement of plant water use.
- Crop factors are important but we do not have reliable data on the factors for their practical use.
- In spite of significant advances in methodology for calculating evapotranspiration, it is still difficult to estimate evapotranspiration reliably for a given site.
- Need to recognise different water requirements for garden plant establishment vs. maintenance.
- Need to establish plant suitability to climates of particular postcodes in urban areas.

***Summary statement****: There are no reliable data available on water requirements of different plants suitable for urban landscapes under a range of climatic situations.*

***Issue 2 – System management and operation***

- Need for smart irrigation to reduce user input/influence.

- Need cheap effective sensors for flow measurement (Must have accurate outdoor water use measurement).
- Need to link water service providers profitability to water use efficiency and not water consumption.
- Holistic approach to onsite water management.
- Consumer feedback - KL/green area on each bill as water use efficiency indicator.

***Summary statement****: Measure water use to manage it – preferably automated.*

***Issue 3 – Irrigation infrastructure***

- Must have best practice – design, construction, maintenance and monitoring.
- Cost effectiveness is important.
- Idea of "Roadworthy Certificate" issued on transfer of property.
- Custodian of best practice guidelines needs to be industry, i.e., IAA and other stakeholders.
- Need business models which provide incentives for all to be involved.
- Concept of "Body Corporate" or cooperative ownership and management of irrigation infrastructure.

***Summary statement****: We need cost effective, best practice urban irrigation infrastructure that is managed by the 'whole-of-industry'.*

***Issue 4 – Alternative water sources***

- Affordable grey water capture and reuse (design standards will be important).
- Acceptable risk need to be established in relation to public health, soil quality and nutrient runoff in waterways (EPA regulations).
- Neighbourhood stormwater harvesting.
- Recycled water as source of water for irrigation.
- Water sensitive urban design.

  (N.B., not just new suburbs but existing ones for all the above points)

***Summary statement****: A retrofit model is required for the application of alternative water sources for urban irrigation in established and new neighbourhoods.*

**Q.2. What are the advantages and disadvantages of moving towards a nationally coordinated approach to urban water conservation?**

***Issue 1 – National recognition/focus data***

- Potential integration of all players.
- Training is transferable and recognised.

- More weight with national media and greater consumer focus.
- National consumer awareness program.
- Encourage national focus in irrigation expertise.
- National recognition of irrigation practice as a profession.
- Transferable skills, standards and accreditation.
- National recognition by governments, environmental agencies, business sector and community as a whole.
- Encourage close relationship between irrigation industry and user.
- National assessment is a process not an outcome.
- Who will coordinate urban water conservation nationally?

***Summary statement****: We need a national approach that facilitates integration and transferability of credible expertise, standards, and recognition by all players in the urban irrigation sector.*

### *Issue 2 – Science and research*

- Need consistent science to advance urban irrigation.
- Research needs to be more efficient.
- Research needs to be more long-term and strategic.
- National data collection – science based.
- Critical mass of expertise is needed.
- Better resources are required for range of disciplines associated with urban irrigation.
- Synergy and shared learning are important.
- Get science right and then apply it locally to achieve improved urban irrigation.
- What are the similarities between diverse areas in urban landscapes?
- Some research could flow on from urban water related CRCs

***Summary statement****: We need a national approach to urban irrigation issues for providing better resources to support consistent, strategic, and long-term R&D leading to a critical mass of expertise and data collection.*

### *Issue 3 – Supply and product efficiency for a national approach*

- Encourage home-grown innovation.
- Encourage more investment.
- There is a need for national marketing of programs and products.
- Irrigation product suppliers could market across the country (More cost effective).

- Business certainty is important.
- Effectiveness of investment.

***Summary statement****: A national approach allows and encourages investment, innovation, business development and certainty.*

***Issue 4 – Coping with diverse issues in each region***

- National coordination will not work in some cases; provides a framework, not specific solutions to particular issues.
- Local political environments are important factors.
- Different microclimates and soils
- Same measures may not be adequate for different situations.
- Could reduce flexibility to deal with local issues.
- Diverse urban environment vs. rural.
- Losing sight of specific user area needs.
- Still have need for individual refinements.
- Disadvantage – will increase complexity.

***Summary statement****: A national approach has perceived disadvantages – it will not deliver specific solutions, may reduce flexibility across diverse range of interests and environments.*

**Q.3 How do we define and measure effectiveness of urban irrigation in both domestic and commercial situations?**

***Issue 1 – Regulator/infrastructure definitions and measures***

- Lower peak demand – saving in capital costs.
- Improve quality of waterways from percentage recycled.
- Indoor and outdoor meters.
- Amount of water used off peak.
- Give every householder a finite irrigation area and expected water use.
- Percentage of peak seasonal demand.

***Summary statement****: Measuring effectiveness of urban irrigation by cost and utilisation of infrastructure and adoption of irrigation technology.*

***Issue 2 – Definitions and economic measures***

- KL of irrigation water used outdoor and profitability, number and growth of irrigation related businesses.
- KL of irrigation water used /person hours spent watering.
- KL of irrigation water used /people employed and $ turnover.

- KL of irrigation water used /value of delivery assets.
- KL of irrigation water used /value of open space irrigated.

***Summary statement****: Measure irrigation effectiveness against economic activity - $ generated per KL irrigation water used.*

***Issue 3 – Environment/horticultural definitions and measures***

- KL of irrigation water used /$m^2$ of landscape/type.
- Plant health.
- KL of irrigation water used/$m^2$ of area.
- Over-watering

***Summary statement****: Concept of plant water usage compared with water applied.*

***Issue 4 – Social definitions and measures***

- 'Feel good' environment in the area (sporting activity; wellbeing, health).
- Frequency of sports injuries (sports fields).
- Hours spent in garden watering.
- Transfer of irrigation demand from private to public space.
- Extent of biodiversity.
- Increase in population and tourism.

***Summary statement****: Measures of irrigation by quality of lifestyle and effect on changes/variations to the same.*

**Q.4. What can be done to assist the adoption of best practice urban irrigation in domestic, public open spaces and commercial situations?**

***Issue 1 – Technology***

- Need easy to use, cost effective irrigation systems that are based on better science and technology and deliver better performance. Also, the systems are interactive for users who want them.
- Need irrigation professional inputs to this – soil, plants, engineering and others.
- Need to change public perception about returns vs. investment in irrigation systems - move away from a focus on lowest cost solutions.
- Current low cost and poor systems offer low margins to manufacturers, distributors and retailers and as such reduce funds to educate customers.
- Need professional urban irrigation industry to design, specify, install and maintain irrigation systems.
- Educate end users for more efficient urban irrigation.

***Summary statement**: We know we can deliver much better technology in irrigation management but need to bring all the science (engineering, agronomy and social) together to achieve more efficient water use and need to change value perceptions amongst users.*

### *Issue 2 – Regulation, accreditation and standards*

- Regulate the sale of irrigation products so high standards are maintained.
- There is a need for Australian Standards for all irrigation products.
- Consumer friendly guidelines at point of sale.
- License high volume users.
- Accreditation and training is important.
- Provide “Choice magazine” type service to guide consumer buying.
- Different training requirements need to be established.
- Training and education: certification, regulation, incentives and best practice need to be promoted.

***Summary statement**: Focus efforts on high quality irrigation equipment, irrigation system installation by professionals and provide clear guidelines for consumers to identify and choose appropriate irrigation hardware for their use.*

### *Issue 3 - ‘Hard’ drivers encourage practice change*

- Price and allocation structures to encourage meeting targets.
- Incentives and rebates are for good improved irrigation performance.
- Little ‘hip pocket’ drivers are in action currently.
- Rebates for performance compared to benchmarks, e.g., benchmark households and benchmark sports fields.
- Social, political and cultural drivers are also important.

***Summary statement**: Rather than provide prescriptions for ‘ideal’ residential, open space and commercial landscapes, provide clear financial and water allocation direction and information for best management practice. Also, allow people to develop their individual specific landscape responses.*

### *Issue 4 – Education and Partnership Approach*

- Educate community.
- Understand ‘best practice’.
- ‘Permanent’ behavioural change.
- Demonstration gardens.
- Influence by example - partnerships with water authorities and garden and irrigation industries.
- Deliver community education and training.

***Summary statement**: To achieve permanent widespread behavioural change efficiently, water authorities need to access and utilise the opportunities offered through partnerships with the industries directly related to customers and their water use.*

**Q.5. What strategies will be needed for sustaining urban irrigation in the future and what further research & development is needed to for this?**

***Issue 1 - Price and Regulation***

- You need to charge the right price (in Townsville it is $1900/ML).
- You need regulatory measures to compliment the other strategies like on-going education and improvements in technology.
- Research financial models for watering savings through reuse of stormwater and wastewater, and this in turn will lead to further investments in urban irrigation infrastructure and potable water savings.
- Licence high volume irrigators and provide them with an appropriate training.

***Summary statement**: Pricing and regulation are arguably the most effective measures.*

***Issue 2 - Technology***

- Need to develop technologies that in some situations help bypass the irrigator.
- Consumer behaviour is not easy to change.
- Regulation alongwith technology can also help bypass consumer behaviour.
- Weather stations are needed for evapotranspiration data.
- Water authorities to sell water saving devices.
- Build technical capacity of consumers.

***Summary statement**: Required to bypass consumer behaviour in some way to improve irrigation practice.*

***Issue 3 - Education***

- Difficult.
- Need to have suites of solutions.
- Effectiveness can be limited.
- Who should do it? – Water Authorities?
- Feed into R & D and vice versa.
- Different programs for different sectors of irrigation.

***Summary statement**: We should do it but technology may be a good substitute in many situations.*

***Potable Water Substitution***

- How much water is used externally? There is a need of some hard data to assist in policy development.
- Alternative water sources (including domestic rainwater harvesting) are important since traditional urban water sources are not adequate.
- Dual reticulation is important, especially in new dwellings.
- Health risks with effluent irrigation.
- Some alternative water sources are not economical yet.
- Public acceptance of alternative water sources is an important issue.
- Quality of water needs to be fit for purpose.
- Need to develop suitable national guidelines to encourage the use of alternative water sources in urban landscapes.

***Summary statement****: New water sources will be important in the future, but there is a need for focussed R & D in this area.*

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# 14. SUMMARY OF COMMON ISSUES IDENTIFIED FROM WORKSHOP DISCUSSIONS

(i) There are no reliable data available on water requirements of different plants suitable for urban landscapes under a range of climatic situations.

(ii) Measure water use to manage it – preferably automated.

(iii) There is a need for whole-of-industry managed, cost effective, best practice urban irrigation infrastructure.

(iv) A retrofit model is required for application of alternative water sources for urban irrigation in established and new neighbourhoods.

(v) We need a national approach that facilitates integration and transferability of credible expertise, standards, and recognition by all players in the urban irrigation sector.

(vi) We need a national approach to urban irrigation issues for providing better resources to support consistent, strategic, and long-term R&D leading to a critical mass of expertise and data collection.

(vii) A need for national approach to encourage investment, innovation, business development and certainty in urban irrigation.

(viii) Urban irrigation across Australia is quite diverse and complex and we cannot have 'one-size-fits-all' type solutions – sometimes we need specific solutions and require flexibility across diverse range of interests and environments of urban landscapes.

(ix) Measure the effectiveness of urban irrigation by cost and utilisation of infrastructure and adoption of irrigation technology.

(x) Measure irrigation effectiveness against economic activity - $ generated per KL irrigation water used.

(xi) The concept of plant water usage compared with water applied may be a useful indicator of urban irrigation success.

(xii) Measure effectiveness of urban irrigation by quality of lifestyle and effect on changes/variations to the same.

(xiii) We know we can deliver much better technology in irrigation management but need to bring all the science (engineering, agronomy and social) together to achieve more efficient water use and need to change value perceptions amongst users.

(xiv) Focus efforts on high quality irrigation equipment, irrigation system installation by professionals and provide clear guidelines for consumers to identify and choose appropriate irrigation hardware for their use.

(xv) Rather than provide prescriptions for 'ideal' residential, open space and commercial landscapes, provide clear financial and water allocation direction and information for best management practice. Also, allow people to develop their individual specific landscape responses.

(xvi) To achieve permanent widespread behavioural change efficiently, water authorities need to access and utilise the opportunities offered through

partnerships with the industries directly related to customers and their water use.

(xvii) Pricing and regulation are arguably the most effective measures.

(xviii) Required to bypass consumer behaviour in some way to improve irrigation practice.

(xix) Education and training of urban irrigators is helpful, but technology may be a good substitute in many situations to improve irrigation efficiency.

(xx) New water sources will be important in the future, but there is a need for focussed R & D in this area.

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# 15. DETAILED CONSIDERATION OF POPULAR ISSUES

Out of twenty issues identified, four issues were prioritised by the workshop participants as being the ones that would provide the greatest leverage to benefit the workshop theme. So, four participant groups were formed to examine the above issues in details. Each group explored one issue focussing key question: what are the main goals for tackling the issue?; what are the barriers that may be experienced?, who is responsible or stakeholder(s) in the issue?; what are the resources needed to tackle the issue?; how will the research?; development and extension activities be funded to deal with the issue?; and how will outcomes be measured for solutions developed and implemented.

## Group 1

*Issue: There are no reliable data available on water requirements of different plants suitable for urban landscapes under a range of climatic situations*

*Reporter: Rebecca Dawson*

### Goals

- To improve the understanding of actual water use requirements and drought tolerance in ornamental plants.
- To provide information that is appropriate for both the commercial and domestic garden markets (scientific vs. practical).
- To support better decisions when plants are selected; based on appropriateness, water use and drought tolerance.
- To provide clear information to allow plants with similar water use to be grouped together.

### What are the barriers?

- Huge diversity of plant species to be studied.
- We should consider what is available in the trade. However, some preliminary research could be undertaken to consider a matrix of species groups, i.e., Xerophytic (Tree, shrub, perennial, and groundcover), Mesotrophic (Tree, shrub, perennial, and groundcover). Apart from this, a consideration of popular garden plants that we suspect of being more tolerant of drought or potential lower water usage than previously considered such as Camellia sasanqua.
- Variations in plant behaviour and response according to context (soil/climate/condition) which varies with locations.
- The need to source on-going funding in order to keep updating with new plants.
- Lack of research expertise in the amenity/recreational plant use context.

- Low motivation to fund and drive such research. A good case could be made on expected water savings and a cost benefit analysis from knowing actual plant water use.
- People often buy 'low water use' plants and then water them as normal. Behaviour has to change and this needs credible information to drive it.
- The Royal Botanic Garden (Melbourne) has found that considerable water and subsequent cost savings can be made by improving irrigation practice and understanding more fully plant water use.
- The current oversimplified approach to water wise plants (i.e. 'natives' and succulents) limits perceived need for this information as above.
- Lack of coordination of the funding available to such research projects.
- Need to legitimise the worth of the research and establish credibility of the information provided.
- The high value of the industries involved is not reflected by their R&D budgets yet.
- The role of fashion/trend/personal choice in driving plant selection and demand.
- The need for effective marketing and communication strategies to promote the results. This included the need to find ways to provide complex information about plants in a simple and easy to understand way for garden consumers.

**Who is responsible?**

- Nursery and Garden Industry (including NGIA).
- Turf Growers (including TPA).
- Open Space Managers (both local government and private eg resorts, sport venues etc).
- Water Authorities (with reservation?).
- Users of facilities, e.g., sporting clubs, golf clubs, racing clubs.
- Irrigation Industry (IAA).
- Botanic Gardens (Research and delivery).
- Australian Golf Course Superintendents Association.
- Education Institutions (Universities/TAFE/schools).
- Government (Federal/State/Local).

But we need to find a leader/driver to champion the research!

**What resources are required?**

- Funding.

- Capital (access to available facilities, researchers, materials).
- Development of a strategy for progressive research (Literature review, definitions; market needs analysis; cost benefit analysis; short term and long term outcomes; result delivery and extension options).
- Expertise for ornamental plants.

**How will it be funded?**

- Levy on excess water use.
- Industry levies.
- Taxes?
- Use money from the stick to drive the carrot!
- Everybody is involved therefore everybody needs to pay.
- $ for $ funding with government.
- HAL to coordinate?
- Provide incentives to increase private sector contribution/research.

**How will outcomes be measured?**

- Reductions in outdoor water use (domestic and public/commercial) (although this is limited by the need for behaviour change to change watering habits; behaviour change needs credible/ demonstrated evidence. Horticulturists, both professional and residential are very 'visual' people and need to 'see' results. Large public gardens and landscapes would be one way of providing this evidence.
- 'Misconceptions' about appropriate plants challenged.
- Plants sales in key species tracked.
- Development of locally appropriate plant lists.
- Nationally accredited plants rating/labelling systems.
- Improved knowledge and expertise in domestic and commercial sectors.
- Maintained social/amenity values (including people's health and well-being – but hard to define or measure these!) of both commercial and residential landscapes (in conjunction with water savings).

## Group 2

*Issue: We need a national approach that facilitates integration and transferability of credible expertise, standards, and recognition by all players in the urban irrigation sector.*

*Reporter: David Cox*

**Goal**

- To achieve efficient water management with urban water irrigation systems.

**What are the barriers?**

There are no agreed and established methods to define and measure effectiveness of urban irrigation in domestic and commercial situations. Hence there is a lack of data that measures effectiveness against:

- urban irrigation infrastructure capital costs and O&M costs,
- economic activity,
- quality of lifestyle in an urban environment and
- health and amenity benefits.

The urban irrigation industry is fragmented and cannot promote itself effectively at a national level.

There will inevitably be opposition to regulation due to the costs of implementation, auditing and surveillance to support accreditation and certification activities, training etc.

Issues of social equity may arise due to the increased costs of adoption of best practice urban irrigation systems compared to inefficient low cost 'do-it-yourself (DIY) systems or hand watering.

**Who is responsible?**

An urban water irrigation industry alliance should be formed and a "business plan" prepared. Inter alia, it could collect available data and prepare industry fact sheets, guidelines and standards that could be used to promote best practice urban irrigation with consumers ("the voters"), equipment manufacturers and installers and to influence the three tiers of Government to introduce appropriate legislation and regulation to effectively manage the urban irrigation sector.

**What resources are required?**

- CRC Irrigation Futures coordinating an alliance of industry partners e.g. IAA, WSAA, NGIA and others.

**How will it be funded?**

Funding should not be a major issue as funding will mainly be contributions in-kind. Where a need for funding is identified, Department of Environment and Heritage, National Water Commission and individual alliance partners could be approached. Opportunities to secure funding from the federal government would be enhanced by having an industry coalition approach.

**How will outcomes be measured?**

- Outcomes need to be clearly and easily understood by government, industry and consumers and be quantifiable to enable longer-term targets to be set and benchmarking between different urban communities.
- Indices based on quantity of water applied/saved (sustainability) and improvements to quality of life (externalities such as health, amenity, outdoor activity and biodiversity).
- Outcome—"Fit-for-purpose" urban irrigation systems with clear guidelines for specification, installation, operation and maintenance.

## Group 3

*Issue: We need a national approach to urban irrigation issues for providing better resources to support consistent, strategic, and long-term R&D leading to a critical mass of expertise and data collection.*

*Reporter: Jolyon Burnett*

**Goals**

- Establish a process of coordination for R&D.
- Develop clear and consistent messages on the outcomes of the R&D.
- Efficient use of R&D resources.
- Secure long-term strategic commitments to fund urban irrigation R&D.

**What are the barriers?**

- Complexity of the processes being researched.
- Fragmentation of the industry, both special and structural.
- Jurisdictional separation; each govt and authority doing its own thing.
- Lack of resources.

**Who is responsible?**

- National Water Initiative.
- Industry.
- Water Service providers.
- CRC IF.

**What resources are needed?**

- Funds - similar commitment to that provided for rural water use efficiency, say around $100 million.
- Leadership – NWI, CRC IF, WSAA, IAA?

**How will it be funded?**

- The funds are there they need to be coordinated and prioritised and spent more wisely.
- Possibly, a clearly identified and segmented levy as part of water charges.

**How will outcomes be measured?**

- KL saved per capita.
- Market research of the perception of urban irrigation and water use efficiency.
- Have the coordinating process in place.

***Summary statement:*** *Research and development into urban irrigation efficiency needs to be nationally coordinated and prioritised through some agency or process. Funds already committed to demand management and other related initiatives need to accessed and spent according to a clear analysis of the likely return in terms of real water savings in the long term.*

## Group 4

*Issue: We know we can deliver much better technology in irrigation management but need to bring all the science (engineering, agronomy and social) together to achieve more efficient water use and need to change value perceptions amongst users.*

*Reporter: Geoff Connellan*

**Goal**

- To achieve utilisation of better technology that delivers high irrigation efficiency

**What are the barriers?**

- Lack of current standards dealing with irrigation product.
- Lack of science to support technology.
- Price of water too low and lack of incentive to adopt technology.
- Lack of proper accreditation of the products.
- Inadequate skill levels in industry to support technology.

- Lack of support for product in the field.
- Technology too complex for many customers.
- Customer perception that the technology does not provide a positive cost benefit.

**Who is Responsible?**

- Irrigation Association of Australia (IAA).
- Standards Australia.
- CRC-IF.
- Manufacturers.
- Water Authorities.
- Water Pricing Regulators.

**What resources are required?**

- Funding from stakeholders and relevant government departments.
- Irrigation Association of Australia.
- CRC-IF.
- Incentives schemes that encourage adoption (Water authorities).

**How will it be funded**

- National Water Initiative.
- Need a strategy to gain national focus and support to address this issue.
- Suggest a Leadership/Lobby Group like the Wentworth Group be established.

**How will the outcomes be measured?**

- Demonstrated water savings (hard data).
- Introduction of Standards for irrigation equipment.
- Incorporation of technology in Best Practice Guidelines.
- Public acceptance - sales and conduction of surveys.

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# 16. COLLABORATIVE AND NATIONAL APPROACH FOR URBAN IRRIGATION RESEARCH IN AUSTRALIA - STRATEGIES AND ACTION PLAN

## Background

The CRC IF coordinated a meeting of personnel from across the country interested in improving the efficiency and management of urban irrigation. The group of over 35 individuals included representation from:

- Industry groups such as IAA, WSAA, and NGIA,
- Urban Water Service Providers from WA, Vic, SA, NSW and Qld,
- Commercial equipment and service providers interested in the area,
- Researchers from university and government instrumentalities; and
- Potential funding organisations.

As a result of the two days of presentations and facilitated discussions a wide range of issues were identified and explored – the nature of this discussion has been captured in the preceding sections of this report. This section will provide the industry with a useful overview of critical issues facing the Urban Irrigation Sector over the medium to long-term.

One issue which received significant attention and was the focus of the CRC IF's interest was how to achieve national coordination of efficient and effective R&D in Urban Irrigation in Australia. Here, we examine a number of proposals which could be established to achieve this aim, some of which were discussed on the day.

### Objectives of Collaboration

In discussing the establishment of some form of coordinated approach to urban irrigation-related R&D, the participants in the two-day workshop recognised that such a structure should support the need for at least the following:

- National coordination of the research effort and presentation of outcomes;
- Consistent scientific approach to assessment and policy development;
- Initiation of longer term strategic research activity and capacity development;
- Establishing a national data base on matters relevant to this aspect of irrigation; and
- More efficient use of scarce research resources.

The meeting also identified the need for the development of effective partnerships between the irrigation industry and water service providers to better communicate with customers and develop coordinated policy tools. Although the proposed R&D Coordination would support these functions by providing

professional R&D outcomes, the structure being discussed here is not designed as an industry lobbying or promotions organisation.

The key objectives of this new body may not in fact be significantly different to the existing mission statement of the CRC IF at least in broad terms:

> *Our mission is to facilitate cooperative research and training networks and programs which continuously improve irrigation policy, tools, practices and processes to:*

- double irrigation water use efficiency ;
    - *Assuming some agreed measure of efficiency can be determined;*
- improve profitability for commercial irrigation enterprises;
    - *recognising that this needs to include all sectors of the value chain including water service providers, equipment suppliers etc and end users perhaps through reduced charges and improved capital value of the house; and*
- protect and enhance our landscapes and environment
    - *In the urban context this will be twofold – improved sustainability of overall water supply options as well as a reduced impact from irrigation practice on water quality.*

It will be important for the review committee to refine this objective more clearly before considering potential alternative structures.

## Proposed CRC-IF Urban Research Model

### Possible Options

Matthew Durack presented one model on the last day of the workshop that did not meet unanimous support in itself. However, it initiated considerable discussion on alternatives and an interest by the group in establishing a committee to review a range of options which would then be presented back to the group with the intention of eliciting formal support for one or other of these.

#### *Establishing an Urban Irrigation Research Unit linked to the CRC IF*

Figure 15.1 depicts a proposed structure for urban irrigation research model. The benefits of this type of structure could include:

- maximises the synergies with the existing capacity of the CRC IF without diluting the funding across agriculture,
- provides an opportunity for direct industry governance of the R&E program, while minimising the overhead cost of establishing an independent entity,
- provides national leadership and coordination,

- prevents the ad-hoc project-by-project activity which is currently occurring, and
- the entity will have the credibility and capacity to attract serious support from state and federal governments

The down side may include:

- administrative complexity; and
- lack of real focus on end user outcomes.

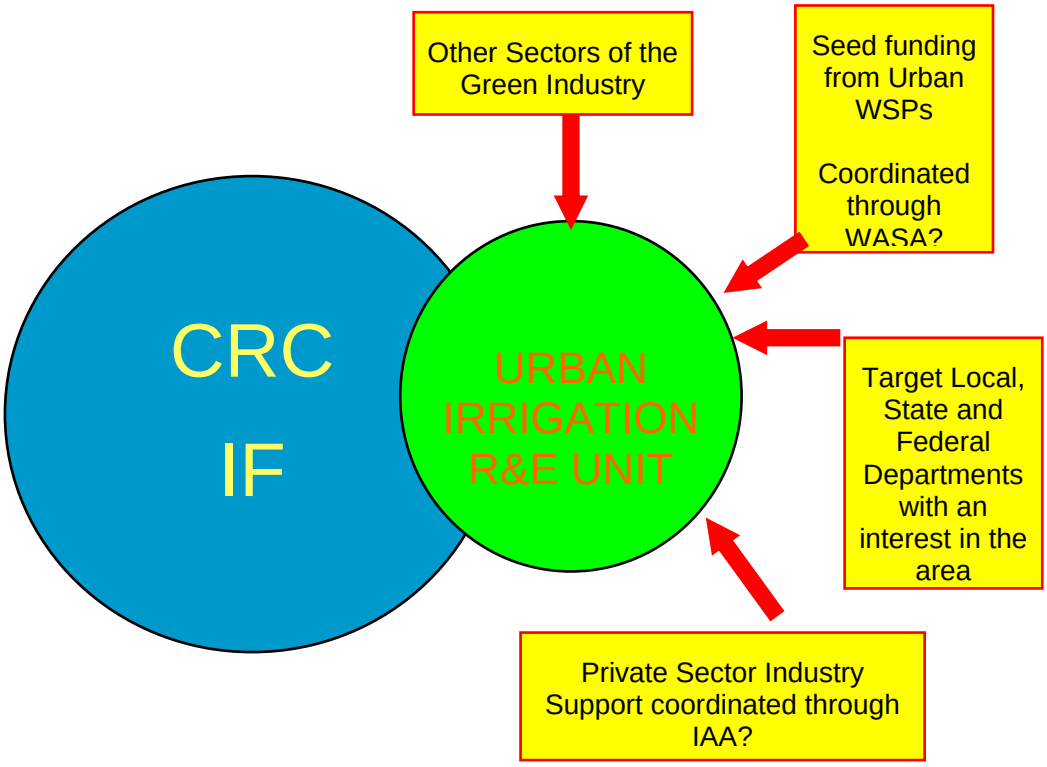


*Figure 16.1. Proposed model for urban irrigation research at the national level.*

***Alternative Models***

The group did not consider an extensive range of alternative options and as such the following list is incomplete but provides some ideas for discussion at a later date:

- Direct investment by WSAA and/or water service providers in the core of the CRC IF – and the utilisation of the existing management structures to ensure appropriate research investment and development and extension outcomes are achieved;
- Establishment of a completely new entity to provide research direction and industry coordination and lobbying – which then commissions independent research organisations (including the CRC IF) to undertake targeted research projects; and/or

- Maintenance of the current process of ad hoc research investments but overlay some form of coordination role through the existing industry associations such as WSAA and IAA.

## Formation of Urban Subcommittee

The strategies and action plan are meant to stimulate thinking on possible options for achieving an effective, efficient and sustainable level of research and development activity on urban irrigation matters in Australia for review by a subcommittee established on the day to examine these matters. The membership of the subcommittee is as follows:

- Matthew K Durack (CRC IF and Committee Chair)
- Charles Thompson (HAL)
- Steve Wachtel (MicroMet)
- Ted Gardiner (DNRM Qld)
- David Cox (WSAA)
- Jolyon Burnett (IAA)

## The Way Forward

It was agreed at the meeting that the subcommittee established on the day should consider a range of options and report back to the broader stakeholder group with a number of proposals for subsequent approval. In order to achieve this end, we need to go through the steps outlined in Table 15.1.

Table 16.1. Steps needed to establish urban irrigation research agenda and co-ordination at the national level.

| ACTIVTY | WHO | WHERE/WHEN |
|---|---|---|
| Subcommittee to develop a range of alternate scenarios independently | Subcommittee | Over the next two weeks |
| Teleconference to examine the options and consider which are worth formalising as potential proposals | Subcommittee | 22nd November 2004 |
| Further develop preferred scenarios | Matthew Durack | |
| Teleconference to review formal proposals | Subcommittee | 20th December 2004 |
| Send out in the mail the proposed options for review by all stakeholders | Matthew Durack | 24th December 2004 |
| Proposed meeting of all stakeholders to examine options and confirm support | All Stakeholders –similar representation to last meeting | 21st January 2005 |

# APPENDIX A - OUTLINE OF THE WORKSHOP

## Overall Aim

The overall aim of this workshop was to identify research, education and training needs for sustainable irrigation in urban landscapes.

## Key outcomes:

- A national perspective on urban irrigation issues.
- Identification of key research areas and funding opportunities for sustainable urban irrigation.
- Identification and prioritisation of possible technical strategies and solutions for achieving high urban irrigation efficiency.
- Development of strategies that will promote education, training, certification and accreditation of smart urban irrigation practices at all levels.
- Identification of organisations with a capacity to carry forward key research, education and training needs identified through this workshop.

## Venue

Horticulture Australia Limited, Sydney

## Date

October 28-29, 2004; start at 10 am on October 28 and finish at 3.00 pm on October 29.

## Participants

By invitation (Refer to Appendix A.2)

## Why a National Workshop on Urban Irrigation

### Background

Irrigation in an urban catchment not only includes irrigation of lawns, home gardens, parks, sporting ovals and golf courses but also includes significant irrigation activity for growing vegetable, fruits, nurseries, cut-flowers and turf. A

significant volume of high quality, drinking water is used for urban irrigation. For example, about 630,000 ML of water is consumed in the Sydney Metropolitan Area (SMA) in 2001 and up to 30-40% this is used for urban irrigation. Any saving in water through more efficient urban irrigation and the use of alternative water supply will mean less pressure on the available water resources in urban catchments. The saving in water is also required to cope with growing water demand resulting from ever increasing population of Australian cities. Furthermore, water supply for cities and towns and that for peri-urban agriculture are in direct competition with one-another, and invariably the former takes higher priority in-terms of the total water allocation in a catchment.

Current drought conditions and increasing water demand in urban areas have led to water restrictions which are likely to stay in some form in the future. To cope with future water demand, urban water authorities and other stakeholders have been developing and implementing strategies that help conserve water. In recent years, there have been many technological developments through irrigation equipment manufacturers and innovative individuals to help monitor soil moisture or plant water use, control the amount and time of irrigation and automate irrigation. There are claims made about potential water savings with these technologies, but often there are no independent verifications of these savings available to average urban irrigators.

Comprehensive management strategies for water demand in urban context require a clear understanding of issues that affect water use by individual irrigators, evaluation of current water use practices and detailed validation of new technologies that have potential to save water. It is therefore important to bring all the stakeholders together in a national forum that will help understand and define limitations and opportunities for existing and new water saving technologies and strategies.

The specific objectives of the workshop were to:

- share views, experiences and strategies being canvassed by different urban water authorities and other stakeholders for water conservation and demand management,
- develop a broad picture of current urban irrigation practices, issues and demand management strategies that can be developed and implemented through available technologies,
- identify criteria for the development of industry best practice guidelines and certification of urban irrigation installers to allow authorities to have confidence about industry self regulation or develop improved regulatory frameworks, and
- prioritise research, education and training needs at water authority, practitioner and irrigator levels

## Major/broad areas covered in the workshop:

- Developing an overview of issues
- Understanding the problem

- Developing solutions
- Implementing solutions

**Overview of issues**

Key stakeholders were invited to make a 10 min presentation on their experiences and strategies for water conservation and issues they face in the future. These presentations provided context for the participants to develop an overview of multiple perspectives of urban irrigation water use and management. About 10 presenters were invited to cover different aspects of urban water use and irrigation. Presenter were asked to get straight to the point; no corporate waffle.

**Understanding the problem**

Discussion on research associated with collecting relevant urban irrigation data and their analysis to understand issues involved in developing effective solutions.

**Developing Solutions**

The following topic areas were discussed to understand the major issues involved in achieving high irrigation efficiency:

***Reduce plant water demand***

- Factors in achieving high water use efficiency
- Landscape design, plant selection
- Landscape water requirements (important in irrigation design and scheduling)

***Water supply***

- Water supply conditions – flow and pressure regulation
- Alternative water supplies
- Optimising stormwater

***Achieving high application efficiency***

- Definition or description of an efficient system and ways to identify an efficient system (e.g., auditing)
- Uniformity of application – sprinklers and sprays
- Systems matched to site – design
- Application methods – effectiveness of various techniques
- Minimisation of losses due to operating conditions – hydraulic and environmental
- Maintenance – effective functioning of equipment

***Achieving more effective scheduling and control of irrigation***

- Optimum irrigation schedule (Education)
- ET based control
- Environmental sensors – soil moisture, rain shut off
- Control technology - Centralised control

## Implementing Solutions

The implementation of urban irrigation solutions will have a strong educational component. This will require an effective government (or water authority), industry and community partnership in terms of developing and implementing best practice guidelines, training programs and certification and accreditation programs. The key issues explored during the workshop include:

- How effective are the water conservation strategies of the water authorities? What are the key issues that need addressing?
- What best practice guidelines, training programs and certification and accreditation programs are available to the irrigation practitioners and how effective are they?
- What do we need now in terms of best practice guidelines, training programs and certification and accreditation programs for sustaining urban irrigation?
- What practices and products are available now for immediate use and implementation? What difficulties exists for immediate use and implementation those products and practices? (Linkage to Smart Approved WaterMark)
- How do we make individual urban irrigators more efficient in their water use? What educational and other support material we need to provide to them to improve their practice?

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# APPENDIX B - WORKSHOP PROGRAM

| When | What | Who |
|---|---|---|
| **Day1: October 28, 2004** | | |
| 9.45 am | Registration and morning tea | |
| 10.15 am | Welcome, program and process | Roger Packham, Facilitator |
| 10.25 am | CRC IF and Urban Irrigation Research | Matthew Durack, CEO CRC – IF |
| 10.40 am | Issues in Water Management – a National Perspective | Ross Dalton, Department of Agriculture, Fisheries and Forestry, Canberra |
| 11.15 am | Overview of Water Resource Management in Australia | David Cox, Water Services Association of Australia, Sydney |
| 11.50 am | Urban irrigation issues | Basant Maheshwari, University of Western Sydney, Hawkesbury Campus |
| 12.10 pm | Developing irrigation technology solutions | Geoff Connellan, University of Melbourne, Burnley Campus |
| 12.30 pm | Lunch | |
| | Water conservation in urban landscape - Perspectives from Water Authorities | Chair: Basant Maheshwari |
| 1.00 pm | • Sydney Water Corporation | André Boerema |
| 1.15 pm | • Water Corporation (Perth) | John Brennan |
| 1.30 pm | • Yarra Valley Water | Peter Roberts |
| 1.45 pm | • A review report on water restrictions in urban areas | Jeremy Cape |
| 2.00 pm | Conversation Mapping | Roger Packham and Sally Mackinnon |
| 3.30 pm | Afternoon tea | |

| | | |
|---|---|---|
| 3.45 pm | Plenary – feedback from groups and discussion | Chair: Matthew Durack |
| 5.30 pm | Close | |
| 7.00 pm | Workshop Dinner | |
| **Day2: October 29, 2004** | | |
| | Water conservation in urban landscape – issues, challenges and opportunities in different sectors of urban irrigation | Chair: Geoff Connellan |
| 9.00 am | • Garden and Nursery Industry | Rebecca Dawson |
| 9.10 am | • Experiences from CSIRO Land Water | Richard Stirzaker |
| 9.20 am | • Initiatives from Horticulture Australia | Charles Thompson |
| 9.30 am | • Water Use Efficiency in Public Open Spaces | Neil Power |
| 9.40 am | • Irrigation equipment manufacturing | Wally Edwards |
| 9.50 am | • Irrigation Association Perspectives | Jolyon Burnett |
| 10.00 am | • Other views and perspectives | Volunteers |
| 10.15 am | Prioritising issues | Roger Packham and Sally Mackinnon |
| 10.30 | Morning tea | |
| 10.50 | Break-out groups – formed around areas of expertise and interest to explore solutions and strategies to defined issues | Roger Packham and Sally Mackinnon |
| 11.20 | Plenary – groups report back | Chair: Jolyon Burnett |
| 11.50 | Break-out groups – formed around areas of expertise and interest to develop action plan for solutions and strategies to defined issues | Roger Packham and Sally Mackinnon |
| 12.20 | Plenary – groups report back | Chair: Ted Gardner |
| 1.00 pm | Lunch | |
| 1.45 pm | Priorities for the future – recommendations for action | Roger Packham and Sally Mackinnon |
| 3.15 pm | Close | |

# APPENDIX C - WORKSHOP PARTICIPANTS

| 1 Category | 1 Participant | 1 Organisation | 1 e-mail |
|---|---|---|---|
| CRC IF | | | |
| | Matthew Durack | CRC | durackm@usq.edu.au |
| | Geoff Connellan | UM | geoffc@unimelb.edu.au |
| | Jolyon Burnett | IAA | jolyon.Burnett@Irrigation.Org.Au |
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| | Richard Stirzaker | CSIRO | richard.Stirzaker@csiro.au |
| | Jim Sands | UQ | j.sands@mailbox.uq.edu.au |
| | Ted Gardner | NRM-Queensland | ted.Gardner@nrm.qld.gov.au |
| | Roger Packham | Workshop Facilitator | r.packham@uws.edu.au |
| Research Organisations | | | |
| | Charles Thompson | Horticulture Australia | charlest@rmcg.com.au |
| | Alison Turnbull | Horticulture Australia | alison.turnbull@horticulture.com.au |
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| Government | | | |
| | Ross Dalton | National Water Initiative –(AFFA) | ross.dalton@daff.gov.au |
| | Craig Henderson | QDPI | craig.henderson@dpi.qld.gov.au |

| | | | |
|---|---|---|---|
| Water Authorities | | | |
| | André Boerema | Sydney Water | andre.boerema@sydneywater.com.au |
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| | David Cox | WSAA | david.cox@wsaa.asn.au |
| Industry Associations | | | |
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| | Peter Symes | Botanic Garden | peter.Symes@rbg.vic.gov.au |
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| | | | |
|---|---|---|---|
| | Henry Knight | HR Products | henryk.nsw_hrproducts@bigpond.com.au |
| Consultant | | | |
| | Jeremy Cape | CapeAbility Consultants Pty Ltd | jeremy@capeability.biz |

# APPENDIX D - WORKSHOP METHODOLOGY AND PROCESS

*Roger Packham*

*University of Western Sydney, Hawkesbury Campus*
*r.packham@uws.edu.au*

## The Workshop Process

The workshop on *Role of Irrigation in Urban Water Conservation: Opportunities and Challenges* was designed around an experiential learning cycle, asking the following questions in each of the four phases of the cycle:

- Diverging - What is there?
- Assimilating - What does it mean?
- Converging - What might we do?
- Accommodating - How will we do it?

Day one of the workshop dealt with the first two stages, diverging and assimilating, in what might collectively be called ***finding out***. Day two then dealt with the second two stages, Converging and accommodating, collectively called ***taking action***.

## Diverging

There were two steps to this process. The first was a series of input talks by a variety of experts drawn from the broad area of urban irrigation.

The second step utilised a group activity called conversation mapping.

### Conversation Mapping

- In groups of approximately 7 participants were arranged around a table with a large sheet of newsprint with a trigger idea circled in the centre. (The organizing group provided five trigger questions.)
- Each person selected a different coloured pen.
- One member of the group then suggested a response to the trigger (what is here called a “theme”) and wrote the essence of their response on the paper, linking it with a single line to the circle and talking to the others about this as they did so
- Other members of the group then added their comments to the first so that the theme was explored and discussed fully and that discussion recorded as it proceeded.

- When the theme was exhausted, another was written onto the map and similarly discussed.
- The process continued until every possible idea had been discussed and the contributions recorded. Often the groups broke into sub-groups as the 'energy' grew for the task, and other group members later read and added to these comments.
- The group produced a colourful 'mess' that represents the complexity of the original 'trigger' idea.
- After about 20 to 30 minutes, the groups then circulated around the other tables, spending about ten to fifteen minutes reading and adding to the other group conversation maps. Finally they returned to their original map, and read what had been added.

## Assimilating

The groups now tried to draw meaning for these conversation maps by drawing out emergent themes.

**Emergent Themes:**

- From the complex mess, the group looked for emergent themes (insights/ideas) that seem to be the basis of large sections of the map, or recurred in different sections of the map.
- A start to finding these emergent issues was to select a theme (or one branch of it) and ask the question, "why are we saying the comments that we have recorded", then checking to see if the same answer applied to the "why" question in other parts of the map. These were marked with 'post-it' notes provided, a different colour for each theme.
- If the same answer emerged from 3 or more parts of the map, the theme **was** recorded**,** along with the specific comments from the Map where the issue had been identified.
- In this activity the insights are referred to as "opportunities" because they have the capacity to leverage significant change in the 'trigger' idea if they are developed.
- Finally, a summary sentence was written that captured the overall ideas of the transposed comments. These emergent opportunities were recorded in detail by the group on a large sheet of newsprint for sharing with all workshop participants.

That evening, all the theme outcomes (four for each of the five groups) were typed up and distributed to participants the following morning, together with a consolidated list of the twenty sentences describing the emergent themes.

## Converging

This marked day two of the workshop, and the day commenced with a series of short talks from volunteer participants to introduce others to new ideas they had experience of, and that may be useful to others in planning solutions.

Participants were each then asked to vote for the top five issues that they believed would give greatest leverage to benefit the workshop theme. The votes were combined and the issues ranked. Participants were then asked to self-allocate themselves to one of the top six issues, to start planning what needed to be done about it. Five issues attracted three or more participants, and were explored in the next phase of the workshop. The other issues were referred back to the workshop organizing committee for further work at a latter date.

The working groups were then asked to answer the following questions:

- What is the goal of the activity?
- What are the barriers to achieving the goal?
- Who is responsible?
- What resources are required?
- How will it be funded?
- How will outcomes be measured?

It was also noted that for some issues, it would be necessary to document the required integrated research, education, policy and other important activities. Also domestic plans should be kept separate from commercial/professional plans, as these were seen as very different contexts.

The groups reported back on their outcomes at a plenary session.

## Accommodating

The final stage of the experiential learning cycle is doing what is planned. Clearly this could not happen at the workshop, but it was appropriate to clearly establish who would be doing what and when and how the enthusiasm generated by the workshop would be carried forward. To this end, the CEO of the CRC for Irrigation Futures, Mathew Durack, led a plenary session and presented ideas for endorsement on the next steps.

# APPENDIX E - MEDIA RELEASE

## CRC Forum Identifies Massive Water Savings Available in Urban Irrigation

### November 4 2004

As Australian cities and regional centres battle long-term drought and water shortages the national spotlight has turned to outdoor urban water use by households, industry and councils.

The average household uses approximately 350 kilolitres (350,000 litres) of water each year. Of this, about 30 percent or 100,000 litres per year goes onto gardens and lawns.

The Cooperative Research Centre for Irrigation Futures (CRC-IF), Australia's only research centre for rural and urban irrigation, recently hosted the first national forum to address sustainable outdoor water use for urban environments. It identified how up to 50 percent of outdoor household water use could be saved through existing and new technology, knowledge and research.

Chief Executive Officer of the CRC-IF Matthew Durack said, "Outdoor water use by households, industry and councils is a significant environmental, social and economic issue.

"This CRC-hosted urban irrigation forum was the first to gather together many of Australia's leading scientists and researchers, local and state governments, water utilities, industry associations, irrigation suppliers and universities to examine urban outdoor water use and the potential savings available through technology, research and knowledge.

"Our focus is now on opportunities to improve performance of urban irrigation in both our own backyards as well as the larger commercially-operated open space developments in our cities and towns.

"A priority for the CRC-IF will be the development and evaluation of irrigation technology that provides irrigation efficiency gains of up to 30 percent in urban areas.

"The outcomes from the forum aim to achieve sustainable outdoor water use for our urban environments while also maintaining the urban amenity and recreation facilities which city dwellers and tourists alike have grown to expect," Mr Durack said.

The National Urban Irrigation Forum was held in Sydney on October 28 and 29 2004. As a result of the forum a national partnership between government, industry and researchers is being formed to achieve a critical mass of research and development activity.

In addition, the partnership will work towards improving the adoption of nationally-planned and locally-implemented best practices across all irrigated urban landscapes.


| For further information contact: | |
|---|---|
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# Workshop Participants

*Front row (L-R): Geoff Connellan, Neil Power, Bettina Gollnow, Charles Thompson, Henry Knight, David Cox, Peter Roberts, Rebecca Dawson, Alison Turnbull, Jim Townsend and Basant Maheshwari*

*Middle row (L-R): Jim Sands, Dennis Heron, Roger Wood, Shane Jones, Tim Waterhouse, Tony Robinson, Jolyon Burnett and Jeremy Cape*

*Back row (L-R): Peter Symes, Wally Edwards, Roger Packham, Steve Wachtel, Richard Stirzaker, Matthew Durack, John Nieuwland, Gerard McEvilly, Sally McKinnon and Tim Buckle*