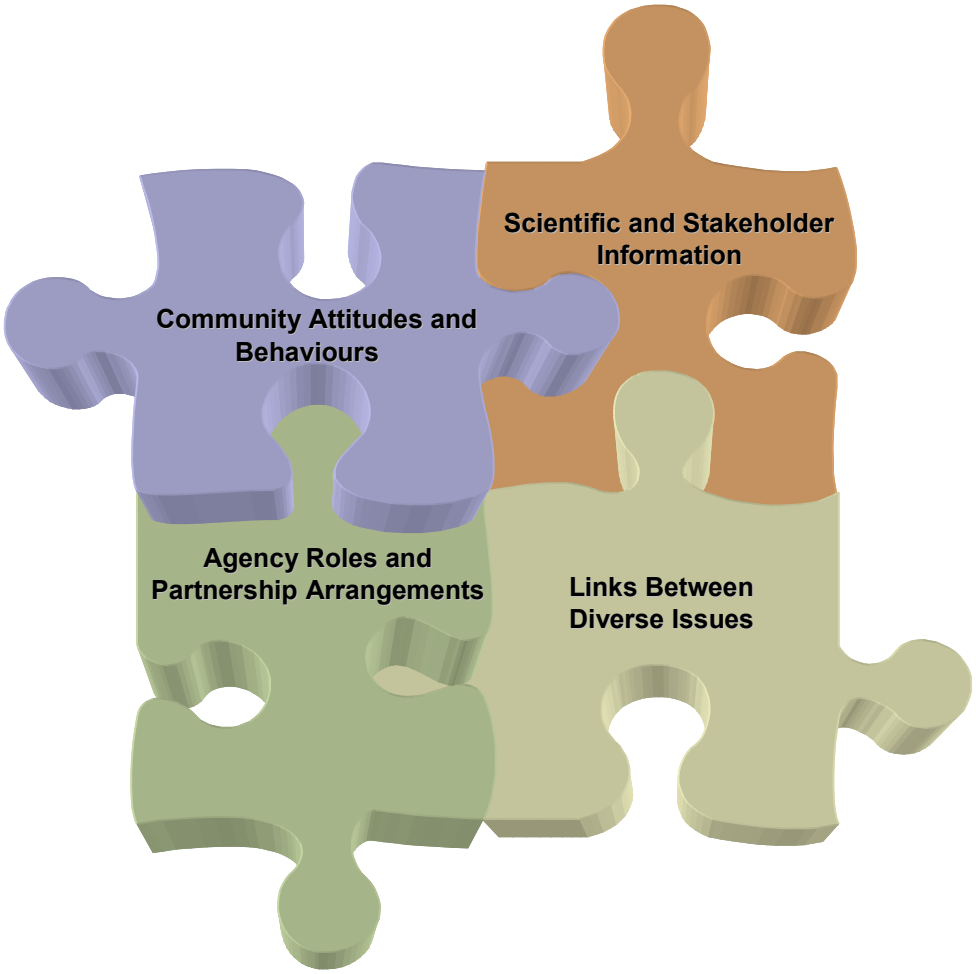
Institutional Arrangements for Water Management in South East Queensland

Ben Harman and Tabatha Wallington

July 2010



Urban Water Security Research Alliance
Technical Report No. 21

Queensland Government

National Research FLAGSHIPS Water for a Healthy Country

CSIRO

Griffith UNIVERSITY

The University Of Queensland AUSTRALIA

Urban Water Security Research Alliance Technical Report ISSN 1836-5566 (Online)
Urban Water Security Research Alliance Technical Report ISSN 1836-5558 (Print)

The Urban Water Security Research Alliance (UWSRA) is a $50 million partnership over five years between the Queensland Government, CSIRO's Water for a Healthy Country Flagship, Griffith University and The University of Queensland. The Alliance has been formed to address South East Queensland's emerging urban water issues with a focus on water security and recycling. The program will bring new research capacity to South East Queensland tailored to tackling existing and anticipated future issues to inform the implementation of the Water Strategy.

For more information about the:

UWSRA - visit http://www.urbanwateralliance.org.au/
Queensland Government - visit http://www.qld.gov.au/
Water for a Healthy Country Flagship - visit www.csiro.au/org/HealthyCountry.html
The University of Queensland - visit http://www.uq.edu.au/
Griffith University - visit http://www.griffith.edu.au/

Enquiries should be addressed to:

The Urban Water Security Research Alliance
PO Box 15087
CITY EAST QLD 4002

Ph: 07-3247 3005; Fax: 07-3405 3556
Email: Sharon.Wakem@qwc.qld.gov.au

Harman, B. and Wallington, T. (2010). *Institutional Arrangements for Water Management in South East Queensland*. Urban Water Security Research Alliance Technical Report No. 21.

Copyright

Disclaimer

Cover Photograph:

Graphic – produced by the Project Team.

ACKNOWLEDGEMENTS

This research was undertaken as a part of the South East Queensland Urban Water Security Research Alliance, a scientific collaboration between the Queensland Government, CSIRO, The University of Queensland, and Griffith University.

Special thanks go to the members of the Project Reference Group for their valuable contributions and advice:

Greg Claydon and Richard Priman - Department of Environment and Resource Management (DERM)

Greg Oliver - Queensland Water Commission (now DERM)

Seamus Parker - SEQ Council of Mayors

The authors are also grateful to Brian Head, Don Begbie, Emma Jakku, Sonja Heyenga and Sharon Biermann for helpful suggestions to improve earlier versions of the report.

FOREWORD

Water is fundamental to our quality of life, to economic growth and to the environment. With its booming economy and growing population, Australia's South East Queensland (SEQ) region faces increasing pressure on its water resources. These pressures are compounded by the impact of climate variability and accelerating climate change.

The Urban Water Security Research Alliance, through targeted, multidisciplinary research initiatives, has been formed to address the region's emerging urban water issues.

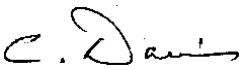
As the largest regionally focused urban water research program in Australia, the Alliance is focused on water security and recycling, but will align research where appropriate with other water research programs such as those of other SEQ water agencies, CSIRO's Water for a Healthy Country National Research Flagship, Water Quality Research Australia, eWater CRC and the Water Services Association of Australia (WSAA).

The Alliance is a partnership between the Queensland Government, CSIRO's Water for a Healthy Country National Research Flagship, The University of Queensland and Griffith University. It brings new research capacity to SEQ, tailored to tackling existing and anticipated future risks, assumptions and uncertainties facing water supply strategy. It is a $50 million partnership over five years.

Alliance research is examining fundamental issues necessary to deliver the region's water needs, including:

- ensuring the reliability and safety of recycled water systems.
- advising on infrastructure and technology for the recycling of wastewater and stormwater.
- building scientific knowledge into the management of health and safety risks in the water supply system.
- increasing community confidence in the future of water supply.

This report is part of a series summarising the output from the Urban Water Security Research Alliance. All reports and additional information about the Alliance can be found at http://www.urbanwateralliance.org.au/about.html.



Chris Davis
Chair, Urban Water Security Research Alliance

CONTENTS

LIST OF BOXES

LIST OF FIGURES

EXECUTIVE SUMMARY

South East Queensland (SEQ) is currently the fastest growing region in Australia. With population growth set to continue, and with the growing recognition of climate change-related impacts on the reliability of rainfall in the region, water resources in SEQ will continue to be placed under extensive pressure. To ensure that water resources are managed sustainably, the Queensland Government has committed to a total water cycle management approach, which recognises the interrelationships between the human uses of water and its role in the environment. The Queensland Government's response to the 'water crisis,' occasioned by the Millennium Drought, has included a regional demand management program, a number of infrastructure projects and major institutional reform.

The purpose of this paper is to provide an overview of the institutional reforms related to urban water resource management in SEQ introduced between 2000 and the Queensland State election in March 2009. To place such reform in context, recent water policy initiatives at the national level, and their influence on the Queensland Government's water reform agenda, will first be outlined. The regional scheme for reform in SEQ, and related changes to the roles of the State Government and local governments in the provision of water and sewerage services under the new institutional arrangements, will then be described. In particular, the paper will focus on the roles and responsibilities of the Queensland Water Commission (QWC), relevant State government agencies, and local government. The final section will canvass the water supply and demand initiatives developed in SEQ to March 2009.

1. INTRODUCTION

Australia is one of the most sparsely settled, yet most highly urbanised, countries in the world (Williams 2007) with some 84 percent of the population concentrated within 50 kilometres of the coastline (ABS 2003). It is also the driest inhabited continent in the world, with the highest per capita rate of water consumption (Smith 1998; Claydon and Milligan 2003). Water is arguably the most precious resource on earth. It is ecologically, economically and culturally valuable, and it has been recognised as an important element in maintaining and enhancing amenity. Although water is acknowledged to be a valuable natural resource, water quality has suffered considerably due to the rapid removal of vegetation, inefficient farming practices and political mismanagement (Dixon 2000, p. 3). In some regions, the biological impacts of such activities on rivers, wetlands and groundwater have been catastrophic due to the large volume of water extracted for agriculture, household and industrial use (ABS 2005). Another important aspect of water management is the impact of climate change on water planning and risk management. There is now overwhelming evidence to suggest that global average temperatures are increasing as a result of human induced interference of the Earth's climatic system (Hennessy et al. 2007). Since 1950, the climate has warmed resulting in more heatwaves, fewer frosts, less rain in southern and eastern Australia, more intense droughts and a rise in sea level (Hennessy et al. 2007).

The prospect of irregular rainfall due to natural climate variability and longer-term climate change along with unprecedented growth in the regional population over the past two decades, have been key motivators for water reform in South East Queensland (SEQ) (Department of Natural Resources, Mines and Water (DNRMW) 2006). The Millennium Drought – so named because it began at the turn of the millennium (see DNRMW 2007) – exposed the vulnerability of the region's water supplies, and the fragmented approach to the delivery of water services throughout SEQ. Traditionally, local governments have held primary responsibility for the provision of reticulated urban water supply and sewerage service delivery in Queensland. However, the onset of drought brought home the need for a more integrated approach. To ensure that water resources are managed sustainably, the Queensland Government has committed to a total water cycle management (TWCM) approach – also known as Integrated Water Cycle Management (IWCM) (COAG 1994) – which recognises the interrelationships between the human uses of water and its role in the environment. Specific response measures were introduced, including a regional demand management program, the planning and construction of several infrastructure projects, and major institutional reform.

The development of 'integrated' strategies for the management of urban water is a priority under both the National Water Initiative Framework and State-based strategic water planning frameworks. The National Water Initiative contains a number of commitments under the heading Innovation and Capacity Building to Create Water Sensitive Australian Cities (National Water Initiative paragraph 92), which aim to identify and develop innovative ways of managing and achieving more efficient water use in our cities. In this context the Parties agreed to review the institutional and regulatory models for achieving Integrated Water Cycle Management. As the National Water Commission (NWC 2007a:6) notes:

> *The Council of Australian Governments' agreement to this action in the National Water Initiative reflects underlying concerns about the extent to which the current institutional and regulatory environment facilitate Integrated Water Cycle Management. This has become more pressing as water scarcity is increasingly becoming a driver for interest in and uptake of Integrated Water Cycle Management in some metropolitan and regional urban centres.*

The NWC (2007a) review of the progress of integrated urban water reform in Australian States recommends an institutional analysis of water management. The importance of understanding the institutional context of water management is that institutional reform is necessary to foster the adoption and diffusion of technical innovations in supply and demand management. As such, attention to the social and institutional dimensions of urban water management is a necessary complement to the prevailing focus on the physical water infrastructure in Australia's approach to integrated urban

water management (Mitchell 2006). Social institutions are both determinants of environmental change, and critical forces in shaping 'real world' environmental governance responses (Young et al. in press). This paper is part of a larger project that explores the institutional conditions for sustainable and integrated urban water management in SEQ.

Against a backdrop of three key principles advocated in the international literature as necessary to achieve sustainable regional water resource planning and management, this paper will detail the roles and responsibilities associated with the new institutional arrangements for urban water management in SEQ, with a focus on the period between the enactment of the *Water Act 2000* and the Queensland State election in March 2009. The discussion will be set in the context of earlier water reform agendas at the national level, and of the subsequent reforms instituted at the State level in Queensland. The focus of this paper is on the urban context. Of particular interest are the roles and responsibilities of the newly created Queensland Water Commission (QWC), along with the relevant State and local government agencies charged with the planning and management of water resources in SEQ under these reformed water arrangements. The paper will conclude with a high level view of the urban water management institutional reforms which took place between 2000 and 2009 in relation to the key principles for achieving sustainable water resource planning and management.

It should be borne in mind that institutional arrangements in SEQ are continually evolving and, as such, the roles and responsibilities of individual organisations have changed since March 2009, and may also change in the future. The institutional arrangements described in this paper, including organisations and related roles and responsibilities, are those that existed prior to the Queensland State election in March 2009.

1.1. Guiding Principles of Regional Water Resource Planning

Three guiding principles relevant to regional-scale water resource planning and management can be identified in the national and international literature on sustainable regional planning in urban contexts. Each principle is briefly described below in order to locate the account of institutional arrangements for urban water management in SEQ in the broader context of the international policy shift towards Integrated Water Management (for a comprehensive review of the IWM literature and implications for SEQ, see Wallington et al. 2010).

Principle 1 *Regional planning must be based on the principles of Ecologically Sustainable Development*

Ecologically sustainable development (ESD) is the term adopted in Australia to refer to the integrative consideration of the economic, social and environmental dimensions of development (Haughton and Counsell 2004, p. 141). In order to achieve an effective or sustainable water management strategy, decisions must be evaluated according to this so-called Triple Bottom Line framework. According to the Australian Water and Wastewater Association (2000), ESD takes a long-term perspective to managing water resources for future generations to ensure that:

- high quality water is available for a range of applications, including human and animal consumption;
- adequate water supplies are available for agricultural and industrial use;
- ecological values are protected and enhanced;
- public health values are not compromised; and
- community needs for water-based recreation and related amenities are met.

Principle 2 *Regional planning must be holistic and inclusive*

The institutional arrangements for regional water resource management may vary from region to region; however, it is important that a holistic approach to regional planning is taken to ensure that economic, social and environmental imperatives are addressed in an integrated manner (Haughton and

Counsell 2004; Calthorpe and Fulton 2001). Integrated water resource management, also referred to as 'integrated catchment management' or 'whole-of-catchment' management, is based on the idea that all water sources should be viewed as a potential resource. Integrated management of water resources is also important to ensure that all stakeholders have equal opportunity to collaborate and share information to enable successful plan implementation. The need for horizontal integration between the various sectors and for 'vertical consistency' is another well-documented aspect of integrated water planning (McDonald 1996; Aplin 1998).

Principle 3 Regional planning must be flexible, adaptive and transparent

Effective water resource management at the regional scale will not be a one step process; instead, it will need to be a part of the cyclic planning process which is flexible, adaptive and transparent (Natural Resource Management Task Force 1999; Haughton and Counsell 2004). These attributes are necessary due to the lack of knowledge about the natural environment, and the uncertainty this generates (McDonald 1996). The cyclic or adaptive planning process (Figure 1) helps to address this problem by introducing appropriate information at all stages of the planning process (Briassoulis 1989), thereby contributing to effective plan implementation. Although scientific knowledge is an important input to the planning process, it is imperative that this information is translated in generic terms so that decision-makers and other stakeholders fully comprehend the information being presented (Everard 1999).

Figure 1: Cyclic Planning Process.
Source: Healthy Waterways Partnership (undated).

2. WATER REFORM IN AUSTRALIA

The sustainable management of water resources is one of the most important and urgent matters facing Australia (Stoeckel and Abrahams 2007). Until the early 1990s, the structure and processes of water resource management throughout Australia had remained largely unchanged for nearly a century (Cox undated). The characteristics of that era were significantly different to the arrangements being developed in Australia under the current institutional water reform agenda. Prior to the 1990s, water entitlements were tied to the land and therefore could not be traded separately. Under these arrangements, the sharing of water resources was primarily a matter to be negotiated by individual users and extractors, and little or no consideration was given either to ecological impacts, or to environmental requirements (Hussey and Dovers 2007; Khouri 2006). Moreover, decision-making processes regarding entitlements to water resources were conducted on an 'ad hoc' basis and failed to adequately consider the cumulative impacts of water use beyond the local scale (Cox undated). In the urban context, the core focus was on the progressive expansion of urban water systems, the primary objective being to provide safe and reliable water supplies to a growing population (Productivity Commission 2008).

By the early 1990s, the management of water resources and the structural arrangements to facilitate this were being seriously challenged due to growing concerns about long-term water security, degrading water quality and the alarming rate of environmental degradation resulting from poor land management and over-extraction of water resources. However, it was neither the state of the environment nor the way in which resources were being managed 'that was the impetus for the biggest shift of all, but economic policy' (Hussey and Dovers 2007, 38).

2.1. The Council of Australian Governments (COAG) Reforms

While concerns about efficiency and environmental impacts had prompted the initiation of sectoral reform in the early 1980s (Productivity Commission 2005), it was not until 1994 that the reform effort was coordinated at the national level when the Council of Australian Governments (COAG) agreed to implement a framework to achieve an efficient and sustainable water industry (COAG 1994; Khouri 2006; Hussey and Dovers 2007). Water reform was more closely linked to the wider microeconomic reform process in 1995, when COAG linked jurisdictional implementation of the agreed water reforms to the National Competition Policy (NCP) as part of the broader national agenda for economic development (Hussey and Dovers 2007a; Tisdell et al. 2002). Importantly, this meant that water reforms were linked to fiscal incentives in which federal taxation money was distributed to the States and Territories undertaking reforms. The National Competition Council (NCC), an independent body, is responsible for assessing each jurisdiction's performance in implementing the required reforms, and this assessment forms the basis for determining eligibility for payment (Australian Government 2007). Consequently, failure to comply with national water reforms resulted in suspended payments. As a result, in the realm of water policy, 'economic efficiency and competitiveness became the most pervasive policy shift of recent decades' (Hussey and Dovers 2007a, p. 38).

The COAG reform agenda commits all State and Territory governments to 'enact new water laws, apply pro-competition laws, create independent bodies to regulate pricing of services from State monopolies and undertake structural reform to facilitate competition and review of legal restrictions to competition' (McKay 2005, p. 42). The separation of water rights from land rights and the promotion of water trading have all been major elements of the water reform agenda initiated since the signed COAG agreement in 1994 (McKay 2005). For the first time, governments formally acknowledged that Australian rivers, catchments and aquifers did not stop at State boundaries (NCC 2008). Also, where water initiatives had previously been confined to rural Australia, the COAG framework covered both the rural and urban water sectors. Finally, the COAG agreement encouraged greater community participation in the planning and implementation of new water resource sharing arrangements to ensure that social, ecological and economic imperatives were adequately addressed (McKay 2005). In sum, the key elements of the COAG agreement were (Khouri 2006):

- The separation of water access entitlements from land to enable effective water trading arrangements;
- Cost reflective water pricing with any subsidy of costs made transparent; and
- The development of catchment-based water resource plans specifying the amount of water allocated to preserve environmental needs and the share available for allocation under water access entitlements for consumptive use.

Despite significant progress towards achieving greater efficiency in water management, the need for further water reform at the national level persisted (Stoeckel and Abrahams 2007). The ever-increasing knowledge base regarding ground water and surface water systems and the requirements for effective and efficient water markets created an opportunity to complement, and to build on, the existing water reform agenda (Stoeckel and Abrahams 2007; National Water Commission (NWC) 2007). As a result, the COAG reforms 'were only a partial construction, and set the scene' for further water reform initiatives (Hussey and Dovers 2007: 39).

2.2. The National Water Initiative

In 2004, the national water reform agenda was revitalised by COAG with the adoption of the *National Water Initiative* (NWI) – the new blueprint for Australian water reform (Hussey and Dovers 2007). The NWI is an intergovernmental agreement between the Commonwealth of Australia and all State and Territory governments, with the aim of improving water management around the nation (QWC 2008). While the NWI addresses urban water, the focus is the rural water sector (Productivity Commission 2008). In parallel with previous water reforms, the NWI coincided with a severe drought (Hussey and Dovers 2007a). A major driver of the NWI was growing concerns about the over-allocation of water resources (Productivity Commission 2008). As a result, the NWI provides specific criteria for water resource planning, and entitlement and registration systems (NWC 2007a). It is also an important step forward in Australia's approach to environmental management and water policy because it is now the 'primary statement of policy with which all water-related legislation and policy must comply' (Hussey and Dovers 2007a, p. 40).

The overall objective of the NWI is to achieve a 'nationally compatible market, regulatory and planning based system of managing surface and ground water resources for rural and urban use that optimises economic, social and environmental outcomes' (NWC 2008). The overall goal of optimising economic, social and environmental imperatives will be met through achieving the following ten objectives:

1. Clear and nationally compatible characteristics for secure water access entitlements;
2. Transparent, statutory-based water planning;
3. Statutory provision for environmental and other public benefit outcomes, and improved environmental management practices;
4. The return of all currently over-allocated or overused systems to environmentally sustainable levels of extraction;
5. Progressive removal of barriers to trade in water, and meeting other requirements to facilitate the broadening and deepening of the water market, with an open trading market to be in place;
6. Clarity around the assignment of risk arising from future changes in the availability of water for the consumptive pool;
7. Water accounting that is able to meet the information needs of different water systems in respect to planning, monitoring, trading, environmental management and on-farm management;
8. Policy settings that facilitate water use efficiency and innovation in urban and rural areas;
9. Addressing future adjustment issues that may impact on water users and communities; and
10. Recognition of the connectivity between surface and groundwater resources and connected systems managed as a single resource (NWC 2008).

To achieve these objectives, the NWI identifies eight critical elements for actions where specific work is required (see Box 1). One of these action areas is urban water reform (Action 6).

Box 1 Actions Required to Meet NWI Objectives

1. Water access entitlements and planning framework – separating water from land and focusing on establishing water entitlement rights, including water for the environment, enshrining such rights in statute, and providing for an adaptive management framework.
2. Water markets and trading – facilitating the efficient and effective operation of water markets and identifying opportunities for water trading within and between jurisdictional boundaries.
3. Best practice water pricing – promoting economically efficient and sustainable water use, water infrastructure assets and government resources, while facilitating the efficient functioning of water markets in both rural and urban settings under the principles of 'user-pays', transparency, and cost recovery.
4. Integrated management of water for environmental and other public benefit outcomes – the agreed outcome is to identify the environmental and other public benefit outcomes sought for water systems and to develop and implement management practices and institutional arrangements that will achieve these outcomes.
5. Water resource accounting – to ensure that adequate measurement, monitoring and reporting systems are in place in all jurisdictions, to support public and investor confidence in the amount of water being traded, extracted for consumptive use, and recovered and managed for environmental and other public benefit outcomes.
6. Urban water reform – focusing on the provision of healthy, safe and reliable water supplies, increasing and promoting water efficiency in urban environments, encouraging water reuse and recycling, as well as innovation in water supply. This element is also linked with the need for improved water trading and pricing outcomes.
7. Knowledge and capacity building – identifying the key knowledge and capacity building priorities needed to facilitate ongoing implementation of the NWI.
8. Community participation and adjustment – to engage water users and other stakeholders in achieving the objectives of the NWI by building confidence in the reform process, ensuring transparency in decision-making, and ensuring that sound information is available to all sectors at key decision points (NWC 2008).

2.2.1. Urban Water Reform

The NWI sets specific actions for urban water reform, which fall into three categories:

1. Managing the demand for water, increasing urban water use efficiency;
2. Encouraging the re-use and recycling of wastewater where cost effective; and
3. Encouraging innovation in integrated resource planning and pricing to enable water sensitive cities (NWC 2008c).

Despite significant progress in the implementation of various urban water reforms under the NWI (see 2007 Biennial Assessment – NWC 2007b), it was noted that the challenges in the management of urban water have intensified since the NWI was signed (NWC 2008c). As a result, the Commission recommended that the original NWI actions be supplemented with a set of enhanced actions to enable the broader NWI outcomes to be met. It was suggested that the enhanced set of actions should cover:

- Improved supply and demand planning (including supply diversification to accommodate climate risk);
- Fundamental reforms to institutional and market arrangements for water supply entitlements and pricing/charging arrangements;

- Rationalisation or water restrictions, with clearer understanding of risks to water supplies and levels of supply security; and
- Better integration between water and energy resource suppliers, and the adoption of water sensitive urban design principles into mainstream planning processes (NWC 2008c).

Under the provision of the NWI, all State and Territory Governments are required to submit an implementation plan for accreditation by the National Water Commission that details how they intend to address the NWI actions (NWC 2009). Almost half of the NWI's actions involve national actions or other actions by governments working collaboratively (Stoeckel and Abrahams 2007). This not only reflects the scale at which water resource planning and management occurs (Stoeckel and Abrahams 2007), but also points to the greater level of commitment and cooperation between governments required to deliver equitable and effective water resource management in Australia (Hussey and Dovers 2007).

In this respect, the NWI and its key elements reflect the 'modern idea of sustainability' and Australia's commitment to achieving ecologically sustainable development (Hussey and Dovers 2007). The NWI was designed to complement other natural resource management initiatives occurring across the country at the time; the National Action Plan for Salinity and Water Quality (NAPSWQ) and the Natural Heritage Trust (NHT) in particular (Stoeckel and Abrahams 2007). Recognising the need for and desirability of a nationally consistent approach, the NWI notes that where there are inconsistencies, the NWI will take precedence over all other water management policies and agreements (Stoeckel and Abrahams 2007).

2.3. The National Water Commission

In late 2004, the Australian Government established the National Water Commission (NWC) under the *National Water Commission Act 2004* to assist with implementation of the NWI and to drive the national water reform agenda (NWC 2008a). The NWC is an independent statutory authority within the Environment, Water, Heritage and Arts portfolio, responsible for providing advice to COAG and the Australian Government on water related issues (NWC 2008a). The Commission consists of seven Commissioners who are appointed for their expertise in a range of water related fields (e.g. freshwater ecology, hydrology, environmental economics and public sector management), rather than being representatives of sectoral or government interests (Stoeckel and Abrahams 2007). The Commission is supported by three groups of staff:

1. Water reform group is responsible for overseeing the implementation of the NWI, and develops assessment frameworks, guides State and Territory governments in relation to implementation plans, and monitors and reports on the progress of government agencies in implementing the NWI. The group is also responsible for delivering the Raising National Water Standards Program.
2. Water science group is responsible for providing strategic scientific direction for water reform, and is committed to developing improved methods for determining sustainable levels of water extraction. The group is also charged with the responsibility for implementing the Groundwater Action Plan, along with the Irrigation and Water Resource Assessment themes of the Raising National Water Standards Program.
3. Water markets and assessment group provides advice on water reform matters involving urban water, including water markets and water pricing (NWC 2008b).

The NWC has assessment responsibilities and is required to advise COAG on progress achieved with regard to national water reform issues and NWI implementation (Stoeckel and Abrahams 2007). The NWI will be formally reviewed by the Commission in 2010/11, including an assessment of the NWI against a set of performance criteria, and an analysis of the extent to which the actions have improved the sustainable management of water resources (Stoeckel and Abrahams 2007).

3. WATER REFORM IN QUEENSLAND

3.1. Water Act 2000

The Queensland Government's water reform agenda aims to ensure the sustainable management of water resources throughout Queensland. The Queensland Government delivered the framework for COAG and subsequent NWI through the *Water Act 2000*.

The *Water Act 2000* provides for the development of catchment-based water resource plans (WRPs) and resource operation plans (ROPs) which are designed for the allocation and sustainable management of water resources to meet future requirements, including the protection of natural ecosystems and security of supply to water users (Head and Cooper 2008). Under the provisions of the *Water Act 2000*, the Queensland Government established the power to monitor trends in the use of groundwater and to regulate farm dams through the water resource planning process.

A WRP is prepared for the following purposes:

- to define the availability of water for any purpose;
- to provide a framework for sustainably managing water and the taking of water;
- to identify priorities and mechanisms for dealing with future water requirements;
- to provide a framework for establishing water allocations; and
- to provide a framework for reversing, where practicable, degradation that has occurred in natural ecosystems, including for example, stressed rivers.

WRPs have been developed and finalised for all major catchments in SEQ – Mary, Moreton, Logan and Gold Coast (QWC 2008).

A secondary level of water resource planning leads to the development of 'regional water supply strategies', which build on previous WRPs to develop a long-term 'whole of catchment' plan for managing water at the regional level (Claydon 2008). The regional water supply strategies are the result of extensive input from local councils, water service providers, industries and community groups (Claydon 2008). In Queensland, regional water supply strategies cover the SEQ, Far North Queensland (FNQ), North Queensland (NQ), Mackay Whitsunday (MW), Central Queensland (CQ) and the Wide Bay Burnett (WBB) (Figure 2).

In recent years, the provision of urban water supply in SEQ has been challenged by several factors, most notably: (i) increased demand for potable water supplies; (ii) the supply of additional traditional water sources and infrastructure (i.e. dams) is considered to be an expensive option likely to generate social and environmental conflicts; and (iii) the Millennium Drought (Cox undated). In response, the Queensland Government's *Water Amendment Act 2006* amended the *Water Act 2000* to create the Queensland Water Commission (QWC).

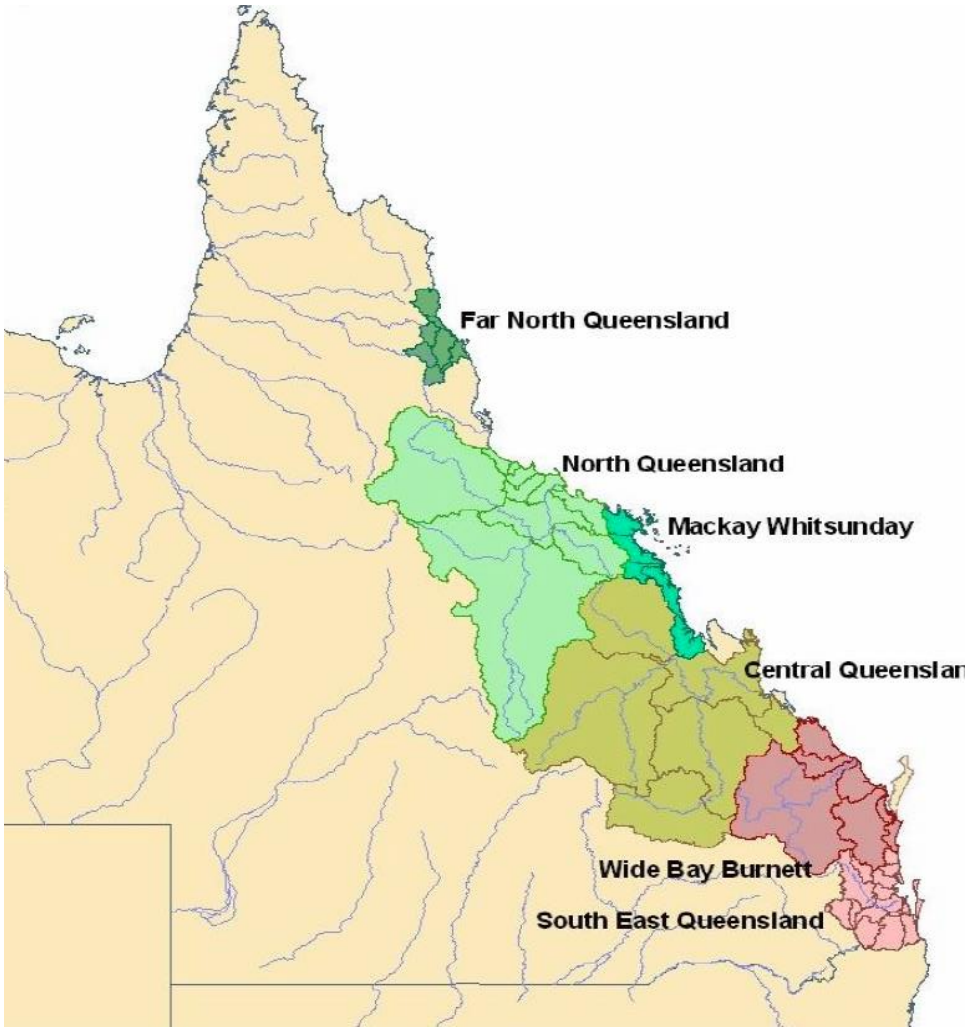


Figure 2: Regional Water Supply Strategies.
Source: Claydon (2008).

3.2. The Queensland Water Commission (QWC)

The QWC is an independent, statutory authority charged with the responsibility for achieving safe, reliable, secure and sustainable water supplies in SEQ and other designated regions (QWC 2008a). The main roles of the QWC are:

- to develop long-term water supply strategies;
- to establish a regional water grid;
- to implement water restrictions;
- to manage water demand;
- to provide advice to government; and
- to reform the water industry (QWC 2008).

The QWC is governed by a legislative framework under Chapter 2A of the *Water Act 2000–06*. Under the *Water Act 2000–06* the QWC's main functions are to:

1. Advise the Minister on:
   - matters relating to water supply and demand management for water; and
   - the delivery of desired levels of service objectives for water supplies to the SEQ region and designated regions;

2. Facilitate and implement regional water security programs; and
3. Ensure compliance with the programs and with QWC water restrictions (Queensland Government 2009).

The overarching principle guiding the QWC is 'that water in the region is to be managed on a sustainable and integrated basis to provide secure and reliable supplies of water of acceptable quality for all uses' (Queensland Government 2009). The QWC's specific principles for performing the functions as stated in Part 2, section 346 (3) of the *Water Act 2000–06* are:

1. Water sharing: water is a scarce resource to be shared across SEQ;
2. Water sources: water quality should be managed from its source to its end-users to ensure the health of catchments, aquifers and their ecosystems as well as to deliver water of a desirable quality at the lowest overall cost;
3. Water supply operations: water supply arrangements should maximise efficient and cost-effective service delivery and the efficient use of water in accordance with desired levels of service objectives. They should ensure appropriate connectivity between supply sources;
4. Cost sharing and pricing: the cost of water sources should be shared among the users who benefit from them, and the pricing be consistent with relevant intergovernmental agreements;
5. Planning: that assessments of regional water supply should consider environmental, social and economic factors as well as applying 'least cost planning' to ensure proper economic comparison of all supply-side and demand-side options;
6. Water restrictions imposed by the QWC: water restrictions should help achieve SEQ objectives for long-term demand management for water and address any significant threats to SEQ's sustainable and secure water supply; and
7. Flood mitigation and dam safety: these issues to be considered when preparing assessments of regional water supply (Queensland Government 2009).

3.3. South East Queensland Water Strategy – Draft 2008

The QWC recently published the draft *South East Queensland Water Strategy* (the Strategy) as the guiding document to ensure a long-term future water supply for SEQ (QWC 2008). The Strategy builds on earlier work prepared by the then Department of Natural Resources, Mines and Water – *Water for South East Queensland: A Long Term Solution* (DNRMW 2006). The Strategy aims to move away from the current reliance on dams and weirs as the primary source of supply to a more diversified approach which utilises technological advancements in desalination and purified recycled water to supplement the region's water supply. The development of the Strategy has been influenced by a number of other policies and initiatives, such as the NWI and the National Water Quality Management Strategy (QWC 2008). Figure 3 depicts some of the key State and regional plans that have influenced the development of the Strategy.

The final Strategy, due for release in 2009, will provide the basis for advice to the Queensland Government on delivering the SEQ Regional Water Security Program (DIP and QWC 2008).

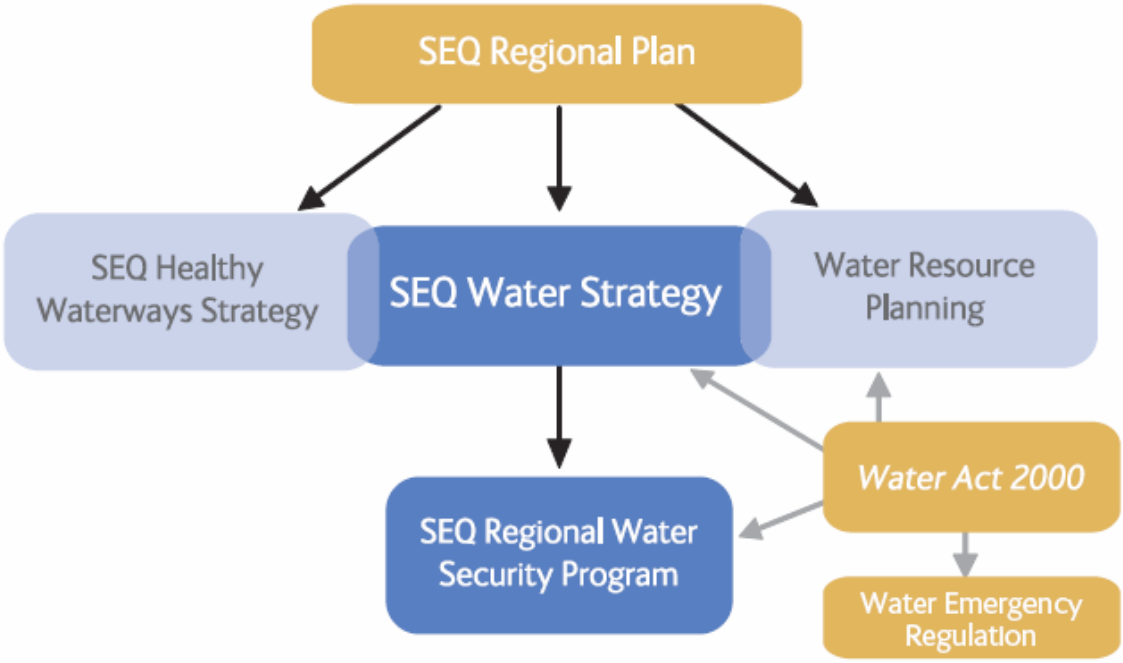


Figure 3: Relationship of the Strategy with Other Planning Processes.
Source: QWC (2008).

3.4. Legislative Amendments to Facilitate Institutional Reform

A number of legislative amendments have been introduced since 2006 to facilitate Strategy implementation. The *Water Supply (Safety and Reliability) Act 2008* (the Water Supply Act) amended the *Water Act 2000* to implement new institutional arrangements for urban water supply within SEQ: to establish a regulatory framework for an urban water market; and to facilitate the operation of a water grid. The water grid, a series of interconnected pipelines that connect water sources, treatment plants and bulk water transport networks, is based on the principle that water is a shared resource. The Water Supply Act also provides a framework for the regulation of drinking water quality in Queensland, where none had existed previously, and makes specific provision for the regulation of purified recycled water (PRW).

Under the provisions of the *South East Queensland Water (Restructuring) Act 2007*, enacted a year earlier than the Water Supply Act, it is proposed to transfer the role of supplying water and sewerage infrastructure to urban communities in SEQ from local governments (Figure 4) to four new Queensland Government-owned statutory authorities that will own and operate the SEQ Water Grid (Queensland Water Commission 2009a) (Figure 5):

- the Queensland Bulk Water Supply Authority, trading as Seqwater, which owns all dams, groundwater infrastructure and water treatment plants in SEQ;
- the Queensland Manufactured Water Authority, trading as WaterSecure, which owns the desalination plant at the Gold Coast and the Western Corridor Recycled Water Project;
- the Queensland Bulk Water Transport Authority, trading as LinkWater, which owns all major pipelines in SEQ to provide regional connectivity and delivery of treated water to distribution points in the network; and
- the SEQ Water Grid Manager – a statutory authority responsible for managing the water market on a not-for-profit basis, i.e. buys services from the other State owned entities and sells water to the distribution and retail businesses (a single desk buyer and seller) (QWC 2008b).

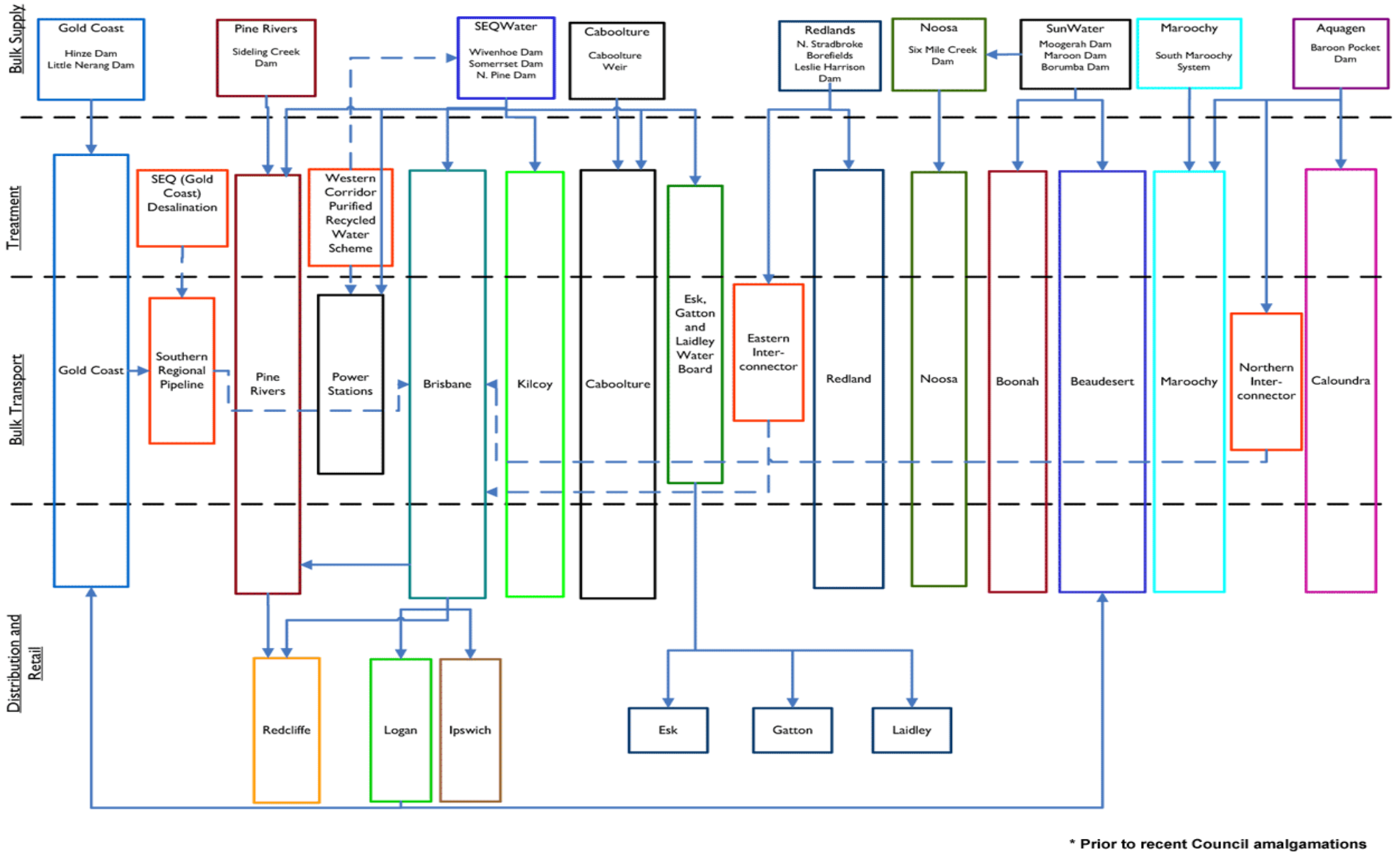


Figure 4: Previous Urban Water Arrangements in South East Queensland*.
Source: QWC (2008b).

The first stage of reform included the transfer of local government assets and service provision to State-owned entities, and was effective as of 1 July 2008.

The second stage of the reform involves the establishment of three combined distribution/retailer entities that will own the water and sewerage distribution infrastructure and sell water and sewerage disposal services to customers in SEQ (Figure 5). The entities will purchase treated water from the SEQ Water Grid Manager, sell and deliver that water to customers, collect sewage and deliver it to treatment plants, and treat and dispose of the sewage (QWC 2009a). The entities will be local government owned, but will operate as stand-alone businesses (DIP and QWC 2008). These entities will be established by 1 July 2010 and service the following council groups (QWC 2009a):

- Brisbane, Scenic Rim, Ipswich, Somerset, Lockyer Valley – Queensland Urban Utilities;
- Gold Coast, Logan, Redlands – Allconnex Water; and
- Sunshine Coast, Moreton Bay – Unitywater.

In addition, amendments to the *State Development and Other Legislation Amendment Act 2006* allowed for the provision of a new category of 'prescribed projects', which include 'critical infrastructure projects' with their own fast-track rules that provide the Coordinator General with powers to take over the approval process where agencies have not made decisions in 20 days (Waters 2007). These powers come into play for projects declared by the Minister to be 'prescribed projects' and 'critical infrastructure projects'. The new powers have been used by government to implement a number of projects including, Gold Coast Desalination Project, Southern Regional Water Pipeline and the Western Corridor Recycled Water Project. Once the project assessment is taken over by the Coordinator General, other government departments only have an advisory role. The public are also unable to appeal the approval of such projects under the new arrangements. For a summary of key planning policies, legislation and plans, refer to Appendix A.

Figure 5: **New Urban Water Arrangements in South East Queensland.**
Source: QWC (2009a).

4. THE REGIONAL APPROACH TO WATER RESOURCE MANAGEMENT IN SEQ

4.1. Total Water Cycle Management

In the *South East Queensland Regional Plan* (SEQRP) 2009–2031, released by the Queensland Government and the Council of Mayors SEQ, the term Total Water Cycle Management (TWCM) is used to infer the need for an integrated approach to water planning and management. The key principles of TWCM include:

- minimising the alteration to natural flow (frequency, volume and duration) and water quality regimes;
- ensuring that volume of water extracted from a source is sustainable (i.e. capable of providing a reliable supply to the community and sufficient flows for ecosystem health, taking into account climate change);
- reducing demand by minimising water use and losses, and maximising efficient use and re-use;
- considering all potential sources of water when new supplies are needed, including re-using water and stormwater; and
- managing the water cycle at all phases to preserve water quality for the community and the environment (Queensland Government 2009a).

A critical element of TWCM is water sensitive urban design (WSUD), which seeks to avoid or minimise the impact of development and land management on the natural water cycle and environmental values (Queensland Government 2009a).

The SEQRP 2009–2031 acknowledges the importance of managing the region's water resources on a sustainable and total water cycle basis. The QWC's approach is underpinned by a commitment to TWCM, including:

- considering all water sources including wastewater and stormwater;
- using all water sources sustainably;
- allocating and using water equitably; and
- integrating water use and natural water processes, including maintaining environmental flows and water quality (DIP and QWC 2008).

TWCM is currently being implemented in SEQ at the regional, sub-regional and local scales through a number of projects and initiatives. At the regional scale, the Strategy provides a policy framework to promote the implementation of TWCM. The framework includes:

- a demand management program;
- water saving targets for new buildings;
- design objectives for WSUD;
- operating principles for the SEQ Water Grid; and
- an extensive research program including purified recycled water (PRW) and stormwater harvesting (DIP and QWC 2008).

In selected areas where large scale development and significant infrastructure is earmarked, the QWC will lead the development of sub-regional total water cycle management plans which seek to 'integrate land use, waterway health and water supply planning for urban and rural purposes' (Queensland Government 2009a). Key outcomes of sub-regional planning will be used as recommendations for

inclusion in the Regional Water Security Program under the provisions of the *Water Act 2000* (Queensland Government 2009a).

The SEQRP also includes a commitment to ensuring that development in SEQ incorporates WSUD through the provision of policy 11.1.1 'Incorporate total water cycle management and water sensitive urban design principles in land use and infrastructure planning' (Queensland Government 2009a). A critical component of WSUD is stormwater management. The SEQRP 'Implementation Guideline No. 7: Water sensitive urban design – design objectives for urban stormwater management' specifies design objectives for best practice urban stormwater management and describes how they should be adopted (Queensland Government 2009a).

4.2. State Government Roles and Responsibilities

4.2.1. Queensland Department of Natural Resources and Water

The Queensland Department of Natural Resources and Water (NRW) (now Department of Environment and Resource Management (DERM)) is responsible for preparing and implementing water resource plans (WRPs), resource operating plans (ROPs) and wild river declarations (NRW 2008a). The department is also responsible for administering water licences, water allocations and resource and distribution operations licences. NRW manages and allocates the State's land and water resources, and manages native vegetation and the use and sale of native forest resources (NRW 2008a). Within a framework of extensive legislation and policies, developed through exhaustive consultation processes between key government and industry stakeholders, client groups, Indigenous people and the community, the Department has discrete planning and management responsibilities for these natural resources.

Under the provisions of the *Water Act 2000*, parts of Queensland have been declared as 'catchment areas', a designation that allows DERM to become a concurrence agency in the development approval process. As a concurrence agency, DERM is responsible for assessing development applications that have the potential to impact on water quality within a declared catchment area (NRW 2008b). Development applications include building work, plumbing and drainage work, operational work, reconfiguring a lot and material change of use (NRW 2008b). Development applications are assessed against DERM's 'Policy and Code for Preserving Water Quality in Declared Catchments Areas'. The department also regulates the taking of overland flow, and issues riverine protection permits (NRW 2008c).

The Department works closely with other organisations that have water and catchment management roles, including: the QWC; infrastructure businesses; water service providers; regional natural resource management bodies; other government agencies; and industry (NRW 2008d).

4.2.2. Queensland Department of Infrastructure and Planning

The Queensland Department of Infrastructure and Planning (DIP) works across Queensland to ensure planning and infrastructure is delivered in a coordinated and sustainable manner (DIP 2008). The *Integrated Planning Act 1997* is the primary piece of planning legislation in Queensland. Under the provisions of the *Integrated Planning Act 1997* and other legislation, the State government has prepared a number of State Planning Policies (SPPs) that are relevant to the management of water resources. These include:

- State Coastal Management Plan;
- Regional Coastal Management Plan;
- Natural Hazards;
- Acid Sulfate Soils; and
- SEQ Regional Plan 2009–2031 (ALGA 2006).

The *Integrated Planning Act 1997* also provides the framework for coordinating and integrating planning at the regional level. Regional plans, both statutory and non-statutory, are being rolled out

across the State with the first statutory-based plan in Queensland being developed for SEQ: the *South East Queensland Regional Plan 2005–2026*. An early review of this plan, producing the *South East Queensland Regional Plan 2009–2031*, was called for due to unforeseen population growth. The regional plan has important implications for the management of the region's water resources since it is binding on local governments, State agencies and developers.

4.3. Local Government Roles and Responsibilities

4.3.1. Recent Institutional Reform

Traditionally, local governments in Queensland have been responsible for the supply of reticulated urban water and sewerage service delivery within their jurisdictions (QWC 2007). Institutional water reform in SEQ since 2006 has resulted in significant changes to the role of local government in providing reticulated urban water and sewerage services under the new institutional arrangements (DIP and QWC 2008). The full details and implications of these changes, including the future roles and responsibilities of the various stakeholders, are still to be determined and will depend on current organisational structures as well as future reforms.

The role of supplying water infrastructure to urban communities in SEQ will transfer from Councils to several State-owned entities: Queensland Bulk Water Supply (Seqwater); Queensland Manufactured Water Authority (WaterSecure); Queensland Bulk Water Transport Authority (LinkWater); and the SEQ Water Grid Manager (DIP and QWC 2008).

The Council of Mayors' Water Reform Program has been established to develop and implement the State Government's institutional water reforms (Council of Mayors 2009). The Program is 'responsible for the separation and transition of current water businesses from Councils, and for assisting in the establishment of the new local government-owned water distribution business and three retail businesses' (Council of Mayors 2009).

Under the new institutional arrangements, developers will continue to provide non-trunk water and sewerage infrastructure for developments (i.e. internal infrastructure to the development) (DIP and QWC 2008). Current arrangements for local government infrastructure charges will remain in place until retail and distribution reforms are implemented in 2010 (DIP and QWC 2008).

The new institutional arrangements apply to SEQ's ten local government areas:

1. Brisbane City Council;
2. Gold Coast City Council;
3. Ipswich City Council;
4. Lockyer Valley Regional Council;
5. Logan City Council;
6. Moreton Bay Regional Council;
7. Redland City Council;
8. Scenic Rim Regional Council;
9. Somerset Regional Council; and
10. Sunshine Coast Regional Council (DIP and QWC 2008).

4.3.2. Land Use Planning

Local governments retain their land-use planning responsibilities under the new arrangements, which require the integration of utility infrastructure delivery, including water services (DIP and QWC 2008). For more details regarding the implications of water reform on land use planning and development assessment, refer to the discussion paper *Impact of Water Reform on Land Use Planning and Development Assessment in South East Queensland* (DIP and QWC 2008). The future roles and responsibilities of the participants, included those proposed in the discussion paper, are provided in Appendix B.

The SEQRP 2009-2031 is perhaps the most influential plan for local government activities and planning processes. Under the provisions of the SEQRP 2009-2031, all Councils are expected to apply the principles of TWCM and WSUD during the planning and design phases of new structure plans and master plans (Queensland Government 2009a). It is through this process that Councils will continue to play a major role in the management of water resources, as water entities and developers will be bound by Council structure plans, master plans and local area plans (DIP and QWC 2008). All Councils are expected to align their local plans with the SEQRP to ensure that the desired regional outcomes are achieved. Consistency will be verified in State checks during the plan-making process to ensure that all Council planning schemes align with the goals and objectives of the SEQRP (DIP and QWC 2008). This is timely given the need for amendments to local plans as a result of the recent local government amalgamations throughout Queensland.

4.3.3. Urban Land Development Authority

The Urban Land Development Authority (ULDA) was created and given special planning powers and processes under the provisions of the *Urban Land Development Act 2007*, which can override local government planning schemes (ULDA 2008). The ULDA works with local and State government, community, landholders and the development industry to assist in delivering 'viable developments that are diverse [and] affordable, [and] sustainable housing that incorporates best practice urban design' (ULDA 2008a).

A key element of the ULDA's role will be to incorporate WSUD. Under the provisions of the *Urban Land Development Act 2007*, the ULDA is responsible for development planning and assessment in declared Urban Development Areas (UDAs) across the State (ULDA 2008b). Where a UDA is declared, the 'ULDA will take the place of the Council and coordinate with the new water entities' (DIP and QWC 2008).

4.3.4. Urban Stormwater Management

Local governments will retain responsibility for urban stormwater management under the new arrangements (DIP and QWC 2008). Legislation that influences stormwater management in Queensland includes:

- *Water Act 2000* (see Section 2.1);
- *Integrated Planning Act 1997*;
- *Environmental Protection (Water) Policy 1997*;
- *Environmental Protection Act 1994*;
- *Coastal Protection and Management Act 1995*; and
- *Vegetation Management Act 1999*.

Under the *Environmental Protection (Water) Policy 1997* – the EPP (Water) – local governments are required to develop urban stormwater management plans which target activities in the catchment that are likely to adversely affect the quality of stormwater runoff and hence the quality of the receiving waters. The EPP (Water) identifies five environmental values to be protected:

- Biological integrity;
- Suitability for recreational use;
- Suitability for drinking after minimal treatment;
- Suitability for agricultural use; and
- Suitability for industrial use (EPAQPWS 2003).

It is the intent of the EPP (Water) to protect the ecological integrity of the receiving environment whilst allowing development to occur (Department of Main Roads 2002). This regulation provides for the management of local government wastewater and stormwater discharges and the setting of environmental values and water quality objectives consistent with the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (GBRMPA 2004).

There are two clauses in the EPP (Water) that relate directly to the release or potential release of contaminants and sediment:

- Section 31 – A person must not deposit or release certain things into, or where it could reasonably be expected to enter, a roadside gutter, stormwater drain or a waterway (e.g. rubbish, cement or concrete, paint, paint thinner, herbicide, oil).
- Section 32 – A person must not release stormwater runoff nor deposit sand, silt or mud into, or where it could reasonably be expected to enter, a roadside gutter, stormwater drain or a waterway that results in the build-up of sand, silt or mud in the gutter, drain or water (Department of Main Roads 2002).

Local governments also play an important role in translating State and regional interests into on-ground projects through the Integrated Development Assessment System (IDAS) process (LGAQ 2004).

5. WATER MANAGEMENT INITIATIVES IN SEQ

A range of water supply and demand management initiatives have been proposed to meet the needs of regional growth and to provide security of supply during drought (QWC 2008, p131). Key initiatives are outlined below.

5.1. Demand Management Initiatives

As part of the strategy to address the prolonged drought and to reduce the demand on potable water supplies in SEQ, a regional demand management program was initiated (2008c). This includes:

- Target 140 Initiative (e.g. retro-fitting homes with water saving devices);
- Comprehensive water restrictions (household and commercial);
- Targeting inefficient, excessive water users and minimising water wastage through leakage, seepage and evaporation (reducing pressure in mains pipes); and
- Applying water use efficiency (WUE) measures and improving regulation to ensure buildings are water efficient (industry and businesses using more than 10 million litres of water per annum are required to implement a Water Efficiency Management Plan).

In addition, the Queensland Government is actively promoting water conservation measures through the delivery of incentives and education-based programs, which include:

- WaterWise;
- Home and Garden WaterWise Rebate Scheme;
- Business Efficiency Program;
- EcoBiz Program;
- Climate Smart Living Education Program; and
- Rural Water Use Efficiency (Cox undated).

Since 2005, Brisbane households have reduced their water consumption by 57 percent. Water consumption hit an all-time low of 112 L per person per day in July 2008 (a significant reduction from the previous 296 L per person per day). Water consumption rates have been maintained at levels below the 170 L/person/day targets through the early months of 2009, despite the high temperatures and rainfall in the region. The draft Strategy is based on permanent conservation measures of 230 litres per person per day, which some conservation groups argue is far too high (Queensland Conservation Council 2008).

5.2. Water Supply Initiatives

The draft Strategy (QWC 2008d) also provides for a number of supply-side initiatives including:

- Water Grid – to link existing and new water infrastructure, and to transfer water across the region;
- Tugun Desalination Plant (part of Gold Coast City Council's WaterFuture Strategy) and the State's SEQ Regional Drought Strategy Contingency Supply Plan;
- Western Corridor Recycled Water Scheme – the largest recycled water scheme in Australia. The project involves a pipeline from six wastewater treatment plants in Brisbane and Ipswich to transport recycled water to industry and agriculture;
- The proposed construction of Wyaralong Dam, Bromelton Off-stream storage, Cedar Grove Weir and raising the level of Hinze Dam; and
- The reactivation of old dams – e.g. Lake Manchester and Enoggera Dams.

6. CONCLUSION

In the past, Australians found themselves responding to external crises; exile, wars and depression. The crisis of today is 'one of meaning and of finding a way to live within the constraints of a finite natural world' (Garrett, cited in Fullerton 2001, 328). The review of institutional reform in SEQ water management undertaken here provides indications of such a shift in outlook, from one that views environmental change as an external risk, to one that integrates environmental needs alongside human development concerns within the fabric of urban water planning and management.

Since the 1990s, national initiatives such as the COAG agreement and the NWI have advocated a more integrated paradigm for water management across Australia. Driven by a range of pressures – including prolonged droughts in major population centres and projections of increasing climate variability, together with the degrading quality and over-allocation of water – these policy initiatives have engaged all Australian States and Territories in the development of strategies to achieve long-term water security, to address water demand, and to integrate social, economic and environmental objectives into water planning and management. Unprecedented and sustained population growth, and associated demands on existing services and infrastructure, made the need for such reform particularly acute in SEQ.

This paper has outlined the key institutional reforms that have influenced urban water management in SEQ between 2000 and 2009. Legislative, policy, planning and operational reforms have not only enlarged the substantive focus of water management, but have also altered the roles and responsibilities of government. The first significant State-level initiative, the *Water Act 2000*, provides a legislative basis for the allocation and sustainable management of water resources for both environmental and human uses. This Act provides the framework for the development of catchment-level water resource plans and resource operations plans, which are designed for the allocation and sustainable management of water resources to meet future requirements, including the protection of natural ecosystems and security of supply to water users (Head and Cooper 2008).

Later, in the wake of the Millennium Drought, the focus of reform shifted from water resource planning to water supply planning. In the first such reform, the *Water Amendment Act 2006* amended the *Water Act 2000* to create the QWC – an independent, statutory body with responsibility for achieving safe, reliable, secure and sustainable water supplies in SEQ and other designated regions. Subsequent legislative reform has modified the roles of State and local governments in the provision of water and sewerage services through the *South East Queensland Water (Restructuring) Act 2007*, which enables the transfer of water supply and sewerage infrastructure responsibilities from local governments to State-owned entities. The *Water Supply (Safety and Reliability) Act 2008* provides the framework for an urban water market to regulate the operations of these entities. The Council of Mayors' Water Reform Program was established to develop and implement these latter reforms (Council of Mayors 2009).

The draft *South East Queensland Water Strategy* is the primary policy strategy by which the QWC has sought to discharge its responsibilities through the introduction of both supply- and demand-side initiatives. Consideration of TWCM and WSUD principles in urban development planning has also been introduced in SEQ under the provisions of the *South East Queensland Regional Plan 2009–2031*, as part of local governments' pre-existing responsibilities for land-use planning and stormwater management.

Several principles underpin these and broader shifts in regional water planning nationally and internationally, as noted in Section 2 of this report:

1. Regional planning must be based on the principles of Ecologically Sustainable Development.
2. Regional planning must be holistic and inclusive.
3. Regional planning must be flexible, adaptive and transparent.

In Australia, as elsewhere, the aim of regional water planning is to address economic, social and environmental aspects in an integrated manner. This sustainability principle is captured in the overarching objective of the NWI: to achieve a 'nationally compatible market, regulatory and planning based system of managing surface and ground water resources for rural and urban use that optimises economic, social and environmental outcomes' (NWC 2008d). In turn, the QWC has directed 'that water in the region is to be managed on a sustainable and integrated basis to provide secure and reliable supplies of water of acceptable quality for all uses' (Queensland Government 2009). The integrated approach embraced by these core institutions recognises the interrelationships between the human uses of water and its role in the environment.

A related aspect of the integration imperative is the need to consider all water sources as a potential resource. This is reflected in the second principle for regional water planning: the need for a holistic and inclusive approach. This principle is embodied in the Queensland Government's commitment to a total water cycle management (TWCM) approach. The QWC's commitment to TWCM includes the consideration of all water sources (including wastewater and stormwater), the sustainable use of water, the equitable allocation of water, and the integration of water use and natural water processes. The *South East Queensland Regional Plan* 2009–2031 also incorporates TWCM principles as the framework for achieving integrated water management in SEQ. Industry perspectives highlight the need for greater attention to the social and environmental impacts and benefits of supply options to complement the economic comparison of options as part of TWCM in SEQ (Stormwater Industry Association 2008).

With respect to the second element of this principle – the need for an inclusive approach – the NWI highlights the requirement for community participation to engage water users and other stakeholders in achieving the objectives of the NWI (see Section 3.2). The Council for the Australian Federation, in a set of urban water planning principles submitted to COAG for adoption in 2008, has also recognised the need for a partnership approach to ensure that the community is able to make an informed contribution to urban water planning, including consideration of the appropriate supply/demand balance (see Marsden Jacob Associates 2008). Industry perspectives point to the need for greater stakeholder and community consultation in association with Strategy development in SEQ (Australian Water Association 2008; Stormwater Industry Association 2008).

To maximise the benefits of engaging stakeholders in delivering NWI objectives, transparency in decision-making and the provision of sound information to all sectors at key decision points are identified as key strategies in the NWI (see Section 3.2). These requirements also underpin the third principle of regional water planning: the need for a flexible, adaptive and transparent approach. The need for clearer community transparency regarding the risks to water supplies and levels of supply security has recently been proposed to supplement existing COAG reform obligations in Australia (NWC 2009). With respect to SEQ, industry perspectives highlight the need to set out how regular monitoring, review and updating will be undertaken for the Strategy (Australian Water Association 2008), and for the SEQ Regional Plan (Environment Institute of Australia and New Zealand 2009) to ensure the ongoing relevance and success of these strategic documents.

In summary, the institutional arrangements for water supply planning and water resource management in SEQ, have been the subject of significant reform in recent years. Reform in SEQ has been guided by national-level commitments to three guiding principles for sustainable regional planning in urban contexts, principles also espoused as part of the international policy shift towards Integrated Water Management. The dynamic nature of water reform in Australia in recent years suggests that institutional and structural change will also continue in SEQ into the future. In this process, the perspectives of industry, such as those highlighted above, are likely to warrant additional attention as SEQ continues to move towards a sustainable regime of water management.

APPENDIX A: OVERVIEW OF THE SEQ WATER MANAGEMENT FRAMEWORK

Scale	Agency / Organisation	Key Roles / Responsibilities	Key Policy Documents and Legislation	Summary of Policy Objectives
National				
	National Water Commission (NWC)	Responsible for helping to drive national water reform and advising the Prime Minister and State and Territory governments on water issues. Also responsible for assisting and assessing the progress of the National Water Initiative and progress of water reform commitments under the National Competition Policy.	Intergovernmental Agreement on a National Water Initiative (NWI)	A blueprint for national water reform, focusing on the sustainable and efficient management of Australia's water resources.
State				
	Queensland Water Commission (QWC)	Created June 2006 to take responsibility for administering the completion of the Regional Water Supply Strategy and the associated consultation with the community on water planning and management issues. To reduce the impact of the drought, the Commission and its partners are undertaking a series of projects to: • manage the development of the Water Grid; • reduce water wastage; • identify alternative water sources; and • efficiently manage existing water sources. Achieve safe, secure and sustainable water supplies in SEQ and other regions that may be designated in the future. Oversees development of the SEQ Regional Water Supply Strategy. Prepare the SEQ Regional Water System Operating Plan.	South East Queensland Water Strategy	A strategy to secure long term water supply for South East Queensland. These define local government's obligations as responsible service providers to safeguard our waterways and deliver reliable and safe water services. The *Water Act 2000* stipulates all rights of use, flow and control of water in the State of Queensland. The Queensland Government has responded to the water supply emergency with the Water Amendment Regulation (No. 6) 2006, under the powers of the *Water Act 2000*, to implement a strategy to secure the essential water supply needs of the region.
	Department of Planning and Infrastructure (DIP)	A State Government initiative for the development and implementation of key regional planning strategies in SEQ to manage increased growth, plan the infrastructure to support it and ensure the Queensland way of life is preserved for future generations.	SEQRP 2009-2031 (draft) SEQ Infrastructure Plan and Program 2008-2026	The SEQRP is the key document (plan) for managing the regions growth and development over the next twenty years. The South East Queensland Infrastructure Plan and Program 2008–2026 outlines the government's infrastructure priorities for the South East Queensland (SEQ) region to support the SEQ Regional Plan. It represents a long-term commitment to infrastructure delivery in SEQ.
	Department of Natural Resources and Water (DNRW)	Responsible for water planning and management. The Department of Natural Resources and Water is responsible for ensuring the sustainable management and use of water. NRW monitors the implementation of water resource plans. The water resource planning process is designed to plan for the allocation and sustainable management of water to meet Queensland's future water requirements. Prepare and implement water resource plans and resource operation plans. Administer water licences, water allocations, resource and distribution operations licences.	Queensland Water Plan 2005-2010 SEQ Regional Water Supply Strategy (draft 2008) SEQ Water Security Program SEQ Regional Water System Operating Plan	The Queensland Water Plan 2005-2010 provides a general framework for sustainably managing QLD's water resources. The plan sets out a program for water planning across the State and outlines seven strategies for meeting future water needs for consumption and the environment whilst maintaining economic growth. 1. Securing water for the environment and for users 2. Planning for future water needs 3. Smarter use of existing supplies 4. Pricing water for sustainability 5. Protecting water quality 6. Compliance to protect users and the environment 7. Investing in science and technology To develop a whole of government approach to meeting the water supply challenges of Queensland growth regions.

Scale	Agency / Organisation	Key Roles / Responsibilities	Key Policy Documents and Legislation	Summary of Policy Objectives
	Environmental Protection Agency (EPA)	TheEPA, which includes the Queensland Parks and Wildlife Service (QPWS), is a department of the Queensland Government. The EPA strives to protect Queensland's natural and cultural heritage, promote sustainable use of its natural capital and ensure a clean environment. Key functions of the organisation are environmental planning, environmental policy, management of parks, forestry and wildlife, environmental operations, sustainable industries, environmental and technical services, corporate affairs, and corporate development.	*Environmental Protection Act 1994* *Environmental Protection (Water) Policy 1997*	To protect QLDs environment while allowing development to occur to improve the total quality of life both now and in the future that maintains ESD. To protect the environmental values in relation to QLD waters. To better protect riverine, estuarine and coastal water quality.
			Water Act 2000	Provides a statutory planning framework for the allocation and management of water. It vets all rights to the use, flow and control of all water in the State. The approval to take water (the water licence) is issued under the provisions of the *Water Act 2000*.
			Water Amendment Act 2005	Provides Ministerial powers to give State water supply emergency directions to service providers in emergency water shortage situations.
			Water Amendment Act 2006	This Act amends the *Water Act 2000* to create the QWC.
			Water and Other Legislation Amendment Act 2007	Implements a range of demand management measures – supported by the QWC – to deal with continued drought in SEQ. It also provides for long term sustainable water supply in SEQ and across the State.
			Water Supply (Safety and Reliability) Act 2008	Provides new Statewide regulatory frameworks fro drinking water and recycled water standards, including purified recycled water (PRW). The Act establishes recycled water management plans and drinking water quality management plans – including approval and monitoring requirements. The Act is designed to protect public health and ensure that water recycling infrastructure continues to operate. The three main objectives of the Act are to: 1. ensure the safety and reliability of water supply. 2. amend the *Water Act 2000* and the *SEQ Water (Restructuring) Act 2007* to further implement the new institutional arrangements for urban water supply – establish framework for Water Grid and water market as well as granting water entitlements to the Water Grid Manager. 3. amend the *Water Act 2000* to enable full and effective implementation of ROPs.
			South East Queensland Water (Restructuring) Act 2007	The role of supplying water and sewerage infrastructure to urban communities in SEQ will transfer from Councils to the State owned bulk entities.
			Wild Rivers Act 2005	Purpose is to preserve the natural values of wild rivers. It does this by providing for declaring of rivers as 'wild' and then regulating future development activities within the declared wild river and its catchments area.
			Integrated Planning Act 1997	The *Integrated Planning Act 1997* is the primary piece of legislation dealing with land use and planning in Queensland. The process for approval of works such as bores is provided by the *Integrated Planning Act 1997*.

Scale	Agency / Organisation	Key Roles / Responsibilities	Key Policy Documents and Legislation	Summary of Policy Objectives
			Queensland Development Code 2003	New rules for rain water tanks are part of the QDC. Previously all local councils had discretion to require new homes to install rain water tanks – it is now mandatory for all new housing in SEQ from Jan 2007.
			State Development and Other Legislation Amendment Act 2006	'Prescribed Projects' 'Critical Infrastructure Projects' which have their own fast track rules. The hurry up powers in the State Development Act has been used by government for the Tugun Desalination Plant, Southern Regional Water Pipeline and the Western Corridor Recycled Water Project.
Regional				
	SEQ Healthy Waterways Partnership	A collaboration between the Queensland Government, local governments, industries, research organisations and community groups. The Partnership aims to improve how we manage our catchments and the health of the waterways in South East Queensland through five programs: science and innovation; ecosystem health and monitoring program; water by design; communication, education and motivation program; and Strategy coordination and performance monitoring.	Healthy Waterways Strategy 2007-2012 Water Sensitive Urban Design Action Plan (WSUD)	500 actions to improve the health of our waterways - an integrated set of Action Plans, the Strategy is designed to maintain and improve the health of the waterways and catchments of South East Queensland. The Water Sensitive Urban Design Action Plan aims to minimise the negative impacts on the natural water cycle and protect the health of aquatic ecosystems. The WSUD Action Plan is one component of the SEQ Healthy Waterways Strategy.
	SEQ Catchments	A community-based business that sources and coordinates investment in activities that help South East Queensland to a sustainable future and restores natural resources for the benefit of future generations. SEQ Catchments acts as an intermediary between all levels of government, community and industry in order to make the connections, secure financial support, coordinate activities, provide technical and scientific advice and administrative support to deliver measurable, long-term outcomes for our natural resources.	SEQ Natural Resource Management Plan	The SEQ Natural Resource Management Plan sets a strategy for the long term sustainability, continued lifestyle and economic prosperity of the entire south east region.
Local				
	Local councils	Local councils retain their role in, and responsibility for, land use planning and development assessment. They also retain their responsibility for stormwater management.	*IPA 1997* Local Planning Schemes Priority Infrastructure Plans (PIPs)	Under the *Integrated Planning Act 1997* (IPA), local governments are required to prepare a planning scheme. Planning schemes are the main planning documents used to manage future growth and development throughout Queensland. They seek to achieve: ecological sustainability through coordinated planning and management of development and its effects on the environment.

Source: ACIL Tasman (2005); NWC (2006); Claydon (2008); DIP (2008); SEQ Catchments (2008); DNRW (2008d).

APPENDIX B: FUTURE ROLES AND RESPONSIBILITIES OF PARTICIPANTS IN SEQ WATER MANAGEMENT

Participant	Main roles
State Government	• To determine sub-regional dwelling targets and growth estimates (including business and industry growth estimates impacting on water consumption) through the *SEQ Regional Plan*. • To take responsibility for ensuring there is sufficient water to meet the growth in SEQ (water security) and to outline overall supply and demand management strategies in the Regional Water Security Program. Other participants can assume there will be adequate supplies to meet growth in the *SEQ Regional Plan*. • To set more detailed minimum supply and demand measures through instruments such as the Queensland Building and Development Code. • To own the bulk water entities (the QBWSA, QBWTA, QMWA, and WGM). • To set 'Grid Bypass Rules', which regulate the ability of parties to buy and sell water in SEQ other than through the Water Grid Manager. • To set health and environmental standards such as sewerage discharge licences and recycling standards.
Queensland Water Commission (QWC)	• To provide advice to the State Government on making the Regional Water Security Program and institutional arrangements. • To provide advice on total water cycle management initiatives at the sub-regional level for inclusion in appropriate statutory and policy instruments. • To undertake planning for regionally significant water cycle projects. • To make water-use restrictions when needed. • To make a System Operating Plan within which the bulk entities operate. • To administer Water Market Rules.
Councils	• To participate in and provide input to sub-regional total water cycle planning coordinated by the QWC. • To formulate planning schemes, structure plans, master plans and local area plans, in accordance with the *SEQ Regional Plan*. Other participants (including the Distribution Entity) will be involved in making these plans. • To undertake population and development forecasts (planning assumptions) for its area under the PIP Planning process of IPA. Common planning assumptions will underpin planning for water supply and sewerage networks by both Councils and the Distribution Entity. To outline the main 'local' policies on how water and sewerage are to be supplied and what objectives are to be met (e.g. dual reticulation, stormwater harvesting or reduction of mains water consumption). These policies will be particularly apparent in structure plans, master plans and local area plans. • The plans are approved by the State – which is an avenue for resolution of differences of opinion between the participants. • To manage the assessment of development applications. • To own the Distribution Entity and retailers. • To own (subject to Grid Bypass rules or other regulatory requirements): – local water and sewerage services for sale to retailers, such as stormwater harvesting – independent schemes for their own use such as sewer mining to irrigate their parks.

Participant	Main roles
Qld Bulk Water Supply Authority Qld Manufactured Water Authority Qld Bulk Water Transport Authority	• To provide and sell services to the Water Grid Manager in accordance within the System Operating Plan and contracts with the Water Grid Manager.
SEQ Water Grid Manager	• To sell water to retailers in accordance with State-set rules and administer the System Operating Plan. • The Water Grid Manager does not determine or influence, through its contracts with retailers, where development will occur. Development patterns are determined by the State Government, Councils and developers.
Distribution Entity	• To own water distribution and sewerage collection networks and sewerage treatment plants. • To provide infrastructure and services to meet development within the *SEQ Regional Plan* and Council plans. • To participate in the development of Council land use plans. • To be bound by these plans once made, including the provisions which guide how water services will be supplied. • To be bound by its charter and directions of Councils as owners of the entity. The charter or directions may, for example, require the Distribution Entity to use integrated water cycle management principles in its decision making processes and criteria to guide when certain types of water solutions (e.g. recycling or stormwater harvesting) are to be used. Where there is a purified recycled water scheme established, the Distribution Entity would be obligated to protect production flows for the scheme. • To seek economically efficient outcomes within regulatory or owner's requirements and objectives. • To plan the provision of its infrastructure in a similar way to that which Councils are required to use in their PIPs. Common forecast growth/planning assumptions should underpin both Council PIPs and the Entity's regional plan for trunk water and sewerage infrastructure. The entity's plan will be reflected within Councils' PIPs. • This planning will be done in consultation with Councils. • To be responsible for the assessment, conditioning and approval of the water and sewerage aspects of development applications (with some possible exceptions as canvassed in this paper) and acceptance of operational works. When establishing the Distribution Entity, Councils will need to decide how the relationship between the Entity and Councils is affected (refer to Section 4.4.3). • To be subject to any rules about allowing other parties to use its assets to supply water or sewerage services (e.g. third-party access regimes).

Participant	Main roles
Retailers	• To purchase water from the Water Grid Manager, sell this water to customers and pay the Distribution Entity to deliver the water to the customer. • To sell sewage collection and treatment services to customers and pay the Distribution Entity to collect and treat the sewage. • May participate in the development of Council land use plans and will be bound by these plans once made, including the provisions which guide how water services will be supplied. • To be bound by their charter and the directions of its owner Councils. • To seek economically efficient outcomes within regulatory or owners' requirements and objectives. • May own or purchase water and sewerage services from other parties, subject to grid bypass rules, and sell these services to customers. • May offer incentives to consumers to influence their consumption behaviour (within any regulatory constraints).
Developers	• To be bound by Council planning schemes (including PIPs) and other regulatory instruments such as the Queensland Development Code and Queensland Plumbing and Wastewater Code. • To propose water and sewerage solutions as part of development applications. These proposals may involve infrastructure, services or measures not owned by the Distribution Entity but will need to align with the objectives and requirements of planning schemes and other regulatory requirements. • May propose water and sewerage solutions during Council preparation of plans such as Council structure plans or master plans.
Property owners (including bodies corporate)	• May establish independent services (e.g. recycling, greywater reuse and stormwater harvesting) on their own properties. This is subject to relevant regulatory requirements, for example, controls over on-site sewerage systems under the *Plumbing and Drainage Act 2002* and *Environmental Protection Act 1994*.
Other water providers	• May be able to own independent water sources, water and sewage treatment plants and/or distribution infrastructure. They may sell these services to retailers. • This will be subject to grid bypass rules and/or third-party access regimes. Note that initially, at least, the Distribution Entity will be a monopoly business.

Source: DIP and QWC (2008).

GLOSSARY

ABS	Australian Bureau of Statistics
COAG	Council of Australian Governments
DERM	Queensland Department of Environment and Resource Management
DNRW	Queensland Department of Natural Resources and Water
EPA	Environmental Protection Agency
EPP Water	Environmental Protection (Water) Policy 1997
ESD	Ecological Sustainable Development
GCCC	Gold Coast City Council
IDAS	Integrated Development Assessment System
NCP	National Competition Policy
NWC	National Water Commission
NWI	National Water Initiative
PRW	Purified Recycled Water
QWC	Queensland Water Commission
ROP	Resource Operation Plans
SEQ	South East Queensland
SEQRP	South East Queensland Regional Plan 2009–2031
SEQROC	South East Queensland Regional Organisation of Councils
SEQRWS	South East Queensland Regional Water Strategy
SPP	State Planning Policies
TCWM	Total Water Cycle Management
ULDA	Urban Land Development Authority
WRP	Water Resource Plans
WSUD	Water Sensitive Urban Design
WUE	Water Use Efficiency

REFERENCES

ACIL Tasman 2005, 'Institutional Arrangements in the Australian Water Sector', *Information Paper*, prepared for the National Water Commission, pp. 1-60.

Aplin, G. 1998, *Australians and their Environment: An Introduction to Environmental Studies*, Oxford Uni Press, Oxford, Section 1.4, 'Multidisciplinary Approaches to Environmental Studies', pp. 17-18.

Australian Bureau of Statistics (ABS) 2003, Census of Population and Housing: population Growth and Distribution, Australia, Canberra.

Australian Bureau of Statistic (ABS) 2005, Year Book Australia: water supply and use (online), Available: http://www.abs.gov.au/ausstats/abs@.nsf/0/4eb070c49861da5dca256f7200832fae?OpenDocument (17 February 2009).

Australian Government 2007, 'National Competition Policy Report 2005-2007' (online), Available: http://www.treasury.gov.au/documents/1306/PDF/Australian_Government_National_Competition_Policy_Report.pdf (1 April 2009).

Australian Local Government Association 2006, 'Policy and Research: Environment', (online), Available: http://www.alga.asn.au/policy/environment/coasts/roles/ (4 March 2009).

Australian Water Association 2008, Australian Water Association Submission on the South East Queensland Draft Water Strategy, July 2008. Available online at: http://www.awa.asn.au/uploadedFiles/SEQLD_Water_Strategy_Jul08(1).pdf

Briassoulis, H. 1989, 'Theoretical Orientations in Environmental Planning: An Inquiry into Alternative Approaches', Environmental Management, vol. 13, no. 4, pp. 381-392.

Calthorpe, P., Fulton, W. 2001, *The Regional City: planning for the end of sprawl*, Ch 1 'Living in the regional world', Island Press, Washington DC, p. 24.

Claydon, G. 2008, 'Water Reform in Queensland: Irrigation Australia Conference' (online), Available: http://www.irrigation.org.au/Day2/Stream1_S39.pdf (1 April 2009).

Claydon, G., and Milligan, G. 2003, Water – The New Precious Resource, Planning, Management and Allocation Queensland Style, Paper for the Water in Mining 2003 Conference, Queensland Government Department of Natural Resources and Mines.

COAG (2004) Intergovernmental Agreement on a National Water Initiative, Council of Commonwealth Governments. Available online at: www.nwc.gov.au/resources/documents/Intergovernmental-Agreement-on-a-national-water-initiative.pdf (31 March 2009).

Council of Mayors South East Queensland 2009, 'The Water Reform Program' (online), Available: http://www.seqwaterreform.qld.gov.au/ (31 March 2009).

Cox, R. undated, 'Water Reform in Queensland', *Queensland Department of Natural Resources and Water*.

Dixon, N. 2000, Water Allocation and Sustainable Management: Chapter 2 of the Water Bill 2000: Legislation Bulletin No 9/00, Queensland Parliamentary Library, Brisbane.

Department of Main Roads 2002, 'Erosion and Sediment Control', Chapter 5, Queensland Government (online), Available: http://www.mainroads.qld.gov.au/MRWEB/prod/CONTENT.NSF/0/dc2b2ef83f579a754a256c31007fd506/$FILE/5a_chapter%205%20no%20Appendices.pdf (12 February 2007).

Department of Natural Resources, Mines and Water (DNRMW) 2006, Water for South East Queensland: A Long Term Solution.

Engineers Australia 2008, South East Queensland Draft Water Strategy March 2008 Submission by Engineers Australia, 31 July 1008. Available online at: http://www.engineersaustralia.org.au/da/index/getfile/id/8782

Environment Institute of Australia and New Zealand 2009, Draft South East Queensland Regional Plan Review Feedback, 1 May 2009. Available online at: http://www.eianz.org/sitebuilder/aboutus/knowledge/asset/files/67/seqregionalplansubmission.pdf

Environmental Protection Agency Queensland Parks and Wildlife Service (EPAQPWS 2003) 2003, 'Cardwell-Hinchinbrook Regional Coastal Management Plan' (online), Available: http://www.epa.qld.gov.au/publications?id=719 (9 February 2007).

Everard, M. 1999, 'Towards sustainable development of still water resources', *Hydrobiologia*, vol 395, pp29-38.

Fullerton, T. 2001, Watershed: Deciding our Water Future: Juggling the Interests of Farmers, Politicians, Big Business, Ordinary People - and Nature, ABC Books, Sydney.

Gold Coast City Council 2009, 'South East Queensland Water Reform: Water Reform Model' (online), Available: http://www.goldcoastwater.com.au/t_gcw.asp?PID=7457 (31 March 2009).

GBRMPA 2004, 'Environmental Status: Water Quality' (online), Available: http://www.gbrmpa.gov.au/corp_site/info_services/publications/sotr/latest_updates/water_quality (15 February 2007).

Haughton, G. and Counsell, D. 2004, 'Regions and sustainable development: regional planning matters', *The Geographical Journal*, vol. 170, no. 2, pp. 135-143.

Head, B. and Cooper, A. 2008, Roles and Relationships for Water Security in South East Queensland. Report to the Urban Water Security Research Alliance. The University of Queensland, Brisbane, Australia, April 2008.

Hennessy, K., Fitzharris, B., Bates, B., Harvey, N., Howden, S., Hughes, L., Salinger, J. and Warrick, R. 2007, Australia and New Zealand, in Parry, M., Canziani, O., Palutikof, J., Van Der Linden, P. and Hanson, C. (eds.) Climate change 2007: Impacts Adaptation and Vulnerability. Contributions of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge, UK, Cambridge University Press.

Hussey, K. and Dovers, S. (ed.) 2007, *Managing Water for Australia: The Social and Institutional Challenges*, CSIRO Publishing, Australia.

Hussey, K. and Dovers, S. 2007a, 'Trajectories in Australian Water Policy', *Journal of Contemporary Water Research and Education*, Issue 135, pp. 36-50.

Khouri, G. 2006, 'Integrated Water Cycle Management: An Australian Perspective', *European Water*, vol. 15, pp. 23-32.

LGAQ (Local Government Association of Queensland) 2004, 'Integrating Natural Resource Management into local government corporate, strategic and operational plans', Queensland Government.

Marsden Jacob Associates (2008) National Snapshot of Current and Planned Water Recycling and Reuse Rates', Final Report prepared for the Department of the Environment, Water, Heritage and the Arts, Melbourne.

Mitchell, V. G. 2006, 'Applying integrated urban water management concepts: A review of Australian experience', *Environmental Management* 37(5): 589–605.

McDonald, G. 1996, 'Planning as Sustainable Development', *Journal of Planning Education and Research*, vol. 15, pp. 225-236.

McKay, J. 2005, 'Water institutional reforms in Australia', *Water Policy*, vol. 7, pp. 35-52.

National Competition Council 2008, 'Water: NCP Water Reforms' (online), Available: http://www.ncc.gov.au/sector.asp?sectorID=8 (1 April 2009).

Natural Resources and Water (NRW) 2007, 'The South East Queensland Drought to 2007' Queensland Government (online), Available: http://www.climatechange.qld.gov.au/forecasts/pdfs/seq_drought_2007.pdf (3 March 2009).

National Water Commission 2006, 'Governance at a glance: Metropolitan Water Planning and Management' (online), Available:
http://svc044.wic032p.server-web.com/nwi/water_governance/governance-at-a-glance/pdfs/MetropolitanWaterPlanningAndManagement.pdf (31 March 2009).

National Water Commission 2007, 'Water Reform in Australia' (online), Available: http://www.nwc.gov.au/resources/documents/water-reform-Australia-PUB-0107.pdf (3 March 2009).

National Water Commission 2007a, Institutional and regulatory models for integrated urban water cycle management - issues and scoping paper' (online), Available: http://www.nwc.gov.au/www/html/565-institutional-and-regulatory-models-for-integrated-urban-water-cycle-management.asp (30 March 2009).

National Water Commission 2008, 'National Water Initiative Objectives' (online), Available http://www.nwc.gov.au/www/html/672-bjectives.asp?intSiteID=1 (18 March 2009).

National Water Commission 2008a, 'Role and Functions' (online), Available: http://www.nwc.gov.au/www/html/93-roles--functions.asp (18 March 2009).

National Water Commission 2008b, 'Structure' (online), Available: http://www.nwc.gov.au/www/html/94-structure.asp (18 March 2009).

National Water Commission 2008c, 'Urban water reform' (online), Available: http://www.nwc.gov.au/www/html/185-urban-water-reform.asp (1 April 2009).

NWC (2008d) Annual Report 2007-2008. National Water Commission, Canberra. ISBN: 978-1-921107-63-4.

National Water Commission 2009, 'Implementing water reform' (online), Available: http://www.nwc.gov.au/www/html/143-implementation.asp?intSiteID=1 (18 March 2009).

Productivity Commission 2008, 'Towards Urban Water Reform: A Discussion Paper' (online), Available: http://www.pc.gov.au/__data/assets/pdf_file/0003/78150/urbanwaterreform.pdf (2 April 2009).

Queensland Department of Environment and Resource Management 2009, 'Corporate documents' (online), Available: http://www.nrw.qld.gov.au/about/documents/index.html (6 April 2009).

Queensland Department of Infrastructure and Planning and the Queensland Water Commission 2008, 'Impact of water reform on land use planning and development assessment in South East Queensland: Discussion Paper, Dec 2008 (online), Available:
http://www.qwc.qld.gov.au/myfiles/uploads/Discussion%20Paper/Title%20page%20and%20table%20of%20contents.pdf (18 February 2009).

Queensland Department of Natural Resources and Water 2008, 'NRW Organisational Chart' (online), Available: http://www.nrw.qld.gov.au/about/pdf/org_chart.pdf (20 February 2009).

Queensland Department of Natural Resources and Water 2008a, 'Water Management and Use' (online), Available: http://www.nrw.qld.gov.au/water/management/index.html (20 February 2009).
Queensland Department of Natural Resources and Water 2008b, 'Declared Catchment Areas' (online), Available: http://www.nrw.qld.gov.au/water/declaredareas/declaredcatchment.html (6 April 2009).
Queensland Department of Natural Resources and Water 2008c, Riverine protection permits' (online), Available: http://www.nrw.qld.gov.au/water/management/rpp.html (6 April 2009).
Queensland Department of Natural Resources and Water 2008d, 'Natural Resources and Water: Annual Report 2007-2008' (online), Available: http://www.nrw.qld.gov.au/about/documents/annual_report/pdf/annual_report_0708.pdf (6 April 2008).
Queensland Government 2009, *Water Act 2000*, Reprint No. 6E
Queensland Government 2009a, 'South East Queensland Regional Plan 2009-2031' Queensland Government Department of Infrastructure and Planning (DIP).
Queensland Water Commission 2007, 'Legislation' (online), Available: http://www.qwc.qld.gov.au/Legislation (19 February 2009).
Queensland Water Commission 2007b, 'Our Water: urban water supply arrangements in South East Queensland', Final Report, May 2007 (online), Available: http://www.qwc.qld.gov.au/myfiles/uploads/institutional%20arrangements/Urban_Water_Supply_Arrangements_in_SEQ.pdf (23 February 2009).
Queensland Water Commission 2008, *Water for Today, Water for Tomorrow: South East Queensland Water Strategy, Draft, March 2008*.
Queensland Water Commission 2008a, 'About the Queensland Water Commission' (online), Available: http://www.qwc.qld.gov.au/About+QWC (18 February 2009).
Queensland Water Commission 2008b, 'Water Reform' (online), Available: http://www.qwc.qld.gov.au/Water+Reform (19 February 2009).
Queensland Water Commission 2008c, 'Demand Management' (online), Available: http://www.qwc.qld.gov.au/Demand+management (19 February 2009).
Queensland Water Commission 2008d, 'Supply Initiatives' (online), Available: http://www.qwc.qld.gov.au/Supply+initiatives (19 February 2009).
Queensland Water Commission 2009, 'Commissioners' (online), Available: http://www.qwc.qld.gov.au/Commissioners (2 April 2009).
Queensland Water Commission 2009a, *South East Queensland Water Strategy, Revised Draft, November 2009*.
Smith, D. 1998, Water in Australia: Resources and Management, Oxford University Press, Melbourne, Australia.
Stoeckel, K. and Abrahams, H. 2007, 'Water reform in Australia: The National Water Initiative and the role of the National Water Commission', in *Managing Water for Australia: The Social and Institutional Challenges,* eds. K. Hussey and S. Dovers, CSIRO Publishing, Australia, pp. 1-10.
Stormwater Industry Association 2008. Submission on QWC Water Strategy. Available online at: http://www.siaqueensland.info/QWC_SIA_Paper_Summary.pdf
Tisdell, J., Ward, J. and Grudzinski, T. 2002, 'The Development of Water Reform in Australia' (online), Available: http://www.catchment.crc.org.au/pdfs/technical200205.pdf (1 April 2009). Urban Land Development Authority 2008, 'Our Role' (online), Available: http://www.ulda.qld.gov.au/01_cms/details.asp?ID=6 (3 March 2009).
Urban Land Development Authority 2008a, 'Planning and Development' (online), Available: http://www.ulda.qld.gov.au/01_cms/details.asp?ID=3 (3 March 2009).
Urban Land Development Authority 2008b, 'Development Assessment' (online), Available: http://www.ulda.qld.gov.au/01_cms/details.asp?ID=17 (3 March 2009).
Wallington, T., Maclean, K., Darbas, T. and Robinson, C. 2010, *Designing Knowledge Institutions for Integrated Water Management: International Experiences, and Implications for South East Queensland*, Technical Report to the Urban Water Security Research Alliance.
Williams, P. 2007, 'Government, People and Politics' in Planning Australia: An Overview of Urban and Regional Planning, ed. S. Thompson, Cambridge University Press.Example of reference listing.
Young, O.R., King, L.A., and Schroeder, H. (eds) *Institutions and Environmental Change: Principal Findings, Applications and Research Frontiers*. Forthcoming, MIT Press.