

TURNING THE TAP

Drinking Water Governance & Public Health in Tasmania:

A sociological study

by

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BA (Hons)

Submitted in fulfilment of the requirements for the Degree of

Doctor of Philosophy

University of Tasmania

July 2009

Declaration of Originality

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Abstract

All the water that will ever be is, right now.

National Geographic, *October 1993*

This thesis provides a sociological investigation of the key processes and issues underpinning the control, management and provision of drinking water in Tasmania. Drinking water is an increasingly important social issue, not only because it is a fundamental human need, but also because the quality and quantity of drinking water resources are declining within Australia and worldwide. This study examines how governments and policy makers are responding to drinking water issues and the social, political and economic conditions, under which these responses are taking place.

The research draws on semi-structured interviews with drinking water managers, providers and regulators to describe and explore how drinking water is governed in the state of Tasmania. A thematic analysis of the data was conducted which enabled a probing interpretation of drinking water governance and the processes of management, provision and public health regulation. Key texts relating to drinking water (legislation, policies, media documentation) were also used to inform the research and to contextualise the study from a national and international perspective.

This study found that the management, control and regulation of drinking water in Tasmania particularly in regards to the protection of public health, is surrounded by contention, ambiguity and tension. The findings suggest that the institutional judgements and decisions pertaining to the management and regulation of safe drinking water is problematic, and that interpretations and constructions of risk are vastly different among managers and regulators of drinking water. The localised effects of national economic reform and global neo-liberal policy are also shown to be impacting on the equitable provision of safe and plentiful drinking water in this state.

The thesis builds on and adds to environmental sociology by drawing on risk and political economy perspectives to explore the key processes supporting the governance of drinking water. It concludes with a discussion of different strategies for managing safe drinking water and points to the need for further sociological investigation into water issues as a social problem.

Acknowledgements

A PhD is a substantial journey. It is largely an individual experience. However, it can also become an involuntary part of the lives of those closest to and around you. I have been lucky enough to have a network of friends, family and colleagues who have encouraged me, not only go on the PhD journey, but also to finish it.

I would like to thank the following people who have facilitated and supported me in doing my PhD research:

To my primary supervisor Professor Rob White, whose work and insight has inspired me since I was an undergraduate student. I am exceptionally grateful for the ways in which you taught me to question the most simple of my life's circumstances and to write with passion and integrity.

To my director at the University Department of Rural Health (2005-2009) Professor Sue Kilpatrick who gave me unconditional support, time to write and who has nurtured my research interests' and my development as a young academic.

I will always be indebted to my colleague and friend, Dr Lisa Dalton, who encouraged me to complete, read my work, tirelessly listened to my thoughts and provided critically insightful and constructive feedback in the completion stages of my thesis.

To Dr Kristin Natalièr, for critique and feedback.

To Dr Karen Willis who provided guidance, particularly in the earlier stages of my candidature, and who encouraged me to pursue an academic career.

I am very grateful to all my friends who have supported my work and particularly those who took the time to understand my area of research. Rebecca and Nick Oliver were particularly irreplaceable throughout the years. I must also single out my postgraduate colleagues from the School of Sociology and Social Work and the University Department of Rural Health; Martin Harris, Nicole Lehmann, Dr Sonya Stanford and also Neil Trivett and Dr Thomas Gunn.

To Shauna Ellis, who took time out of her busy life to edit my thesis.

To my parents Marian and Tim Campbell, for believing in my ability and for supporting my unwavering passion for learning. To my siblings Gerald and Bridget for support and kind ears.

To Maggie, Scott (and Mic) Woodroffe for your support, and for allowing me such a special place to do much of my most inspired writing.

Finally, to Alister Ross Woodroffe, my partner of eight years, it is to you whom I dedicate this work, with all my love and deepest appreciation. This is the greatest wedding present I can give you.

Research publications

The following works were written and published from my research during my PhD candidature:

Whelan, J and Willis, K 2007, 'Problems with provision: barriers to drinking water quality and public health in rural Tasmania, Australia', *International Electronic Journal of Rural and Remote Health* 7, [Online] pp. 627–636.

Whelan, J 2005, 'Neo-liberal water policy and socio-environmental harm', *Current Issues in Criminal Justice*, vol. 16, no. 3, pp. 286–293.

Whelan, J and White, R 2005, 'Does privatising water make us sick?' *Health Sociology Review*, vol. 14, no. 2, pp. 136–145.

Whelan, J 2004, 'Not a drop to drink', *Seeing Red Magazine*, Sydney, vol. 1, no. 1, pp. 40–41.

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Glossary

Australian Drinking Water Guidelines (ADWG) is the current version of the Australian Drinking Water Guidelines published by the National Health and Medical Research Council/ Natural Resource Management Ministerial Council.

Bulk Water Authority: is an authority established for the purpose of supplying drinking water. In Tasmania there are three Water Authorities licensed to divert water, rivers and streams for on-selling to councils. Bulk water is essentially wholesale water supply, rather than the retail water supply that councils reticulate to water consumers in their municipality.

Council: (see definition of Local Government)

Drinking Water: denotes water that is intended primarily for human consumption and includes water supplied by reticulated systems. In Australia, potable or 'safe' drinking water refers to water that complies with the health guideline values in the Australian Drinking Water Guidelines and *Public Health Act Tasmania (1997)*.

Drinking water supply system: includes every part of water supply from the point of collection to the consumer. Water supply systems can include catchments, source waters, storage reservoirs, intakes, treatment systems, service reservoirs, and distribution systems and operational maintenance.

Environmental Health: comprises those aspects of human health, including quality of life, that are determined by physical, chemical, biological, social and psychological factors in the environment. It also refers to the theory and practice of assessing, correcting, controlling and preventing those factors in the environment that can potentially affect adversely the health of present and future generations (World Health Organisation 2002).

Governance: in this thesis denotes the processes of managing, providing, controlling and regulating drinking water in Tasmania.

Integrated Catchment Management: an ongoing process whereby various parties and stakeholders interested in water catchment areas are brought together typically through land and water management plans to achieve transparency in activities affecting the catchment and in improving drinking water quality. Ideally, the process involves the community and spheres of government, as well as private stakeholders.

Industrial Forestry: large-scale clearing of forests to establish monoculture plantations that use a range of management practices, including fertilisers, pesticides and high-intensity burning.

Local Government/Councils: is one of the three spheres of government in Australia (along with federal and state) that services the needs of local communities. Local government makes decisions on local, town or city matters and collects rates from land-owners. The money from these taxes, together with grants from state and federal government, pays for local government services. Constitutional responsibility for local government lies with the State Government of Tasmania; the roles and responsibilities of local government differ from state to state. The generic areas that local government is responsible for in Australia include:

- infrastructure and property services (roads, footpaths waste)
- provision of recreational facilities (parks, sports fields, halls, camping)
- water and sewerage services
- planning and development approval
- community services, such as child care, aged care and welfare services
- health services, such as water and food inspection, immunisation services.

Private water source: refers to any water used or supplied for human consumption, other than water supplied by a council or other public authority established to supply water.

Regulation: a principle, rule, or law designed to control or govern conduct.

Threat to public health: any event or circumstance that is likely to:

- (a) damage, injure or compromise public health, or
- (b) prevent or restrict the improvement of public health.

Water Authority/Provider: refers in Tasmania to a:

- (a) council which supplies drinking water, or
- (b) bulk water authority:

Water Catchment: is an area or region of land from which run-off water drains into a river, river system or other body of water. A water catchment area is one of the primary considerations in the planning of a reservoir for water-supply purposes and the protection of water supplies from contamination.

Water Resources: all water available for human use, namely domestic, agricultural and industry uses.

Water Resource Management: the management and protection of surface water and groundwater used for domestic and non-domestic uses.

Acronyms

ABS	Australian Bureau of Statistics
ADWG	Australian Drinking Water Guidelines
AIHW	Australian Institute of Health and Welfare
ARIA	Accessibility Remoteness Index of Australia
COAG	Council of Australian Governments
CRC	Co-operative Research Centre for Water Quality and Treatment
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DHHS	Department of Health and Human Services (TAS)
DPIWE	Department of Primary Industries, Water (TAS)
EPA	Environmental Protection Agency (US)
GATS	General Agreement on Trade and Services
GBE	Government Business Enterprise
GPOC	General Pricing Oversight Commission
IMF	International Monetary Fund
IWMI	International Water Management Institute
NAFTA	North American Free Trade Agreement
NCP	National Competition Policy
NHMRC	National Health and Medical Research Council
NWQMS	National Water Quality Management Strategy
PHA	<i>Public Health Act 1997 (TAS)</i>
TDWQG	Tasmanian Drinking Water Quality Guidelines
UN	United Nations
UNCED	United Nations Conference on Environment and Development
US SDWA	United States Safe Drinking Water Act
WHO	World Health Organisation
WTO	World Trade Organisation

Water is sometimes sharp and sometimes strong, sometimes acid and sometimes bitter, sometimes sweet and sometimes thick or thin; sometimes it is seen bringing hurt or pestilence, sometimes health giving, sometimes poisonous.

It suffers change into as many natures as are the different places through which it passes. And as the mirror changes with the colour of its subject, so it alters with the nature of the place, becoming noisome, laxative, astringent, sulphurous, salty, incarnadined, mournful, raging, angry, red, yellow, green, black, blue, greasy, fat or slim.

Sometimes it starts a conflagration, sometimes it extinguishes one; is warm and is cold, carries away or sets down, hollows out or builds up, tears or establishes, fills or empties, raises itself or burrows down, speeds or is still; is the cause at times of life or death, or increase or privation, nourishes at times and other does the contrary; at times has a tang, at times is without savour, sometimes submerging the valleys with great floods.

In time and with water, everything changes.

Leonardo da Vinci

Preface

Before I unwind the wider orientations of my study, I would like to begin with some anecdotes that started me on this journey.

A great mentor of mine once said that ‘good’ sociology is about making sense of the things that we take for granted, which involves challenging ‘what is’ and replacing it with ‘what ought to be’. I have often thought about this and, as my research proceeded, I have slowly realised that with inspiration the simplest daily practices can become the most important enquiries.

My interest in drinking water started from the most necessary but nonchalant of life’s routines – the habitual turn of a tap. My mother would boil our tap water daily before we were ‘able’ to drink it. In hindsight, it looked and tasted objectionable, but there was no other choice; buying bottled water every day was not an option that my parents could entertain, even when the government deemed the water we were provided with as ‘microbiologically unfit for consumption’. As water restrictions tightened and the price of water increased, my family and many others were confronted with water quality issues on one hand and water quantity worries on the other.

At present many Tasmanian municipalities are unable to access a drinking water supply, safe from chemical and microbiological contaminants. How is it possible that families like mine, living less than 30 kilometres from one of Tasmania’s largest cities, are being supplied with drinking water that does not meet national guidelines for safety? Just *how* and *why* is the most basic human need being denied by governments and accepted by citizens? And how can my own sociological knowledge inform such matters?

These are just some of the (often frustrating) questions that I have grappled with over the course of my doctorate and that have formed the foundations of this dissertation. If good sociology is about linking wider social forces and structures with individual lives, the value of studying fresh water – the arbiter of life and death for every human being on earth – is paramount.

This thesis interrogates how fresh drinking water is regulated, managed and provided in my own backyard – the island state of Tasmania. I hope that my contribution will reinforce my mentor’s, and now my belief, that what we drink and the conditions under which we drink, deserve the close attention of sociologists.

1 Introduction

Civilization has been a permanent dialogue between human beings and water.

Paolo Lugari

The passing of the millennium prompted many predictions and debates about life in the twenty-first century. Never before in our history had concerns for planet earth and the environment been so high on the global public agenda. Anxieties and uncertainty about our environment have not faded or disappeared. Rather, commentary about the environment has increased as activists, for example, David Suzuki (2002, 2008) and Al Gore (2006), continue to raise awareness of the growing environmental issues that are affecting our individual and collective existence.

At the centre of many environmental concerns and debates is the issue of fresh water. Global demands for safe and plentiful drinking water, the cornerstone to human development and the heart of human health and wellbeing, have never been more pressing or more pertinent at global, national and local levels (Aegisson 2002; Archer 2001; Barlow & Clarke 2003; Barlow 2007; Beltran 2002; Boyd 2003; Castro 2007; Christensen 2002; Fullerton 2001; Gleick 2002; Hall 1999; Laifungbam 2003; Narrain 2000; Olmstead 2003; Pauw 2003; Postel 2000; Ravindran 2003; Rothenberger et al. 2001; Swyngedouw 2004; Snider 2004; White 2007).

Despite its essential nature, fresh water is in limited supply. Freshwater makes up less than three per cent of the earth's total water supplies and more than two thirds of these are inaccessible, because they are either locked in ice caps and snow or in deep water

aquifers (Gleick 2003; Global Environment Outlook 2007).¹ While the earth's natural supply of fresh water is claimed to be virtually the same as in prehistoric times, the use of renewable water resources has grown sixfold since the twentieth century (Gleick 2001). Globally 1.2 billion people currently lack access to safe and affordable water (World Health Organisation 2004). The impact of continuing human activity, unprecedented population growth, industrial development and climate change have intensified claims that the demand for fresh water is currently outpacing the availability of global water resources (Aegisson 2002; Barlow & Clarke 2003; Laifunbam 2003; Postel 1998, 2000). If the current demand for fresh water persists, severe water shortages will affect over fifty per cent of the world's population over the next several decades (Alcamo 1997, 2000; Seckler et al. 1998; Shiklomanov 1998).

Although water issues are global, some countries are more severely affected than others. Some areas of the world are particularly susceptible to fresh water shortages due to temporal and geographic variations (CSIRO 2006; Cooperative Research Centre for Water Quality and Treatment 2002; Tietenberg 1994). At present, eighty countries worldwide face severe water shortages and many more countries face moderate to high water stress (Gleick 2002). These areas include North America, the Middle East, Latin America, Southern Asia and some parts of Africa. However, countries such as Australia are also experiencing severe water shortages.

Australia has only one per cent of the total fresh water carried by all the world's rivers and also has variable rainfall (CSIRO 2006). In addition, extreme weather cycles,

¹ An aquifer is an underground layer of water-bearing permeable rock or unconsolidated materials, such as gravel, sand or clay from which groundwater can be extracted using a water well. Aquifers can occur at various depths. Those closer to the surface are not only more likely to be exploited for water supply and irrigation, but also deep water aquifers are often inaccessible.

accentuated by Pacific Ocean weather cycles such as El Niño,² have caused severe droughts in many parts of the country. For example, the water catchments supplying Australia's largest cities of Melbourne and Sydney have recently been measured as having the lowest levels ever recorded (CSIRO 2006; Taylor 2005). Also, analysts have been consistently identifying the Murray–Darling Basin in the south-east agricultural hub of Australia as a key area of considerable water scarcity problems (Cooperative Research Centre for Water Quality and Treatment 2002; Fullerton 2001).

The quality and quantity of fresh water resources are ultimately concerned with issues of management and control. Without effective and equitable management of water resources our natural and social landscape will be undeniably transformed and the conditions for human life and wellbeing will be irrevocably changed.

In Australia we are facing a watershed. In her book, *Watershed: deciding our water future* (2001), Australian environmental journalist, Ticky Fullerton, draws attention to water-related issues affecting the fabric of Australian life and livelihood, including drought, land degradation, unsafe supply and the embracing of economic rationalist water policies by our government. However, Fullerton (2001) goes on to argue that not all the states and territories of Australia are the same. In reference to the island state of Tasmania, she says that 'there is nowhere in Australia greener' (Fullerton 2001, p. 114). This is a common perception. On closer examination, the quality and quantity of Tasmania's fresh water resources raise many social concerns that require immediate attention and response. Many Tasmanian communities are unable to access drinking water that meets national health

² El Niño is a term used to describe large climatic disturbances rooted in the tropical Pacific Ocean and occurring every three to seven years. El Niño events are characterised by temperature increases of a few degrees Celsius at the ocean's surface and have a strong impact on the continents in the tropical Pacific Ocean, such as South America, Asia and Australia. A consequence of such warming is the long-term perturbation of the weather systems over the lands around, notably heavy rains in usually dry areas and drought in normally wet regions (Trenberth 1997; Earth and Space Research 2008).

guidelines (Bleaney 2004; Tasmanian Department of Health and Human Services 2006; Whelan and Willis 2007). Minimal catchment management, competing land and water uses, limited water supply infrastructure and resourcing, and problematic legislative frameworks are contributing to problems with drinking water provision and management in Tasmania.

Water management reforms and institutional decisions will need to be made in the next decade to determine whether Tasmanians, and all Australians, have access to safe and sufficient drinking water resources in the future.

In drafting the Constitution of Australia (1900), natural resource policy and management became the responsibility of the states and territories. The constitutional division of power led to water resources being left within the jurisdiction of each state and territory of Australia (McKay 2005, p. 41). A patchwork of laws and policies has resulted in responsibility for the control, management and provision of fresh water being spread across all levels of Commonwealth, state and local government. Responsibility for drinking water regulation and management is particularly disjointed.

In response, the Australian Government has increasingly intervened in water policy and reform through agreements with state and territory governments. Three key water reform bodies now drive changes in the control and management of fresh water resources, including drinking water. These are: the Council of Australian Governments (COAG); the National Water Commission (NWC); and the National Health and Medical Research Council (NHMRC). These bodies have initiated a number of water reforms over the past decade. Reforms have mainly been competition promotion and fiscal water reform policies. Examples include: the increased pricing of water and full-cost recovery; urban water reforms and the corporatisation and de-bureaucratisation of government-owned water

supplies; water markets and trading; water access entitlements and trading; as well as the promotion of private sector participation in the specific parts of water management (McKay 2005, p. 46). In addition, emphasis has been placed on reforms that increase the integrated management of water for environmental and public benefit outcomes that build community partnerships around water resources, as well as increased knowledge and capacity building about water management and practices at a local level (Australian Government National Water Commission 2007). Despite the implementation of uniform water reforms in Australia having made significant changes, in most Australian states (McKay 2005) some reforms have not been fully achieved, or they need to go further (Fitzpatrick 2001). Achieving these reform policies is complicated by the processes and systems underpinning the management, provision and regulation of drinking water in Australia.

There is a great deal of social, economic and political diversity by which drinking water resources are controlled, managed and provided. Demographic factors, limited and ageing water supply infrastructure, inadequate staffing and expertise, discrete legal systems, separate quality standards, industry's increased land and water use, and a spectrum of contextually diverse factors affect the implementation and effect of water management reforms at national, state and local levels (Archer 2001; Fullerton 2001; McKay 2005; Moeller 2001). Federal government-driven advocacy for increased community consultation and participation in the management of water resources, for example, has not been visible in states such as Tasmania. In part, this is due to differing interpretations and debates surrounding water management practices in the state. There are social concerns with water reforms throughout Australia, particularly in how socially equitable these policies are when examined at the local level (Archer 2000; Moeller 2001; Sheil 2000). There is also social

concern over drinking water being treated by policy makers and those with power over fresh water supplies predominantly as an economic resource and not as a public good (Barlow & Clarke 2003; Beder 1997, 1998; McKay 2005).

A global review of water-related policies and debates surrounding the control and management of drinking water resources shows two dominant but polarised perspectives. These are economic approaches and rights based approaches to the management and provision of drinking water. Economic approaches, which are visible in current Australian reforms, advocate the fiscal management and valuing of drinking water resources (Moeller 2001; National Competition Council 1999; Sheil 2000). Rights based approaches, most visible in the work of social and environmental activists, argue that the economic treatment of drinking water does not reflect the social, cultural and moral value of water as a public good (Barlow & Clarke 2002; Gleick 2002; Hussey 2007; Narrain 2000; Smith 2002; Van Rooyen 1997). These conflicting perspectives have serious implications for the future management and control of drinking water, because they sit at opposite ends of the water management spectrum. Recently, there has been some reconciliation of these issues with increased moves towards more integrated and holistic approaches to the management of drinking water that reflect competing economic, political, cultural, environmental and social demands for water (Boyd 2003; Castro 2007). However, in many cases these have been slow to be translated into policy and practice in countries like Australia.

Without integrated and holistic drinking water management practices, the individual and collective health and livelihood of citizens and consumers may be at risk, however it is likely given current ideological and political approaches to drinking water that this may be slow to be achieved. The dominance of economic approaches with limited regard for public

interest and health raises significant sociological issues associated with the safety and quality of drinking water supplies, as well as the availability and accessibility of water resources for human consumption and use. Water-related contaminations in advanced nations, such as Canada, Japan, Sweden, and the United States of America (USA) (Hrudey & Hrudey 2004; Snider 2004) and within Australia have drawn attention to the public health risks associated with the inadequate and to some extent fiscal and de-regulatory approaches to drinking water management and provision. These events that led to widespread illness and, in some cases, the deaths of water consumers, have caused many communities, policy makers and transdisciplinary commentators to question the quality, safety and protection of the drinking water flowing from their taps.

The provision of drinking water is often a taken-for-granted part of social life. As citizens and consumers, we are reliant on 'expert' institutions such as governments to warn of potential health risks associated with our environment, and with the water that we drink. In recent years, an ever-growing literature and commentary have called for a more critical and transparent understanding, review and analysis of the inherent practices, regimes and policies that surround the control and management of drinking water in many parts of the globe (Archer 1996; Blakeney 2000; Cameron 1996; Christensen 2002; Cox et al. 2002; Hawkins et al. 2000; Hill et al. 2008; McKay and Moeller 2001; Marsden 2003; Mills 1998; Parvis 2001; Pontius 2002; Roth et al. 2004; Snider 2003; Whelan and White 2005). In practice, however, a public review of water management processes is often constrained by a real and perceived lack of transparency, accountability and reporting on the part of water providers and managers, particularly those in the private sectors. The processes and practices underpinning the management of environmental risks and resources, such as

drinking water, are often poorly communicated to the 'lay' public (Brown 1992; Cameron 1996; Carson 1962; Flynn 1994; Irwin 2001; Julian 2004; Percival 1992; Petersen & Lupton 1996; Roth et al. 2004). Without this information the issue of expertise in the management of drinking water becomes paramount to how water consumers and citizens understand and interpret the water being provided to them; this includes decisions about the protection of their health.

The fundamental role of drinking water to collective livelihood makes it a central concern to sociological inquiry. Revealing the processes and issues that underpin how drinking water is controlled, managed, provided and regulated is a key way in which it may be possible to generate deeper understanding of water as a political, economic and social resource and problem. It is that goal which this thesis works towards. As such, the section below will define the research problem, purpose and the research questions, and will provide an overview of an interpretive and social constructionist approach to drinking water governance. Finally, the study design will be introduced and the structure of the thesis outlined.

1.1 The research problem and rationale

Poor quality and insufficient fresh drinking water is impacting on the health and welfare of Australians, however there is very limited social research about this issue (Archer 2001; McKay and Moeller 2001; Fullerton 2001). Specifically, there is little known about the way managers and providers of drinking water deal with and interpret water management and regulation practices at the local level.

Drinking water is commonly defined as water that is intended for human consumption and domestic uses (Cooperative Research Centre for Water Quality and

Treatment 2002). In Australia the National Health and Medical Research Council (NHMRC) defines safe drinking water through the Australian Drinking Water Guidelines (ADWG). These guidelines, a key reference for drinking water policy makers, providers and regulators in Australia, state that:

Drinking water should be safe to drink for people in most stages of normal life, including children over six months of age and the very old. It should contain no harmful concentrations of chemicals or pathogenic microorganisms, and ideally it should be aesthetically pleasing in regard to appearance, taste and odour. (ADWG: 2006.)

Even though the supply of drinking water accounts for less than one per cent of fresh water used globally, the supply of untreated drinking water constitutes one of the world's greatest environmental and public health threats (United Nations 2003, 2005; World Health Organisation 2003). The World Health Organisation (2003) reports that more than three million people die each year due to the consumption of contaminated drinking water. An additional 1.1 billion people are estimated to be unable to access drinking water supplies and 3.3 billion lack basic sanitation services (United Nations Development Program 2002). In developing nations in particular, it is reported that eighty per cent of illnesses and disease would be preventable through the provision of adequate drinking water supplies and sanitation (United Nations Development Program 2002). The effect of poor quality drinking water on lesser developed nations and communities is given particular emphasis by many commentators (Barlow & Clarke 2003; Beltran 2002; Clonen 2001; Laifungbam 2003; Narrain 2000; Pauw 2003; Roddick & Biggs 2004; Whelan & White 2005). For instance, Sheila Olmstead (2003, p. 1) in her study on poor communities and municipal water supply argues that 'it is hard to imagine a more pressing environmental health

problem or one that more strongly diminishes the length and quality of human productivity in the developing world’.

The issue of water quality, and quantity, is subsequently emerging as a global health concern. In recent decades concern over the effect of industry on fresh water quality has been increasingly documented. The work of Rachel Carson (1962) is one of the earliest and most notable works linking the sustained effects of industrial activity on the quality of the environment and water resources. Internationally, a diversity of epidemiological studies has since highlighted the links between industry and water contamination (Freedman 2000; Russell et al 1987; Leeuwen et al. 1999; Mills 1998; Munger et al. 1997; Ruiecki, De Roos & Lee 2004; Smith et al 2000).

Potential health and environmental impacts of pesticide use continue to raise public health concerns among both the lay public and scientific and medical experts. There is uncertainty over the specific effects of short-term and prolonged exposure to industrial chemicals, such as pesticides, in drinking water supplies. Nevertheless, medical and scientific studies have consistently established links between pesticide exposure and forms of cancer, birth defects, developmental abnormalities, neurological problems and decreased immune function (Boyd 2003; Leeuwen et al. 1999; McConnell et al 1999; Mills 1998; Munger et al. 1997; Ruiecki, De Roos & Lee 2004; Smith et al 2000; Trautmann et al 2008). The presence of pesticides in drinking water supplies is therefore a concern for public health officials and drinking water managers responsible for minimising risks stemming from drinking water sources.

Concerns for the health and safety of the public are further exacerbated by nation specific evidence pointing to the potentially destructive links between fresh water quality

and industrial activity. In Canada alone, the discharge of toxic chemicals and by-products into rivers, lakes and streams, the frequent detection of pesticide residue and ongoing faecal contamination from factory livestock operations are well documented examples of the effect of industry on the quality of fresh water resources (Boyd 2003; Christensen 2002). In Australia the works of Archer (1996; 2001) highlight the detrimental effects of sustained and unregulated industrial activity on fresh water supplies. In the state of Tasmania a growing amount of social concern and debate has centred on the potential effects of industry practices, such as large-scale clear-felling, and the application of pesticides in drinking water catchment areas (Cameron 1996; Bleaney 2004, 2007; Rosser 2005).

A growing demand for water quantity on one hand and the repercussions of this demand and activity on water quality on the other have continued to raise concerns among a variety of commentators. Water activists such as Barlow and Clarke (2003) assert that this is not a unique situation for specific countries. The 'twin realities of water scarcity and water pollution' are having a 'devastating impact on the quality of life of billions of the world's citizens' (Barlow & Clarke 2003; p. 3). These claims suggest, however, that the ongoing sustainability of available fresh water resources worldwide depends on the efficient, fair allocation and management of fresh water resources (Boyd 2003; Tietenberg 1994). Evidence to the contrary indicates that many parts of the world are failing to balance competing demands for fresh water supplies and that governments are failing to respond adequately in protecting fresh water supplies from overuse and contamination (Beltran 2002; Laifungbam 2003; Narrain 2000; Van Rooyen 1997; Whelan 2005). Of particular concern to this research is the issue of drinking water, especially the laws, policies and institutions that are responsible for managing these resources.

It is time that serious questions are raised about the management, provision and control of drinking water for human consumption and domestic uses. While the provision of unsafe drinking water is a phenomenon experienced most gravely by those in lesser developed nations, it is not purely confined to such countries. Protracted social inequalities affecting access to drinking water are also seen to be stemming from 'the inefficiency, ineffectiveness and inefficacy characterising water management' in developed countries (Castro 2007, p. 98). The past decade, for example, has seen mounting cross-cultural social and environmental harms associated with the production, consumption and management of drinking water supplies in more advanced nations (White 2001). Hrudey and Hrudey (2004, p. 83) extensively document over sixty examples of failures in drinking water safety in a number of developed nations, including Canada, Japan, the United Kingdom, Sweden, Norway, Finland, Italy and the USA over the past three decades. These events demonstrate significant inadequacies and problems stemming from the management and regulation of drinking water in so called 'advanced' and 'developed' nations.

One of the most critical examples of inadequate drinking water management and regulation was in Canada in 2000. In Walkerton, Ontario the contamination of the town's water supply and failure of the relevant public health authorities to detect the contamination resulted in the deaths of seven residents, and the poisoning of thousands more in the township (Boyd 2003; Hrudey & Hrudey 2004; Snider 2003, 2004). Less than a year later in another Canadian province, between five and seven thousand residents of North Battleford in Saskatchewan suffered gastroenteritis as a result of *Cryptosporidium parvum* contaminating the drinking water supply of the community (Hrudey & Hrudey 2004).³

³ *Cryptosporidium parvum* is a waterborne protozoan parasite that when ingested can cause gastro-intestinal illness and severe flu-like symptoms.

More than a decade before, over 100 deaths and 403,000 illnesses were reported in Milwaukee, Wisconsin (USA) following the contamination of the public water supply with *Cryptosporidium* in 1993 (Craun et al 2002).

These adverse public health events are a strong catalyst for a growing amount of cross-disciplinary commentary and concern surrounding the policies, regimes and practices underpinning the management, provision and regulation of drinking water supplies. A large amount of the research and documentation on drinking water policy and management practices has emerged from Canada (Barlow & Clarke 2003; Boyd 2003; Hrudey & Hrudey 2004; Snider 2002, 2003, 2004). Much of this commentary has highlighted the significant problems and inequities surrounding how drinking water is being experienced by communities and citizens. For example, Boyd (2003, p. 16) reports that ‘hundreds of Canadian communities are being supplied with unsafe drinking water’ and that rural and aboriginal communities are particularly at risk of contamination and poor public health outcomes (Boyd 2003). These trends demonstrate and draw much needed attention to the fact that advanced nations are not impervious to the consequences of poorly managed and regulated drinking water.

In the past decade, events in Australia have highlighted that it too is not immune to issues relating to poor drinking water management and regulation. When three million people in Sydney were forced to boil their drinking water after the detection of harmful levels of microbiological contaminants in the water supply of Australia’s largest city, national concern over the quality and management of drinking water was heightened (Cox et al. 2003; Hawkins et al. 2000; White 1998). The problems did not stop there. Archer (1996, 2001) has continued to document widespread problems with the quality, safety and

management of drinking water supplies across Australian states and territories. In many cases though a comprehensive picture of the 'real' extent of drinking water problems is hampered by a lack of official documentation, which is largely facilitated by the lack of a national database and a patchwork of public health policies and reporting standards (Archer 2001; Moeller 2001). The accurate reporting of drinking water related illnesses and problems is therefore difficult to assess within Australia (Moeller 2001). The health and regulatory issues associated with drinking water quality management, provision and control may be greater than what is documented in published literature and government reports. Regardless of the recorded impact, issues associated with poor drinking water quality and management practices have undeniable implications for the social health and wellbeing of Australians. The evident risks associated with managing and providing drinking water have been an impetus for water reforms in advanced nations in the past decade. Many Canadian municipal providers responsible for the management and provision of drinking water to communities have 'been confronted with the need to radically reform their water and water supply systems due to perceived poor levels of performance' (Bakker & Cameron 2002, p. 15). Issues such as: ageing infrastructure; declining quality and quantity of water resources; population growth and demands; limited financial resources for water improvements; and increasingly stringent water quality standards are key issues impacting on the poor management and supply of drinking water in many parts of Canada and also the world (Bakker and Cameron 2002: 15). They have also led to calls for more integrated approaches to managing safer drinking water (Boyd 2003; Hrudey & Hrudey 2004). Increasingly, water management policy is used in public health literature to refer to ways in which the safety and quality of drinking water can be managed more effectively and in which the risks posed

by drinking water can be managed more comprehensively (Hrudey & Hrudey 2004). The governance of drinking water with respect to public health and safety is exemplified in the work of Bakker and Cameron (2002, p. 53), who examine the role of governance in the municipal restructuring of water services in Canada and acknowledge that governance failures are increasingly recognised to be ‘contributing factors in poor and/or declining standards of management and water quality in many jurisdictions’.

Integrated approaches to drinking water governance draw attention to what is effective governance and the processes needed to underpin the management, regulation and provision of safe drinking water. A key part of an integrated approach is the acknowledgement that a technically or legally ‘safe’ water supply does not always mean that it is risk free.⁴ Commentators who advocate an integrated approach to drinking water management argue that the governance of drinking water in all parts of the world need to take into account a number of critical factors that can influence the quality and safety of drinking water. In an extensive review of water policy literature (Falkenmark 2004; Global Water Partnership 2000; Global Development Research Centre 2008; Ontario Ministry of the Attorney General, Walkerton Inquiry 2002; United Nations Development Program 2002) five key principles of effective or ‘integrated’ water governance can be identified. These are: the protection of public health and safety; accountability for stewardship and performance; transparency; participation and equity; and efficiency and effectiveness (Bakker & Cameron 2002, p. 7).

The importance of an integrated approach to water governance is being translated into regulatory design in some nations. In Canada, for example, the Walkerton tragedy provoked calls for the regulation and management of drinking water to be based on

⁴ The notion of risk and its relevance in this study will be discussed in the next chapter.

integrated processes. In particular, the *Report of the Expert Panel on Safe Drinking Water for First Nations* (2006), the *Walkerton Commission of Inquiry Reports* (2002), as well as the works of Boyd (2003), Snider (2003) and Hrudef and Hrudef (2004), are comprehensive examples of the growing literature surrounding the regulatory strategies for preserving and protecting water quality through the integration of principles of effective water governance. These works similarly highlight key principles of effective water supply systems in order to protect public health and ensure safe drinking water. The principles are:

- a) Protection of drinking water sources, such as catchments, from contamination, including contamination from industries.
- b) Adequate treatment of drinking water via processes, such as chlorination and filtration, to disinfect source water is also viewed as a fundamental part of managing and maintaining a clean, safe and reliable drinking water supply.
- c) A safe distribution system as critical part to drinking water management and delivery. Safe distribution systems include water supply infrastructure, such as pipes and treatment facilities that are well maintained and adequately resourced by staffing and economic investment (Boyd 2003). Competent, well-trained water management personnel are also essential to the safety of drinking water distribution systems.
- d) Comprehensive testing of drinking water, which enables water contamination to be identified, communicated to the public and ideally remedied before people become ill (Boyd 2003).
- e) Public Notice and Reporting, to improve public awareness about drinking water issues. This may include general information about testing regimes and results, operational performance and plans for timely public disclosure in the event that something should go wrong.
- f) Adequate Resources, significant and incremental financial resources are required to manage and provide safe drinking water, including the costs of operating, maintaining and upgrading water treatment and reticulation systems (Boyd 2003).

- g) Adequate policy and legislative frameworks need to be enacted by government that take an integrated approach to drinking water; that is, transparent and accountable regulatory frameworks for all aspects of drinking water management and provision, including staff training, infrastructure upgrades, adequate monitoring and compliance and the management of source water and catchments.
- h) Finally, public involvement and awareness of water-related issues in local and national communities is an important stage in the management and monitoring of clean, safe and reliable drinking water. Involving the public is increasingly argued to improve community and individual awareness of drinking water quality and quantity. Increasing public awareness and participation enables people to have an element of control over their own environment and the activities and issues that have the capacity to affect it.

It is time to generate deep sociological understanding regarding who has access to drinking water resources, how they are managed and provided and under what conditions. Along with quality issues, securing sufficient and safe water resources for consumptive uses has become one of the most significant challenges of the twenty-first century (Hussey 2007). As a result, there are innumerable political, ideological and practical positions responding to declining fresh water availability, quality and management. A key part of understanding drinking water issues at a local, national and even global level is to concede that, to a large extent, the main causes for this state of affairs are neither technical nor 'natural', but are of a social and political nature (Castro 2007, p. 98). It is therefore necessary to generate new sociological knowledge that locates the social, economic and political structures and processes that are contributing to and underpinning the management and governance of drinking water resources in states like Tasmania. However, there is an acknowledged 'theoretical vacuum' surrounding how environmental issues such as drinking water should

be theorised, studied and generally understood sociologically (Hannigan 1995, 2008).

These issues are further complicated by the fact that current approaches to and understandings of effective water management and control are contested.

A review of drinking water related literature shows a vast amount of commentary surrounding the issue. The many political, ideological and practical positions that give response to drinking water are too extensive and diverse to be covered in this study. However, it is possible to identify the key cross-disciplinary perspectives on drinking water management, provision and control in the literature. These are economic, risk and rights based perspectives of drinking water management, which are presented in chapter two. These perspectives each vary in their social implications, but might assist in understanding and contextualising the issues and processes underpinning the management, provision and regulation of drinking water in Tasmania.

In summarising this section, one main and one secondary research problem can be identified.

First, issues associated with poor drinking water quality appear to be impacting on the health and welfare of Australians, and yet there is little known sociologically about how managers and providers of drinking water interpret these issues.

Second, there is a pressing need for greater integrated and comprehensive approaches to the management, provision and regulation of drinking water in Tasmania.

A lack of sociological research focusing on these issues invites empirical investigation. As such, the focus of this research is to generate new sociological knowledge and understanding of drinking water provision, management and regulation in the state of Tasmania.

1.2 Research purpose and research questions

This section outlines the purpose of the study and the key research questions. The purpose of this study is to:

- describe the ways in which drinking water is governed (regulated, managed and provided) in Tasmania;
- identify and generate deep understandings of the issues and processes underpinning and impacting on the governance of safe drinking water in Tasmania;
- interpret how managers and providers of drinking water understand these issues, and
- describe the main barriers to the provision of safe drinking water in Tasmania.

In order to achieve the purposes of the research, four research questions were developed to drive the methodological design and focus of the study. These were:

- How is drinking water managed, provided and regulated in the state of Tasmania?
- What are the key conditions, processes and issues underpinning and impacting on the management, provision and regulation of a safe and plentiful supply of drinking water in the state of Tasmania?
- How do managers, providers and regulators understand, interpret and respond to these issues?

The following section provides an overview of the methodological design and framework of this study before moving to an overview of the structure of the thesis.

1.3 Study design

This thesis presents a sociological investigation of drinking water management, provision and regulation in the Australian state of Tasmania. The starting premise is that fresh drinking water is a fundamental part of our collective social existence, and the conditions underpinning how drinking water is managed as a social issue are not well understood. As such, this research departs from the common realist understanding of water as an environmental entity to take instead a social constructionist approach. Realists typically understand and frame environmental resources, like water, as objects that exist outside society, that possess independent powers and that can be managed purely by objective means (Irwin 2001). Therefore, realists effectively deny the separate existence of the natural world from the social world and so it is argued that realists miss ‘one of the most important aspects of environmental debate’ (Irwin 2001, p. 16); namely, the ways in which particular environmental issues and practices become prominent and are constructed as social issues and problems. The thesis does not serve to offer a critique of comparison of realist and social constructionist approaches to drinking water governance, but rather supports Hannigan (2006) and White’s (2008) view that drinking water is undeniably a real and existing social issue, however that is made ‘knowable’ through ‘dynamic social processes of definition, negotiation and legitimation’ such as regulatory decision making and policy (Hannigan 2006: 31).

A social constructionist approach to the sociological study of drinking water is used in this thesis to draw attention to the key institutions, processes and practices being used to manage and regulate water resources in Tasmania. Although water as a natural entity can be understood as an object, drinking water can also be understood as a social construct.

Berger and Luckmann (1996) define social constructs as ‘any phenomenon invented or constructed by participants in a particular culture or society, existing because people agree to behave as if it exists’. In this sense, drinking water is not just a ‘given’ part of the social world, but is actively created, interpreted, constructed and contested within institutional practices and forms of expertise (Irwin 2001, p. 2). This study is therefore concerned with the social and institutional processes that make drinking water ‘knowable’ and how issues and knowledge associated with drinking water in Tasmania are conceptualised, constrained, contested and channelled ‘through existing structures of economic and political power’ (Hannigan 1995, p. 40).

Using an interpretive and qualitative framework, this study uses semi-structured interviews and a review of policy and legislative documents to describe, analyse and interpret how Tasmanian managers, regulators and providers of drinking water understand and construct issues and processes surrounding water governance. In doing so, this research aims to reveal the ‘political and discursive struggles’ (Freudenburg & Pastor 1992, p. 398) underpinning how drinking water is controlled and managed in Tasmania. In analysing the data, an iterative thematic analysis was used. A full discussion of the methods of data collection and analysis is provided in chapter four.

1.3.1 Operationalising drinking water governance

This section theorises the processes of water management, provision and regulation as the concept of governance. In addressing the research focus and questions it was necessary to conceptualise the notion of drinking water governance and to clarify its meaning within the context of the study. The following section defines drinking water governance and provides

a discussion of the key approaches and contestations surrounding the concept of water governance stemming from a review of drinking water related literature.

The concept of water governance is a multidimensional issue that provokes a number of interpretations and interdisciplinary approaches. Despite contested definitions of water governance, there is wide consensus in water management literature that ‘good governance is necessary for effective water drinking management’ (Bakker & Cameron 2002, p. 53). The common use of the term ‘governance’ in water-related literature seems to suggest a shared understanding of the meaning of governance (Bakker and Cameron 2002; Castro 2007), but at closer examination its meaning is a contested and ambiguous term, because governance is subject to underlying confrontations between rival and sometimes incompatible intellectual and political traditions. The contradictions between competing intellectual and political frameworks underscore much of the institutional and political transformation happening in the field of water policy and management (Castro 2007, p. 102).

Different traditions in the governance of drinking water, which largely reveal tensions between water as a common good and water as an economic resource, are centred on market principles (Castro 2007). More recently there have been calls for a more holistic approach to drinking water management. Therefore, it is important for this research to operationalise the term ‘governance’ in a way that encapsulates the complexity and multidimensional nature of the notion of water management practices. Hanf and Jansen (1998, p. 3) define governance as ‘the shaping and sustaining of arrangement of authority and power within which actors make decisions and frame policies that are binding on individual and elected actors within different territorial bounds’. Drawing on this definition,

governance incorporates an understanding of the economic, social and political relationships 'between a society and its government or between an organisation and its governing entity' (Bakker & Cameron 2002, p. 37).

A sociological framework demands that water management processes and governance need to be understood not as a technical, objective or neutral process and depoliticised, but rather as a highly political and social construction (Castro 2007, p. 101). This involves recognising drinking water governance as a 'complex process of democratic dialogue, negotiation, and citizen participation that includes the discussion about what objectives must be pursued by society' (Castro 2007, p. 103). This study, then, identifies drinking water governance as a socially constructed process and operationalises it as the social, economic political and legal structures and processes that contribute to the management, regulation and provision of drinking water in Tasmania. A sociological perspective is useful for enabling researchers to examine ways in which claims about the environment and drinking water are constructed and contested by different stakeholders and groups in order to advance particular social, political and economic agendas. The social constructionist approach is not solely the domain of environmental inquiry (Hannigan 2006). The social sciences, humanities and health science disciplines have a long history of using social constructionism to make sense of aspects of social life that are overlooked and taken for granted. There is, for example, a common perception that governments responsible for the provision of essential services such as drinking water are providing safe drinking water in abundance to the communities that they serve. Social theorists have well documented the way unspoken and taken-for-granted assumptions enable more powerful institutions to sustain their dominance. By making these hidden dimensions of drinking

water governance more visible it will be possible to open new opportunities for sociological enquiry.

Acknowledging drinking water governance as a social and politically constructed process is useful for understanding issues relating to drinking water governance and provision in Tasmania. Some commentators argue that sociological approaches are useful for understanding why certain conditions are perceived as problematic (Berger & Luckman 1966; Hannigan 1995, 2008). Understanding how various groups and individuals construct issues of drinking water quality and safety will allow for some interpretation of how those who formulate these constructions advance their own agendas. Institutions such as governments and science have been identified as the major 'claims makers' (Hannigan 1995) in the process of governing and managing environmental resources like drinking water. Other voices are less audible in a review of the literature. By using a sociological lens to examine how state and local government officials understand their responsibilities for the provision and management of drinking water in Tasmania, it will be possible to understand how drinking water as an environmental issue is constructed and contested at the local level. By linking these accounts to broader published literature and policy documents this study seeks to make a cross-disciplinary contribution to understanding issues of drinking water governance and regulation.

1.4 Thesis structure

The previous section introduced the study of drinking water and discussed some of the key global trends about drinking water. It points to the need for greater sociological understanding of the conditions under which drinking water is controlled, managed and provided at many levels and has pointed to the state of Tasmania as the focus of this study.

The remainder of the thesis is presented in seven chapters, which are outlined in the next section.

Chapter two introduces the key issues and theoretical perspectives in the study of drinking water within the wider discipline of environmental sociology. It outlines how theoretical perspectives of risk and political economy can be used to assist in interpreting issues associated with the management, regulation and provision of drinking water in Tasmania, and draws attention to the issues of power affecting how governments make decisions about the regulation of drinking water and how they frame risks.

Chapter three places the study of drinking water governance in the research context. The first part of the chapter describes the key policies and issues surrounding drinking water at the Australian or national level, including frameworks relating to the management of drinking water quality and quantity. The second part of the chapter narrows the focus to the state of Tasmania. Key policies, documents and legislation underpinning how drinking water is managed, provided and regulated are described. This provides a political context from which the findings of the study can be situated and better understood.

Chapter four explores the methodological basis of the research, including the research content and the qualitative and interpretive framework used. The chapter also describes the primary data sources and the methods used for data collection and analysis. It concludes with a discussion of how rigour was achieved in the research.

Chapter five presents the findings of the thesis and reveals how managers and providers of drinking water understand and interpret the governance of drinking water in Tasmania. The findings reveal that the processes and practices underpinning the regulation and management of drinking water in Tasmania, such as water sampling, water testing and

definitions and judgements of safety are highly contested between managers and regulators of drinking water. The findings suggest that the governance of drinking water is based on competing claims about safety and public health and that there is considerable anxiety and ambiguity over the effectiveness of public health drinking regulations. The chapter also suggests that there are a number of significant barriers affecting the provision of safe drinking water in Tasmania, particularly in rural and regional parts of Tasmania. These include ageing and inadequate water supply infrastructure, the impact of industries like forestry and agriculture on water quality, limited catchment management and monitoring, and poor levels of staffing and expertise. The chapter also reveals how drinking water in Tasmania is being increasingly managed through corporate bodies and increasingly valued through economic pricing. The findings show that access to drinking water is now based on an ability to pay, which has led to concerns over the capacity of all citizens in Tasmania to access a safe drinking and plentiful water supply.

Chapter six discusses and interprets the findings of the study. The chapter argues how tensions and contestations over drinking regulation and management are centred on the notion of risk and its definition, assessment, and management. It shows that Tasmanian government regulators are seen to be engaging in the compartmentalisation of risk and that current regulatory frameworks in the state ignore critical components of managing risk and protecting public health, such as catchment and source water security. The discussion argues that there is an urgent need for a more integrated approach to the regulation and management of drinking water supplies in Tasmania, including the more stringent monitoring of industry activities such as forestry and agriculture within water catchments. The chapter also shows that there is a clear social distribution of risk associated with

drinking water provision, and that citizens, particularly in rural and less urban parts of Tasmania, are most likely to experience poor quality drinking water and are being forced to manage this public health risk themselves. The chapter also reveals and discusses how neo-liberal economic rationalist approaches to managing drinking water can be seen increasingly in Tasmania. Specifically, the findings show that the processes of corporatisation and commodification of drinking water is affecting how drinking water is being valued less as a public good and social right and more as an economic good, and that some communities and citizens are unable to afford drinking water tariffs. The findings suggest that neo-liberal economic reforms are seen by many local government providers as the inevitable solution to water provision problems because there has been a critical lack of incremental assistance and funding by the state and Commonwealth governments to support the provision of safe drinking water by non-corporatised providers.

Chapter seven presents the summary of the thesis and is the conclusion. It highlights how the research aims were met and how the research questions were answered. The chapter proposes different strategies and recommendations for managing safe drinking water in Tasmania. That is, the need for more integrated approaches to drinking water management and the introduction of catchment management schemes; the need to consider issues of social equity and social justice in the provision of drinking water supplies; and that there should be better frameworks for dialogue between government officials charged with responsibility for drinking water policy and those managers and providers at the local level of provision and management. The chapter concludes by highlighting the broader implications of the study's findings for drinking water policy and points to the key areas and future directions for water-related sociological research.

1.5 Chapter summary

Equitable access to safe and plentiful drinking water is a critical social issue. Until recently 'turning the tap' has been a nonchalant part of social life for many citizens, particularly those in advanced nations. In the past decade, however, a number of critical events associated with the provision, management and regulation of unsafe drinking water in 'advanced' nations have shown that accessing safe and plentiful drinking water is a global problem being experienced by those who least expected to be affected by contaminated water.

The quality and quantity of fresh water resources is ultimately dependent on issues of management and control. Therefore, it is time to generate deep understanding regarding who has access to drinking water resources, how they are managed and provided and under what conditions. This can be achieved using sociological inquiry. This study draws on both a broad range of secondary sources and interviews with managers, providers and regulators of drinking water in Tasmania to examine the key social processes and structures that are underpinning the governance of drinking water as a social resource. It aims to generate deep qualitative understandings of the issues that impact on drinking water provision and access and how those responsible for drinking water interpret these issues.

The next chapter will describe and consider the key issues and theoretical perspectives regarding drinking water as an environmental issue.

2 Australian drinking water: current issues and policy

I love a sunburnt country,
A land of sweeping plains,
Of rugged mountain ranges,
Of droughts and flooding rains.

Dorothea Mackellar (1904)

2.1 Introduction

The previous chapter introduced this study and provided an overview of the key debates on drinking water as a social issue. It pointed to the increasing need for more integrated and holistic approaches to the governance of drinking water resources at global, national and local levels. It also highlighted the heightened push for drinking water regimes, practices and policies to be more transparent and better understood by diverse social groups. By highlighting the way water-related issues are global in scope, it is possible to recognise the diversity of environmental, political, social and demographic contexts in which drinking water resources are governed. This chapter narrows the focus by situating this study within the local research context of both Australia and Tasmania. It discusses, from a broad national perspective, the key issues and policies surrounding the quality and quantity of Australian fresh water resources. The discussion will then be narrowed to the context of this study, the state of Tasmania. An analysis of the major policies and trends relating to fresh drinking water resources in Tasmania will also be provided.

2.2 Australian drinking water quality issues

This section examines how drinking water quality is governed (managed, regulated and provided) in Australia. It gives an overview of the key policies, trends and issues impacting on the quality and quantity of fresh water and drinking water resources. Of key importance

to this study and to address the research aims is an understanding of the political and social context, through which the governance of drinking water in Australia and Tasmania takes place, and the principal issues surrounding these processes.

In Australia approximately 96 per cent of all Australian dwellings are connected to a reticulated water supply (Cooperative Research Centre for Water Quality and Treatment 2002). Moëller (2001, p. 126) argues that this high provision of reticulated water raises two critical social issues in Australia. First, people generally have no choice in their water provider because water supplies are natural monopolies. The risk associated with consuming drinking water is therefore not voluntary. Second, large numbers of people are potentially at risk from drinking supplied water. These two factors impose a 'moral binding' (Moeller 2001, p. 127) on the duty of government regulators and the water supplier to provide the best socially achievable water quality. Therefore, the ability of drinking water to be managed effectively and controlled equitably is of key importance to society.

The importance of a clean, safe and reliable drinking water supply to human health is well documented (Archer 2001; Blakeney 2000; Clonen 2001; Hrudey & Hrudey 2004, Laifungbam 2003; McKay & Moeller 2001; Radcliff 2003; White 2002; World Health Organisation 2007). A core part of supplying drinking water is to protect consumers from disease and illness that may stem from the environment from which water is drawn and in which it is managed (Archer 2001; Hrudey & Hrudey 2004; Moeller 2001). In recent decades, water-related fatalities in countries such as Canada, Japan, the USA (Archer 2001; Blakeney 2000; Christensen 2002; Hrudey & Hrudey 2004; Snider 2003, 2004) have dramatically highlighted the critical importance of adequately managing and monitoring

drinking water supplies. Such events have raised widespread debate over the effectiveness of governments and authorities in governing drinking water supplies and have also prompted a closer examination of the regimes and responsibilities that underpin the processes of drinking water governance in many parts of the world (Beder 2001; Blakeney 2000; Castro 2007; Gleick 2002; Hill et al. 2008; Hrudey & Hrudey 2004; Olmstead 2003; Sheil 2002; Whelan and White 2005).

In Australia there has also been ongoing interdisciplinary deliberation and discussion over the control, management and regulation of drinking water in many parts of the country (Archer 1996; Cox et al. 2003; Fullerton 2000; Hussey 2007; McKay & Moeller 2001; White 1998). Responsibility for Australia's drinking water regulation, management and supply is highly disjointed, because the control, management and provision of drinking water supplies are spread across all levels of Commonwealth, state and local government. In most states and territories of Australia, including Tasmania, both local government and corporatised bulk water authorities are responsible for managing and reticulating drinking water.

The disjointed nature of responsibility for drinking water in many parts of Australia is further complicated by similar issues surrounding regulation. Unlike most developed nations, Australia has no uniform or mandatory approach to protecting and regulating the quality of drinking water (Archer 2001; McKay & Moeller 2001; Radcliff 2003). In Europe and the USA, for example, 'mandatory standards are integral parts of overall drinking water programs'; most have been in place for decades (Moeller 2001, p. 6). In the USA water standards have been implemented under the banner of the US Safe Drinking Water Act (US SDWA) to specifically address issues such as: 'deficiencies in surveillance and reporting;

the re-emergence of waterborne disease; new chemicals that have entered the environment and poor compliance' (Moeller 2001, p. 26).

In Australia there is no 'Safe Drinking Water Act' or uniform legal definition of drinking water. Rather, water regulation is a matter for each state and territory (Archer 2001; Moeller 2001). Australian water providers use voluntary guidelines with different quality requirements as a means to benchmark water quality. Instead of legislation, most urban water providers in Australia are regulated by other means; for example, 'operating licenses, charters, customer contracts, and memoranda of understanding' (CRC for Water Quality 2005, p. 55). Tasmania is one of the few states that have made moves to legislate water quality standards:

The only consistent influence in water management in Australian states and territories is that the majority of the regulatory frameworks draw on the National Health and Medical Research Council's (NHMRC) Australian Drinking Water Guidelines (ADWG). The ADWG (2006, p. 3) define safe drinking water as:

... water, which, on the current state of knowledge, is safe to drink over a lifetime; that is, it constitutes no significant risk to health ... Ideally, drinking water should be clear, colourless, and well aerated, with no unpalatable taste or odour, and it should contain no suspended matter, harmful chemical substances, or pathogenic micro-organisms.

Although such definitions provided by the ADWG represent an authoritative Australian reference on drinking water quality and management, these guidelines do not constitute enforceable standards on water providers. Rather they are a basis for negotiating the quality of drinking water supplies throughout the country and for identifying acceptable water

quality through community consultation (National Health and Medical Research Council 2004, p. 1).

The lack of uniform drinking water quality standards across Australia is problematic, given that different levels of accountability and definitions of safety exist between states and territories. This makes a co-ordinated or integrated national approach to drinking water problematic. Increasing problems with the quality of water supplies in many parts of Australia are also creating ongoing issues for those responsible for the governance of drinking water quality in many parts of the country (Archer 2001; Birnbauer 2003; Cox 2003; Hall 1999; White 1998). For example, commentators like McKay and Moeller (2001) argue that risks associated with drinking water in Australia are of a dimension discernible to warrant mandatory regulations.

The main risks relate to the contamination of source water and of unsafe distribution systems.⁵ In Table 1, Moeller (2001, p. 122) documents key contaminants in Australian drinking water and source supplies and their capacity to adversely affect human health and wellbeing.

⁵ Source Water is defined in this study as the fresh water supply, for example a catchment from which drinking water is drawn for treatment and reticulation. The protection of source water is consistently argued to be one of the most important elements of maintaining drinking water quality and safety (Boyd 2003; Hrudey & Hrudey 2004).

Table 1: Key drinking water contaminants in Australia

Category of contamination	Definition	Key contaminants	Effect on human health	Evidence of contamination in Australia
Microbiological	Waterborne pathogenic bacteria and viruses and protozoa	Protozoa: <i>Giardia cryptosporidium</i> Bacteria: <i>Legionella</i> , <i>Salmonella</i> , <i>Campylobacter</i>	Short and Long Term e.g. Diarrhoea, nausea, intestinal damage/disease, renal failure, gastroenteritis	1998 Contamination of Sydney's drinking water supply
Aquatic biota	Living organisms	Cyanobacteria: blue-green alga	Production of neurotoxins: headaches, skin and eye irritation, acute gastroenteritis	World's worst reported case of Cyanobacterial blooms in 1991 affected over 1000 kilometres of the Murray-Darling Basin. Key water supply for the city of Adelaide
Inorganic chemicals	Metals and other substances	lead nitrate cyanide fluoride uranium	All carcinogens with adverse cumulative affects Lead is a cumulative poison that can severely affect the central nervous system Nitrate can cause symptoms of chest pain, fatigue Uranium ingested through drinking water has been linked to cancer, kidney disease, organ damage and significant damage to the immune and digestive systems.	Lead levels found to be over 10 times above ADWG standards in Northern Shire of NSW Accentuated by household plumbing and fittings, as well as contamination of bulk water supplies In 2004, Uranium levels in indigenous drinking water supplies of communities such Jabiru in the Kakadu, Northern Territory found to be 108 ppb (5 times EPA standards). Occurred following 150,000 litres of uranium contaminated water spilled from the Ranger mine site into nearby potable water supplies over 3 kilometres away.
Organic Chemicals	Large number of chemicals Including agricultural and industrial pesticides	Carcinogenic Trihalomethanes (THMs), a disinfection by product resulting from reaction of chlorine with organic matter	Estimated that THMs may be increasing total cancer death in Australia from 160 per 100,000 population to 162. Pesticides such as atrazine have also been shown to cause nausea, vomiting, as well as increased risk of cancer.	NSW Chief Health Office report the detection of a wide variety of pesticides in rural water supplies Townships in North East Tasmania report elevated levels of lymphoma and symptoms of nausea and headaches following contamination of water supply with atrazine from forestry activity

It is further argued that a lack of mandatory standards and reporting structures in Australia inhibit understanding and knowledge of the extent of drinking water contaminations and risks (Archer 2001; McKay & Moeller 2001). In particular, the risks from and issues of the quality and governance of drinking water supplies in rural parts of Australia are not well documented (Archer 2001, 1996; Fullerton 2001; Whelan & Willis 2007).

Rural Australia is particularly prone to water-related problems.⁶ Despite approximately thirty per cent of Australians living in rural and remote areas, a clean, safe and reliable supply of drinking water is not always assured (CSIRO 2006; Fullerton 2001; McDonald 2005, McKay & Moeller 2001; Whelan & Willis 2007). Evidence of the problems facing rural Australia was highlighted by a report from the Australian Institute of Health and Welfare (2001), which found that, although samples from major metropolitan water suppliers had 98 per cent compliance with Australian guidelines, in non-metropolitan and rural areas, compliance fell to 85 and 43 per cent respectively (Moeller 2001: 3). Furthermore, recent surveys of Australian water systems, particularly those in rural and remote parts of Australia show that:

... many are not meeting basic water quality criteria, and many communities are not receiving regular monitoring or testing as required by government authorised Australian drinking water guidelines. (McKay & Moeller 2001, p. 1.)

⁶ Definitions of rurality are diverse and somewhat problematic (ARIA 2006; Institute for Rural & Regional Research 2004; Whelan & Willis 2007; Witham 2003). There is little consensus on the exact meaning of rurality, for example the Australian Bureau of Statistics (2000) defines rural localities broadly 'as clusters of between 200 and 999 people'. The Accessibility Remoteness Index of Australia (ARIA) is a widespread classification system used to define population areas within Australia. This is used to measure geographical distances which 'impose restrictions on the accessibility' of services, goods, resources (ARIA 2006, p. 1). ARIA classifies populations of over 25,000 as large rural centres, populations of 10,000–25,000 as small rural centres, populations of less than 10,000 as other rural areas and populations of less than 3000 are classified as remote.

Providing a safe drinking water supply to many smaller communities in more rural and remote areas of Australia is subsequently perceived as a 'major challenge' by governments and organisations charged with responsibility for improving the provision of safe drinking water (CRC for Water Quality and Treatment 2002, p. 2). This problem has been exacerbated in recent years by the declining availability of water resources and the tensions between demands for fresh water by a variety of stakeholders, including water providers, agriculture, industry and environmentalists.

The effect of inappropriate or unregulated use of water resources on public health and water supply has considerable ramifications for the provision and management of safe drinking water in all parts of Australia. Because many parts of Tasmania are classified as rural and remote, water management practices in this state are of particular concern.

2.3 Australian water supply issues

Together with the quality and safety of drinking water supplies, the reliability and quantity of fresh water resources are an important part of drinking water governance. This section examines the key policies, trends and issues impacting on the quantity of fresh drinking water resources in Australia and Tasmania.

The management and regulation of drinking water resources reflect how water is valued socially, politically and economically. In recent decades in Australia the critical importance of water resources to social and economic development has been heightened by unprecedented drought, and increasing population growth and urban expansion. Such issues have led to substantial policy reforms at national, state and local levels in how water quantity is controlled, managed and regulated, particularly by economic means. An

examination of these policies is important to understanding the current use and management issues facing water providers in the state of Tasmania.

2.3.1 Background to Australian fresh water resources

Australia is often described as being the driest continent on earth. Australia has only one per cent of the water carried by the world's rivers and is in the grips of one of the worst droughts in the nation's history (Australian Bureau of Meteorology 2008; Karoly, Risbey & Reynolds 2003). The availability and reliability of fresh water is, of course, dependent on rainfall. In Australia, however, rainfall is highly variable resulting in extreme conditions such as droughts and flooding that are accentuated by Pacific Ocean weather cycles like El Niño. Only 12 per cent of Australia's highly variable rainfall results in run-off into streams and rivers. The rest is lost through evaporation (Cooperative Research Centre for Water Quality and Treatment 2002, p. 5). So it is important to understand who are the largest users of fresh water resources.

The largest use of fresh water in Australia is for agricultural purposes. Irrigation accounts for approximately 70 per cent of total water use in Australia. This has increased over 65 per cent since 1985 (Australian Bureau of Statistics Water Account 2006) and heightened water usage is largely due to the growth of irrigation-intense agriculture, particularly in New South Wales and Queensland, where the areas of irrigated land have doubled (Oz Water 2006; p. 3). Water services are the next biggest users of fresh water, accounting for eight per cent of total water use in Australia, followed by industries such as electricity and gas production, mining and manufacturing. Eight per cent of total Australian water use is urban supply for household use. However, per capita, Australia has one of the

largest consumptions of water in the world behind the USA and Canada (Toth 2007). While two-thirds of all the people on earth use less than 60 litres of water a day, 'the average Australian uses more than twice that amount during a single shower' (National Health and Medical Research Council; Water Made Clear 2004, p. 26).

The location of households has important consequences for the demand and availability of water resources in Australia. Most of Australia's population of 20 million is concentrated on the southern and eastern seaboard of the country; that is, in Victoria, New South Wales, Queensland and South Australia. Critically, population growth in these areas is expected to increase by five million in the next fifty years, raising significant issues associated with increasing future demand for fresh water resources.

At present, many fresh drinking water resources are already strained (Archer 2001; Fullerton 2001; McKay & Moeller 2001; White 1998). It is argued that land overuse, ecological damage and the present (and future) concerted demands of population growth have already seriously compromised catchment areas supplying water to Australia's largest cities (Moeller 2001). This has heightened the need to analyse issues relating to the management and regulation of fresh water resources in Australia in ensuring environmental sustainability, enabling equitable access and in juggling competing demands for the resource.

In the past decade significant reforms in the area of fresh water management and policy have occurred in response to declining water availability and increasing water needs. These reforms and relevant key issues will be discussed in the following section.

2.3.2 Key Australian fresh water reforms and policies

In the Constitution of the Commonwealth of Australia (1899), natural resource policy and management was made the responsibility of the states and territories. Water, as a primary natural resource, is specifically mentioned in the constitution:

The Commonwealth shall not, by any law or regulation of trade and commerce, abridge the right of the State or of the residents therein to the reasonable use of the waters or rivers . . .
(s.100)

Although water is assigned a key focus in the founding laws of Australian history, the constitutional vestment of water policy and management in the states and territories has been argued to ‘in effect limit the role of the Commonwealth’ in relation to issues like water (Cooperative Research Centre for Water Quality and Treatment 2002, p. 1). In recent years, however, the Australian Government has increasingly made moves to drive national water policy and reform through agreements with state and territory governments. Two main initiatives can be identified: the Council of Australian Governments Water Reform Framework and National Competition Policy. Each of these has had a considerable effect on the control, management and regulation of fresh water resources at national, state and local levels.

2.3.2.1 The Council of Australian Government National Water Reform Framework

During 1994, in response to concern about the state of many of Australia's river systems, the Council of Australian Governments (COAG) developed a national policy for the efficient and sustainable reform of Australia's rural and urban water industries.

COAG's primary stakeholders are the Prime Minister of Australia, Premiers and Chief Ministers of the states and territories of Australia, and the national president of the Local Government Association of Australia. These stakeholders acknowledged that the management and regulation of Australia's fresh water resources were in critical need of reform and agreed to implement a 'strategic framework to achieve an efficient and sustainable water industry'. This reform is known as the COAG Water Reform Framework (1994), which sought to establish integrated and consistent approaches to water resource management throughout Australia, largely via institutional reforms that encouraged the economic and commercial incentives into the management of water resources. As a strategic framework, the COAG agreement set out a map of the economic, social and environmental objectives to initiate water reform that is to be undertaken by state and territory governments (MacDonald 2004, p. 8). The critical areas of the 1994 National Water Reform Package are:

All water pricing is to be based on the principles of full cost recovery; new investments in irrigation schemes or extensions to existing schemes are to be undertaken only after appraisal indicates it is economically and ecologically sustainable; States and Territory governments, through relevant agencies, are to implement comprehensive systems of water allocations or entitlements;

Trading, including cross border sales, of water allocations and entitlements within the social or physical or ecological constraints of catchments; an integrated management approach to water resource management; the separation, as far as possible, of resource management and regulatory roles of government from water service provision; greater responsibility at the local level for the management of water resources; and greater public education about water use and consultation in the implementation of water reforms. (Department of Agriculture Forestry and Fisheries 2007)

The implementation and process of COAG national water reforms have proven to be challenging. For example, the unique institutional and natural characteristics of each state and territory have made it difficult to make uniform changes at a national level (Archer 2001; MacDonald 2004; Moeller 2001). However, the adoption of National Competition Policy by all governments has been critical in helping to establish the aims of the COAG Water Reforms.

2.3.2.2 National Competition Policy

In 1992 the Council of Australian Governments initiated the Hilmer Inquiry to investigate 'a consistent national economic regulatory framework' that recognised the importance 'of nationwide business sector competition as a spur to enhanced productivity and increased living standards' (Kain 1994; p. 1). The Hilmer Inquiry stemmed from the push to improve the productivity of Australia's national economy, largely by promoting greater efficiency and competition among businesses, particularly Government Business Enterprises (GBEs) and natural monopolies, such as water, electricity, public transport and health provision. Such microeconomic reforms were based on the general presumption that such spurs to economic efficiency 'can contribute to economic growth and the sustenance of the nation's level of material well-being' (Kain 1995, p. 1).

Findings of the Hilmer Inquiry were released in 1993. The report strongly advocated the formation of National Competition Policy in Australia. The report's main recommendations included the universal application of the Australian Government's *Trade Practices Act 1974* to private and public businesses; the structural reform of public monopolies; and establishment of state-based pricing of public sector monopolies (Tasmanian Department of Treasury and Finance 2007). In February 1994 the Council of

Australian Governments endorsed the principles of the report to coincide with COAG's framework for national water reform.

In the following year National Competition Policy was adopted by all governments in Australia. According to advocates of this form of fiscal reform (National Competition Policy Progress Report 2005; Tasmanian Department of Treasury and Finance 2007) the generic benefits to society of National Competition Policy are the following propositions: benefits to consumers through lower prices, more product choice and better service; benefits to businesses through cheaper inputs; better service from input suppliers; greater choice of suppliers and access to improved technology; benefits to governments through increased revenue from expanding the economy; lower expenditure and improvements in government services; and benefits to the economy as a whole through lower inflation, increased growth, improved international competitiveness, greater investment, a greater choice of jobs and standards of living (National Competition Policy 2002; Kain 1995).

In respect of the provision of drinking water, National Competition Policy can be seen to be strongly aligned with the COAG National Water Reform Agenda, supporting significant changes in the management and regulation of Australia's fresh water resources. The National Competition Policy aims to make the water industry more competitive and commercial and consequently to 'align the industry to the highest market value' (Moeller 2001, p. 23).

National Competition Policy encourages and subjects drinking water authorities to open competition, which is argued to promote economic efficiency. This is often achieved through the full cost recovery pricing of water and the corporatisation of drinking water authorities (National Competition Council 1999). Advocates of fiscal federalism and

competition promotion further argue that National Competition Policy water reforms are aimed at 'promoting good water management practices that make good business sense' and are based on the premise that Australia's water resources (rivers, aquifers, catchments) do not stop at state and territory boundaries, but rather development and activity in one state can have impacts in other states (National Competition Council 2006, p. 1; Oz Water 2006, p. 2). In implementing COAG and National Competition Policy water reforms, including the introduction of two-part bulk water pricing, state and territory governments have received over \$1.5 billion in competition policy payments (National Competition Policy Progress Report 2005).

The introduction and implementation of National Competition Policy and the COAG National Water Reform Framework have permanently changed the nature of how fresh drinking water resources are distributed and consumed by the bulk of the Australian population. The corporatisation of water supply organisations and bodies has been a key process in the economic reform of national water resources.

Corporatisation can be broadly defined as 'the placing of selected publicly-owned enterprises into a position analogous to that of the private sector while retaining ownership' (Tasmanian Department of Treasury and Finance 2007, p. 34). In 1998 the New South Wales Government of Nick Greiner was the first to corporatise drinking water in Australia. Corporatisation has since been entrenched in national policies, such as the 1995 Council of Australian Government Water Reforms and National Competition Policy. Most government authorities providing urban water services in Australia have been subject to these structural economic reforms. For example, all major water authorities across Australia, including Tasmania's three major suppliers, have been corporatised or are

operating in accordance with commercial principles in an effort to increase competition, maintain financial accountability and introduce pricing initiatives such as full cost recovery (Independent Committee of Inquiry into Competition Policy in Australia 1993; Moeller 2001). The inquiry into the Impact of Competition Policy Reforms in Rural and Regional Australia (1999) hailed the moves as a means to enhance the efficiency of government business enterprises 'for the benefit of social welfare and other social goals such as the empowerment of consumers' (Moeller 2001, p. 22). Yet the processes of fiscal water reform in Australia have not come without significant social criticism (Beder 1997; Sheil 2000). For example, an emphasis on economic efficiency and the pursuit of economic interests has been described as inherently at odds with the public interest and interferes with the human right to drinking water in many parts of the globe (Barlow & Clarke 2003; Beder 1997; Beltran 2002; Daly and Cobb 1989; Hall 1999; Laifungbam 2003; Marsden 2003; Olmstead 2003; Pauw 2003; Ravindran 2003; Snider 2004; Sheil 2000; Whelan & White 2005).

Regional and rural states like Tasmania have been implementing COAG National Water Reforms and National Competition Policy obligations over the past eight years. The following section provides an overview of the key water supply arrangements in Tasmania and the impact of national reforms on the provision and governance of drinking water at state and local levels.

2.4 Drinking water quality governance in Tasmania

Tasmania is an island state with diverse geographical, demographic and environmental characteristics. At present over one third of Tasmania's total population (n=482,500) live in

‘other rural’ and ‘remote areas’ according to ARIA classification.⁷ These rural and remote areas are some distance from Tasmania’s two main population centres (Hobart, the capital city and Launceston, the next largest population centre, classified as a regional centre). Responsibilities for the governance of drinking water quality in Tasmania rest with various state and local organisations.

In respect of drinking water supply and services, water is provided from two main types of providers. Three large bulk water authorities (Hobart Water Authority, Esk Water and Cradle Coast) supply drinking water to metropolitan and regional population clusters in the South, North and North West of the state. In the remaining areas of Tasmania, local municipal councils have responsibility for the collection, treatment and reticulation of drinking water. Many of the areas are in rural and remote areas of the state. Of the total 89 drinking water supply systems in Tasmania, 59 are in remote and other rural areas of the state and are managed solely by local municipal councils.

2.4.1 The Public Health Act 1997

The quality and safety of drinking water in Tasmania is governed by public health regulations. The key provisions for the protection of public health are detailed in the *Public Health Act 1997* (PHA 1997). The Public Health Act was passed as legislation in January 1998 and designed ‘to protect and promote the health of communities in the State and reduce the incidence of preventable illnesses’ (PHA 1997, p. 2). The *Public Health Act 1997* makes provisions for the protection of many aspects of public health, including food and hygiene practices, immunisation and tobacco labelling. Section 128 prescribes particular guidelines for drinking water quality in Tasmania. The key aim of the *Public*

⁷ See footnotes on page 30 for details of the ARIA classification system.

Health Act 1997 Drinking Water Guidelines is to 'protect public health and establish best practice frameworks for drinking water quality improvement' (Department of Health and Human Services 2005, p. 4). Under the *Public Health Act (1997)*:

All water suppliers of public reticulated drinking water supply systems must meet the requirements of *The Public Health Act 1997 Drinking Water Quality Guidelines* to ensure the water is safe to use, or that consumers are advised if it is not regarded as potable.

The 'best practice frameworks' referred to in the PHA 1997 draw on guideline values provided in the Australian Drinking Water Guidelines (ADWG). Tasmania is the only state in Australia to have made parts of the ADWG legally enforceable standards. According to the Australian Productivity Commission's Arrangements for Drinking Water Standards (2000, p.1) legally enforceable standards are defined as:

... quantifiable characteristics of the environment against which environmental quality can be assessed. These generally have the force of the law and must be complied with or else penalties are applied.

Under the *Public Health Act 1997*, the Tasmanian Department of Health and Human Services and the Director of Public Health oversee the responsibilities and performances of drinking water suppliers (bulk water authorities and local councils). The Director of Public Health is specifically charged with ensuring that water suppliers in Tasmania are managing drinking water in a manner that does not pose a threat to public health and so are complying with the requirements of the drinking water guidelines.

Water suppliers in Tasmania are legally required under the PHA Drinking Water Guidelines (s.128, rr. 7.1–11.3) to sample and test drinking water at an accredited laboratory for *E.coli* (*Escherichia coli*); to report annually to the Director on the number of water supplies under each council's control; report on tests and analyses performed; and report on water sampling frequency and compliance of water samples with established water quality guidelines. In addition, bulk water authorities are required to develop and implement a Drinking Water Quality Management Plan which should provide a diagram of the water supply systems, barriers to contamination, assessment of the water supply, details of proposed improvements and accident protocols; and to develop, review and implement water management plans for catchments, including consultation with the community.

The PHA Drinking Water Guidelines also require water suppliers to notify the Director of Public Health if drinking water is to become a threat to public health (PHA 1997: s. 128, rr. 9.1–10.4). Notification of a threat to public health requires immediate contact with the Director of Public Health explaining the circumstances and consequent actions being undertaken to combat the threat to public health; and written confirmation by letter, email or facsimile within 24 hours of the initial phone call, formally advising the Director of the circumstances and action being undertaken.

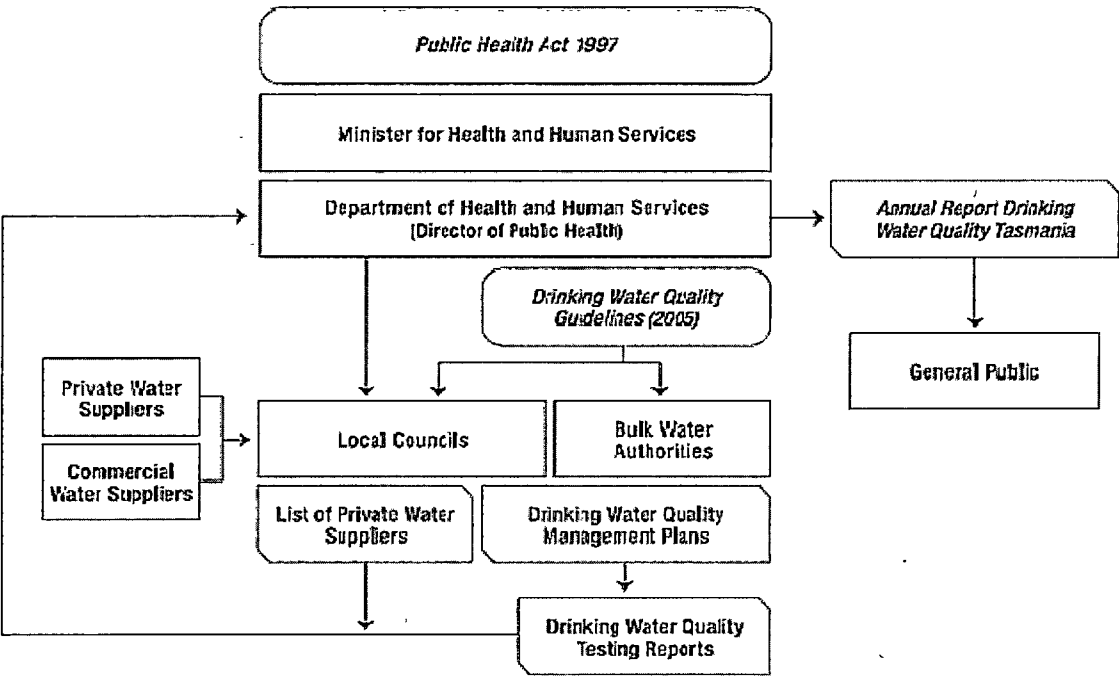
There are potential penalties should these standards be violated. Failure to comply with an order from the Director of Public Health may result in significant fines for water suppliers in Tasmania, where, however, these potential fines cannot exceed \$100,000 (PHA 1997: s. 129, r. 2.0). Monetary penalties are the only form of regulatory action existing for non-compliance with regulatory standards in Tasmania. It is yet to be documented whether these regulations exist as a deterrent to non-compliant water management practices.

However, since the *Public Health Act 1997* was legislated, there have been no monetary penalties issued to water providers in Tasmania that have been reported by the Director of Public Health (based on the *Annual Report into the Quality of Drinking Water in Tasmania 1998–2005*).

In the event that the Director of Public Health, or drinking water supplier in consultation with the Director, has ‘determined that there has been, or there is likely to be a threat to public health’ (PHA 1997: s. 128, r. 10.1) a ‘boil water alert’ should be issued by a drinking water supplier. This involves notification to water consumers that they should boil their drinking water before consumption in order to eliminate waterborne pathogens.

Microbiologically unsafe drinking water violates Tasmanian public health policy. However, the issue of non-compliance with the *Public Health Act 1997* is far from straightforward. In summarising and clarifying this section on water quality governance in Tasmania, Figure 1 illustrates how drinking water is governed in the state of Tasmania. It indicates the key processes and relationships that underpin governance, such as regulatory and legislative bodies and documents, authorities and organisations responsible for drinking water provision and the ways that they interrelate. The following section provides an overview of the key issues surrounding the availability and management of drinking water in Australia and concludes with a specific discussion of the governance of drinking water quantity in Tasmania.

Figure 1: Governance of drinking water quality in Tasmania



Source: National Water Commission: Australian Water Governance (2006)

The introduction of the COAG National Water Reforms and National Competition Policy has had significant implications for all levels of government involved in the provision of drinking water. As discussed in more detail in the following sections, all three bulk drinking water authorities in Tasmania have now been corporatised under the COAG and National Competition Policy reforms. The key water authorities in Tasmania and their operating arrangements, including ownership by local governments, are shown in Table 2.

Table 2: Bulk water authority arrangements in Tasmania

Water authority	Service area	Water service arrangement	Established/Authority details
<i>Cradle Coast Water Authority</i>	North West Tasmania	Collects, treats and distributes bulk drinking water to council in North West Tasmania	Established in 1999 and operates as a jointly owned authority of Circular Head Council, Waratah/ Wynyard Council, Central Coast Council, Devonport Council, Latrobe Council and Kentish Council
<i>Esk Water Authority</i>	Northern Tasmania (Launceston Tamar Valley)	Collects, conserves, treats and sells bulk water to local councils and industries in the Launceston/ Tamar Valley Region	Formed in 1997 and operates as a jointly owned authority of the Launceston City, Georgetown and West Tamar Councils
<i>Hobart Water Authority</i>	Southern Tasmania, including Hobart	Collects, conserves, treats and sells bulk water to local government councils	Formed in 1997, is a joint authority of 8 councils including Hobart City Council, Glenorchy City Council, Clarence City Council, Kingborough Council, Brighton Council, Derwent Valley Council, Sorell Council and Southern Midlands Council

In addition to Tasmania's three bulk water authorities, there are 29 local governments in Tasmania, each having responsibilities for water reticulation and also water quality within their respective municipalities. The majority (n=20) of these councils buy drinking water from bulk water authorities; the water is then distributed to consumers in their individual municipalities. Under the joint authority model of corporatisation, each of the water authorities in Tasmania is owned by a number of councils. Under this arrangement, councils have less direct involvement in the management of business activity argued to assist in 'increasing the efficiency and effectiveness of local government services'

(Tasmanian Department of Treasure and Finance 2007, p. 1). Each water authority in Tasmania operates as a separate business, managed by a commercially focused board of representatives, which directs and oversees the performance of the business and is accountable (Tasmanian Department of Treasury and Finance 2007). Under this model, the councils as owners are paid dividends for their investment in the joint authority.

All water providers in Tasmania, including local government suppliers and water authorities, have been required to report on and implement reforms in the pricing of urban water, which includes the adoption of water pricing regimes that achieve full cost recovery. This has involved the introduction of two-part pricing and water meters in most, but not all, parts of the state. The most recent (2004) investigation into bulk water pricing and full cost recovery in Tasmania recommended substantial increases in the price of water (Government Prices Oversight Commission 2004). As part of national COAG reforms, the Government Prices Oversight Commission found that neither the state's bulk water authorities nor some local government councils were charging enough for water to get a commercial rate of return. To achieve full cost recovery and thus fulfil the national water reform obligations, revenue would need to be increased substantially. For example, the Esk Water Authority reportedly needed to increase revenue by 25 per cent, Hobart Water Authority by 15 per cent and Cradle Coast Water Authority by 11 per cent (Tasmanian Department of Treasury and Finance 2007).

Future plans for the further corporatisation of drinking water supplies in Tasmania are currently being investigated by the Tasmanian Department of Treasury and Finance (2007) under the banner of economic reform.

2.5 Chapter summary

This chapter has situated the study of drinking water in Tasmania within a national and local research context. It has provided an overview of the key water quality and quantity issues from a broad national Australian perspective before focusing the discussion on the Tasmanian context of drinking water governance and the processes of regulation, management and provision. The next chapter introduces the concept of risk and places this study of drinking water governance in risk theory and environmental sociology. It discusses the key 'expert' institutions charged with responsibility for the management of environmental conditions like drinking water and points to some of the key processes and tensions underpinning environmental governance. The chapter concludes with a discussion of political economy approaches to drinking water and examines the global trends of neo-liberalism and capitalism surrounding drinking water governance.

3 Drinking water: theoretical issues and approaches

It is vital to all our futures that we lose no opportunity to acquire the appropriate knowledge about ourselves and our relationship to the planet.

Howard Newby (1991)

3.1 Introduction

This chapter introduces the key issues and theoretical perspectives in the study of drinking water and locates the research within the wider sociological 'sub discipline' of environmental sociology. The chapter argues that there is no solid consensus on which to base a theoretical and conceptual approach to the study of environmental issues such as drinking water (Cable & Cable 1995; Irwin 2001) and so it is necessary to draw from a diversity of sociological perspectives pertaining to the environment. This chapter outlines how theoretical perspectives of risk and political economy can be used to help interpret issues and processes underpinning the management, regulation and provision of drinking water in Tasmania. It draws attention to the issues of power supporting how governments make decisions about the regulation of drinking water, how they frame environmental risks and how they control, value and rationalise drinking water resources.

3.2 Drinking water and environmental sociology

In his controversial lecture in 1991 to the British Sociological Association, sociologist, Howard Newby, asked why sociology has remained 'so silent' about environmental questions in past decades, despite their centrality to sociology (Newby 1991, p. 8). Since then there has been an ever-growing diversity of environmental issues and concerns 'demanding and inviting social interpretation' (Irwin 2001, p. 13) like climate change, acid

rain, nuclear energy, intensive deforestation and the dumping of hazardous waste. Despite this, a continuing issue for environmental sociologists has been 'defining what constitutes the main objects of study' (Hannigan 1995, p. 13). For example, the areas of environmental attitudes, values and behaviours, human ecology, the environmental movement, risk and risk assessment and the political economy of the environment have all been described as key areas of environmental sociological scholarship in the past three decades (Beck 1992; Benton and Redclift 1994; Brown 1992; Buttel 1987; Buttel & Taylor 1994; Dunlap and Michelson 2002; Elliot 1998; Hannigan 2006; Hogenboom et al. 2000; Irwin 1995; O'Connor 1994; Pepper 1993). Intersecting and competing social and cultural definitions and interests (Welsh 1992) about the environment as a source of sociological inquiry have also complicated the theoretical basis of environmental sociology.

These issues have led some environmental sociologists to argue that a 'theoretical vacuum' (Cable & Cable 1995, p. viii) surrounds how environmental issues like drinking water should be theorised, approached and studied. In reconciling these issues, this study draws on two key theoretical approaches to assist in understanding drinking water governance as a major sociological and environmental issue. These are sociological theories of environmental risk and political economy approaches. The use of these perspectives is not intended to generate a hybrid or new theoretical basis for studying drinking water, but rather to assist in understanding the main social issues, processes and conditions about the governance of drinking water as an environmental resource and how drinking water issues are constructed, contested and created.

3.2.1 Constructing drinking water as an environmental issue

The quality and quantity of fresh water is an environmental issue that has significant implications for human health and existence. Nevertheless, the relationship between environmental resources and sociology has been described as impossibly broad and all encompassing (Blowers 1997; Irwin 2001; Garner 1996). As Heberlein (1981) asserts:

The environment is an object which is constantly present and has multiple sub-objects, which do not, as individual objects, represent totality . . . The environment is an experiential object, but no-one experiences “the environment” as a whole, but rather as separate distinct aspects. (As cited in Dunlap & Emmet Jones 2002, p. 483).

Water can be conceptualised as a ‘sub object’ of the environment, demanding significant sociological attention to its governance and treatment by society. Although conceptualising water as an environmental issue is complex, it is core to understanding the symbiotic relationship between people and the environment. The inherent complexity of this environmental–human nexus (White 2005, 2007) is exemplified by the tensions between realist and social constructionist approaches used for the study of environmental issues, like drinking water governance. These approaches used to study the environment and their applicability to the study of drinking water will now be discussed.

Realists propound the objectivity of the environment. They stress that the ‘real’ character of environmental problems and concerns exist independently of social causation and human interpretation (Irwin 2001, p. 162). For example, this approach is reflected in Ulrich Beck’s seminal work, *The risk society: towards a new modernity* (1992). This notion of a ‘risk society’ is characterised by the central distribution and organisation of risks, the

negative and hazardous consequences of modern development on the environment. Beck adopts a realist position in this work to argue that ‘environmental threats and their material outcomes exist independently of social perception and cultural interpretation’ (Higgins & Natalier 2005, p. 81). Critics argue in doing so, Beck ignores the highly subjective nature of environmental risk and the multiplicity of ways in which the environment, whether built or natural, is ‘perceived, defined, interpreted and acted upon’ (Dunlap, Michelson & Stalker 2002). However, Beck’s (1992) work offers important insights into the phenomena of risk in modern society that cannot be ignored in this thesis.

Social constructionists argue that the environment ‘is not simply out there’, sitting apart from everyday reality (Irwin 2001, p. xi). Instead, the environment is ‘brought into the heart of society and its cultural, moral and economic systems’, not a sphere ‘separate from human ambitions, actions and needs’ (Dryzek 1997, p. 129). Polt also argues:

Real *things* are independent of us, but what it *means* to be real depends on us . . . in order to understand what it means to be real, we have to look at how things present themselves as real *in the context of human life*. (As cited in Irwin 2001, p. 162.)

On the basis of these social constructionist arguments, realist approaches have been criticised for denying how the environment and spheres of social society and interpretation exist simultaneously.

Defining and understanding water as an environmental issue is an area of social construction. Orienting the study to this perspective is useful, because social constructionists view environmental problems and conditions as socially defined and contested. In this context, drinking water is not simply an objective phenomenon waiting to be discovered, but is an environmental issue that poses significant threats and problems to

individuals and social life. Hannigan (1995, 2006) argues that that such environmental threats and problems do not materialise by themselves. Rather, key 'claim making' institutions in society, such as government, science and the media, instead define, judge and negotiate the nature of environmental issues and present them to the lay public accordingly. By constructing water in different ways, for example as a public health issue, commodity or environmental resource, different groups and institutions can present water in a way that suits their agendas and interests. Environmental groups are more likely to construct unsafe drinking water as an environmental problem, compared with scientists or government officials, who may contest definitions of safety. Although it will never be possible to construct water in a way that is neutral or apolitical, it is important that the ideologies associated with these constructions are transparent and visible in the domain of environmental governance.

In recent years there has been some reconciliation of realist and social constructionist approaches to the environment (Hannigan 2006). Specifically, social constructionists have come to acknowledge the environmental risks are real and objective harms undeniably stem from the environment (White 2008). However, what is seen to be most important and a view that is supported in this study is to look at the underlying social, political and economic processes (Hannigan 2006) by which environmental conditions are negotiated, defined and contested through institutions such as governments and science. As Dryzek (2005, p. 12) notes:

Just because something is social interpreted does not mean it is unreal. Pollution does cause illness, species do become extinct, ecosystems cannot absorb stress indefinitely, tropical forests are disappearing. But people can make very different things of these phenomena and- especially- their interconnection, providing grist for political dispute.

Social constructionists are concerned with the ways risk is constructed and used to govern environmental resources such as drinking water. Douglas and Wildavsky (1982, p. 46), for instance, argues that 'risk' is 'not a thing', but 'it is a way of thinking'. The types of authority and social conditions that give rise to the use and judgement of risk to manage drinking water are a primary focus of this social constructionist study of water governance. Theories of risk will be discussed in detail in the next section.

3.3 Environmental governance and risk

Unsafe drinking water is an environmental condition capable of widespread human illness and mortality. If the quality and quantity of drinking water resources are not adequately managed the threat to public health is undeniably heightened. The notion of risk is of vital importance to the study of drinking water governance, because 'human deficiencies in the management of drinking water and risk' have a central place in debates regarding environmental threats and hazards (Castro 2007, p. 107).

According to a growing number of commentators 'the defining markers of modern society' (Maythen 2004, p. 1) are associated with the phenomenon of risk and its governance. Sociological perspectives on risk (Beck 1992; Douglas & Wildavsky 1982; Elliot 2002; Gabe 1995; Lupton 2002) have subsequently established the notion of risk in a plethora of political and structural elements of social life; some assert that risk is 'casting

its spectre over a wide range of practices and experiences' (Maythen 2004, p. 1).

Contemporary discussion of health and the environment incorporate the notion of risk as a magnitude of dangers and hazards that can threaten individuals, communities and society collectively (Petersen & Lupton 1995).

The environment has become a growing source of both risk commentary and public health risk. As Mehta (1995, p. 1) argues, the 'most insidious risks facing both the individual and the collective is the danger from the steady decline in the quality of the natural environment'. For example, water and air pollution, climate change, disposal of nuclear and toxic waste, and acid rain are all environmental conditions involving objective and subjective notions of risks to human health and wellbeing. Contemporary sociological theories of risk are therefore useful in theorising areas of environmental and health management, such as drinking water governance.

Like most theoretical constructs, the way risk is perceived and interpreted depends on the discipline and ideological standpoint from which the notion of risk is used.

Consequently, it is important to recognise that the exact meaning and effect of risk are

'keenly contested' (Maythen 2004, p. 2) by environmental stakeholders, including

politicians, sociologists, the media, scientists and the general public. For these reasons it is

important that this study should acknowledge the different ways that risks are constructed,

interpreted and experienced through everyday interactions and institutional processes

(Maythen 2004). What is important is to understand how risk is used by governments to

regulate, control and construct drinking water as a social issue.

The following section extends the discussion of drinking water and risk to discuss key debates about the social construction of risk. It includes a discussion of the key

institutions charged with responsibility for environmental governance, focusing on the use of risk as a tool for institutional judgement and justification in the management and regulation of drinking water.

3.3.1 Drinking water governance in a 'risk society'

Drinking water can be considered an environmental risk that threatens public health if it is not adequately managed. Prompted by Ulrich Beck's works, *Risk society: towards a new modernity* (1992) and *Ecological politics in an age of risk* (1995a), risk society theory centralises the notion of the environmental risk by placing environmental degradation at the heart of modern society (Goldblatt 1996, p. 155). Beck defines risk as a 'systematic way of dealing with hazards and insecurities introduced by modernisation itself' (1992, p. 20). As a theory of modernisation, Beck (1992) believes that we are no longer concerned with building an industrial society, but we 'are moving into a post-industrial "risk distributing" society', concerned chiefly with controlling environmental risks created by modern technology' (Mehta 1995, p. 1). According to Beck (1992, p. 19) in this advanced modernity, 'the social production of *wealth* is systematically accompanied by the social production of *risks*'. As Lash, Szerszynski Wynne (1992, p. 2) explain, the central premise of Beck's work is that risk has become the organising global principle of late modernity.

For Beck, the consequences of scientific and industrial development are a set of risks and hazards, the likes of which we have never previously faced. These dangers can, for example, no longer be limited – as future generations are affected – their spatial consequences are not amenable to limitation – as they cross national boundaries.

'Risk societies' have 'uncertain collective and individual consequences' (Heyman 1998, p. 18) and are characterised by ambiguity and anxiety, whereby the potential for risk always remains present, but what, how and to whom these risks might exist or affect is unclear. Beck argues that modern societies are in a 'constant state of concern, anxiety and even dread' (Petersen & Lupton 1996, p. 95) because of the risks in their environment. Within the risk society anyone can be exposed to environmental risk due to its egalitarian nature. To quote Beck: 'poverty is hierarchic, smog is democratic' (1992, p. 36) and 'nitrates in the groundwater do not stop at the director general's tap' (1992, p. 22). The dangers affixed to modern risks are 'not subject to temporal restrictions and defy geographical enclosure' (Van Loon 2000a, as cited in Maythen 2004, p. 19). Rather, these risks are unprecedented by having the potential to 'induce systematic and irreversible harm' (Beck 1992, p. 22) and by having the ability to be global in reach with the means of extending beyond the means of those that produced them. Many risks in modern society are also 'out of sight' in that we often cannot touch, see, smell or taste them. As Beck (1992, p. 2) argues, 'they are "piggy back products", which are inhaled or ingested with other things, they are *stowaways of normal consumption*', they travel on the wind and in the water'. For instance, the herbicide atrazine, used by large-scale forestry operations in Tasmania, is largely imperceptible to the human senses and is described as a 'slow poison in that its health effects are not immediately apparent but rather cumulative in nature' (Cameron 1996, p. 9).

In the risk society, the unpredictable and undetectable nature of environmental risks means that the identification of risk is beyond the ability of most lay individuals. In the 'disempowerment of the senses' we are 'more vulnerable to the very institutions that have

created the conditions of environmental collapse' (Irwin 2001, p. 63) and become increasingly reliant on such 'experts' and the institutionalised knowledge they bear, not only to inform us of risks, but also to render risks calculable and determine levels of 'safety'. As Beck argues:

That which impairs health or destroys nature is not recognisable to one's feeling or eye, and even where it is seemingly in plain view, qualified expert judgement is still required to determine it 'objectively' . . . hazards in any case still require the 'sensory organs' of science . . . *in order to become visible or interpretable as hazards at all* . . . (1992, p. 72.)

Much of the 'risk society' is consequently centred upon the 'rapid expansions of scientific, technological and medical knowledge' that have 'created an assemblage of expert systems of risk calculation, assessment and management' (Maythen 2004, p. 2). Thus the interpretation, identification and definition of risks have 'become the preserve of those who have access to technology and expert knowledge', such as scientists and members of the medical profession (Petersen & Lupton 1996, p. 99). As Irwin (2001, p. 65) sees it, in the risk society if we have no 'common sensical way of knowing what risks we run: hazards assessment becomes a combination of scientific rationality and institutional deliberation'.

In the domain of drinking water governance, there is a reliance on formal scientific methods and values to identify and determine 'acceptable levels' of contaminants and to define what is safe drinking water. Beck (1995a) questions these 'relations of definition' and the ways in which our 'sense of external threat' (Irwin 2001, p. 58) are linked to the acceptance of science in providing rational, legitimate and standardised statements on risk that do little to reflect the health outcomes of issues such as contaminants in drinking water:

The subject of this decree then, is not the prevention of, but rather *permissible extent* of poisoning. *That* it is permissible is no longer an issue on the basis of this decree . . . the really rather obvious, demand for non poisoning is rejected as *utopian*. At the same time, the bit of poisoning set down becomes *normality*. It disappears behind the acceptable values. Acceptable levels make possible a *permanent ration of collective standardised poisoning* . . . statistical estimates of ‘acceptable’ levels of pollution are meaningless, ‘at least as long as “safety” and “danger” has anything to do with the people who breathe or swallow the stuff’.

(Beck 1992, p. 65.)

Making expert knowledge privileged in the risk society is therefore often at the expense of other less ‘legitimate’ knowledge like that of the lay public. The risk society is distinguished by an ongoing conflict of meaning between experts following the guidelines of scientific rationality and the lay public gazing through the lens of social rationality’ (Maythen 2004, p. 57). This relationship is often characterised by ambivalence and involves decisions about the environment strongly dominated by technical expertise (Mehta 2001). By adopting technical and expert definitions over issues such as drinking water safety, the risk society has the capacity to ignore a citizen’s democratic right ‘to understand and participate in governmental decision making’ (Mehta 1995, p. 1) by using local and lay knowledge of their water.

While the risk society ‘deftly matches up the various economic, political and scientific parties involved in the production and management of environmental risk’ (Maythen 2004, p. 50) in that it describes for instance the way ‘risks are industrially produced, economically externalised, juridically individualised and scientifically legitimised’ (Beck 1995a, p. 127), there are two criticisms of Beck’s work that must be

considered in this research and in the greater governance of environmental issues like drinking water.

First, it is argued that environmental risks are more diffuse and complex than can be accounted for in risk society framework (Maythen 2004, p. 43). Critics of Beck's work argue that it is over-rationalistic and fails to account for the subjective ways that risks are socially constructed. For example, Wynne (1996, p. 76) asserts that ideas and values about risk are 'publicly generated as well as institutionally disseminated with lay and expert groups interfacing'. This is not to deny that environmental risks 'exist only as social constructs, for the physical impacts of these problems are (or will be) real enough' (Blowers 1997, p. 849), but it still ignores the ways that risks are socially constructed, particularly by institutions, such as government, mass media and science. As Buttel and Taylor (1987) argue, the construction of environmental risk issues is significantly 'as much or more a matter of the social construction and politics of knowledge production as it is a straightforward reflection of biophysical reality' (as cited in Hannigan 1995, p. 39). Beck's work fails to account for the multiple ways in which the politics of risk are framed (Elliot 2002). Thus, drinking water quality and safety issues are not simply speaking for themselves (Irwin 2001), but knowledge of the environment is developed, maintained and constructed by experts and claim makers, such as science, the mass media and government. The ways risks associated with drinking water are institutionally judged, interpreted and translated into public health regulation, policy and discourse are of clear interest to this study.

A second criticism of Beck's work is concerned with the premise that risks found within the risk society are egalitarian. Petersen and Lupton (1996, p. 102) argue that Beck's

‘focus on the “democratising of risk” tends to obscure the ways in which there remain differentials in potential exposure to risks’.

Class divisions in society undoubtedly intensify the predisposition to environmental risks and so are disproportionately endured and suffered by poor and marginalised groups (Field 1998; Halfacre, Matheny, Rosenbaum 2000; Julian 2004; Maythen 2004). For example, people with less capacity to pay for bottled water or filter attachments will generally experience a greater proportion of risk when water quality and management fails. The capacity to pay is linked to the distribution of risk and justice (Field 1998; White 2002). The relative ability of an individual or community to avoid risks, such as unsafe drinking water, is often moulded by their ‘relative ability to financially buffer and resist these types of inducements’ (Mehta 1995, p. 5).

It follows that the experience and structuring of risk and the construction of environmental knowledge are fundamentally tied to patterns of power and ensuing institutional relationships. Those social groups who control the framing of risk (Hannigan 2006) therefore determine what issues are included or excluded from public knowledge and discourse (Hannigan 2006). It is important to examine more closely the key institutions and groups involved in governance and construction of environmental issues like drinking water, and to examine types of contestations.

3.3.2 Institutional ‘risk judgements’ and the governance of drinking water

The institutional judgements and decisions involved in the construction and definition of drinking water quality and safety in Tasmania are a key focus of this study. An understanding of these issues departs from recognition that governments are responsible for and have power over the identification and regulation of environmental risks.

Given this social significance assigned to governments in managing, regulating and controlling drinking water resources, it is important for sociologists to ‘consider *how* such institutions operate and on *what* basis’ (Irwin 2001, p. 117). The decisions made by governments concerning the use and management of natural water resources have been a continuing area of concern for social and environmental commentators. In some cases, these decisions can literally be a matter of life and death. In her ground-breaking work, *The Silent Spring* (1991, p. 121), Rachel Carson raises pertinent questions about the governance and definition of environmental risks like drinking water:

Who has made the decision that sets in motion these chains of poisonings, this ever-widening wave of death that spreads out, like ripples when a pebble is dropped into a still pond?...Who has decided – who has the right to decide for the countless legions of people who are not consulted?

The governance of drinking water is a matter of significant practical and institutional concern. Responding to this concern involves a sociological understanding of how ‘the interaction among different interests within the social structure underlies the creation, maintenance and change’ (Dunlap, Michelson & Stalker 2003, p. 24) of drinking water governance and management practices. Importantly, it involves comprehending how the key decision makers in the regulation of drinking water, like governments, consider and evaluate the tenuous balance between the health of humans, eco-systems and animal populations, while also conciliating the interests of industry and economics. Because drinking water risks do not ‘speak for themselves’, but are ‘actively created and interpreted’ (Irwin 2001, p. 74), the interpretation and judgement risks stemming from drinking water

can be used as a powerful tool of governance to justify policy and decision making about how different groups and stakeholders access and respond to drinking water resources.

Using a sociological perspective to consider how risks such as unsafe drinking water are constructed and governed converges with examining the roles and rhetoric of political and scientific institutions. As Plough and Krinsky (1987) argue, those that control the discourse of risk will most likely control the political battles as well. Understanding the relationship between regulation and political conflict over risk is critical, because 'it is organisations and their putative masters that make choices about risk which often has implications well beyond their immediate environs' (Cohen 2000, p. 12). And so it is critical to sociological analysis to examine the social processes by which regimes, knowledge and definitions of risk are constructed and mobilised, because they are inseparable from encumbrance of political values, trade-offs and power. The 'provenance of policy' and 'the interests that it serves' (Blowers 1997, p. 851) make the institutional structure of government and its implicit decision-making and regulatory powers particularly important in gauging how drinking water is used and managed.

The use of science to assess and make decisions about risk has become a defining feature of environmental governance. Science is presented by risk theorists as a driving force behind risk definition and evaluation and also in regulatory decision making (Maythen 2004; Mehta 1995). Because we cannot measure environmental risks and we cannot always touch, see, hear, taste or smell them, scientific expertise has become highly prized in risk assessment and evaluation, and in policy formulation and implementation (Dietz, Frey & Rosa 2002, p. 348).

Identifying technological hazards and estimating the 'quantitative likelihood of adverse consequences' (Dietz, Frey & Rosa 2002, p. 329) to conceptualise and define environmental risks through science are key ways in which decisions are made about risk and from which drinking water policies are formed. For example, the likelihood of industry chemicals affecting the content and safety of drinking water supplies is presented as a probabilistic formula or likelihood and consequence. The essence of risk, and its governance 'is not that it *is* happening, but that it *might* be happening' (Adam & Van Loon 2000, p. 2). Science and its 'sensory organs' (Beck 1992) of judgement (institutionalised probability, quantifiable likelihood and other objective calculative regimes) become vital to how the environment, or aspects of the environment, is regulated and defined.

The judgement and assessment of risk is a central part of regulating drinking water. According to Field (1998) environmental regulation is based on the logic of risk through two questions. What is an acceptable level of risk? What controls can be imposed to keep pollution within such limits? However, this logic of risk can lead to a highly professionalised debate about the extent of risk and its cause. For example, using combinations of scientific and political institutions to decipher the environment and make it 'knowable' is criticised by both Cohen (2000) and White (2007), who argue that the governmental approach to such issues is typically to define risk in narrow, ostensibly objective terms; for instance, by estimating the number of expected deaths per thousand people from exposure to environmental conditions. Employing systematic predictive strategies to govern drinking water is based on positivist conceptions of science that 'only represent a narrow and incomplete picture' (Petersen & Lupton 1996, p. 29). This form of environmental assessment 'invariably involves the "compartmentalisation of risk" whereby

risk is limited to specific events, activities and outcomes' (White 1999, p. 242) . Such constructions and 'compartmentalisation' are arguably problematic, largely because they ignore 'the holistic, intertwined and complex nature of the environment' (White 1999, p. 242). For example, the prescribed risk to populations of atrazine poisoning in a river water supply does little to exemplify the bigger picture of water management; that is the types of industry practices, flows and catchment activities that affect the final quality of water delivered to communities.

Such assessments of risk, according to Sjoberg (1987), fail to account for the way environmental risks like chemical contaminants in water supplies 'possess cumulative properties, which may or may not combine synergistically' (Mehta 1995, p. 4). This process of scientific risk management and the ways risks are assessed in governmental approaches to regulation are often deemed unacceptable by some groups (Dietz, Frey & Rosa 2002; Field 1998; Garner 1996; Maythen 2004). As Cameron (1996, p. 15) argues, such dominant discursive practices⁸ that are 'constructed through the systems of scientific knowledge' give the state or government, as the owner of that knowledge, 'power over the bodies of its citizens'. These processes of 'acceptable' risk, estimates and calculations run the danger of 'reifying and neutralising the concept of risk and render invisible the body at risk' (Cameron 1996, p. 15). Patterns of meaning make it possible to regulate and manage risk for a disembodied and homogenous public (Cameron 1996). Others (Field 1998, p. 90), question the 'rational scientific concept of average risk' as a basis for environmental health regulation. For example, 'data from the most sensitive of individuals, such as children and the elderly will not be the bases for regulation, but rather data from the "statistically average" person' (Field 1998, p. 90).

⁸ Discursive practices create certain practices of meaning that are uncritically accepted or taken for granted.

Douglas and Wildavsky (1992) argues that such criticisms and differences are at the heart of political debates between rival interest groups (e.g. government and citizens), when it comes to assessing and managing water-related risks. It shows the process of environmental assessment and regulation having 'underlying themes of uncertainty, indeterminacy and ambivalence' (Irwin 2001, p. 180).

Debates like these also highlight sociological questions about whether such processes constitute 'pure' scientific decisions or whether governments are 'susceptible to the political-economic pressures' (Mehta 1995, p. 5) when making decisions about the regulation of resources. These questions stem from issues of power in the social construction of risk and in definitions of safety.

On this basis it is important to consider how government institutions sought to 'make sense' of environmental matters, particularly the formal structures and contexts of decision-making and regulation that influence 'how such institutions operate and on *what* basis' (Irwin 2001, p. 117). This introduces the argument that sociologists can play an important role in opening up implicit institutional assumptions about environmental decision making to larger critical scrutiny (Wynne 1996, p. 172). For example, how governments respond to environmental issues, including regulation of risks, is often a reflection of how they deal with competing interests, such as development, private industry and community needs. Inherent in this inquiry is the role of economics and power in the governance, management and control of environmental resources; that is, according to White (1999, p. 236), the underlying influences that define how the environment is managed, or more specifically, 'what is regulated and how it is regulated are essentially issues of state and class power'.

Because water governance is political, the issue of power is essential to discourses and constructions of risk in environmental governance. Hannigan (1995, p. 21) points out that what is of particular importance to social constructionism, and so to this study of drinking water, is how risk experts 'influence those who hold the reins of power to recognise definitions of environmental problems, to implement them and to accept responsibility for their solution'. Environmental issues and their management undeniably cut across many elements of governmental policy and regulation. A distinguishing feature of environmental policy and management is often the mediation and resolution of conflict and competing needs between interest groups like agriculture, manufacturing and mining, as well as individuals and community groups, whose health may be at risk from such activities, while also promoting economic growth and progress. However, according to Irwin (2001), environmental protection is usually framed by regulatory authorities as a 'best judgement' informed by scientific evidence, rational analysis and negotiation between regulators and industrialists.

The ways that government regulators contest and frame drinking water risks to the general public are embedded in powerful social structures and processes of inclusion and exclusion; for example 'expert' and institutional knowledge having privilege over that of the general public. The governance of drinking water and structuring and defining risks by science are inherently tied to patterns of power. The lay public rarely discover knowledge of environmental risks associated with drinking water (Cameron 1996). Consequently, although science and governments are undoubtedly central proponents of environmental regulation, 'the presence of science also permits policymakers to discount the importance

of public participation' in environmental regulation (Halfacre, Matheny & Rosenbaum 2000, p. 3).

It is ironic that, although scientific knowledge often excludes lay people from the process of environmental risk definition and assessment, increasingly there are calls for greater community consultation in water management practices and environmental decision making (Bleaney 2006; Boyd 2003; Cameron 1996; White 2007). Nevertheless, in most debates about environmental issues, scientific knowledge is commonly presented as rational and objective, which is in opposition to 'lay knowledge' or the subjective insights, observations and experiences of the general public. Cohen (2000, p. 36) argues that 'most public risk perceptions are at odds with the best scientific estimates' and citizens are often given little or no support from government officials or scientists over environmental concerns (Brown 1995; Roth et al. 2004). Individuals and communities have experiential knowledge of their local environment generated by the conditions of their everyday life. This kind of local knowledge can be understood as 'alternative expertise' (Beck 1992). 'Situated knowledge' represents an important viewpoint on environmental issues. Lay or situated knowledge draws on 'a very different basis of authority than the forms of expertise provided by official institutions, such as industry and government' (Irwin 2001, p. 102).

Lay experiential knowledge of the environment can often precede official and scientific awareness (Brown 1992). In the Chernobyl nuclear contamination in Ukraine, it was the daily observations of local sheep farmers and the detailed contextual knowledge of their immediate environment that first raised attention to the negative impact of radioactive contamination on their animals. This local knowledge was considered by scientists as systematically lacking validity and reliability. As such, it was seen to be 'preventing their

solutions from taking into account the local knowledge of lay actors involved in this ecological crisis' and their place in the risk analysis (Lash, Szerszynski & Wynne 1996, p. 8). In the Camelford area of Cornwall in the United Kingdom, 20 tonnes of aluminium sulphate were dumped into a water tank feeding off the town's main water supply. The chemical was accidentally released into the drinking water supply. Following the contamination, local residents reported 'illnesses ranging from diarrhoea to mouth and nose ulcers and many began to suffer from memory loss (Garner 1996, p. 24). Despite a continued increase in reports from the region of Alzheimer's disease, of which memory loss is a persisting symptom, a subsequent government enquiry 'showed no strong scientific evidence to support the residents' claims of a link between these conditions and the pollution'. As Brown (1992, p. 97) reports this is 'typical' of lay-professional differences concerning the rationalisation and assessment of risks and hazards in the environment:

Communities, which believe themselves to be contaminated or at risk have found that the response is often defensive and hostile, based on the view that alternative hypotheses are threats to scientific inquiry . . .

This example highlights the contextual and relational nature of environmental problems. The way responses and definitions of environmental risk are defined is embedded in relationships between experts and individuals. These meanings and constructions are entrenched by power relations that continue to privilege specialised institutions (e.g. science, law and government) over the lay public (Snider 2004). This is despite the argument that lay input is pervasive in the discussions of environmentally caused disease (Brown 1992, p. 103). Some commentators (Lash, Szerszynski & Wynne 1996, p. 58) point out that nearly all studies of public risk perception and responses show that 'ordinary

people bring more to their definitions and evaluations of risk than recognised in the reductionist framing of experts’.

Such issues raise greater sociological questions over the ability of science and political decision-making ‘to co-exist with democracy in an environment of uncertainty’ (Halfacre, Natheny & Rosenbaum 2000, p. 649). It also supports claims that ‘experts’ and institutions involved in the governance of drinking water operate using what was termed by community members in America as ‘the dissonant language of regulation’ (Halfacre, Matheny & Rosenbaum 2000, p. 3). The language of political decision making and accountability is said to be dissonant, because it is centred on technical terminology and discourse. These specialised meanings can serve to alienate and obscure ‘the effective participatory mechanism for the lay public’ (Mehta 1995, p. 1). This de-democratises the capacity of other interest groups to be engaged in decisions about the environment and health and can hinder public participation in environmental health issues. A lack of scientific evidence and expertise may also hamper the ability of the public to feel confident in reporting public health issues. For example, this may account for the estimate that only half of waterborne disease outbreaks in community systems are reported and investigated (Putnam & Wiener 1995, p. 133) and that community involvement in the management of water supplies has been slow in nations such as Australia (Archer 2001).

The business of dealing with what counts as environmental fact becomes legitimate (indeed essential) for sociological inquiry, particularly when framing and defining environmental risks, like unsafe drinking water, as ‘worthy’ of investigation through scientific assessment (Irwin 2001, p. 85). The role of government and science and the

implicit institutional judgements in the governance and regulation of drinking water in Tasmania is therefore an important part of this social constructionist study.

The impact of global policies that promote the de-regulation and the economic rationalist management of drinking water supplies are also significant. The following section describes how political economy approaches to drinking water governance are important in understanding the issues and processes underpinning drinking water governance in Tasmania.

3.4 The political economy of drinking water

The governance of drinking water quality and safety is clearly associated with the decisions and judgements of institutions, including governments. It is also important that sociology should interrogate the political and economic contexts which underpin and influence how governments make decisions about drinking water resources in Australian states like Tasmania.

A political economy approach to environment issues is based on the premise that drinking water issues and inequalities are not socially or politically separable (Schnaiberg 1980). Cortner and Moote (1999, p. 2) suggest that ‘it is an illusion to see politics separate from ecosystem and natural resource management’, because governments have the ultimate power to decide under what social conditions resources like water are used, consumed and exploited. As a theoretical approach, political economy is concerned with revealing and exploring the causal political and economic relationships that shape how people are affected by issues of drinking water quality and quantity and how governments respond to drinking water issues. It focuses on questions surrounding the ownership, use and management of drinking water and the political and economic climate in which these

processes are developed and sustained. An understanding of these issues and processes enables this study to trace the impact that global political and economic processes have on life at the local level, specifically the governance of drinking water in Tasmania. According to White (2001, p. 82) political economy approaches to the study of drinking water must 'proceed from the sustained analysis of the basic institutions and structures of contemporary capitalism', as well as ideological policies such as neo-liberalism.

3.4.1 Letting the market rule? Capitalism, neo-liberalism and drinking water

There is consensus that the inherent demands of the global economy underpin national and international politics of the environment (Burkett 1999; Dryzek 1997; Garner 1996; Goldblatt 1996; Pepper 1993; Schnaiberg 1980; Sklair 1994; White 2002). Unlike any other time in human history, the environment is being increasingly and severely shaped by advanced capitalism, as the central defining feature of human production and consumption (Burkett 1999; Goldblatt 1996; Jacobs 1994; Miliband 1989; Pepper 1993; Schnaiberg 1980; Sklair 1994; White 2001).

The system and processes of capitalism and neo-liberalism have far reaching consequences for how the people, individually and collectively, use and experience the environment and natural resources. In the case of fresh water resources, capitalist processes and neo-liberal ideology have had profound effects on the ways governments approach water provision, management and control, and on the ways individual citizens and communities access drinking water resources.

According to Robbins (1999, p. 65) at 'no other time in human history has the world been a better place for capitalism'. According to White (2002, p. 98), who tracks the

‘contours of contemporary capitalism’, a key dynamic of capitalism is the ‘imperative to expand’. Capitalism is most simply about economic expansion and development and making maximum profit at minimum expense. In short, the capital process involves the exploitation of labour and resources by the creation and search for new markets through which to make a profit. Under capitalism the primary means of creating wealth is the production or quantity of manifold ‘use values’. That is, anything ‘directly in consumption or indirectly as a means of production that satisfies human need’ constitutes use value (Burkett 1999, p. 25). The dynamic expansionary and accumulative nature of capitalism stems from ‘transforming use-values into exchange values, which are commodities produced purely for exchange and of which can be valued’ (White 2002, p. 85).

The acceleration of capitalist principles of how drinking water is being valued at the local level is due mostly to governments across the globe embracing neo-liberalism. It has become widespread over the past 25 years, perhaps most strongly endorsed in the market intensive policies and capitalist doctrines of Margaret Thatcher in the United Kingdom and Ronald Reagan in the USA. Neo-liberalism is best defined as an ideological position and set of economic policies that are predominantly concerned with freeing the movement of resources, goods and business between nations and across the globe to maximise profits and trade efficiency (Shah 2005; Robbins 1999). Neo-liberalism promotes an economic rationalist view through policies that promote the management of drinking water by processes such as privatisation, corporatisation, de-regulation and commodification. This means that the priorities of neo-liberalism are the ‘promotion of general good’ through market intensive policies and economic-based competition (Haque 1999, p. 199). These

priorities include national regulations, laws and standards that apply within and across nations in all areas of policy, including the environment.

It is argued that by placing the rights and freedoms of corporations above the rights and freedoms of individuals (Robbins 1999), neo-liberalism is fundamentally at odds with the notion of public interest, for example the satisfaction of basic needs, democratic participation and other 'human centred development' policies (Haque 1999 p. 206). One of the most prominent features of neo-liberal thinking is its emphasis on maximising the role of the market, while minimising the role and controls of the state. In unravelling the tangible effect of neo-liberalism on nations, states and individuals across the globe, a number of commentators have documented the key principles and ways in which neo-liberalism has transpired at a global level (Bourdieu 1998; Haque 1999; Kermath 2004; Portes 1997; Robbins 1999):

Privatisation – Neo-liberalism strongly advocates the selling and movement of state-owned water enterprises, assets and goods/services to the private sector. It is argued that the privatisation of traditionally state-owned and -operated drinking water services will reduce public expenditure and minimise economic efficiencies.⁹

Free markets – Neo-liberalism supports the liberation of free/private enterprises from any restraints or bonds imposed by government to enhance economic growth and productivity and to allow the most efficient and socially optimal allocation of resources. This includes the removal of barriers to the 'free flow' of capital, goods, services and the 'trickle down' notion of wealth distribution. As well there is support and involvement in water trading through agreements such as the General Agreement on Trade and Services (GATS) and NAFTA (North American Free Trade Agreement).

⁹ An extended discussion of neo-liberal water policy and water privatisation stemming from this study is found in journal articles published by Whelan (2005) and Whelan and White (2005) in the addendum to this thesis.

De-regulation – De-regulation of water provision and management services is a hallmark of neo-liberal policy. De-regulation involves the reduction of government intervention and control over drinking water provision. The elimination of administrative and political barriers such as regulation is argued to allow market forces to act as a self regulating mechanism, allowing the maximisation of capitalist profit, increased economic efficiency and optimal allocation of drinking water resources.

Reduction in State Services/Expenditure – Neo-liberal policy advocates the restructuring and down-scaling of state-supported water services and so changes the notion of drinking water as a public good and economic equality and replaces it with individual responsibility and competition.

At local and national levels, the effects of late capitalism and neo-liberalism on how drinking water is being controlled, managed and consumed are becoming increasingly clear. As Haque (1999, p. 203) contends ‘under dominant neo-liberal persuasion, almost all nations have been engaged in selling state enterprises, de-regulating and contracting out government services’. The social and environmental implications of neo-liberalism on the control, management and regulation of drinking water are particularly pertinent in all parts of the globe, particularly where there are limited fresh water resources. For example, the fundamental human need for fresh water combined with the restricted availability of fresh water has invariably nurtured a commodifying and neo-liberal approach. It is now claimed that fresh drinking water may soon be the most valuable commodity on earth (Barlow & Clarke 2003; Bond & Bakker 2001; Centre for Public Integrity 2003; Hall 1999; Johnston 2003; Pauw 2003; Ravindran 2003; Shah 2005; Swyngedouw 2004; Van Rooyen 1997). As *Fortune* magazine predicted in 2000:

Fresh drinking water is one of the world's greatest business opportunities . . .

Promising to be to the 21st century, what oil was to the 20th, the precious commodity that determines the wealth of nations. (As cited in Centre for Public Integrity 2003, p. 1.)

Some commentators argue that the private and economic control of water resources and its commodification acts as 'a powerful environmental imperative, for solutions to water scarcity' (Narain 2000; Postel 2000). From the dominant neo-liberal and capitalist view of the environment, the actual or perceived scarcity of natural resources, such as fresh water, means that the 'sustainable and rational use of nature' through commodification is presented by capitalism and the neo-liberalising agenda as legitimately 'solving' environmental sustainability problems (Jacobs 1994). The economic valuing of drinking water supplies and the private control of drinking water provision services is an increasing example of capitalism's attempts to subsume essential parts of daily life into the web of accumulation (White 2002, p. 87). Under capitalism and neo-liberalism, water is being increasingly transformed into a commodity that is assessed for its 'exchange value' rather than its 'use value' in all parts of the globe.

The commodification of fresh drinking water has variously led to safe drinking water access being determined by the ability to pay rather than human and social need (Whelan & White 2005). When water is commodified and its control is put into private hands, issues of social inequality emerge. For example, since the privatisation in 1999 of water in Cape Town, South Africa, it is claimed that water cut-offs have increased sevenfold and over 100,000 households have had their water cut off, because they cannot afford water bills (Pauw 2003, p. 3).

The social consequences of such international neo-liberal policies have had significant effects on life at the local level. However, under such neo-liberal water provision arrangements, the provision of safe drinking water at a local level is fundamentally changed, in that access to water becomes less of a social right and more of a consumer right (Rothenberger, Truffer & Markard 2001). Subsequently, commentators, such as George (1999, p. 5), argue that such conditions are inherently problematic. This is because the 'common denominator of these institutions is their lack of transparency and accountability, in short the essence of neo-liberalism' has profound influences on the rights of citizens and their relationship to the environment. For instance, Beltran (2002, p. 45), a community activist in Bolivia, argues that 'the organising dominance of neo-liberalism as a discourse at the global level has important consequences for the distribution of drinking water at lower scales':

Economic instruments, privatisation and environmental evaluation ensure that priority is still given to economic goals and that they enable firms to make decisions that affect others on the basis of their own economic interests. (Beder 2001, p. 3.)

Advocates of neo-liberal water policy argue that private control increases management skills, technological resources, expertise and economic efficiency and subsequently takes the pressure off governments in providing basic resources such as water (Aharoni 1991; Barlow & Clarke 2003; Gleick 2002). But this often involves the abrogation of democratic governmental water responsibilities and assets and leads to less transparency for and consultation with the public. The underlying economic incentives of neo-liberal water policy through de-regulation, corporatisation and privatisation raise concerns about the effectiveness of private business in making a profit, while maintaining the sufficient protection of public health and maintaining public interest in the management of basic

resources. In Walkerton, Canada, for example, the deaths of seven consumers and the illnesses of thousands more resulting from the contamination of their town's drinking water supply has been directly attributed to the downsizing and deregulation of the town's water supply (Snider 2003, p. 27). As such, the management of Walkerton's drinking water supply was said to have been 'captured by neo-liberalism' (Snider 2003). Governments like those in Walkerton, Ontario, have unconditionally accepted a climate of de-regulation, fiscal competitiveness and private-sector participation as a solution to providing basic water services, which is to the extreme detriment of public health and safety.

There are similar developments in the management of drinking water in Australia (Whelan & White 2005; White 1998). For example, the Sydney Water Board responsible for the delivery of drinking water to over three million residents was corporatised in 1990 to become a subsidiary of the private water company, Suez, Lyonnaise des Eaux. Like privatisation, corporatisation, which involves the management of state agencies as for-profit institutions, involves selling water as a commodity, most often at the expense of public interest. As Vassilopoulos (1998b, p. 13) argues, the provision of drinking water in Sydney can be seen to have been seduced by fiscal de-regulation and the pursuit of economic competitiveness over social concerns:

When the Sydney Water Board was corporatised, thousands of jobs were lost. Household water prices went up from 65 cents a kilolitre in 1994 to over \$1 a kilolitre in 2000. Water bills for big business have dropped by an average of 45% in real terms since 1993. Operating costs have been cut by 25% in real terms since 1993.

In the case of water corporatisation or privatisation, the consumer will often 'lose out' on a number of fronts (White 1998, p. 216). In the instance of profit-driven control of a water

management facility, where the producer has 'the exclusive rights to commodity, there is less pressure on companies to provide a product that meets bare minimum quality and safety requirements'. White (2002, p. 90) argues that there will generally be three reasons for this that act against public interests such as health. These are: non-investment in new equipment or plant technology, reducing the overall labour force; cost cutting at the point of production will likely lead to poorer quality in the product, because, if a 'captive market exists', the impetus to improve the quality of the product is reduced; and prices for the supplied product may increase, in so far as pricing controls being driven by the company's profit considerations, rather than by the actual costs of production.

3.4.2 Social implications of neo-liberal water policy

The impact of capitalism and particularly neo-liberalism on the local management, control and provision of drinking water is a major concern of political economy theory. At global, national and local levels, neo-liberalism has continued to change the way that drinking water resources are being controlled and accessed. Neo-liberal water policy undermines public health through de-regulation of national water markets and through its influence on public decision-making at the local policy level. Neo-liberal water policy and capitalism have caused drinking water resources to be valued economically rather than socially (Barlow & Clarke 2003; Beltran 2002; Elliot 1998; Johnston 2003; Narrain 2000; Ravindran 2003; Snider 2003; Vassilopoulos 1998).

When essential water resources and services are valued more for exchange or market value than use, their value for human need becomes a secondary concern. Neo-liberal water policy is based on the treatment of drinking water as an economic and

tradeable good, which in practice ties its management and control to notions of economic efficiency and the pursuit of market revenue. The commodification and corporate control of drinking water introduces commercial imperatives, for example the need for profit into water service delivery. In order to make a profit, it is imperative that business keeps the money spent on labour, infrastructure and other expenses as low as possible (Robbins 2005). Neo-liberal water policy often affects the pricing of drinking water and other measures, such as full cost recovery, which remove responsibility for the provision and management of safe drinking water on to citizens through their ability to pay. The social realities of these policies most seriously affect lower socio-economic groups who have the least capacity to pay. Thus, social inequalities from the unequal distribution of wealth and capital often lead to low-income consumers only being able to 'receive fewer or poorer quality goods and services than people with disposable incomes' (White 2001, p. 91). The attribution of prices and values to essential needs under capitalist processes has implications for substantial social justice issues.

Given the current climate of capitalism and neo-liberalism that threatens the democratic management and control of environmental resources by regulatory regimes and compressing public interest, there is a need for inclusive and collaborative decision making in managing the natural environment. It is essential that 'the social and political basis of natural resource management goals is explicit' (Cortner & Moote 1999, p. 137). Importantly, this allows a degree of transparency and accountability in the current regulatory regimes that govern how resources are managed to both protect public health as well as appease competing interests. However, this form of regulation requires inclusive

and collaborative decision making about the environment, through holistic and integrated environmental management to ensure equitable access and quality to such resources.

Sociologically, then, it is important that questions are raised over the ability of the modern state to effectively balance both economic and social concerns in a climate of capitalist accumulation and neo-liberal policy. In the context of this study, it is important to understand how global neo-liberal and capitalist policies and processes underpin and influence how drinking water is managed, controlled, regulated and provided in Tasmania.

3.5 Chapter summary

This chapter introduces the key issues and theoretical perspectives in the study of drinking water and locates research in the wider sociological ‘sub discipline’ of environmental sociology. It outlines how theoretical perspectives of risk and political economy can be used to assist in interpreting issues associated with the management, regulation and provision of drinking water in Tasmania, and draws attention to the issues of power underpinning how governments make decisions about the control, regulation and management of drinking water and how ideological positions of neo-liberalism can affect how governments frame and define environmental risks like unsafe drinking water.

An overview of the key political and economic forces shaping the management, control and provision of drinking water resources has been presented. The chapter has discussed the commodification and de-regulation of drinking water that have detrimental effects on valuing and regulating drinking water at the local level. It assists in providing a theoretical basis for understanding the social processes and issues underpinning the governance of drinking water in Tasmania, including the main institutions that regulate and value water resources, and the philosophies behind their governance.

The next chapter outlines the methodological underpinnings of the study and the key methods used for data acquisition.

4 Studying drinking water in Tasmania

4.1 Introduction

This chapter outlines the methodological underpinnings of the study and the key methods used for data acquisition. The purpose of this research is to identify the major social issues and processes surrounding and impacting on the governance of safe and reliable drinking water in the state of Tasmania.

Considering that no previous sociological research on Tasmanian drinking water existed, important decisions were made about the most appropriate methodological strategies to effectively achieve the research aims. This chapter discusses the rationale and relevance of an interpretive qualitative approach to the sociological study of drinking water governance in Tasmania. It describes the processes of sample selection and participants, ethics and consent, methods of data collection and analysis, as well as issues associated with rigour and the practicalities of doing this research.

4.2 The research context

The research was conducted throughout the state of Tasmania. Tasmania is an island state south of the south-eastern corner of the Australian mainland. It is the smallest of Australia's six states and has diverse geographical, demographic and environmental characteristics.

Tasmania has a geographically dispersed population of approximately 500,000 people and many parts of the state are deemed rural and remote by national classification.¹⁰

¹⁰ At present over one third of Tasmania's total population (n=482,500) live in 'other rural' and 'remote areas' according to ARIA classification. These areas are distanced from Tasmania's two main population centres (Hobart the capital and Launceston the next largest population centre).

Tasmania was chosen as a site for this study for three reasons. First, Tasmania is the only state in Australia to regulate drinking water using mandatory microbiological water quality guidelines to protect public health. Second, Tasmania's fresh water resources account for 12 per cent of Australia's total fresh water resources, despite the state representing less than one per cent of the nation's total land area and supporting less than three per cent of Australia's population. Third, permanent water quality boil alerts are present in many parts of rural and remote Tasmanian communities.

4.3 The research framework

The sociological study of water governance and the issues involved in this process require understanding people and their social actions and beliefs. This focus suggested the need for the research to use a qualitative approach to data collection and analyses. Much has been written about qualitative research and the merits of its methods as opposed to quantitative approaches (Denzin & Lincoln 2000; Gergen & Gergen 2003; Patton 2002; Silverman 2001). This research fits within a qualitative and interpretive position associated with sociological works, such as those of Glasser and Strauss (1967), Berger and Luckman (1967) and Denzin and Lincoln (2000). Broadly, this type of research is best described as 'an interpretive, naturalistic approach to its subject matter' (Denzin & Lincoln 2000, p. 2) that allows its methods to be 'flexible, iterative and continuous, rather than locked in stone' (Babbie 1999, p. 268). While there is no exhaustive definition of what qualitative research is, a qualitative and interpretive approach allows 'an exploration of values, processes, experiences, language and meaning' (D'Cruz & Jones 2004, p. 60). A key task in interpretive research is seeking meaning in context, so that the focus of the research or the subject being investigated is set in its social and historical context. The reader can then see

how the current situation emerged. Its value in this study is that it allows an interpretation of meaning that is immersed in an individual's understanding or intellectual positions about drinking water governance and provision. The qualitative framework therefore allows me to engage with participants' configured meaning and interpretation in an institutional and political context. As Chapter 3 shows, these institutions inform and shape individuals' knowledge about, values and practices in the management of drinking water. In employing an interpretive framework, therefore, this research positions the meaning and interpretation of participants and 'elevates them to a central place' (Blaikie 1992, p. 173).

The participants selected for this study of water governance in Tasmania were recognised as professionals with knowledge of water provision, management and regulation. A qualitative approach allowed an understanding of how knowledge is 'constrained by and channelled through existing structures of economic and political power' (Hannigan 1995, p. 40). As Jankowski, Clark and Ivey (2000, p. 242) argue, this type of approach 'rests on the ontological assumption that reality or what can be known is constructed by persons as they interact within a social context'. It is based on 'the view that all knowledge and therefore all meaningful reality as such, are contingent upon human practices' (Crotty 1998, p. 42). As human actors we establish parameters for what is considered 'knowledge' and thus construct our notions of 'reality' around this knowledge (Berger & Luckmann 1966). It is this socially constructed knowledge that is of interest to this study.

The application of qualitative techniques, such as semi-structured interviewing, to this study of drinking water complements a social constructionist framework by allowing a holistic analysis of the issue. By focusing specifically on entities, responses, processes and

meanings presented by participants (Patton 2002) qualitative research helps us answer 'how' and 'what' questions about social reality (Fontana & Frey 2003) and 'provide a deeper understanding of social phenomena than would be obtained from purely quantitative data' (Silverman 2001, p. 32).

4.4 Primary data sources and collection

4.4.1 Semi-structured interviews

Semi-structured interviews were used as the primary data gathering technique in this study to complement the collation of a wide range of secondary sources. Although there are various styles of qualitative interviewing (Liamputtong & Ezzy 2005; May 1997; Neumann 1997; Patton 2002), semi-structured interviews were carried out in person. Semi-structured interviews were most appropriate to this study in order to 'elicit extensive and rich data' from participants about the social determinants and processes underlying the provision of safe drinking water. Semi-structured interviews facilitate in-depth understanding (Hansen 2006) and are preferred over structured interviews, because they 'permit greater flexibility than the close-ended type and permit a more valid response from the informant's perception of reality' (Burns 2000). This is largely due to allowing the interviewer 'more initiative' and 'more ability to respond to the perceptions and priorities of the respondent' (Alston & Bowles 1998, p. 118). Each interview was between 45 and 90 minutes, although in two cases around three hours was spent speaking with participants. The complexities of interviews as a qualitative method are explored by Wimpenny and Gass (2000) in the following statement:

Collecting research data by interview is by no means simple. Not only must researchers use dialogue for an inquisitive purpose, but they must also legitimise their questions, helping respondents to evaluate the place of the research and their part in it. (As cited in Price 2002, p. 273.)

While each of the study's participants were asked the same set of questions (see Appendix C), such as background regarding their employment experience, core responsibilities and position description, a less structured interview schedule allowed me to explore 'additional information' and ask questions that were not originally included in the interview schedule (Alston & Bowles 1998, p. 118). Considering the lack of sociological knowledge of drinking water in Tasmania, it was important to avoid asking questions that may have 'led' participants to particular responses. A central tenet of a social constructionist approach to data collection is to take a 'non-knowing stance' (Jankowski, Clark & Ivey 2000, p. 245). Commentators like Anderson and Goolishian (1992) assert that taking a non-knowing stance promotes greater dialogue and understanding through the asking of questions with genuine curiosity for that which is 'not known about that which has just been said' (as cited in Liamputtong & Ezzy 2005, p. 62). Consequently the interviews required me to be flexible and to 'keep quiet and listen actively' (Seidman, as cited in Liamputtong & Ezzy 2005, p. 59) in order for the meanings, interpretations and values constructed by participants around water governance to emerge. This approach to interviewing has been argued to be beneficial in the 'levelling of the researcher-participant's hierarchy such that understanding may more likely approach an egalitarian and collaborative process (Jankowski, Clark & Ivey 2000, p. 245). The effective use of methods such as semi-structured interviews can offer insight into the types of economic, political, social and

cultural factors that influence health and wellbeing, such as drinking water. For example, Baum (1995) argues that this kind of qualitative helps:

. . . gain an understanding of how communities and individuals within them interpret health and disease; and to study the interactions between the various players who are relevant to any given public health issue. (As cited in Liamputtong & Ezzy 2005, p. 5.)

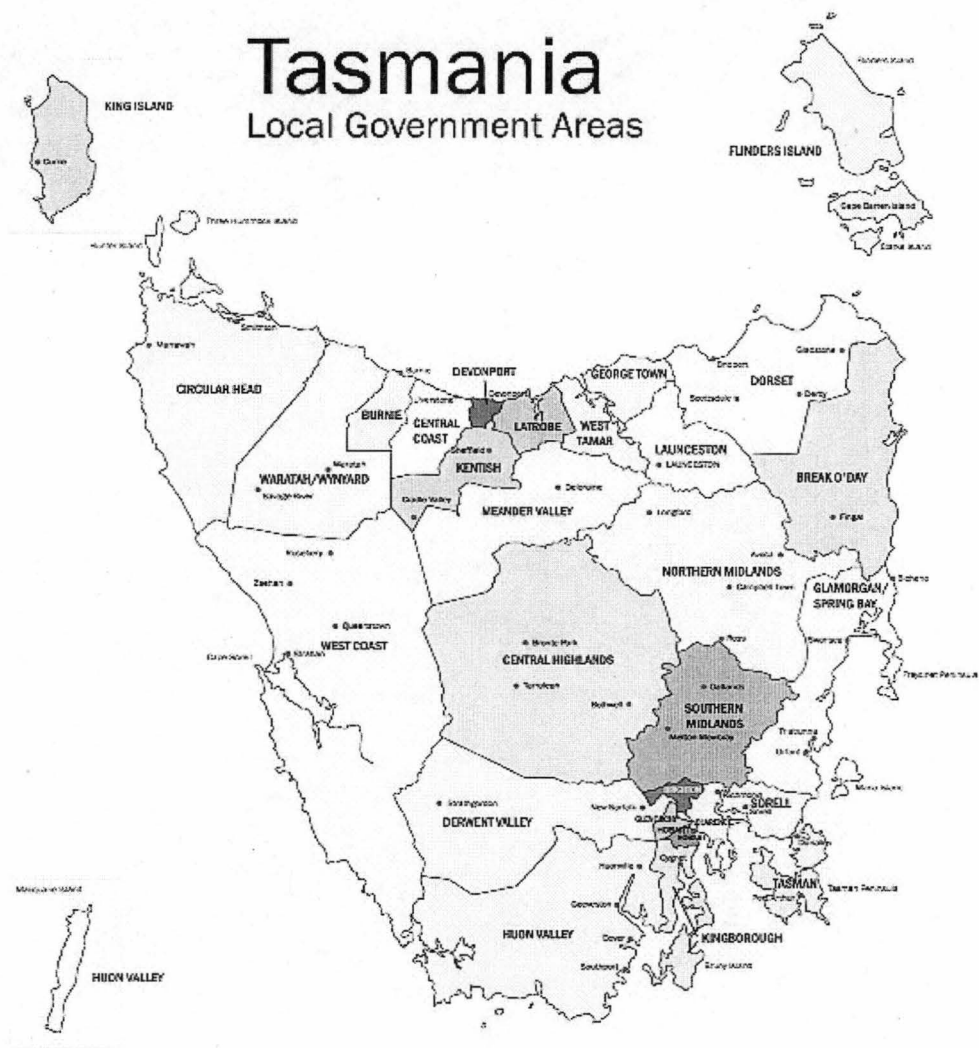
4.4.1.1 The interview sample

In order to study how drinking water is managed, provided and regulated in Tasmania, the interview sample needed to be purposive. Purposive sampling aims at identifying and including participants ‘that will provide a full and sophisticated understanding of the phenomena under study’ (Rice & Ezzy 1999, p. 42). The study sample involved participants drawn from across the state and from three groups directly involved in the control, monitoring or delivery of reticulated drinking water. The sample included representatives from all local government councils in Tasmania, representatives from each of the three bulk water authorities and the Department of Health and Human Services, the main regulator of drinking water and public health in Tasmania (see Appendix A). It was important that the sample included representatives from each of these groups so that similarities and differences in the ways in which drinking water governance was being interpreted, contested and constructed could emerge between these groups.

In establishing and justifying the sample for the interviews, it was discovered that different positions exist in local government structure under the banner of ‘responsibility’ for drinking water. The size and financial resources of a council strongly determines the levels of staffing and infrastructure involved in the everyday management of drinking water

in Tasmania. For example, some councils have designated environmental health officers for drinking water while other councils have smaller staff numbers that have a number of responsibilities within local government. It was therefore critical that I had a representative sample of similarly employed participants to maintain the reliability of my data. I decided that an ideal sample for this study should be managers of environmental and public health from each of the local government areas (see Figure 2) in Tasmania.

Figure 2: Map of Tasmanian local government areas by municipality



Source: Local Government Association of Tasmania (2006)

A total of 32 individuals participated in the study. Twenty-six of those were employees from each of the local governments in Tasmania. Two Chief Executive Officers (CEOs) and one Vice CEO of each of the state's water authorities were recruited and two participants were Department of Health and Human Services officials, each having immediate responsibilities under the *Public Health Act 1997*. This sample was chosen to enable the views of regulators, managers and providers of drinking water in Tasmania to be captured enabling the research questions to be addressed.

The local government municipalities of Flinders and King Island (see Figure 2) were excluded from the study for two reasons. First, because the research sample involved interviewing all participants in person, visiting these two islands would have involved flying at a significant expense, which could not be accommodated at the time of data collection. Second, both municipalities have very small, reticulated supplies that serve only a small percentage of the population; the remaining population collect their water supply in rain water tanks.

The selected sample was invited to participate in the study by mail. An 'information pack' detailing the aims and rationale for the research with an invitation to participate in the study were mailed to each of the 32 potential participants. After 14 days, the participants were telephoned individually. Six weeks from the initial mail-out, the proposed sample of 32 participants had all agreed to be part of the study.

4.4.1.2 Practicalities of conducting the interviews

The collection of data for the study took eight months from the initial recruitment of the participant sample to the completion of the 32 semi-structured interviews. To conduct the research, I travelled over 4000 kilometres to each of the local government municipalities in

Tasmania, as well as to the bulk water authorities in the North, North West and South of the state.

Data collection took longer than anticipated due to the physical disparity in the location of participants and the difficulties in securing adequate availability for interviewing in the schedules of the participant sample.

Although travelling to interview participants was demanding, interviewing participants in their place of employment was the most flexible means of meeting them, considering many of their work schedules and constraints. Visiting and interviewing participants in their place of employment also enabled me to take visual and written notes about the size of their organisation, as well as the geography and nature of their municipality and to see them at the 'front line' of daily water management and control. Encountering the difference in the scale of resources, infrastructure and technology among water providers assisted in understanding the issues and experiences of participants associated with the provision and management of drinking water at a local level.

4.4.1.3 Ethical considerations and participant consent

In accordance with the University of Tasmania Ethics Committee, before each interview, participants were informed about the aims of my research, the structure of the interview and the intention to record the interview using audio-tapes. Issues of protecting confidentiality were also discussed. Participants were provided with an Information Sheet as well as a Statement of Informed Consent, which they were asked to sign before the interview proceeded. Copies of these are provided in Appendix C.

The ethical obligation to protect participants by maintaining confidentiality is particularly important in qualitative research (Hansen 2006). This is especially pertinent in

Tasmania, where low population numbers in some parts of the state make the protection of participant identity and confidentiality difficult. In this study, all participant information was treated as 'sensitive records' (Price 2002, p. 273). So in audio-tape and notebook entries every effort was made to record and transcribe trustworthy verbal and non-verbal details that protected the identity of participants.

4.4.1.4 Recording and transcribing the interviews

The process of conducting 32 interviews over a period of months emphasised the critical nature of having an 'authentic record' of each conversation. All the interviews were subsequently audio-taped with the informed consent of each participant. According to Silverman (2001, p. 13) audio recordings are an 'increasingly important' part of qualitative research. Taping the interviews could record naturally occurring interaction between the researcher and the participants, providing a 'level of detail and accuracy not obtainable from memory or by taking notes' (Liamputtong & Ezzy 2005, p. 67). The audio-recordings were integral in capturing the 'technical' language participants used when describing and explaining the processes of water management and provision. A practical advantage of audio-recording allowed me to concentrate on what was being said rather than the written recording of dialogue. It also facilitated the natural flow of conversation and allowed me to use prompts more effectively, as well as to explore new themes that arose. The result of these described strategies was an accurate record of specialised and expert understandings and interpretations of water management practices in Tasmania.

The audio-recordings, however, could not become text for analysis until it was transcribed. All of the interviews were transcribed verbatim. Various strategies were employed to reflect the nuances of conversation. The following convention ciphers were

used to transcribe the interviews and are used in the presentation of interview data in the coming chapters.

----	a pause in the conversation
....	material edited out
[]	explanatory information inserted
JJW	Researcher (Jessica J Whelan)
WA	Water Authority Employee
C	Local Government Council Employee
SG	State Government Employee

Transcription also involved techniques to further protect the anonymity of participants in the interviews. As well as the use of pseudonyms, participants' statements that revealed their identity, place of employment or other identifiable features were omitted from the study's findings and specifically in the presentation of interview extracts and verbatim quotes.

4.5 Analysis of primary interview data

The data collection methods used in this study produced an abundance of transcripts, secondary data and reflexive notes for analysis. The challenges of analysing qualitative data are well documented (Alston & Bowles 1998; Hansen 2006; Liangputtong & Ezzy 2005; Patton 2002; Silverman 2001). The described absence of clearly developed 'formulas' or rules for how data should be analysed (Hansen 2006) can impede the progress of research, but can allow researchers greater flexibility in how they approach the analysis of qualitative data. This study utilised iterative thematic analysis as the key method to interpret the interview data.

4.5.1 Thematic analysis.

Iterative thematic analysis has been identified as a major part of interpretive sociological tradition (Hansen 2006, p. 139). Iterative thematic analysis involves the identification of themes or recurring or intersecting patterns in interview data. The process is described as iterative or inductive because it involves the 'building up of concepts and theories' (Liamputtong & Ezzy 2005, p. 336) stemming from the process of reading the data. This form of inductive research seeks to establish patterns, consistencies and meanings that suggest relationships between themes, rather than the corroboration and falsification of theory (Gray 2004). The identification of themes allows the researcher to re-focus or adapt research questions to reflect the generalised findings of the analysis.

4.5.1.1 Coding procedures

Coding is the process by which sections of qualitative data are analysed by organising and sorting the data into groups or segments. Codes or labels are then applied to these groups to identify intersecting and consistent themes and processes in the data (Liamputtong & Ezzy 2005).

In taking an inductive approach to data analysis all interview transcripts were coded and recorded using labels. There were 18 codes created in the analytical and coding process.

The process of developing codes and organising the data thematically first required immersion in the reading and re-reading of the interview transcripts. 'Open coding' then took place, whereby statements, patterns and text of interest were noted.¹¹ These texts were then extracted from the transcripts and stored in code 'clusters' or groups that were

¹¹ Text refers to specific sections of written interview transcripts.

assigned a category name. The process of open coding also demonstrated the interconnection of many categories or themes. Whenever this occurred, the coded sections were re-examined to inform decisions about where they fitted or should be placed, which facilitated a deeper level of analysis than just coding 'surface' themes. Alston and Bowles (1998, p. 200) argue that the important function of open coding is 'to help the researchers to move quickly to an analytical level by "fracturing" the data' so that the process of analysis can begin. Open coding allowed movement between categories so that thematic connections emerged. In turn this revealed the meanings of participants to be presented in an objective way and decreased the likelihood that data would be forced into predefined categories (Jankowski, Clark & Ivey 2000).

Once the data had been coded and analysed the categories were organised into themes. An example of the process is provided below.

Table 3: Coding used in the analysis of interview data

Code Clusters	Categories	Themes
Value	Economic management	Power
Pricing/Exchange	Commodification	Commercialisation
Use monitoring	Neo-liberalism	Responsibility
Water meters	Corporatisation	Social equity
Industry water use	Full cost recovery	Water quantity
Water catchments	Scarcity	
Drought/Supply	Rurality	
Consumer accountability	Efficiency and viability	
Economic resourcing		
Water testing	Risk definition and assessment	Water quality
Acceptable quality	Risk contestation	Risk
Legislative responsibility	Institutional judgment	Regulation
Consumer/community perceptions	Expert and lay knowledge	Power
Water safety/levels	Liability and responsibility	Public health
Rural provision	Consumer health and responsibility	
Urban provision	Rurality	
Shifting of responsibility	Resourcing constraints	
	Bureaucracy	
	Neo-liberalism	

After organising data into categories and themes, supporting quotes were used to exemplify the context of each theme and its relevance to the governance of drinking water in Tasmania. This further enabled a deeper analysis of the data by facilitating the theorisation of drinking water governance in Tasmania into two main findings: water quality and quantity. These findings are discussed in chapters five and six.

4.6 Secondary data sources

To achieve the study's research aims and objectives required the compilation and use of secondary sources to assist in the contextualisation of interview data. The collation and analysis of diverse sources on drinking water facilitated insight and greater understanding of the broad issues and debates surrounding drinking water. Legislative documents, health policies, environmental action group websites as well as the analysis of international, national and local environmental and water policy from a variety of disciplines, apart from sociology, provided a political, economic and cultural basis from which to interpret and analyse the issues and processes surrounding the many dimensions of drinking water governance in Tasmania. These secondary sources also allowed me to understand cross cultural comparisons of drinking water management which facilitated an understanding of country-specific conditions which contribute to social and political debate about fresh drinking water. The use of secondary data sources in this thesis is intended to complement the interview data enabling the thesis to present a wide range of ideas, information and dimensions relating to drinking water provision to be presented. The secondary sources included in the secondary data analysis are detailed below. These sources were analysed using an inductive thematic approach (Silverman 2001). This involved reading and coding each of the sources and synthesising them into summaries. Each of these sources were then

used to inform the primary data and to contextualise the study of Tasmanian drinking water within a national and international context.

Table 4: Secondary sources

Source	Issue/Document of interest
National Health and Medical Research Council	Australian Drinking Water Guidelines
<i>Public Health Act Tasmania 1997</i>	Tasmanian Drinking Water Quality Guidelines
The Australian Government Water Fund	
Water Smart Australia	
Australian Productivity Commission (2000)	Arrangements for Setting Drinking Water Standards
State of the Environment Advisory Council Australia	Annual reports
World Meteorological Organisation and United Nations Environment Programme	<i>Report on the intergovernmental panel on climate change</i>
Australian Academy of Technological Sciences and Engineering	Report on water and the economy
CSIRO Australia	<i>Report on the economics of water: first use, reuse and return to the environment</i>
Tasmanian Department of Primary Industries, Water and the Environment	Annual reports and websites Tasmanian river monitoring and quality reports
Expert Panel on Safe Drinking Water for First Nations (2006)	Report
Government Prices Oversight Commission (2003)	Report on urban water pricing: <i>Principles for efficient water pricing</i>
New South Wales Premier's Department (1998)	P McClellan QC, Sydney Water Inquiry – Second Interim Report
Drinking Water and Corporate Structure Act, New South Wales (1998)	Sydney Water Legislation Amendment
Water Services Association of Australia (2000)	The Australian Urban Water Industry: Report and WSAA facts
Melbourne Water Corporation 1999/2000	Public Health Report
Water Services Association of Australia	Report: Water Reform and the Urban Sector
Council of Australian Government (COAG) (1999)	High Level Steering Group on Water: Report to COAG on progress in implementation of COAG Water Reform Framework, Occasional paper, no. 1
Productivity Commission	Performance Benchmarking Report (1991/2–1996/7)
Productivity Commission (2000)	Arrangements for Setting Drinking Water Standards, international benchmarking report
Productivity Commission (2000)	T Fisher, Water lessons from Australia's first

	practical experiment in integrated microeconomic and environmental reform
Productivity Commission (1999)	Impact of Competition Reforms on Rural and Regional Australia
Australian Commonwealth Government (2000)	A national action plan for salinity and water quality in Australia
Water and River Commission (2000)	Report of the scientific panel on interim ecological water requirements
Environmental Protection Authority (1999)	Report on the draft interim allocation plan
National Research Council (1999)	Identifying Future Drinking Water Contaminants, National Academy Press
Department of Resources and energy (2000)	Water 2000: A perspective on Australia's water resources to the year 2000
US Environmental Protection Agency (2006)	Drinking water facts sheets
Health Canada	Guidelines for Canadian Drinking Water
United States Safe Drinking Water Act	Drinking Water Legislation
Cooperative Research Centre for Water Quality and Treatment (2005)	Information for water consumers: Facts and information
Australian Bureau of Statistics (2006)	Water Account 2004-2005
National Health and Medical Research Council (2004)	Water made clear: A guide to drinking water
Australian Commonwealth Government	National Land and Water Resources Audit (2005)
Resource Planning and Development Commission Tasmania (2006)	State of the Environment Tasmania: Tasmanian drinking water catchments and known water intakes
Council of Australian Governments (1992)	The Hilmer inquiry report
Tasmanian Department of Treasury and Finance (2005)	National Competition Policy progress report
Cooperative Research Centre for Water Quality and Treatment (2002)	Key corporatised water arrangements by Australian States and Territories
World Health Organisation (2005)	Paper: Drinking water and human health –
World Health Organisation (2003)	Guidelines for drinking water quality
Oz Water Policy (2006)	Water Resources and Use in Australia
Global Environmental Outlook (2002)	Fresh Water: State of the environment and policy retrospective 1972–2002
Global Water Partnership Technical Advisory Committee (2000)	Integrated resource management background paper

4.7 Achieving research rigour: key methodological issues

The nature of qualitative research demands different ways of judging the quality of research compared with other approaches to research, such as positivist quantitative methods.

Qualitative researchers prefer 'rigour' to the terms validity and reliability; it refers to research being 'trustworthy' by offering a 'systematic, plausible and coherent explanation of the phenomena under study' that could be trusted by other researchers (Mays & Pope 1995, p. 1). The use of verbatim quotes is one of the main ways to reinforce the rigour of qualitative analysis 'by providing a clearer sense of the evidence on which the analysis is based' (Liamputtong & Ezzy 2005, p. 39). Guba and Lincoln (1994) have developed criteria for establishing and maintaining rigour that have been applied in this study. These include the notions of credibility, dependability and reflexivity, which will be discussed below.

4.7.1 Credibility

Issues of credibility are frequently of concern to 'good' qualitative research practice (Denzin & Lincoln 2000; Patton 2002; Silverman 2001). Liamputtong and Ezzy (2005, p. 334) maintain that credibility criteria involve establishing that the results of qualitative research are believable from the perspectives of the participants in the research. The term credibility is often used interchangeably with 'authenticity', meaning to 'give a fair, honest and balanced account of social life from the viewpoint of the people being studied' (Neumann & Kreuger 1997, p. 184). Ideas of credibility and transferability, then, centre on the impact of researchers' ideas, assumptions, values and place in the research setting and the authentic representation of participants' accounts (Jankowski, Clark & Ivey 2000; Silverman 2001). A principle way of establishing credibility in the analysis of qualitative interviews is to provide tangible accounts of the research context and perspectives of participants, so that the reader can judge how interpretations of the data have been arrived at. This study has used a basic strategy to achieve credibility by using primary data in the

form of direct quotes from participants that demonstrate their perceptions and interpretations through the complexity and uniqueness of their own language and expression.

4.7.3 Dependability

Dependability is also an important aspect of maintaining rigour in qualitative research. It is defined as ‘whether a particular technique applied repeatedly to the same object, would yield a similar result each time’ (Babbie 1999, p. 110). Maintaining dependability is concerned with the replicability of the research process and its outcomes, or the consistency of findings over time with similar investigation (D’Cruz & Jones 2004). Achieving dependability in qualitative research emphasises the need ‘for the researcher to account for the ever-changing context within which the research occurs’ (Trochim 2006, p. 1).

In this study of drinking water in Tasmania it is important to acknowledge the changing political climate of drinking water management and regulation. Since this study’s interviews were conducted, there have been a number of public controversies about the quality and management of drinking water resources in the state, particularly in the media. These events have drawn attention to the practices and regimes of many of the participants and their institutions. The growing public contention over drinking water may therefore have implications for the replicability of this study for other researchers wishing to conduct similar research. In particular, contention over the practices and philosophies of both water providers and regulators since this time may impact on the depth and disclosure of the same participants in similar research. However, it is important to acknowledge that the inherent nature of qualitative research is concerned both with the ways managers and providers

interpret and conceptualise issues about drinking water governance, such as risk and public health, as well as with their institutional actions.

4.7.4 Reflexivity

According to Alston and Bowles (1998, p. 578), among ‘the prime innovations in qualitative methodology’ is an increasing emphasis on reflexivity. The importance of reflexivity to rigour is based on ‘the assumption that researchers are active constructors of knowledge as opposed to passive, objective processors of information’ (Jankowski, Clark & Ivey 2000, p. 243). As such, qualitative researchers are not separate from the social world they study, but immediately implicated in the research process (Denzin and Lincoln 2000). The challenge for qualitative researchers is the realisation that researcher, method and data are interdependent and interconnected (Mauthner & Doucet 2003). It follows that the achievement of reflexivity centres on the researcher having an honest and ‘explicit, self aware analysis of their own role’ (Finlay 2002, p. 531). As Fook (1999, p. 15) asserts:

Reflexivity is about recognising and celebrating the use of the subjective in research. It acknowledges the researcher is unavoidably located politically, culturally and socially and that his/her experiences and perceptions are mediated through the lens of their own body, biography and changing context.

The demonstration and achievement of reflexivity also serves to increase the credibility of research in that it helps show the journey of the researcher, the ways the research was carried out and the issues that underpinned how they arrived at the interpretations that they did (Koch 1998).

A key reflexive practice undertaken in this study was the use of a research diary, a practice Koch and Harrington (1998, p. 1184) claim to be 'an essential part of interpretive research'. The diary assisted in maintaining a reflexive position, when used to document and reflect on contextual issues, difficulties and thoughts that arose during data collection and analysis. It was also a way of documenting changes, such as media coverage and public debate, in water governance in Tasmania and how these issues were having an impact on my own interpretations and perceptions of water governance. Patton (2002, p. 434) argues that memos of this kind can be an integral part of 'qualitative fieldwork *and* the beginnings of qualitative analysis' by helping researchers 'to help think about their findings', 'keep track' of their thoughts and by 'recording and tracking analytical insights that occur during data collection' (Alston & Bowles 1998, p. 198). For example, memos from the earliest of my interviews with two participants working in more remote parts of Tasmania noted:

Prevalence of permanent boil alerts . . . Is this safe quality water?

Need to check if rural councils get help/extra funding for water . . . do they pay for it all themselves?

These types of observation and notes recorded in my research diary helped me to contextualise the meanings and interpretations of many participants in the analysis of interviews. Insights from my research diary on interviews were often noted on the top of the interview transcripts as a contextualisation of each interview and the issues that may have been raised as either the interviewer or researcher. Given that the collection of interview data spanned over six months, the research diary was an important tool that allowed me to 'check' details, issues and thoughts during coding and writing.

4.8 Chapter summary

The purpose of this research is to examine the issues surrounding the governance of drinking water in Tasmania and to understand how managers and providers of drinking water interpret these processes. This required both primary data sources and also secondary data sources in which to amass a wide range of ideas and information relating to the many dimensions relating to drinking water governance.

This chapter has outlined the rationale and relevance of an interpretive qualitative approach (interviews) to the sociological study of drinking water and the meanings, interpretations and values of participants working at the forefront of drinking water governance in Tasmania. It has described the processes of sample selection of participants, ethics and consent, methods of data collection and analysis. How issues of rigour were addressed and maintained has been outlined and demonstrated by discussions of credibility, transferability, dependability and reflexivity. It has also shown how the collation and analysis of secondary data sources such as policy and legislative documents was essential to understanding the social and political context of drinking water governance in Tasmania.

The following chapters will answer the research questions by presenting and discussing how drinking water managers and providers interpret issues surrounding the governance of fresh drinking water resources. Drawing on the themes gathered in the analysis, the chapters will discuss the main ways participants conceptualise drinking water, the contentions and debates about governance, and how these interpretations influence the daily management and provision of this resource.

5 Tasmanian drinking water governance: key issues, processes and interpretations

5.1 Introduction

This chapter presents the empirical findings of the study and examines how managers, providers and regulators understand and construct issues associated with the governance of drinking water in Tasmania. In keeping with the interpretative tradition of qualitative research, the chapter presents verbatim the way managers and providers of drinking water speak about governance, which reveals major conditions, processes and issues underpinning the governance of drinking water in Tasmania.

Besides drawing attention to different local and institutional contexts in which drinking water is being managed and provided in Tasmania, this chapter shows how drinking water is actively constructed, negotiated and contested amongst managers, providers and regulators. Specifically, the chapter describes the different ways in which participants interpret drinking water regulation particularly how government regulators institutionally define, negotiate and frame drinking water safety and risk. It also points to the main barriers underpinning the management and provision of safe and plentiful drinking water in parts of Tasmania and shows that limited capital resources are constraining local government municipal councils' ability to manage and provide safe and reliable drinking water supplies to communities. The centralised and corporate control of drinking water in Tasmania is being debated by managers and providers to determine the ideal model for the provision of essential drinking water resources in this state.

The themes that emerged from the qualitative analysis of the interview findings give structure to the chapter, which aims to describe what managers, providers and regulators said about drinking water and in what context. The *next* chapter will interpret these findings and will discuss in depth what these findings mean for sociological theory and how they assist in answering the research questions of this study.

5.2 Tasmanian drinking water: policy, practices and problems

In Tasmania there are multifarious issues affecting the governance of safe drinking water. These processes of governance are understood and interpreted differently by those responsible for regulation, management and provision in Tasmania. The next section will explore the key themes associated with drinking water governance in Tasmania and will draw attention to the different social and political contexts through which issues associated with governance are negotiated, constructed and contested.

5.2.1 Regulatory Roles and Responsibilities

A starting point for all the interviews in this study was how participants interpreted their roles in the management and provision of drinking water. The interviews revealed that the management and provision of drinking water, particularly for those working in local government was seen to be a complicated task that often raised a number of issues for participants. The following comment by a local government public health manager points to some of the general complexities of drinking water provision, management and regulation:

C2: *There is so much to my role and the whole water thing, it is fairly complicated when you consider all the things involved like where you are going to get the water from, where you are going to store it, treat it, test it, reticulate it and monitor it and then there's how you are going to pay for all that and who is going to do it, is a big deal for all councils in this state...*

Throughout the interviews, participants actively acknowledged that the provision and management of drinking water was a significant public health issue. While the practical complexities of managing and providing drinking water were acknowledged such as water treatment and reticulation, participants mostly spoke about their roles and responsibilities in regards to meeting regulatory quality standards and in the protection of public health. The following comment from one local government employee demonstrates how regulatory responsibility is seen to be the most prominent part of this role:

C22: *...Yeah it is always interesting when you have to explain what you do...with drinking water there is certainly a lot to think about, but my main responsibility is to make sure that the water being reticulated here meets our State quality guidelines and that will always be my main priority...*

The issue of drinking water quality regulation and regulatory responsibility emerged as the key way in which participants spoke about and interpreted issues with drinking water governance in Tasmania. Central to drinking water governance in Tasmania is the regulation of drinking water quality through public health policy. In 1997 the *Public Health Act* Drinking Water Quality Guidelines were introduced in Tasmania¹² The main aim of the Act is to 'protect public health and establish best practice frameworks for drinking water quality improvement' (Department of Health and Human Services 2005, p. 4). All reticulated drinking water suppliers must meet the requirements of the *Public Health Act*

¹² See Chapter 2 for a full review of this legislation.

1997 Drinking Water Quality Guidelines to ensure that water is safe to be consumed. In spite of these regulations, the provision of a safe and clean drinking water supply that meets regulatory quality standards is seen to be problematic for many water providers and managers in Tasmania.

C11:I'm not sure if you saw that recent article in the [local newspaper] but the journalist described water supplies in country areas like this as 'third world' and that sounds terrible because people think how can that be right, we live in Tasmania. The truth is, and I probably shouldn't be saying this, is that the comment is actually spot on, it is third world here in some places, the water is terrible, you can't and wouldn't drink it....

Participants from other Tasmanian municipalities (n=13) noted that there were problems with how drinking water was being managed and responded to different parts of the state that was not being reflected in the current regulation. As one local government manager commented:

C12: I think there is a real danger in this State with saying that our water quality is well regulated and protect by public health legislation of whatever you want to call it, in reality it might be regulated but that doesn't mean we haven't been seeing bigger larger and really critical issues with our supply that just aren't getting addressed in the regulation that is affecting the quality of our water hugely...

In other cases, participants working within particular municipalities noted that basic stages for managing safe drinking water such as source water protection and adequate water supply infrastructure was not only minimal but in some cases non-existent and that this was

not being captured by the regulatory prescriptions of the *Public Health Act* (1997) Drinking Water Quality Guidelines.

There is wide recognition amongst commentators that the quality and safety of drinking water is dependent on a number of influences (Hrudey and Hrudey 2004). The international *Report of the Expert Panel on Safe Drinking Water for First Nations* (2006) along with others (Boyd 2003; Hrudey & Hrudey 2004) identify a number of stages or elements that, if integrated into regulatory and management practices, can reduce the risks of unsafe drinking water. These stages include the protection of drinking water catchments and source water, comprehensive testing, the adequate treatment of drinking water, safe distribution systems, adequate legislative and policy frameworks and increased public awareness and involvement in the governance of drinking water resources.

In Tasmania, most water suppliers are not only experiencing considerable difficulties in achieving many of these stages of effective drinking water governance. Simultaneously, areas such as the protection of source water and catchments are not mandated under the current *Public Health Act* (1997) regulation which is a cause of considerable concern and debate amongst managers and providers of drinking water in Tasmania.

5.2.1 Institutional judgements of risk and safety: problems, processes and politics

The regulation of drinking water in Tasmania and the ways in which this translates to everyday management and provision is an issue causing a significant level of debate, dissent and division amongst drinking water managers and providers and government regulators.

Of particular focus within the interviews, were the concerns and anxieties that existed amongst managers and providers over a lack of regulation surrounding the protection of drinking water catchments. The following comment from one water authority employee highlights why he believed that the regulation of drinking water should include the protection of source water:

C1: *....You know I think the biggest risk we have here at the moment is a lack of knowledge on what's actually going on in our catchments....we have no real jurisdiction over forestry or farming and their practices in catchments.that's unquestionably the biggest risk for me from a public health point of view.*

For other local government managers concern about source water protection was also clearly evident. The following comment by local government employee within a larger Tasmanian council suggests that without the adequate protection of drinking water sources and catchment areas, the regulation at present does not represent a comprehensive approach to minimising risk and protecting public health:

C11: *If we are going to be serious about delivering quality drinking water to communities than the government needs to reflect this in their legislation--- it's not just about testing what comes out of the tap at the end of the line is about limiting the risk of water being corrupted in the natural environment-- -- and that ultimately involves a level of control of what's happening to your source water...*

The protection of drinking water sources is recognised internationally as key process in guarding consumers from contaminants that can be harmful (Boyd 2003; Hrudey & Hrudey

2004; Pontius 2003). The impetus for protecting drinking water catchments and drinking water sources is that human activities in these areas have the potential to pollute water through changes in land use and the discharge of materials into the environment. Water is a primary conveyance for pollutants in the landscape, so that many substances have the capacity to enter surface and groundwater, which can result in changes to the physical, chemical and biological quality of drinking water. These changes can compromise the safety of drinking water. The contamination of Walkerton's drinking water supply in 2000 highlighted the importance of protecting drinking water sources, when flooding in the region resulted in contamination of the town's water supply with the E. coli bacteria from a nearby livestock farm. The failure to alert public health officials and consumers to the contamination led to the deaths of seven consumers and the illnesses of hundreds more (Boyd 2003; Hrudey & Hrudey 2004; Ontario Ministry of the Attorney General 2002; Snider 2003, 2004). The events in Walkerton highlighted the risks posed by the inadequate monitoring of drinking water source water and the need for comprehensive testing of drinking water for contaminants. Within Tasmania, some participants (n=9) believed that a lack of catchment regulation and monitoring in Tasmania made it difficult to know what was the actual state of drinking water catchments were and therefore to know what risks were being posed to drinking water:

C30: *I think you only have to look at other parts of the world to see that we are not doing enough here in Tasmania to protect catchments, at least if you knew what was happening in your municipality it would be better but we don't, like a while back I wanted to know what one particular industry was doing because you know they were putting in this plantation near one of our river intakes and I was told that I wasn't legally entitled to that*

information---and even if that is true or whatever according to the law because it was private property it was still potentially a risk you know....

The absence of drinking water catchment management and monitoring in Tasmania continues to raise significant public health concerns over the safety and risk associated with Tasmanian drinking water sources. Simultaneously, other parts of drinking water regulation in Tasmania also raised considerable debate and concern amongst participants. Over half of all managers and providers (n=17) criticised the institutional decision of governmental regulators in Tasmania to assess quality and safety based only on microbiological testing. The following quote from local government manager with thirty years experience in environmental health exemplifies concerns with testing:

C8: *....How on earth the government decided that you could judge water quality on just micro [biological] testing is beyond me...you know to be entirely truthful it infuriates me and it just reinforces our beliefs in local government that these guys [state government regulators] don't really know what they are doing with water....*

Such statements point to significant dissent between managers and providers and government regulators in Tasmania about how drinking water should be regulated. Specifically, participants' criticism of the regulation centred on differences in how individuals felt that drinking water risk should be defined and responded to within the context of government decision making and ultimately regulatory frameworks. In most cases, the use of microbiological testing and the use of guidelines values to determine and judge the safety of drinking water supplies were constructed as persistently problematic amongst participants in their interpretations of the *Public Health Act* (1997) regulation.

In Tasmania the *Public Health Act 1997* Drinking Water Guidelines (s. 128, rr. 7.1–11.3) legally require all water suppliers to frequently sample and test drinking water for *E. coli* (*Escherichia coli*), which are a type of ‘faecal coliform’, or bacteria, commonly found in the intestines of animals and humans. The presence of *E. coli* in water is a strong indication of recent sewage or animal waste contamination. During rainfall or other types of precipitation, *E. coli* may be washed into drinking water sources, such as creeks, rivers, streams, lakes, or groundwater. If these sources are not adequately treated *E. coli* can end up in drinking water supplies. Particular strains of waterborne *E. coli* produce powerful toxins that can cause severe gastrointestinal illness, particularly in consumers who may already be immuno-compromised. Besides the Walkerton incident, in other parts of the world microbiological contaminants, apart from *E. coli*, in contaminated drinking water have been attributed to fatalities and illnesses (Hrudey & Hrudey 2004).

While participants were cognisant of the potential detrimental impacts of *E. Coli* contamination on consumers, many (n=19) felt that just testing was not enough to adequately eliminate risk and also to protect consumers and that a comprehensive approach to drinking water management was needed in the existing regulation in order to minimise risks associated with drinking water. A reliance mainly or solely on drinking water quality monitoring has proven ineffective in preventing waterborne disease outbreaks in many parts of the world (Hrudey & Hrudey 2004; Report on the Expert Panel on Safe Drinking Water for First Nations 2006).

The following comments from one water authority employee exemplify some of the key issues and concerns amongst participants with the use of testing as a key process in Tasmania. It indicates that compliance with the regulatory demands of the *Public Health*

Act does not necessarily mean that participants perceived the quality of drinking water in their municipality to be safe or well protected:

P1: *Some people in this state, including the Director of Public Health, will tell you that water quality in Tasmania is regulated....well we actually believe that they don't even understand their own regulation because in the rest of Australia water quality is judged on a whole range of things for it to be effective ---- What the Public Health Act 1997 does is focus just on only one parameter of contamination ---- by testing for E. coli....effectively regulating drinking water is not just about saying well let's test for this and then the consumers are protected, water quality is far more complicated than the regulation in this state implies ---- and that concerns a lot of people in this industry....*

For other participants working in local government, similar anxieties existed around whether microbiological testing alone was enough to protect public health. The following extract from a water authority employee pointed to some further issues with process of water sampling and testing:

WA 3: *....Managing water should not be about prescriptive numbers---the problem with numbers is that we tend to get the numbers too late. If you do microbiological tests at the very least it will be 2-3 days, at the very least 24 hours before you know there's something wrong. People have always certainly drunk the water before you know the answer, so it's too late and your population is exposed. Tests are a good measure of how you are performing but it's an instantaneous view of a more complicated issue.*

Continuing concerns existed over the use of testing as a way of judging the safety and quality of drinking water. For one water authority manager, the use of numerical standards

to judge the safety of drinking water was seen to be a 'simplistic approach' to drinking water regulation;

WA2: I guess what is significant in looking at our legal obligations to provide drinking water is that regulators like standards because they can assess them and judge them and that's a useful tool for them---- however we know that water is dependent upon a whole raft of factors and risks and I think that the right direction for this is an integrated - understand your system first and make sure you know where your risks are so you can deal with them...

JJW: So how would you go about doing that?

WA2: Well, we need to get the government moving away from verification that water providers here are complying with their numbers and get them to move to the risk based approach of putting multi-barriers in place now and into the future....you need to know where your risks are and that your treatment and things are appropriate to deal with them and there's a whole big picture there, ---- and that's something a tests result can't tell you.

Such comments suggest that some managers and providers see the current regulatory requirements as insufficient in their approach to the protection of public health and that differences exist in how participants interpreted and thought about drinking water as a public health issue.

A limited focus on other microbiological contaminants in the Tasmanian Drinking Water Quality Guidelines was also of concern to local managers and providers. Participants (n=11) reported concern with the fact that Tasmanian drinking water is not currently tested for other harmful microbiological contaminants such as *Giardia* and *Cryptosporidium*, contaminants responsible for outbreaks and public health problems in other nations, for

example in the USA, Japan, Canada and Australia. A local government council water manager expressed his concern about the possibility of other contaminants in drinking water supply:

C19:*Can I make it clear that I don't think that it is possible to test for every possible contaminant that might be in drinking water, but I will say that there are other 'nasties' out there that have serious repercussions for consumer health that we don't take into account in this state. Take 'Crypto' [Cryptosporidium] for instance, I have talked to people in the health department about the fact that we should be looking at this issue and all they could say was that it was far too financially and resource intensive to start testing for it ---- I felt like saying well you tell those poor buggers in the States or wherever that have had it in their bloody tap water.*

Criticisms regarding the regulation of drinking water in Tasmania ultimately concerned how participants interpreted and understood risk. Across the interviews the main point of contention and debate between managers and providers over the regulation centred on criticising how Tasmanian state government public health officials had institutionally defined drinking water risk. In most cases, participants interpreted the current regulation to be 'lacking comprehensiveness' (c28) in how risk was being judged, monitored and responded to. Ultimately this led to participants questioning the merit of state government regulators approach to the overall protection of public health.

How the Tasmanian government decides what is risk, and how it should be regulated is fundamentally concerned with the social process of risk construction. Specifically, managers and providers questioned the processes through which the government was making decisions about what constituted drinking water risk (Hannigan

2006). The governmental decision to ignore other areas of risk in the management of drinking water for example the monitoring and regulation of source water was interpreted by participants as the government engaging in a 'narrow approach' (c22) to public health. In response, the following comments by one state government official provide insight into how the Tasmanian state government make regulatory decisions about drinking water and risk:

P2: I think it's important when we are talking about the regulation to recognise that microbiological contamination represents some of the greatest waterborne threats to human health---.So given that's exceptionally important that we are able to be aware of these contaminants and establish how much is harmful or not in a community's water supply---

JJW: So am I right in saying that you regulate quality by testing for what you see as the greatest risks?

P2: ----yeah exactly--- people forget that you can't possibly test for everything that could possibly be in a water supply, water will never be entirely risk free--- you need to focus on what represents the greatest risk to consumers and then go from there, and we do that through micro [biological] testing.

Deciding what constitutes the greatest threat to human health from drinking water supplies and therefore what is the 'most risky' (Hannigan 2006) is seen to be contradictory among managers and providers of drinking water in Tasmania. The process by which the Tasmanian government regulates drinking water safety is therefore a significant point of contention that has led managers and providers to question and challenge the practices and decision making of how Tasmanian government regulators institutionally construct issues of risk and safety. Even though governments are primarily charged with responsibility for

the identification and regulation of environmental and public health risks, the decisions and judgements about them have become highly contested (Carson 1991; Irwin 2001; Mehta 2001; Mythen 2004; White 2005). At the core of these debates is the process by which governments decide what an acceptable level of risk is.

While a large number of managers and providers (n=23) spoke about their concerns and criticisms of the current drinking water regulations in Tasmania, other managers and providers were reluctant to criticise the current emphasis the *Public Health Act 1997* places on microbiological testing. The following passage from an interview with one local government manager points to a reluctance amongst some managers and providers to see government regulators implement a more comprehensive approach to risk:

C22: *My obligations are to comply with the legislation and whatever risk is identified within those guidelines.*

JJW: *What do you mean by compliance?*

C22: *Well, I mean if a person gets sick out there from drinking the water and they come to me and say 'I'm going to sue this council' well I would say 'well bring it on' because I can show you weekly test results which shows that the water is fine and they might say 'well what about the weeks that it hasn't complied' then I can show them actions that I've tested in accordance with the Public Health Act and health department ---- and as far as I'm concerned I'm not liable and either is the council....*

These comments from one local government provider imply that some managers and providers of drinking water in Tasmania use legislative compliance as a way of avoiding public health liability and responsibility because they do not have the resources to manage drinking water in any other way apart from minimal testing. This was also the case for another local government drinking water manager who conceded that his support for a

greater more comprehensive approach to safe drinking water was being impeded by the financial ability of his council to do anything more than basic compliance with regulatory local standards.

C17:Look, it is interesting in an ideal world I would like to be doing a whole lot more around drinking water than we are doing now---but, the crux of it for us is we barely have the resources to do what we required to now, why would be go rocking the boat when it's only going to get us in more strife in the end---it's sad but it always comes back to money...

Similar themes associated with the avoidance of liability were also evident when participants spoke about the protection of catchments and source water and the possibility of drinking water being contaminated with chemicals. The following section raises the themes of catchment protection and looks at how managers and providers spoke about and negotiated issues of uncertainty and potential liability.

5.2.2 Catchments, chemicals and fear of the unknown

Land use activities and the application of chemicals in and around drinking water catchment areas were issues reported by participant (n=15) as an area of growing concern in their discussion of drinking water regulation in Tasmania. One local government council manager acknowledged his concerns about the protection of drinking water source supplies:

C6: You see a lot of publicity now surrounding forestry and farming activities in the state and lots of chemicals being applied and the flow-down effects of large scale forestry plantations on the water reaching reservoirs and catchments is something we need to be considering, and to complicate things we have quite a large catchment area and we know that for example,

plantation activity in our municipality has grown two fold in the last ten years.

The comment above indicates that the potential impact of sectoral industries such as forestry and agriculture on the quality and safety of drinking water is an issue increasingly being considered by those responsible for the management and provision of water supplies. Industry is a significant contributor to fresh water pollution (United Nations Environment Programme 1996, 2007; World Water Council 2006). Industrial chemicals degrading and contaminating drinking water sources and natural water ecosystems have far reaching implications for the health and wellbeing of populations that depend on these sources (World Commission on Water 1999). Internationally, the links between industrial chemicals, drinking water contamination and detrimental human health outcomes have been increasingly highlighted (Bleaney 2007; Boyd 2003; Trautmann, Porter & Wagenet 2008; United States National Research Council 1993; World Health Organisation 1990). A diversity of epidemiological studies have linked human exposure to pesticides in drinking water to a range of conditions, including forms of cancer, foetal defects, development abnormalities, acute gastrointestinal irritation, neurological effects, decreased immune function, lung congestion, seizures, vomiting, diarrhoea and migraines (Dingle, Strahco & Franklin 1997; Leeuwen et al. 1999; Martin 1999; Mills 1998; Munger et al. 1997; Trautmann, Porter & Wagenet 2008; Ruiecki, De Roos & Lee 2004). In Tasmania in the past five years, the pesticides simazine and atrazine have been found in seven of Tasmania's largest river systems above health guideline values, including those feeding major town supplies (Bleaney 2007; Rosser 2005). The potential public health consequences of Tasmanian consumers being exposed to industry linked chemicals was

seen to be a justification of participants in advocating new regulations that consider the impact of catchment activities on drinking water quality and the health of downstream users.

The likelihood of chemicals being present in some Tasmanian drinking water sources was raised as a controversial and pressing concern for half of participants (n=16) working in all parts of the state. The following excerpt from a rural council water manager with over 20 years' experience in public health points to anxiety over his increasing awareness of the aerial spraying of forestry pesticides in his municipality's drinking water catchment.

C11: *Once upon a time you didn't even think about where your water had been. Now with development, farms and plantations you get thinking about the effect of these kinds of things on supply....I became aware a few months back that one particular industry wasn't spraying [pesticides] where they said they were, they were a lot closer to the catchment than they were supposed to be and there was nothing that that I could do within the legislation....*

Such comments signify that managers and providers are unsure about how to respond to the potential public health risks posed by industry practices, particularly the use of chemicals, in water catchments areas. The issue of chemical testing therefore emerged amongst participants as a possible addition to the current regulation and of a greater and more integrated approach to drinking water management and risk. Simultaneously however, the introduction of chemical testing was also a source of apprehension and contradiction for some participants (n=9). One local government council environmental health manager for

example revealed that chemical testing was likely to raise a number of social and political issues:

C29: *Chemical testing is something I have been thinking about for a long, long time in this state ---- It is getting to the point now in my opinion where ignoring that chemicals aren't there in the water is negligible because we know that they probably are there----the problem is, once you start testing for chemicals and you find something---- that's when things start getting serious and you are liable....*

Such comments indicate that for some managers and providers the threat of liability and the public health ramifications associated with the chemical contamination of drinking water sources is a continuing source of anxiety and uncertainty. At present, the *Public Health Act* Drinking Water Quality Guidelines do not prescribe the mandatory testing of drinking water supplies in Tasmania for any chemicals. However, the detection of industry pesticides such as atrazine in community water supplies across Tasmania has been a contentious and political issue in recent years (Bleaney 2008; Cameron 1996; Rosser 2005; Whelan & Willis 2007) and has received widespread media coverage and debate. Atrazine is a triazine herbicide used predominantly by forestry to control broad-leaf weeds and grasses in plantations and is often applied by aerial spraying in Tasmania (Bleaney 2008). The similar use of atrazine is banned in countries such as Austria, Denmark, Italy and Germany and heavily restricted in the USA due to its reputed cancer causing properties (Leeuwen et al. 1999; Mills 1998; Munger et al. 1997; Ruiecki, De Roos, Lee et al. 2004; WuQuang et al. 2007).

The banning or restriction of chemicals like atrazine in Tasmania is seen by participants to be complicated by inherent tensions between the protection of public health

and the productivity of primary industries. For example, a handful of participants (n=5) implied that state government public health regulators were reluctant to respond to concerns about the possible contamination of drinking water supplies with industrial chemicals. One local government manager spoke of his frustration with what he saw as the unwillingness of the state government to better regulate industry in catchment areas:

C1:*If the outcomes of an independent inquiry showed ---- and it would have to be an independent process that there were not only chemicals in this state's water supplies and they were the ones people are so worried about, I can't imagine the government would react to the point where they would go and better regulate industry and make them change their long standing operating practices.....no ---- they wouldn't ---- they would stand to lose too much.*

JJW:*What do you mean by lose too much exactly?*

C1: *Oh well you know, the government is not going to run around and say to big industries like forestry 'Hey you need to stop doing this or that' because of some inquiry ---- I honestly believe that there would not be much of a response there....they would lose too much, everyone knows that industry are in the government's pockets within this state we all know that and it's why we haven't seen a greater concerted effort to regulate industry that we have seen elsewhere....*

These comments suggest that the prioritisation of economic growth and industry activity over the protection public health is a contentious issue among managers and providers. The impact of environmental regulation on non-environmental values, such as the economy and employment, is a principle area of contention in the governance of resources, because economic growth is often seen to be favoured over stricter environmental controls (Irwin 2002; Percival 1992). How the Tasmanian State Government regulates drinking water and

the decisions that underpin this process are therefore essentially an issue of state power (White 1999, p. 237). Specifically, the institutional power of the government to construct what is risk and how it should be managed is ultimately a matter of power in social debates about drinking water and public health. As the previous comments have suggested, some managers and providers in the state perceive the Tasmanian state government to be using their institutional power as a way of constraining more integrated approaches to risk.

While the decision of government regulator's not to mandate regular testing of drinking water supplies for chemicals was criticised by managers and providers (n=10) others saw a lack of chemical testing as a form of public liability avoidance. Participants who took this stance reported feeling that it was easier to continue meeting the regulatory demands of the State Government than to begin addressing larger issues, such as the testing of their drinking water for chemicals. For example, one rural local government manager argued that public concern over the chemicals in drinking water supplies had caused consumers to question the drinking water management practices of his very council:

C8:*We were testing for everything the law requires us to and you have people jumping up and down and saying that they are not happy with the testing we have done because there still might be something there in the water ----*

In this particular municipality, public concern over the impact of active forestry operations near municipal drinking water catchments had led the local council to test for particular chemicals. The local government manager continued to speak about how consumers in the region had not been satisfied with the detection of the chemicals, despite levels of the chemical being reported as within national health guidelines:

C8: *The chemicals we have tested for you can drink any day of your life, that's what the national guidelines say, you can drink it any day of your life and have no harm....and people are saying yes but it is in the water and we are ending up in the position where we are saying okay if we listen to you people we really have to terminate the supply and so what do you do with the majority of consumers that are happy with the supply....*

The comments above and the assertion that testing drinking water was indicative of an 'acceptable level' of contamination signals that this manager was concerned less with the prevention of chemical risk and its uncertain consequences (Heyman 1998) and more with what is permissible under the regulations. The assumption that consumers or the lay public did not understand the realities and processes of testing demonstrates the claim that government judgement, seen here in the form of scientific 'evidence', is being used in Tasmania to stifle the other voices in environmental discussions (Beck 1992). The knowledge and 'voices' of lay or 'ordinary' citizens (Irwin 2001, p. 73) are commonly seen as non-legitimate when compared with technical and scientific expertise and processes employed by regulatory agencies of environmental governance (Bleaney 2007; Hannigan 1995; Irwin 2001).

The unregulated monitoring of industry's activities and the chemical contamination of drinking water in Tasmania prompted further criticism of the scope and adequacy of the Public Health Act Drinking Water Quality Guidelines. One local government manager said:

C4: *You can fall into the trap of thinking that the Public Health Act is catchment or land management legislation and it is not; it couldn't be further from it.*

Such statements suggest that criticism of the regulation centres on the belief among participants that state government regulators needed to address the impact of all activities in and around catchments by integrating water and environmental management, in order to fully protect public health. Integrated Catchment Management (ICM) is a globally recognised approach to effectively managing water quality (Global Water Partnership 2000; UNESCO 2008) and involves an understanding of the parts of the natural world that are impacting on the quality and availability of drinking water through a coordinated and planned use of water resources in a catchment area (Global Development Research Centre 2008). Effective catchment management frameworks in developed nations (e.g. the United States, France and the United Kingdom) bring together key stakeholders in the use of drinking water resources (public health officials, industry, natural resource agencies and communities) leading to less catchment degradation and the maximum potential uses for water resources (Global Development Research Centre 2008, p. 1). In Tasmania there is no integrated catchment management framework for drinking water and the main regulator, the Department of Health and Human Services, has no legislative or jurisdictional authority under the Public Health Act over drinking water catchments.

Over two thirds of all drinking water managers and providers (n=21) reported that this lack of control and regulation of catchments was a significant source of uncertainty in their roles and an issue that they envisioned would continue to be important in the future. One bulk water authority Chief Executive Officer showed his concern with the lack of integrated catchment management:

P 1: *....There is a legislative gap at the moment in this state and the legislative gap it's between the protection of public health and actual integrated catchment management legislation, because we do not have that in Tasmania ---- so that's a great risk from my perspectivethe [Public Health Act] legislation does need to be more concise, for instance you have our legislation [The PHA Drinking Water Quality Guidelines], which is all about protecting water quality and consumers and then you have this other legislation which is privacy legislation for land use so you get this clash of legislations trying to achieve conflicting things. So there is this whole lot of various interests invested in water catchments....while we have a duty of care to protect and improve public health ---- there's no doubt that being unable to control activities in catchments is something that the government needs to address....*

These contradictions point to the need for revisions or additions to the Public Health Act Drinking Water Quality Guidelines in to secure water quality and public health through protecting and monitoring source water and catchments. The issues associated with this were also acknowledged by state government regulators as an important issue in Tasmania. A state government employee expressed his desire for a more comprehensive approach to the management and regulation of drinking catchments:

JJW: *Would there be anything that you would ideally like to see happen in respect to improving the regulation of water in the near future?*

SG 2: *I have expressed a desire to physically go and audit every set up in the state ---- in fact in Walkerton they just appointed 33 new water inspectors over there....*

JJW: *What do you mean exactly by auditing every set up?*

SG2: ----*Well first we would actually go out and fly over the catchment and look at any particular licences and activities that might be happening and then you find out what they are about and what they may be using etc. And the second you actually go and look at the treatment plant and make a note of exactly what each council has....but with the amount of resources that we have here at the moment in Tasmania that would be an impossibility here unfortunately....*

It seems that a more holistic approach to the protection and management of drinking water sources is supported by public health officials in Tasmania. The importance of source water protection for is particularly exemplified in a number of the recommendations in Commissioner Dennis O'Connor's, *Report of the Walkerton Inquiry* (2003). The inquiry recommended that watershed or source water protection through a number of processes, including the introduction of water inspections in order to adequately ensure the safety of drinking water supplies. Under its *Drinking Water Inspections Protocol*, the Ministry of the Environment (MOE) in Ontario direct drinking water inspectors to conduct comprehensive inspections of drinking water supplies, including the inspection of source, treatment and distribution systems for safety. In 2002 the Ontario government more than doubled the number of water inspectors from 25 to 51 and increased the frequency of inspecting source water (Ontario Ministry of the Environment 2003). The costs of implementing all recommendations of the O'Connor inquiry have been estimated to be between CA\$100 and 200 million (CBC News 2004). Nevertheless, within Tasmania the possibility of more comprehensive approaches to management and protection are being constrained by the limited financial resources of both government regulators and also local water providers such as local government councils.

5.2.3 Resources, risks and rurality

Tasmanian water suppliers, particularly those working in local government councils, spoke about a number of problems associated with the management and provision of safe drinking water under the *Public Health Act 1997*. One local government council employee stated:

C17:*Now don't get me wrong, I don't have any problems with what the state government are trying to achieve by bringing in these regulations [PHA Drinking Water Quality Guidelines] ---- what I do have a problem with is how they actually expect us to achieve this quality of water when we have crap infrastructure, no staff and expertise and no great pool of money to upgrade our systems ---- that's a real frustration for me in doing this job*

These comments indicate that tensions exist for managers and providers between meeting the requirements of water quality legislation, while sustaining the financial and resource demands to meet these regulatory requirements. Globally, there is wide consensus that drinking water supply systems are financially intensive and require high levels of capital expenditure to maintain and extend infrastructure networks that assist in the provision of quality drinking water (Bakker & Cameron 2002, p. 17). At present, the *Public Health Act 1997* Drinking Water Quality Guidelines do little to assist water providers in Tasmania to meet the costs of managing and providing safe drinking water. Rather, water providers must generate their own fiscal resources for the ongoing management and provision of drinking water, which means some water supply systems are better resourced than others.

The geographic location of water supply systems appears to be critically affecting the management and provision of safe drinking water in Tasmania. A local government

employee working in a large rural municipality spoke about the constraints of location on the provision of drinking water supply:

C23:*although every consumer should be equally provided and yes should have good quality water or whatever, the whole ongoing issue is we don't have the resources and money in rural Tasmania and someone is going to have to start thinking about how that's going to be addressed...*

This excerpt denotes the complexity of issues associated with drinking water provision in less urbanised parts of Tasmania and indicates the impact of geographical location on the supply of safe drinking water. Tasmania has a highly dispersed population, over a third of whom live in rural and remote areas (ARIA 2006; Institute for Rural and Regional Research 2004). In addition, of the 89 water supply systems in Tasmania, there are 69 in rural areas (Whelan & Willis 2007). The influence of geographical location on poor drinking water quality and supply has been acknowledged as a significant issue both globally and locally in advanced and developing nations (Boyd 2003; CSIRO 2006; Fullerton 2001, 2007; McDonald 2005; Whelan & Willis 2007).

In parts of Tasmania, water provision infrastructure – distribution and treatment systems – are inadequate to meet regulatory requirements for drinking water quality and safety. One rural water provider reported:

C9: *When the Public Health Act came ---- all of a sudden we [local government] were in this situation where with one stroke of the pen we were having to do five times more water sampling, do upgrades on our reservoirs, replace pipes, improve chlorination and with the same money that was coming in before the legislation got passed ---- I remember saying to one guy from the [Public] Health Office, 'This is all very well for you but how are we*

supposed to pay for all this?' ---- and all he could say was that we should put our rates up....

This excerpt suggests that ageing and inadequate infrastructure in rural areas of Tasmania is critically impeding water providers' ability to reticulate safe drinking water to their communities. Water supply infrastructure consists of what is built to pump, divert, transport, store, treat, and deliver safe drinking water. Ageing water supply infrastructure has emerged as an increasingly critical problem in many nations (Archer 2002; Bakker & Cameron 2002; Kail 2004; Vatandoust 2003). The United States Environmental Protection Agency (2008, p. 1) acknowledges that 'the staggering cost of maintaining, operating, rehabilitating, and replacing our aging water infrastructure' in the USA has required the ongoing development of new funding partnerships between federal, state and local government to rectify drinking water supply infrastructure needs.

In Tasmania inadequate water provision infrastructure is having a negative impact on providers' water management and supply practices. Maintaining and operating ageing infrastructure is becoming more costly and the economic capacity of many small and rural councils is minimal. One council manager said that municipalities such as his own have been deferring water infrastructure maintenance, because there were seen to be more pressing needs for the council:

C20: We have pipes that are literally at least a hundred years old. To replace them would cost hundreds of thousands of dollars but we don't have the money to do that and there are so many other things we have to do as a council....it's something that we are going to have to urgently address if we want to keep providing water....

Building new or upgrading existing water supply infrastructure (pipes, treatment facilities and storage reservoirs) is integral to maintaining the provision of safe drinking water distribution systems in Tasmania. However, managers, providers and regulators conceded that such issues were diverse and are not easily solved. As one rural provider reported, 'In some of our community systems we don't even have the capacity to store water let alone chlorination facilities' (C17). The treatment of drinking water has long been acknowledged as a vital part of minimising waterborne disease and protecting human health (Archer 1996; Clonen 2001; Cooperative Research Centre for Water Quality and Treatment 2002; Hawkins et al. 2000; Pontius 2002; Putnam & Wiener 1995). A lack of basic water treatment infrastructure could, through waterborne diseases, critically affect the health and wellbeing of populations receiving untreated drinking water. Each year millions of consumers in mostly developing nations die from the consumption of untreated drinking water.

The treatment of drinking water is non-existent in a number of rural Tasmanian municipalities. One rural water provider spoke about the limited nature of water supply infrastructure in his council and the impact of this on regulatory responsibilities:

C29:we have quite a few water supplies that are untreated because they service fairly small townships I guess and we find it really difficult because of that to comply with the micro-criteria [of the legislation]....that's not to say that the water is causing anyone any problems, but because it is not treated it's a difficult situation....

For participants working in rural Tasmania, a lack of basic treatment facilities made it impossible to eliminate harmful microbiological contaminants. Water supplies are therefore

in permanent compliance with the quality requirements of the Public Health Act Drinking Water Quality Guidelines, making the supplies unsafe for human consumption.

In some local government councils responsibility for drinking water management practices, like water testing and sampling, is entrusted to one employee. The following excerpt from a rural council employee encapsulates the staffing and resourcing issues facing some local government water providers:

C8:*The buck stops with me really when you ask about who does the sampling here. So yeah ---- it's up to me, which is 'kinda' hard because it's a big job ---- I guess because we have a fairly big area to cover and there's no one else that can help because we just don't have the staff....unlike bigger councils I do it all myself and that's as well as the other stuff I do ---- I think this is something that three men should be doing not just me....but that's what happens around here.*

The sense of responsibility and liability participants in these positions feel has clear implications for the daily management practices of some council providers in Tasmania. A lack of staff and training among some councils contribute to some water providers being unable to adequately manage, monitor and respond to drinking water supplies in their municipality. The adequate training, experience and expertise of staff responsible for drinking water management and provision play a critical role in delivering safe drinking water (Archer 2000; Boyd 2003; Hrudey & Hrudey 2004; Report of the Expert Panel on Safe Drinking Water for First Nations 2006; Snider 2003; White 1998). Managers and providers of drinking water need to be capable and responsive to the immediate and contextual environment in which they operate in order to protect water quality (Hrudey & Hrudey 2004). The report of the inquiry into the Walkerton contamination by Justice

Dennis O'Connor (2002) stated that key staff responsible for testing and reporting on drinking water quality in the Walkerton region were ill trained, engaged in improper operating practices and were uninformed about water safety (Brubaker 2005). It seems that the lack of training and water management expertise in Tasmania may place the health of communities at risk due to improper water management practices.

The most tangible effect of inadequate staffing, training and expertise among those working in drinking water management and provision in some parts of Tasmania is the supply of unsafe drinking water to the public. One State Government official reported:

P1: *....a year ago they were having heaps of problems with one community's supply. Now, the basic premise of water treatment is that you filter and then you chlorinate to disinfect to then increase efficiency right? ---- we actually checked the water treatment plant in this particular place and the filter had been put in after the chlorinator....and surprise, surprise, the water hadn't complied for years. So that was basically just a lack of training on the person who installed the stuff...*

These comments imply that state government drinking water regulators are cognisant of the staffing and resourcing issues facing providers. However, unlike other parts of the world, Tasmanian state government regulators are not responsible for the monitoring of water supply infrastructure or the adequate training of staff responsible for operating or maintaining this infrastructure, despite this being suggested as an ongoing concern in the management of drinking water in parts of Tasmania. These issues appear to be unable to be amended easily, particularly in light of the pressing financial demands and under-resourcing of local government councils in Tasmania.

Water providers and managers reported that, along with infrastructure and staffing constraints, many were struggling to meet the financial costs of sampling and testing drinking water as defined by the Public Health Act Drinking Water Quality Guidelines. The following comments from a rural council provider relay the ongoing frustrations in his role as a water manager:

C8:At the moment we are trying to test our water weekly and that is a 75 per cent increase in price and then if you started testing more regularly or heaven forbid for other contaminants it would probably be well over 100,000 ---- it couldn't be done by this council, we just don't have that kind of money....Even now there's nothing in the [Public Health] Act that says how we are supposed to pay for testing and we just can't afford to keep up....on top of that we also recently got a test for one herbicide because we were worried about some forestry activity ---- it was \$1347 per test and that's just for one chemical and there are hundreds of other chemicals that we could be testing for....

The adequate testing and sampling of drinking water for contaminants is an undeniably important part of managing safe drinking water and minimising public health risk (Boyd 2003; Hrudey & Hrudey 2004). And yet, it seems that while some participants demonstrate a sense of social obligation to provide safe drinking water, the extreme financial pressures of water management practices for some smaller councils outweigh the greater pursuit of a comprehensive approach to drinking water.

C9: ...I have been working here for a long time and I've seen a lot of changes to how local governments have approached drinking water and don't get me wrong it's a good thing and people should be being given good quality water, but when you look at the fact that we have no more money coming in-

--- it's getting to the point where it's all well and good to say let's do this and that, and lets pay someone to be a catchment officer or whatever---- but when you don't even have the money to meet the bare minimum standard or to replace pipes then how do you decide what is most important supplying water or being economically viable?

In many cases, managers and providers of drinking water (n=11) within local governments across Tasmania therefore argued that the main obstacle with safe drinking water in Tasmania is not a lack of regulation, but a lack of resources in and capacity of local governments to meet regulatory requirements. One participant stated:

C15: ...What I have had a big problem with is not the regulation of drinking water, of course that makes sense ---- There is no doubt in my mind that local government is the crutch for State Government ---- I think that local government is great for dealing with their own backyards and being accountable to their ratepayers but I see that more and more responsibilities are being handed on to local government with less and less help from the state and federal government....You can't just legislate water quality and then expect organisations like local government to magically comply with your demands for non-problem water ---- I also don't enjoy being made to look incompetent in how we are handling our [drinking water] systems when we have no money because we have a limited rate paying base ---- although some people including the State Government will tell you that we are just buck shifting which is ironic because if you ask them who should pay for improvements they will say 'Put your [municipal] rates up'....

These comments highlight that local government water managers and providers often perceive the *Public Health Act* (1997) Drinking Water Quality Guidelines to give little or

no recognition 'of the struggles or limitations' (C20) facing councils in the provision of drinking water in many parts of Tasmania.

The financial health of a utility has been acknowledged as having a major effect on its ability to provide safe drinking water (Environmental Finance Centre 1998). The size and location of municipal drinking water systems are therefore viewed internationally as an important consideration in the assessment and development of regulatory options for water quality improvement (Report on the Expert Panel on Safe Drinking Water for First Nations 2006). In most countries water services are a municipal responsibility. It therefore makes sense that improvement should include 'key criteria and support for incremental improvement of water supplies involving community engagement and considering cost, practicality, ease of maintenance and repair and effectiveness' and other ways of building the economic capacity of water providers (World Health Organisation and National Health and Medical Research Council 2006, p. 6). In countries such as Canada, too, increasingly strident water quality standards and limited financial resources for municipal water improvements have been exacerbating the inadequate management of drinking water (Bakker & Cameron 2002). This has led to the creation of long-term partnerships between levels of government and communities in these countries to address inadequate infrastructure, staffing and economic constraints. In the USA the Drinking Water State Revolving Fund (DWSRF) was established under the 1996 Safe Drinking Water Act (SDWA) to provide financial assistance for water systems in disadvantaged areas to be improved, so that they comply with regulatory standards (Beecher & Shanghan 1998).

In Tasmania there is limited support for local government suppliers to build their economic capacity in order to continue providing safe and reliable drinking water. A lack

of economic support makes it difficult to manage and provide safe drinking water free from contamination. Instead, managers and providers in some parts of Tasmania have been forced to respond in other ways to meet regulatory requirements and to the management of public health risk.

5.3 Persistent problems and bandaid solutions: responses to public health risks

There are a number of ways that problems associated with drinking water in Tasmania are being dealt with at both local and policy levels. Proposals for improving the governance of drinking water often raise significant concerns associated with social inequity, geographical disadvantage and the most effective transparent ways to manage and control drinking water in Tasmania.

In most rural Tasmanian municipalities, the issuing of boil water alerts is a common practice in managing untreated drinking water supplies. A rural participant, who was an environmental health officer for a local government council spoke of the need to issue boil alerts to community members:

C14: *According to the guidelines [the PHA Drinking Water Quality Guidelines] untreated water supplies are always unsafe. So the way we deal with that is by issuing boil water notices, so with the rates notices that go out to all these people living in these small communities that have untreated supplies saying that it's an untreated supply and to assure microbiological quality they should boil it prior to drinking it....*

Boil water alerts involve notifying consumers to boil their tap water for at least three minutes before consumption to kill potentially harmful bacteria. The most recent Director of Public Health's *Annual Report on the Quality of Tasmania's Drinking Water*

(Department of Health and Human Services Tasmania 2006) detailed that 30 boil alerts were issued in Tasmania for the reporting period. Twenty-nine of these were in rural municipalities and over half were permanently issued (Whelan & Willis 2007). In one municipality, boil had alerts affected ten of their 11 public water supply systems in the 12-month reporting period.

The ongoing need to issue boil water alerts as a means to protect public health and safety has led to calls for radical changes to community water supplies. Two council employees charged with environmental and public health responsibilities stated:

C23:*Council with my encouragement is saying, 'Let's cut the pipe, let's stop the supply' because the liability is existing and that's huge in providing a community with untreated water.*

A lack of water supply infrastructure and the permanency of boil alerts in some areas of Tasmania are causing some councils (n=3) to consider stopping the reticulated supply of drinking water altogether. Stopping the supply of drinking water to communities is most often associated with the non-payment of water bills or the inadequate availability of water resources for water reticulation, particularly in developing nations (Beltran 2002; Hacher 2004; Olmstead 2003; Pauw 2003; Ravindran 2003; Whelan & White 2005). However, the issue of public liability and risk associated with the provision of safe drinking water appears to be a gap in water literature.

Non-compliance with regulatory standards because of poor and inadequate drinking water supply infrastructure raises obvious tensions between the exigency of providing basic water needs and the willingness and fiscal ability of rural councils in Tasmania to operate under the threat of liability. A sense of liability and responsibility associated with drinking

water appeared to be heightened among participants working in councils with limited staffing and expertise. Tasmanian drinking water managers, providers and regulators argued that addressing and improving the governance and safety of drinking water was not amenable to an easy solution. One rural council water manager stated:

C27:I don't have any problems with what the state government are trying to achieve in respect to public health by bringing in regulations----what I do have a problem with is that if something terrible did go wrong then the excuse would never be accepted that we just didn't have the money to support new pipes or a new chlorination system. If people are sick or even dead because you let something poison their supply, you are the one that is liable ---- but the scary thing is that we literally don't have the money to support upgrading our water supply ----- and we are not getting any support from the people in Hobart [State Health Department] who are pushing for it to happen....

For some drinking water providers (n=14), particularly those in rural areas of Tasmania, tensions exist over the best way to improve the quality and safety of municipal drinking water supplies. In cases where governments are unwilling or unable to increase debt to meet investment needs, restructuring may provide a means of improving the provision and management of drinking water services and resources. Over the past decade many municipalities in nations such as Canada and the USA 'have been confronted with the need to radically reform their water and wastewater supply systems, due to real or perceived poor levels of performance' (Bakker & Cameron 2002, p. 15). Poor performance of municipal water supplies is often attributed to multiple factors, for example ageing infrastructure, increasingly stringent water quality standards, lack of finance for infrastructure renewals and replacement and dependence on often unreliable government

subsidies (Bakker & Cameron 2002). These factors are similar to the issues that participants in Tasmania reported following years of deferred and minimal investment in water supply systems.

Local government council employees in Tasmania appear to be irresolute about the possibility of restructuring and reforming drinking water management and provision, despite ongoing quality and safety concerns. A council employee in rural Tasmania said:

C3: *It is not as simple as going out into our towns and saying okay we are going to finally fix the water here but by the way your rates are going to go up heaps in the process ---- we tried to do that with one of our larger townships a couple of years ago and people in that community said that while they wanted the water they just couldn't afford a rates rise.*¹³

Shifting financial responsibility for improvements to drinking water supplies and infrastructure does not sit comfortably with some participants (n=15) in their role as a local government drinking water provider. In Australia local governments are elected to represent their local communities and their mandate is to 'deliver a responsible and accountable sphere of democratic governance' (Local Government Association of Australia 1997, p. 1). A fundamental part of the role of local governments in Australian social life is the provision of appropriate services to meet community needs in an efficient and effective manner, and the facilitation and coordination of local efforts and resources in pursuit of community goals (Local Government Association of Australia 1997). The inherent mandate of local governments in delivering essential services like drinking water is that they must consider the financial capacities of communities and consumers when implementing

¹³ Municipal rates refer to an annual fee charged to a property owner by the local council. This often includes levies for services, such as water, sewerage, garbage collection etc.

changes or enacting reforms. Dialogue between municipal council water providers and consumers is an essential part of effective water governance in all nations. Effective consultation enables 'the community to have a role in determining the preferred course of action' in regard to water resources and supply (O'Connor 2002, p. 37).

In Tasmania local government council employees in rural areas (n=12) argue that an understanding of community needs and financial capacity for capital investment in drinking water infrastructure is essential. For example, one rural council employee spoke of the importance of his council being aware of the socio-economic status of consumers and communities in his municipality:

C8: *We not only have a small rate-paying base, but also lots of our rate-payers are pensioners or low-income families; our consultation with them over the years has shown repeatedly that they would rather have untreated water than have their rates go up.*

These comments indicate that the injection of capital into improving the quality of drinking water is complicated, not only by the fiscal deficits of local government councils, but also the limited socio-economic capacity of consumers and communities in some parts of Tasmania to afford safe drinking water. In many parts of Tasmania where permanent boil alerts exist has ultimately been perpetuated by the inability of residents to be able to afford improvements. This supports claims that class divisions within social structure have been shown to intensify the predisposition of some poor and marginalised social groups to environmental risks, such as unsafe drinking water (Field 2000; Halfacre, Matheny & Rosenbaum 2005; Julian 2005; Mythen 2004). Consumers with limited socio-economic means usually have limited ability 'to buffer drinking water risk' because they have less financial capacity to pay for drinking water or other ways of minimising risk when water

quality fails (White 2002). The location of consumers is also a contributing factor to the burden of risk associated with drinking water. Rural communities are more likely to experience increased risk of contamination and poor public health outcomes resulting from drinking water supply (Boyd 2003; CSIRO 2006; McDonald 2005; McKay & Moeller 2001; Whelan & Willis 2007). Achieving municipal water reform in communities that are financially constrained at social and council levels raises a number of social justice issues associated with the capacity of communities and consumers to afford safe drinking water. There is a need for organisations responsible for water provision to carefully consider these social needs when implementing any type of economic reform of essential services (Archer 2000; Bakker & Cameron 2002; Beder 1998).

5.3.1 Minimising risk and responsibility: Is the answer corporate control?

Tensions exist for local government drinking water providers and managers over the most effective way of governing supplies, while attending to the important social justice issues associated with the provision of safe and plentiful drinking water. The corporate control of more than half of Tasmania's drinking water supplies raised issues over whether local governments or corporate water authorities should be responsible for providing drinking water, and whether further corporatisation was the best way of addressing quality and safety concerns. A local government employee working in a council that has drinking water supplied by a bulk water authority argued that corporate control of water resources should be a priority in Tasmania:

C13: *---- Here in this state of ours we really need to be thinking more strategically about what we are going to do in the future with many of our supplies. I went to this seminar a few months back on the mainland and they*

were all talking about the fact that the only way that we are ever going to enable the long the long-term efficiency and viability of providing water is to toe the reformist line and to corporatise all supplies, it is a win-win situation if councils actually sat down and worked out the sums....

The corporatisation of drinking water supplies is one way in which some drinking water managers and providers saw that the fiscal and resource problems for councils providing drinking water could be solved and how public health risks associated with provision could be solved. At present in Tasmania, two thirds of drinking water supplies are managed by corporate water authorities.

Corporatisation is a process of structural economic reform that involves 'the placing of selected publicly-owned enterprises into a position analogous to that of the private sector while retaining ownership (Tasmanian Department of Treasury and Finance 2007, p. 34).

The deterioration of assets, a lack of expertise and resources and the deferment of investment in essential water infrastructure under the control of municipal councils' drinking water resources are often a key impetus for the corporatisation of services (Bakker & Cameron 2002). By corporatising drinking water supplies in Tasmania, the responsibility for the immediate management of drinking water is removed from local governments and subjected to commercial market principles. In doing so, it may be possible to improve the incentives of council entities to minimise costs and operate more efficiently (Kerr 1998, p. 5). Economic efficiency is frequently raised as a major rationale for the management of water resources through corporatisation and privatisation (Aharoni 1991; Barlow & Clarke 2002; Johnston 2003; White 1998). Corporatisation can often be a precursor to privatisation or the outsourcing of public water supplies to private companies (Archer 2000; Beder 1998; Moeller 2001; Sheil 2000). Indeed, the corporatisation of drinking water supplies is

becoming increasingly entrenched in the economic reform of Australian water resources through fiscal policies, such as the Council of Australian Government Water Reforms and National Competition Policy. As a result, most major drinking water authorities in Australia have been corporatised. Tasmania's bulk water authorities are now corporatised and are responsible for the management and provision of drinking water in three large regional areas. Like other corporate water authorities in Australia, Tasmanian bulk water providers are operating in accordance with commercial principles that emphasise financial goals: increased competition, the generation of dividends and the improvement of financial performance and accountability (Moeller 2001).

The introduction of economic water reforms in Tasmania and the restructuring of water authorities may have significant effects on the management and provision of drinking water. A bulk water authority Chief Executive Officer spoke about the impact of National Competition Policy:

WA3:*When National Competition Policy came in there were a lot of structural changes to how water was going to be controlled ---- there were a number of changes....there was a huge impetus for water authorities like us to change to become fully commercially viable businesses and to have councils as our economic shareholders....*

Economic water reforms have changed how water providers and managers think about drinking water as a public resource in Tasmania. In 1994 all state and territory governments in Australia agreed that the management and regulation of Australia's water needed 'significant changes' (National Competition Council 2008, p. 1). A package of reforms, known under the umbrella of National Competition Policy (Council of Australian

Governments 2007), were implemented. They were designed to ‘promote good water management practices and ensure the development of strategies to promote water uses that make good business sense, are good for the environment and ultimately ensure the long term sustainability of the resource’ (National Competition Council 2008, p. 1). The main areas of water reform are based on the promotion of economic competition and include the establishment of corporate water service institutions, water trade entitlements and water pricing, based on recovering the costs of managing and providing drinking water. Although National Competition Policy (National Competition Council 2008, p. 1) is argued to promote economic competition in the public interest, there is significant social debate over the effects of economic drivers on the equitable provision of drinking water. For instance, the impetus for economic efficiency and performance is argued to interfere with the notion of drinking water as a social resource because it driven by consumption and the pursuit of fiscal gains rather than public service (Aharoni 1991; Barlow & Clark 2002; Beder 1998; Whelan 2005; White 1998).

The management and control of drinking water supplies by corporate bulk water authorities is prompting some concerns amongst participant in Tasmania that the provision of drinking water is being driven by economic rather than social concerns. One local government council manager working in rural Tasmania expressed his concerns over the impact of economic reform processes:

C5:*I know that more and more councils in this state think that corporatised bulk water authorities are the best thing since sliced bread because they don't have to worry about supplies so much. Personally, I think local government involvement and management is the best way to control water -- -- mainly because we are actually there in the community and more willing*

to respond to issues and to public concerns, for example I know a case where there was public concern about water being provided by one big authority and one consumer rang them five times and could not get anyone to address her concerns.

Instead of the corporatisation of drinking water supply, some local government managers are embracing the continuing management and control of drinking water by local government councils as a way of ensuring that the voices of local citizens and consumers are heard in the process of democratic drinking water governance. 'Clear and direct accountability' and 'the protection of vulnerable consumers' from disconnections and the 'abuse of monopoly power' are seen as a key advantages of the municipal control of drinking water (Bakker & Cameron 2002, p. 19). A lack of these processes may affect the equitable provision of drinking water to consumers, because corporatisation may potentially weaken accountability. The needs of low-income and other socially vulnerable consumers may not be considered and therefore public accountability is at risk of being eroded. Only a small amount of managers and providers of drinking water in Tasmania (n=5) questioned whether the commercial orientation of corporatised water authorities might be interfering with the notion of drinking water as a public service. One local government manager with over thirty years' working in water management expressed his apprehensions about corporatising water provision authorities:

C7: There is no doubt that the big water authorities have monies for greater resources, staff and infrastructure because they have a greater financial base ---- but what I worry about is whether that is clouding the issue of being receptive to public concerns ---- there are some serious issues for me in commercialising water resources this way. Here in local government we

are almost sanctioned to prioritise our consumers or rate-payers in providing services because that's what we do and have always done. At the [bulk water] authority level I don't think there are the same considerations happening, how could there be when you are worried about dividends....

This suggests that some managers and providers are unsure about corporate water provision as an ideal model in Tasmania, because of the tensions between the protection of public interest and health and the demands on corporatised water authorities for financial return (Dovers 2008). The links between the corporatisation of drinking water authorities and poor quality drinking water were questioned in 1998 when three million Sydney residents were forced to boil their drinking water due to the detection of harmful levels of *Giardia* and *Cryptosporidium* in Sydney's water supply. The Sydney Water Board and the contract to supply drinking water to the city of Sydney had been corporatised in 1995. Following the corporatisation, thousands of Sydney Water Board employees involved in the management and provision of drinking water were sacked or made redundant. Operating costs were cut by over 25 per cent (Vassilopoulos 1998). The drinking water treatment plants responsible for the contamination had been privatised and it was later revealed that the company running the faulty filtration plant was not contractually obliged to test for and remove these organisms (Beder 1998). A later inquiry showed the inability of Sydney Water Board management to notify the public and to respond with accurate and reliable information (Hrudey 2008). The event further highlighted the need for comprehensive statutory framework to ensure that 'public-good functions', including long-term monitoring, public health, and infrastructure planning initiatives, are catered for in the management of drinking water (Dovers 2008, p. 10).

Across the interviews however, over half of all participants (n=15) advocated the existence and expansion of drinking water corporatisation in Tasmania. The reasons given by participants for corporate control of drinking water included 'greater technology and resources' (c17), 'specialist expertise' (c23), 'better monitoring technology' (c9) and 'greater financial resources for water reticulation' (c10) as reasons for believing that corporatisation of water authorities was the most efficient and accountable way of managing drinking water. In another example, a local government manager who had worked previously for a corporate water authority in another state reported:

C21: *I have a hundred per cent confidence that this council is getting the highest quality water available from our regional [bulk water] authority....water is their sole business and priority. For councils on the other hand, water isn't our only responsibility – we have a lot of other things that we have to do. I like to say that we are the doctors or GPs [General Practitioners] when it comes to water and they are the specialists and so you can't compare the expertise that you get between the two....*

The trust and confidence reported by some managers and providers (n=18) of drinking water in corporate water authorities is also supported by the quality and safety record of water authorities in Tasmania. The most recent Director of Public Health's *Annual Report on the Quality of Tasmania's Drinking Water* (2006–07) reported that all bulk water systems met the water quality standard and microbiological monitoring requirements of the *Public Health Act 1997* in the reporting period. The advantages of corporate water authorities are increased fiscal and human capital for the provision and management of safe drinking water (Bakker & Cameron 2002) and greater economic efficiency through increased economies of scale, but they are not necessarily the lowest cost solutions to the

affordability of drinking water for consumers in Tasmania. According to the General Pricing Oversight Commission (2006, p. 6) economies of scale are achieved when natural monopolies, for example urban water supplies, are characterised by declining average costs as production increases. Corporate water authorities' provision of drinking water to small communities is unlikely to produce commercial profitability and efficiency without considerable production costs associated with the supply of water to remote areas. The limited financial capacity of consumers in rural and remote parts of Tasmania therefore eliminates the possibility of any bulk water supply in the near future.

5.3.2 Putting a price on Tasmanian drinking water

Participants reported that as well as the corporatisation of water provision authorities, national water reforms have led to the application of pricing mechanisms for drinking water. One urban council water manager stated:

C10:*When the NCP [National Competition Policy] came in it was a bit of a shock....it really made us evaluate what we had been doing and that really we hadn't been doing things that well in terms of cost recovery....so we brought in the two-part pricing and things have become better from a council point of view....*

These comments signify that managers and providers have accepted market instruments as a solution to water provision problems in Tasmania. The pricing of drinking water indicates that drinking water is being regarded as an economic resource capable of economic exchange, rather than as a social need. Under fiscal reform, the 'efficient pricing' of drinking water facilitates the most efficient use and allocation of drinking water resources

by enabling the costs of drinking water provision to be recovered and by yielding considerable gains in economic efficiency (Rogers, de Silva & Bhatia 2002, cited in McDonald 2004, p. 14). Benefits and objectives of 'setting a price' for drinking water are cited as: economic efficiency, cost recovery, revenue maximisation, regional equity, ability to pay and demand management (Albanese 2007; CRC for Water Quality and Treatment 2006; MacDonald 2004; Urban Ecology Australia 2007).

Under National Competition Policy, Tasmanian water providers are required to implement the pricing of drinking water through full cost recovery. Full cost recovery is based on water providers charging for the costs of water provision and consumption in order to increase economic and consumptive efficiency. The model has two-part pricing, which constitutes a fixed charge based on the cost of service provision and a variable charge based on the volume of water purchased (CSIRO 2004; Moeller 2001; National Competition Policy Progress Report 2005; Rogers, de Silva and Bhatia 2002). In Tasmania full cost recovery has required replacing water charging based largely on property value to one based on 'user pays' – the amount of water consumed. For the first time in most parts of Tasmania the installation of water meters on individual households and businesses has allowed the use of potable water to be 'more efficiently' managed and quantified through consumptive based pricing. The Resource Planning and Development Commission of Australia (2005, p. 1) argue that:

Water metering contributes to a strategic approach to the management of water resources through improved tracking of water use consumption at a range of scales (from an individual household to suburb or even state-wide assessment).

The Resource Planning and Development Commission of Australia (2005, p. 2) further argue that the transition from current fixed base water charges towards two-part pricing and

consumption based pricing should be initiated and promoted 'to provide incentives for efficiency and water conservation, while avoiding an overall increase in economic burden'.

Many participants (n-17) reported that they supported full cost recovery using two-part pricing for a number of reasons including economic efficiency and the recouping of water supply costs, a fairer allocation of water resources as well as making consumers more accountable for their water use. In one instance, a local government council employee spoke about the use of full cost recovery and water meters as a way to make consumers more accountable for water usage and consumption:

C12:*It has been noticeable that people have used less water since we bought in meters, most councils around here have introduced metering and people are getting these excess water bills and you get people ringing up and saying 'Oh crikey why is my water bill so big?' and then they think 'Oh yeah I have been watering my lawn excessively' or 'I've had a leaky tap' and then they take measures to control those things because otherwise they end up paying....*

The use of full cost recovery and water metering appears to have affected consumers' use of potable water in Tasmania. The pricing of drinking water globally is seen as a 'powerful environmental imperative for solutions to water scarcity', because it makes consumers accountable for their use of water resources (Narain 2000; Postel 2000; Ward 1997). In some parts of Tasmania, there is a shortage of reliable drinking water sources due to a number of factors, such as drought, lack of water storage facilities and competing uses for water resources. The use of full cost recovery and water meters is complicated by the supplies of safe drinking water not always being available;

C11:*Last year we literally ran out of water and people were getting really irate and were saying, 'We pay our water rates' and 'We have the right to water' and of course we agreed and 'Yes, you do have the right to water' to, providing that it's available to give to you' ---- and I can see their point in a way – here we are charging them their rates when half the time we either cannot give them safe water or don't have it to give....*

The introduction of two-part pricing does not necessarily mean that local councils or water providers have the infrastructure or resources to improve supply or upgrade infrastructure in the near future. The umbrella reform of drinking water provision based on pricing and market mechanisms is therefore dependent on the frameworks and resources that enable water providers to take up the use of market mechanisms (Bakker & Cameron 2002).

A number of local government providers explained that the financial constraints of their councils made it impossible to implement cost recovery and pricing reforms, despite pressures from state and federal governments to do so. One rural council employee commented:

C16:*From a personal point of view I think that water meters are good because they do help to conserve water....but from a council perspective it just isn't economically viable for us to put in meters ---- we are talking about hundreds of thousands of dollars to put them in and this council just cannot afford that no matter how much we are getting pressured....it would be financial suicide.*

The financial constraints of some councils in Tasmania are impeding their ability to meet regulatory demands for economic reform. In some areas, these fiscal constraints are causing reluctance on the part of councils to adhere to National Competition Policy and implement

full cost recovery measures, such as water metering, leading to regional discrepancy and inequity; some municipalities in Tasmania are using full cost recovery and others are not.

For councils to be able to afford the capital outlay associated with full cost recovery and, in particular, the implementation of water meters, managers and providers perceived full cost recovery as a solution to some of the financial problems attached to the ongoing provision of safe drinking water. A local government manager in urban Tasmania argued that the pricing of drinking water was good because it assisted in recouping the costs of providing safe drinking water:

C25: There is so much involved in the reticulation of potable water and most people have no idea what is involved and just how costly that is....people tend to think that water should be free because of what it is, but safe potable water actually costs money to produce and to deliver. So for that reason it needs to be priced accordingly....

It seems that some managers and providers perceive the process of full cost recovery as a means of reflecting the costs of producing and delivering drinking water in Tasmania. It is reported that when cost recovery and sector funding have been ignored, there has been deterioration in infrastructure, which eventually leads to the breakdown of systems, absence of an adequate water supply and an increased public health risk services (World Health Organisation 2008, p. 1). Even though the production and provision of clean water to consumers entails the cost of both initial capital outlay and ongoing operation, maintenance, management and extension of services worldwide (World Health Organisation 2008, p. 1), full cost recovery raises significant debate over the implications of charging for essential social services such as drinking water (Beltran 2004; Elliot 1998; Johnston 2003; Narrain 2000; Ward 1997; Whelan & White 2005). Charging for water

services changes the nature of providing drinking water, because it is based on treating drinking water as an economic and tradeable good, rather than a human need and in doing so turns citizens into consumers. This removes rate-payers' rights as common owners of water by reducing them to the status of customers, 'whose only recourse is compensation when things go wrong' (Beder 1998, p. 2). When citizens become consumers, the economic imperatives and constraints of water provision overshadow the rights-based approach to drinking water provision. Those with the least capacity to pay for safe drinking water become the most vulnerable to household water disconnections and rates by being priced out of the water market (Barlow & Clarke 2002; Gleick 2002; Whelan & White 2005).

Tasmanian drinking water managers and providers acknowledged some social equity concerns with the process of full cost recovery in some parts of the state. A council employee who had lived and worked in a municipality for over 20 years spoke about the impact of two-part pricing on more vulnerable consumer groups:

C28:*Introducing water meters here was really to try to make people think about water use and in some cases that has worked, but on the other hand I would be deceiving you if I didn't say that it has hit people like the elderly and the retired the hardest, because they just can't afford to pay their water bills and that plays on your mind sometimes ----*

The introduction of full cost recovery in Tasmania is a persistently contentious issue. Some participants (n=7) argued that issues of affordability and social equity should be at the core of accessing drinking water resources. These participants supported the ideological stance that the pricing of drinking water should therefore take account of the need for equity and basic needs of the poor and the vulnerable (Hussey 2007; World Health Organisation & NHMRC 2005), because those with the least capacity to pay for water resources are most

commonly those from lower socio-economic or culturally marginalised backgrounds (Beder 2005; Beltran 2005; Centre for Water Research and Co-operation 2007; Pauw 2003; Whelan 2005). Social resistance to drinking water pricing and metering is happening globally, nationally and locally and has led to increasing pressure on governments to address the affordability and control of water resources (Barlow & Clarke 2002; Castro 2002; Field 1998; Marsden 2003; Olmstead 2003; Social Justice Committee 2002; Van Rooyen 1997; Whelan 2005). In turn this has led to increasing calls for governments to be more transparent in their policy making and to increase levels of community consultation and participation in the management of drinking water resources (Archer 2000; Moeller 2001; Social Justice Committee 2002; Ward 1997). Participants reported that there is a growing resistance among consumers to using water meters in some parts of the state. A local government drinking water manager, who is in the process of trying to implement water meters and working in an urban council, related the public opposition that his council is encountering:

C4: *It has got very political here, water ---- I mean I guess no one really wants to pay for water when they haven't in the past and it complicates the job we are trying to do. Our municipality is refusing to get meters and it's getting pretty heated and ratepayers are organising public meetings saying water is this and that and they are really fighting the issue and we have the Federal Government on our back wanting to know why we are behind in having done it [implemented two-part pricing]....*

This suggests that resistance to the implementation of two-part pricing and to water meters in particular is not just about fiscal concerns on the part of consumers and rate-payers. It may indicate that consumers are commonly concerned that the 'valuing' and management

of drinking water should not only reflect economic incentives, but should also reflect its social, environmental and cultural values for all its uses (Hussey 2007).

Consulting communities and citizens over the reform of essential services is an important part of environmental governance and public transparency. The *International Report on the Expert Panel on Safe Drinking Water for First Nations* (2006) states that local solutions to drinking water issues and governance need community acceptance and that community consultation is an integral part of an integrated approach to safe drinking water management and provision. In Australia the COAG Water Reform Framework (1994) also prescribes the need for more public education about water management and consultation in implementing water reform and policy. Despite this, building community partnerships in and consulting about drinking water appear to be slow in Tasmania. Managers and providers rarely expressed interest in community consultation and engagement. The following comments from an urban council manager point to a limited degree of support for greater community involvement:

C8:*You get some people, particularly those from larger cities coming down here and telling us that we need to get people involved and all that ---- That's all very well in theory but in reality there's a fairly large knowledge gap in this state between consumers and then us. Sometimes I can't help but think we are better off doing what we do and reporting to them in Hobart [State Government Regulators] than trying to explain the ins and outs of what we do to the public....*

Two issues that arise from this are associated with involving and consulting community members more about drinking water governance in Tasmania. First, water management and provision, including decisions about the cost of water and its quality, are seen to be the

domain of 'experts', such as drinking water managers and government officials, rather than of the non-expert 'lay public' (Hannigan 1995; Irwin 2002). Second, greater transparency in drinking water governance appears to be seen as more of an obstacle to managers and providers and their jobs than a benefit, because it requires them to disclose their practices to a 'largely uneducated public' (C19). Only three local government managers perceived that greater community consultation and engagement was an issue needing greater attention.

5.4 Chapter summary

A safe and reliable water supply is critical to the health and wellbeing of any community. So far, the findings presented suggest that the current governance of drinking water in Tasmania raises a number of important issues associated with the regulation, management and control of drinking water supplies. These are: the need to protect drinking water catchments and drinking water sources; more comprehensive testing; improvements to water supply infrastructure and distribution systems; greater staffing and expertise in water management; the social inequities impacting on equitable access to drinking water; and the need for greater public awareness of and involvement in the governance of drinking water resources. These issues appear to be related to a combination of factors. First, dissension exists between regulators and managers and suppliers of drinking water over how safe drinking water is being defined and responded to by public health regulators, leading to tensions about what is needed to adequately protect drinking water. Second, limited capital resources are constraining the ability of local government municipal councils to manage and provide safe and reliable drinking water supplies to communities particularly in rural and remote areas. Third, an increasing focus on the centralised and corporate control of

drinking water in Tasmania is creating controversy over who should have responsibility for the provision of such essential resources. The main findings from this chapter are:

- a) There are contradictions and arguments about how drinking water is being governed in Tasmania, particularly how risk is being constructed and responded to by state government regulators.
- b) The protection of water catchments in Tasmania is a pressing concern.
- c) Rural and remote managers and providers are facing a number of difficulties supplying safe and plentiful drinking water to Tasmanian communities.
- d) Rural and remote water providers have a heightened sense of liability associated with the management and provision of drinking water and have considered shutting down drinking water supplies.
- e) Managers and providers report that there is not a lack of drinking water regulation, but a lack of adequate resources and capital needed to manage and provide safe drinking water.
- f) Some water managers and providers are forced to use 'bandaid' approaches to respond to the supply of sub-standard water quality in some Tasmanian communities.
- g) National economic reforms and policies are impacting on the control and provision of drinking water in Tasmania. The corporatisation of drinking water authorities and the application of greater pricing mechanisms is raising tensions associated with the equitable access to drinking water and the preservation of social justice.
- h) The implementation of economic reforms is not straightforward at the local level; some local governments are struggling to implement processes, such as metering, because of public resistance and a lack of resources.
- i) Managers and providers of drinking water in local government see that responsibility for the provision and management of essential services (e.g. drinking

water) are being increasingly shifted away from the Australian and State Government to local governments and consumers.

The next chapter will discuss the findings of the thesis in detail. It will answer the research questions by identifying the key social conditions, processes and issues underpinning the governance of drinking water in Tasmania and will discuss how these can be understood in light of sociological theories of risk and political economy.

6 Risk, power and Tasmanian drinking water

Just as the biophysical world is the basic component of natural resources, politics is the 'stuff' of people interacting with each other, their environment, and government institutions, all of which affect nature greatly.

Cortner & Moote (1999, p. 1.)

6.1 Introduction

The findings of this thesis show how managers, providers and regulators of drinking water in Tasmania differentially construct key issues and practices associated with governance. The findings indicate that drinking water governance is being highly contested, views on regulation and management differ and that issues of risk are constructed differently and are keenly contested. The findings also reveal the critical effect of limited capital and resources on local governments responsible for providing drinking water. They point to the impact of rurality on managing and providing drinking water, as well as the health risks and the sense of liability being experienced by many providers supplying drinking water in rural and remote Tasmania. Finally, the findings have revealed that economic reforms have changed the way that drinking water is being managed and provided in Tasmania and point to the need for a more integrated and transparent approach to the governance of water resources in order to protect public health.

The purpose of this chapter is to generate an understanding of drinking water governance as a social, economic and political process, and to identify and interpret the key social structures and issues underpinning Tasmanian drinking water governance. To do this the implicit institutional assumptions, decisions and contestations surrounding the governance of drinking water are revealed and examined, which will be followed by

discussion of how the social processes of risk, commercialisation and commodification are underlying the management, provision and regulation of drinking water in Tasmania. The next section discusses the dissonant nature of drinking water governance in Tasmania, paying particular attention to the definition and assessment of risk and how judgements on drinking water safety are constructed and seen as problematic by managers and providers.

6.2 Institutional judgements and contested decisions: the dissonant nature of Tasmanian drinking water governance

The ways governmental institutions 'make sense of' and govern environmental issues such as drinking water is a growing focus of environmental sociology (Irwin 2001). This study found that there is dissent among regulators, managers and providers about the processes and judgements underpinning the governance of safe drinking water in Tasmania. A key point of difference for participants in their understanding of drinking water governance was the notion of risk; how risk should be defined, framed and responded to, were consistent themes of dissonance in this study of drinking water.

6.2.1 Drinking water regulation and the framing of risk: Is safe really that safe?

The findings of this study show that the regulation of drinking water quality in Tasmania under the provisions of the *Public Health Act 1997* Drinking Water Quality Guidelines is a source of dispute and confusion among those involved in the immediate provision and management of drinking water. Compliance with the regulatory demands of the Public Health Act did not necessarily mean that participants perceived drinking water in their municipality to be safe or that public health was protected. How Tasmanian State Government officials are framing risk in their regulation of drinking water was the

principle source of contestation and also ambiguity. Specifically, the Tasmanian State Government's decision to judge and define the safety of drinking water based on microbiological assessment alone was particularly contentious. The findings suggest that there are clear discursive and political struggles (Freudenberg & Pastor 1992) embedded in the conceptualisation and assessment of risk in Tasmanian drinking water governance.

Risk and risk assessment are central organising concepts of environmental governance (Jasanoff 1999). Risk assessment involves the systematic procedure of identifying and measuring the risks to human health posed by various activities and substances in the environment (Hird 1994). The regulation of drinking water quality is typically concerned with assessing and responding to the public health risks from drinking water that consumers are exposed to. As Irwin (2002, p. 192) points out, environmental threats 'do not simply present themselves to institutions', rather governments must 'judge, negotiate and define the character and scale of such threats'. Because regulating drinking water involves regulators, usually government officials, deciding what is safe and what is safe enough to adequately protect public health, risk assessment and regulation is an inherently controversial process and subsequently a regular source of social conflict (Hird 1994; Mehta 1995; Percival 1992; Vaughan & Seifert 1992).

The findings of this study show that the dissent among managers and providers of drinking water in Tasmania is largely caused by the specific requirements of the Tasmanian Drinking Water Quality Guidelines. These are centred on the microbiological sampling and testing of drinking water for the contaminant *Escherichia coli* (*E. coli*) as the primary means by which to judge drinking water quality. As noted in the Water Quality Guidelines (2006, p. 7):

7.1 For drinking water not to be considered a threat to public health it must comply with the health guideline values contained in the ADWG.

7.2 Water supplied by a drinking water supply system must be sampled and tested at an accredited laboratory for *Escherichia coli* in accordance with Table 10.2 of the ADWG unless the drinking water supply system receives treated water from a bulk water authority in which case a lower frequency of sampling is sufficient provided monitoring can demonstrate the maintenance of an effective chlorine residual.

7.3 Water supplied by a drinking water supply system which supplies less than 1000 consumers must be sampled and tested at an accredited laboratory for *Escherichia coli*, once per week.

E. coli contamination is acknowledged to be one of the greatest waterborne threats to human health (Archer 2001; Australian Drinking Water Guidelines 2006; United States Environmental Protection Agency 2007), but other contaminants have significant implications for the quality and safety of drinking water supplies (Archer 2001; Bleaney 2007; McKay & Moeller 2001). Although participants acknowledged that drinking water supplies can never be entirely risk free (Hrudey & Hrudey 2004) the decision of Tasmanian regulators to limit risk assessment and definition to *E. coli* was perceived to be defining risk in narrow, ostensibly objective terms (Cohen 2000; Sjoberg 1987). Regulators' framing of risk this way was interpreted by many managers and providers to be restraining a more comprehensive approach to the protection of water quality and public health, because it involved the 'compartmentalisation of risk' whereby government regulators 'limit risk to specific events, activities and outcomes' (White 1998) while ignoring others. These findings support claims that the treatment of risk in contemporary environmental policy involves two main dimensions on the part of regulators: the identification of risk and the judgement of its acceptability based on quantifiable measures (Tietenberg 1994, p. 64).

Even though it is advocated that the safety and quality of drinking water should be judged on its chemical, radiological, microbiological and physical content (World Health Organisation 2006), a lack of chemical testing in Tasmania was perceived to be an example of 'a risk trade-off' in the regulation and judgement of safe drinking water (Putnam & Wiener 1995). At present, the *Public Health Act 1997* Drinking Water Quality Guidelines do not prescribe the mandatory testing of drinking water for any chemicals. However, the findings reveal that there is trepidation over the impact of adjacent sectoral interests, such as forestry and agriculture, on the quality of drinking water sources in some parts of Tasmania. The issue of potential chemical contaminants raised significant concern and debate among managers and providers of drinking water regarding the public health implications of potential chemical contamination.

6.2.2 To know or not to know? Chemical risk, testing and the burden of proof

The study found that the possibility of introducing chemical testing was a source of significant uncertainty for managers and providers, because they were unsure about the public health and legislative implications of chemicals being detected. For some a lack of testing was viewed as a form of avoiding liability by effectively transferring the burden of proof on to the lay public to establish the existence of chemical risk. This 'burden of proof' (Hannigan 1995) is exacerbated by the difficulties of groups, like communities, in establishing causal links between potentially detrimental environmental activity (the chemical contamination of drinking water supplies from industrial chemicals) and detrimental health outcomes. As Hilgartner (1992) observes, constructing linkages between environmental risks and potential harm is 'always problematic', because risk can be attributed to multiple objects. It therefore becomes exceptionally difficult to attribute the

consumption of drinking water with the onset of health-related problems. In one local manager's view the burden of proof in the chemical content of that municipality's drinking water supply was a source of tension between the local community and the council. Community members and health professionals had reported epidemiological health problems that they believed were stemming from industry activity in the region's drinking water catchments. However, the establishment of possible public health risks stemming from the activity was obstructed by an absence of government mandated chemical monitoring. Such events demonstrate the difficulties discussed by Beck (1992) in detecting such environmental risks, because they are often '“out of sight” in that often we cannot touch, see, smell or taste them', but they are 'piggy back products', which are inhaled and ingested with other things making them 'stowaways on normal consumption' travelling in water (1992, p. 2). Water consumers and communities therefore require the 'sensory organs' of science for risks to become visible or interpretable as public health hazards at all (Beck 1992, p. 27). Without these scientific methods, lay knowledge and concern about the environment is often constructed as irrational.

A lack of chemical testing of Tasmanian drinking water supplies also raised concerns over the possible long-term effects of exposure to chemicals in drinking water. The effect of exposure to chemical drinking water contaminants is complicated by the fact they often have 'a long latency period' (Percival 1992, p. 213). So a considerable time may elapse before physical illness caused by environmental risk may become manifest. The full extent of the public risks posed by possible chemical contamination of Tasmanian drinking water may not therefore be known for some time.

In cases where managers and providers admitted they had tested for chemicals in their drinking water supply, they referred to the use of 'guideline risks and values' to interpret the quality and safety of these supplies. This reliance on language such as 'acceptable guidelines values' to indicate the permissible extent of chemical existence indicated the dominance of quantifiable likelihood and objective calculation as a primary means by which drinking water quality was grounded in scientific processes. Such forms of institutional rationalisation have been criticised because they fail to account for how chemical contaminants in water supplies 'possess cumulative properties, which may or may not combine synergistically' (Sjoberg 1987, as cited in Mehta 1995, p. 4). For example, Field (2001, p. 90) asserts that the 'statistically average' person defined by regulation fails to account for sensitive individuals such as children, the ill and the elderly, thus 'reifying and neutralising' the possibility of risk amongst a non-homogenous public (Cameron 1996, p. 15). In some respects the increasing concern among the Tasmanian public and managers and providers of drinking water over the potential presence of chemicals in their drinking water supplies indicates that many people have come to view even low-level exposure to toxic chemicals as harmful (Percival 1992). Without the regular testing of drinking water supplies for chemicals in Tasmania, it could be asked whether 'an absence of evidence indicates an evidence of absence' (Irwin 2001, p. 73).

The findings indicate that managers and providers interpreted the current exclusion of chemical testing in a number of ways. In some cases, managers and providers, particularly those in local government, suggested that an absence of chemical testing reflected a deliberate strategy by the government to not 'open a can of worms' (C19), because it was an area 'too hard to regulate' (C8). In any case, regulating the testing of

drinking water supplies in Tasmania for particular chemicals was viewed consistently as not amenable to any easy solution or able to be done through straightforward risk minimisation strategies. For example, the only way that chemicals can be avoided is for them not to be used at all. This raises larger issues associated with the ability of governments to regulate industry activity and its by-products, while also serving to protect public health. This is ultimately a reflection of the power of governments to control the risk agenda (Hannigan 2006) in the governance of drinking water, by determining what is tested for and how. An absence of regular chemical testing can be therefore be suggested as serving the interests of government bodies, particularly regulatory agencies in protecting themselves from contestations over environmental quality and safety. Tasmanian government regulators therefore exercise substantial social power by defining what risks are ‘included or excluded from public discourse’ about drinking water (Hannigan 1995, p. 106). These findings also demonstrate the highly contextualised and compartmentalised nature of risk assessment in drinking water regulation in Tasmania, which does not necessarily constitute a safe or holistic approach.

This study’s findings show that understanding and protecting drinking water sources and catchments in Tasmania from both microbiological and chemical risks was seen by managers and providers to be an important part of managing safe drinking water.

6.2.3 Reframing regulation and risk: a catchment-to-tap approach to drinking water

The findings of this study suggest that a lack of drinking catchment monitoring and control had significant implications for declarations of safety and quality under the *Public Health Act 1997*. Specifically, the current regulatory approaches to assessing risk and safety were

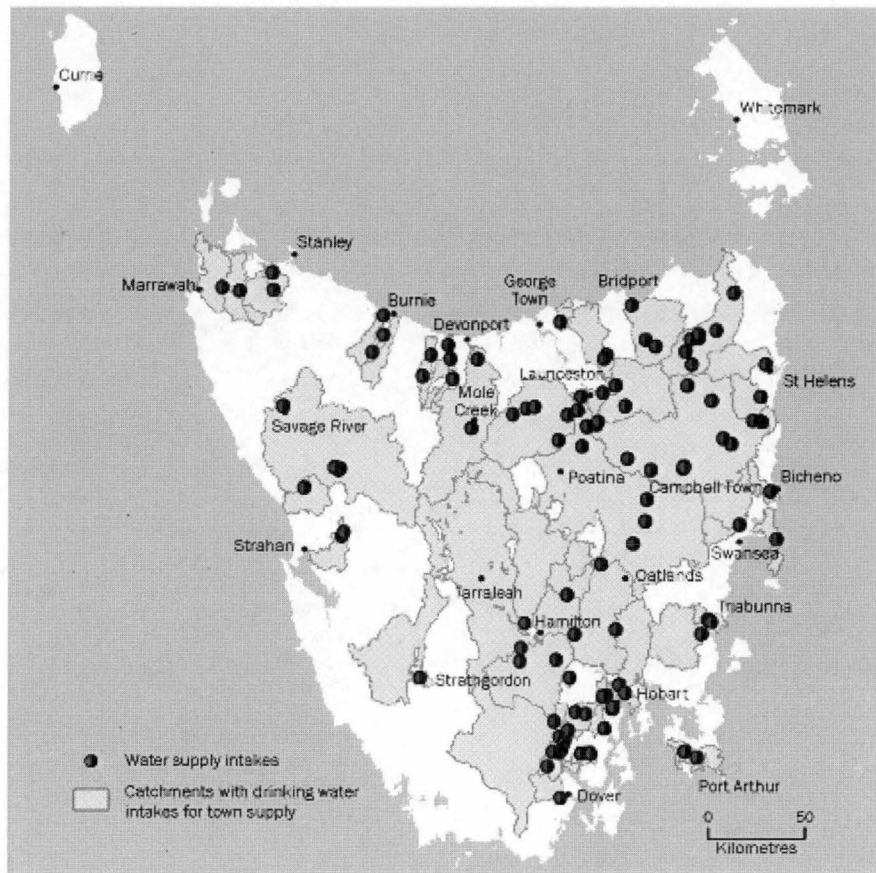
seen to be inadequately protecting water quality because they were denying 'the holistic, intertwined and complex nature of the environment' (White 1999, p. 242) and the wider environmental factors that may influence drinking water quality. Managers and providers argued that testing drinking water alone was only an indicator of water quality problems and that a dependence on microbiological water testing in the appraisal of drinking water safety and quality was inherently problematic, because the scientific process of testing and sampling took time to conduct. This exposed consumers to potential contamination during the testing and judgement process. The findings imply that until a more comprehensive approach to drinking water management and risk is implemented, declarations of drinking water safety would continue to be a source of contestation. The protection of drinking water from 'catchment to tap' was perceived to be a more rigorous approach to risk management and the protection of public health. However given the continuing competing and different perspectives and interests amongst water managers and providers in Tasmania, the differing interpretations of science and risk and ultimately the protection of public health are unlikely to be eliminated or ultimately resolved in the near future.

Internationally, there is consensus that the safety of drinking water is greatly increased if an integrated and preventative approach to governance is implemented (Boyd 2003; Hrudey & Hrudey 2004; Report of the Expert Panel on Safe Drinking Water). This approach involves taking account of the 'characteristics of the drinking water supply from catchment and source to its use by consumers' (World Health Organisation 2006, p. 2). Although the *Public Health Act 1997* Drinking Water Quality Guidelines recommend that large water authorities in Tasmania consider what potential risk may be in their system, it is not mandatory for all water providers to develop drinking water management plans.

Advocating ‘a catchment to tap’ and ‘multi-barrier’ approach indicated that participants understood the risks associated with drinking water to be more omnipresent and complicated than reflected in the current regulation in Tasmania. Such an approach comprises ‘an integrated system of procedures, processes and tools that collectively prevent or reduce the contamination of drinking water from source to tap in order to reduce risks to public health’ (The Canadian Council of Ministers & the Environment & the Federal Provincial Territorial Committee on Drinking Water in Canada 2002, p. 1).

The geographically diverse nature of Tasmania means that many parts of the state are defined as separate water catchment areas. Figure 3 illustrates drinking water catchments and known water intakes in Tasmania (Resource Planning and Development Commission Tasmania 2006).

Figure 3: Tasmanian drinking water catchments and known water intakes



Source: Resource Planning and Development Commission Tasmania (2006)

This study reveals that the protection of drinking water sources is complicated by jurisdictional and legislative problems surrounding the regulation and management of drinking water catchments in Tasmania. The main regulator of drinking water in Tasmania, the Department of Health and Human Services, has no specific legislative or jurisdictional authority under the *Public Health Act 1997* or through any other legislation over drinking water catchments. Because many aspects of drinking water quality management, including catchments and source water, are often outside and beyond the direct responsibility of water suppliers and regulators (World Health Organisation 2006), it is essential that an integrated approach to managing drinking water depends on a collaborative multi-agency approach

(Bakker & Cameron 2002; Hrudey & Hrudey 2004; Global Water Partnership 2000; UNESCO 2008). An integrated approach to water catchment management demands an ongoing process whereby various parties and stakeholders involved in water catchments areas are brought together through land and water management plans to achieve transparency in activities affecting the catchment and in improvement of drinking water quality (Cummings 1999; Falkenmark 2004; Victorian Department of Primary Industry 2008). This may include elements of drinking water quality management, such as monitoring and reporting, emergency response plans and communication strategies between stakeholders (government, private industry and communities) (World Health Organisation 2006, p. 2).

Managers and providers in Tasmania are anxious about the effects of industrial activity on the state and quality of water catchments. Large-scale forestry plantations within catchment regions and in particular the use of chemicals, such as herbicides and pesticides, are of greatest concern. There has been a rapid increase in large-scale forestry plantations within Tasmania in the past decade (Bleaney 2006). This has contributed to considerable increases in plantation forestry activities, such as the aerial spraying of pesticides in and around water catchment areas (Bleaney 2006; Cameron 2002). The findings of this study suggest that without better protection of drinking water catchments and source water in Tasmania, managers and providers see that the quality and ultimate safety of drinking water supplies will continue to be uncertain until reforms are made. The findings also show that drinking water regulators in Tasmania face multiple demands for action that outstrip their limited resources, which results in their often being forced to make regulatory decisions about risk and safety based on economic and political influences (Percival 1992).

Even Tasmanian state government officials identified that a lack of integrated catchment management and limited legislative control over the activities affecting water catchments was of significant concern in the governance of safe drinking water. However, conflicting natural resource policy, the private ownership of land abutting catchments, non-transparent industry practices, departmental fiscal constraints and a reluctance of government treasury to allocate funds to facilitate these improvements are impeding on the implementation of integrated approaches to the safety and protection of Tasmanian drinking water catchments. These very findings support claims that a fundamental contradiction of environmental governance is the balancing of environmental quality, economic expansion and the protection of public on the part of governments (Carson 1962; Irwin 2001). The process by which the Tasmanian government regulates drinking water quality involves expert risk decisions and trade-offs between values and competing interests, and courses of action (Mehta 1995, p. 2). Specifically, defining what is acceptable and what is not in regard to the quality of drinking water catchments is often rooted in negotiations among different social groups and sectoral interests seeking to structure relations among themselves (Hannigan 1995, p. 101).

Managers and providers of drinking water in Tasmania perceive that the regulation and quality of drinking water are complicated by political-economic pressures on policy makers from private industry, as well as greater governmental interests. While there is an understanding among managers and providers that there are naturally competing demands for water resources, a reluctance of public health legislators to implement more stringent regulatory approaches to the protection of water catchments is perceived to be the privileging of economic interests over the protection of public health. Industry's significant

contribution to the increasing pollution and degradation of fresh water sources (United Nations Environment Programme 2007) has supported claims that 'the social production of wealth is systematically accompanied by the social production of risk' (Beck 1992, p. 19). This point is pertinent to Tasmanian drinking water governance, given that some of the state's largest and most valuable primary industries are forestry and agriculture, which are reported to be of most concern to drinking water providers and managers. The findings of this study subsequently indicate that the governance of drinking water in Tasmania is complicated by the impact of non-environmental values such as the economy on public health regulation (Percival 1992) and that the negotiation and mediation of competing interests and demands for fresh water resources have become a distinguishing feature of environmental management and policy (Mehta 1995). This supports claims that environmental regulators are unable to effectively balance economic, ecological and health concerns, because they are often constrained by a climate of capital accumulation and neo-liberal policy (Buttel & Humphrey 1994; O'Connor 1994). The regulation of Tasmanian drinking water can therefore be seen to be inextricably bound by the impetus of capital accumulation (White 2002); the control of water catchments and their use by industry raises issues associated with power and economics, more specifically it highlights the political and economic contexts in which governments dominate the framing of risk and what activity is socially and environmentally acceptable (Hannigan 2008). This finding supports White's (1999, p. 237) claim that what is regulated and how it is to be regulated are essentially issues of state and class power because economic interests and growth will often frame the ways in which in the environment is regulated and managed.

In negotiating and mediating regulatory frameworks for drinking water, governments use such scientific and technical knowledge to define and construct risks to occupy a level of social and political authority over risk that fundamentally suits their environmental agenda (Beck 1992). The protection of public health in Tasmania is typically framed by regulatory authorities as a 'best judgement' informed by scientific evidence, rational analysis and negotiation between regulators and industrialists (Irwin 2002). The development and implementation of integrated water and catchment management schemes worldwide have been leading examples of governments' facilitating dialogue between those most affected by the quality and quantity of water resources, such as communities, water providers, industry and politicians. In Tasmania a lack of integrated catchment management and chemical testing indicates the reluctance of governments to engage with a more comprehensive understanding of the effects of industrial activity on drinking water quality and public health. This raised tensions over the role of governments in encouraging economic growth on one hand and protecting public health on the other (Carson 1962).

This study's findings show that some participants perceived a lack of integrated management of water resources in Tasmania as symptomatic of the state government's reluctance to mandate and engage in regulatory activities that may limit economic and industrial gains and growth. It highlights that competing public health and economic demands for fresh water and the bureaucratic policies surrounding each of these areas are at odds and constrain an integrated and collaborative approach to the management of fresh water resources and catchments in Tasmania. This shows the need for the *Public Health Act 1997* legislation and ensuing regulation to be integrated better with other legislation governing the environment and the economy (Bakker 2000).

6.2.4 Are government regulators risk experts?

The finding that interpretations and definitions of risk were highly contested between providers of drinking water and state government regulators indicates a high level of contestation and uncertainty regarding the governance of drinking water in the state.

Implicit to discussions with managers and providers were doubts over the institutional expertise and knowledge of state government regulators to understand what was involved in the local management of safe drinking water. Such contestations reinforce the hybrid and dynamic negotiation of environmental issues and the highly politicised nature of protecting public health and defining safety in the quality of water. Importantly this criticism and questioning of government regulation and expertise is a role most commonly reserved in the environmental governance literature to the lay public (Beck 1992; Brown 1995; Cameron 1996; Irwin 2002). In environmental debates and contestations between government and lay people, the public are most often dismissed as lacking technical expertise and scientific knowledge (Hannigan 1995; Irwin 2001). However, the findings of this study suggest that environmental governance and the regulation of safe drinking water are contested within the bureaucratic structure of government. Specifically, it indicates how understanding of risk can vary among levels of government. This illustrates that decisions about the regulation of the environment are negotiated and contested within institutional levels of government itself. This raises larger debates about how effective and expert governments are in regulating and governing drinking water resources and questions the consensus that is thought to underpin all levels of governments in regulating the environment and in constructing environmental risks.

The capability of contemporary institutions such as governments to 'cope flexibly and effectively with environmental issues' (Irwin 2001, p. 115) is an ongoing concern of environmental sociology. These findings revealed that differing perceptions of risk and effective management ultimately came back to the issue of expertise and which institutions should be charged with which responsibility for regulating public health and drinking water quality. Water authority managers in particular were the most persistent in questioning the expertise of government regulators and the bureaucratic system in which they operated. Water authority employees placed little importance on the type of risk being defined by the state government through public health legislation. They preferred instead to interpret the management of drinking water in more holistic and comprehensive means, mainly through multi-barrier, more integrated approaches to risk. Water authorities' conceptualisation and interpretation of risk was based on the control and measurement of risk by risk management strategies. Scientific terminology such as 'probability' and 'likelihood' were used to explain what risk was and water authority employees viewed the notion of risk as 'an event' or 'incident' that should be prevented. Risk events were thought to be possibilities that could be calculated and managed strategically, as long as the provision of drinking water was seen as a systematic process that involved a raft of factors; for example water treatment, water supply infrastructure, catchment protection, adequate testing regimes and other factors that determine the quality of drinking water. In this respect, participants who strongly advocated a more holistic and integrated approach to managing drinking water quality asserted that the management of risk had less to do with legislative compliance and satisfying levels prescribed by the government, but more to do with a whole-of-system approach. In this water authority employees and some local government managers were

effectively questioning the ways government regulators were ‘making sense of environmental matters’ (Irwin 2001, p. 114), especially in relation to the judgement of risk. The suggested inability of government regulators to understand daily practicalities and processes of the management and provision of drinking water led some participants to elevate water authorities to a level of greater expertise compared to government regulators, because they were perceived to be more cognisant of the practicalities involved in managing and providing safe drinking water. These findings further demonstrate that the governance of drinking water is intrinsically contested and that the institutional actions and judgements of governments, charged with the ‘independent’ assessment of environmental risks, are being increasingly questioned by those on the receiving end of environmental governance. However, the continuing predominance of government regulators’ framing of risk through drinking water policy, such as the *Public Health Act 1997*, challenges the ability of governments ‘to control the official risk agenda’ (Hannigan 1995, p. 106) by exercising power on a legislative and jurisdictional plane.

6.2.5 Rurality, resource constraints and regulatory responsibility

This research shows that there are a number of barriers affecting the governance of drinking water in parts of Tasmania and that some communities are unable to access permanent safe drinking water. It is universally recognised that the local management of drinking water governance is contextually diverse and is affected by a range of factors (Archer 2000; Bakker & Cameron 2002; Hrudey & Hrudey 2004; Mollinga 2000). However, some water supplies are at more risk of being unsafe or poorly governed than others, leading to claims that:

It is essential in the development and implementation of water quality standards that the current and planned legislation relating to water, health and local government are taken into account and that the capacity to develop and implement regulations is assessed. (World Health Organisation 2008, p. 2.)

The study's findings reveal that rural and remote Tasmanian communities and consumers are at most risk from poor public health outcomes as a result of how drinking water is managed, because many municipalities are struggling to meet the requirements and stages for ensuring safe drinking water that are advocated internationally (Boyd 2003; Hrudey & Hrudey 2004; Report on the Expert Panel on Safe Drinking Water for First Nations 2006). This supports ongoing concerns with the quality and management of drinking water in geographically distanced regions worldwide.

For many rural and remote drinking water providers, the human and capital resources needed to manage safe drinking water and protect public health are limited, or in some cases non-existent. These findings indicate that poor and inadequately skilled staff, ageing and insufficient water supply infrastructure and distribution systems, deficient or non-existent treatment facilities and the decreasing availability of fiscal resources for improvement are severely impeding the provision of safe drinking water. Such findings mirror similar problems in Canada (Report on the Expert Panel on Safe Drinking Water for First Nations 2006) and support increasing claims that the management of safe drinking water in the world's rural and remote communities is a critical issue, requiring significant attention in order to sustain health and development (NHMRC & World Health Organisation 2005).

It has been recognised that major health gains can be achieved through improvements to drinking water quality in rural and remote communities (NHMRC &

World Health Organisation 2005), but as this research shows, this not always easily solved in Tasmania due to a lack of interdisciplinary approaches to infrastructure upgrading and the inconsistency of federal and state government funding for drinking water provision in the state.

A lack of capital resources and investment needed to supply safe drinking water in Tasmania has led to many rural and remote water providers experiencing a constant sense of liability and risk associated with their jobs. The absence of incremental improvements to water supply infrastructure along with limited assistance and support from state and federal governments had led a small number of water suppliers to renegotiate ethical and moral notions of ensuring equal levels of safety for all drinking water supplies in favour of minimising risk as best as possible to avoid liability. In some cases, a severely heightened and ominous sense of risk attached to their responsibility for providing drinking water was so prominent that some providers wanted to stop the supply of drinking water altogether to some communities because they felt unable ~~meet~~ regulatory guidelines and to adequately protect public health. In this sense, the findings showed that participants were effectively torn between the exigency of providing a basic human need to communities and the need to protect their organisation from legislative and public health liability. In many cases, these participants were critical of the current drinking water regulations in Tasmania and advocated a more comprehensive and integrated approach to safe drinking water. But at the same time, the prospect of future regulatory reform was a significant source of apprehension and fear, because participants thought that it would be impossible for their organisations to be able to afford more stringent water quality improvements.

The size and location of municipal drinking water systems is viewed internationally as an important consideration in assessing and developing regulatory options for water quality improvement (Report of the Expert Panel on Safe Drinking Water for Advanced Nations 2006). In nations such as Canada, where many municipal providers have responsibility for drinking water provision, regulatory and policy frameworks have begun to include key criteria and support for incremental improvement of water supplies. This involves greater levels of community engagement, consideration of costs for water supply and management, ease of maintenance and repair and other ways of building the economic capacity of water providers (World Health Organisation, National Health and Medical Research Council 2006, p. 6). This study shows that there are inappropriate levels and systems of financial and technical support, education and training and collaboration from levels of government in maintaining the safety and long-term sustainability of rural and remote community water supplies in Tasmania and issues facing the day-to-day provision of drinking water (World Health Organisation 2006). This affects how drinking water managers and providers view their responsibility for water provision as liability rather than a social need. It is also impacting on rural and remote communities' ability to equitably access safe drinking water.

6.2.6 The social distribution of risk

This study found that some Tasmanian municipalities are at more risk from unsafe drinking water than others. Issues of inadequate infrastructure, permanent boil alerts, detrimental catchment activity, limited staffing and expertise were common problems in over a third of Tasmanian municipalities. The empirical findings challenge Ulrich Beck's prominent claims that in modern society risks are egalitarian in nature and democratic in effect (1992,

p. 36), because the distribution of risk posed by unsafe drinking water is endured most by those in rural and remote communities and also by financially constrained households.

The dispersed Tasmanian population and the prevalence of rural and remote communities were shown to be critical influences on the structural factors that impede local governments' ability to provide safe drinking water to many of their constituents. Rural and remote communities in Tasmania were not only being provided with unsafe and unreliable drinking water supplies, but these same communities were often in a limited financial position to be able to afford improvements to the infrastructure of their water resources.

The findings support claims that class and geographic divisions in Tasmania are intensifying the predisposition to such environmental risks, because of the relative ability of some Tasmanian communities and individuals to 'financially buffer and resist' the environmental risks posed by poor quality drinking water (Mehta 1995, p. 191). For example, people with less capacity to pay for bottled water or filter attachments will generally experience a greater proportion of risk when drinking water quality and management fails (White 2002) in Tasmania.

The prevalence of 'boil water alerts' in a number of rural and remote Tasmanian municipalities is a major example of how some communities are more vulnerable to contamination and management failures than others and of the social distribution of drinking water risk. The issuing of 'boil water alerts' in Tasmania is a common practice in many parts of the state, when water providers fail to meet regulatory standards for drinking water quality. It is primarily a way of 'advising' consumers to boil their water or buy bottled water in order to protect themselves from microbiological contaminants in their drinking water supply. This can be understood as 'risk communication', a key process in

the management and assessment of environmental health (Mehta 1995; Slovic 1987). According to Covello et al. (1984) risk communication is defined as the purposeful exchange of scientific information between concerned parties regarding health or environmental risks. This transfer of information exists predominantly between the government and science or 'experts' and the general or 'lay' public and has increasingly been the source of contestations over claims of 'truth' and 'safety' (Brown 1995; Cameron 1996; Cohen 2000; Irwin 2002; Snider 2005; Lash, Szerszynski & Wynne 1996). While risk communication and assessment is ostensibly intended to provoke rational debate (Mehta 1995), the current processes of regulation in Tasmania suggest a 'one-way flow' of information, thus limiting the ability of the public to engage in decisions about water quality.

This study suggests that risk communication and management via 'boil water alerts' effectively individualise risk by reallocating the responsibility for protecting public health on to the individual consumers, ultimately avoiding the reasons water is unsafe in the first place. In many parts of Tasmania where permanent 'boil water alerts' continue, councils do not have the financial resources to upgrade their supply infrastructure; thus the onus of risk continues to lie with the community. Issuing these alerts also raises issues about the temporary management of risk, rather than providing permanent or sustainable solutions to water quality problems in Tasmania. The prevalence of 'boil water alerts' and water quality problems in some parts of Tasmania are indicative of neo-liberalism, which is concerned with 'minimising the interventionist role of the state' (Portes 1997, p. 238). A neo-liberal approach to public health 'adopts a focus on the citizen as a rational consumer, who engages as an autonomous individual in activities to prevent, reduce or protect them from

health risks' stemming from the environment (Petersen & Lupton 1996, p. 96). By shifting responsibility from governments and on to individuals, citizens or consumers become responsible for managing the risks posed by drinking water quality. The inherent nature of neo-liberalism also raises social issues concerning who or which institutions or organisations should be responsible for the provision of basic services such as drinking water. The continuing shifting of responsibility for all types of services from federal and state governments to local government is also symptomatic of a more neo-liberal approach to governing the environment. The movement of responsibility, for example, is 'ultimately contingent upon baseline economic criteria' (White 1999, p. 249) and involves less liability and fiscal responsibility for the provision of essential water services by federal and state governments. In addition the structure of local government is centred on income from rate-payers and citizens, and so responsibility for upgrading and improving water quality is again shifted back on to individual consumers. This is neo-liberalism both because it decentralises the nature of state power and transforms drinking water into an economic resource, reinforcing the need for issues of social equity to be brought into the policy decisions on drinking water provision (Mollinga 2000). The findings also strongly highlight the relationship between power, inequality and the social construction of risk (Hannigan 1995, 2008) in drinking water provision, because many communities in Tasmania are being 'marginalised by positions of economic, geographic and social isolation' (Blowers et al. 1991).

6.3 The three C's: commercialisation, commodification and corporatisation

This study reveals the increasingly localised effects of neo-liberal global policy on the management, provision and control of drinking water in the state of Tasmania. The

corporatisation of Tasmanian bulk water-supply agencies and the application of pricing mechanisms have occurred under the banner of statutory frameworks, such as the COAG-inspired *National Competition Policy Water Reforms* (Cater 1998; Sheil & Leak 2000; Smith 1998). The social and institutional logic of these reforms have clear synergies with neo-liberal policy that advocates the decreased role of the state in providing essential services and, most pertinently, argues that the most effective way of managing drinking water is to value it economically.

The findings indicate that, although the effective management of drinking water is seen to be an important public health issue, economic efficiency and financial return, particularly in the case of corporatised bulk water authorities, have become the underlying imperative of their operations. Many managers and providers construct and interpret the provision of drinking water to be an issue of cost recovery and economic viability, rather than a human right. This has several repercussions for the equitable provision and consumption of drinking water in Tasmania.

6.3.1 Corporate control and commercialisation

Economic reforms to the governance of Australian water resources over the past decade have mirrored those in other social-democratic nation states, which have embraced neo-liberal water policies, such as commercialisation, commodification, corporatisation and privatisation (Bakker 2005, p. 544). Under neo-liberalism, governments at all levels are under pressure to remove regulatory economic restraints and to divest common resources, such as drinking water, and publicly-owned enterprises, such as drinking water authorities, to create private property rights, and to facilitate the private supply of goods and services (Schneiderman 2000, p. 85).

The last decade has seen the conversion of a number of major Australian water authorities into commercial corporations (Leiss & Hrudey 2007.) The findings of this study show that commercialisation and corporatisation are increasingly underpinning the management, provision and control of drinking water in Tasmania. Commercialisation can best be described as orienting labour and services away from a public service ethos to the production of commodities. Described as a kind of ‘creeping privatisation’ (Encyclopaedia of Marxism 2008) commercialisation of water resources is ultimately about changing the provision and control of drinking water to fiscal rather than human interests. Adopting pricing mechanisms, such as the implementation of full cost recovery, is an example of the commercialisation of drinking water in Tasmania.

Corporatisation is another stage of commercialisation found in the current governance of Tasmanian drinking water. Water corporatisation can be generally defined as the management of state water agencies and bodies as for-profit institutions (Whelan & White 2005). Under corporatisation, water supply organisations act as independent businesses, which is argued to improve the incentives of these agencies ‘to minimise production costs and operate more efficiently (Kerr 1998). A key presumption amongst supporters of corporatisation is that it increases accountability in the sense that it increases efficiency, protects social welfare and empowers consumers (Archer 2000; MacDonald 2001; Moeller 2001; White 1998). There are, though, persistent concerns about the corporate control of drinking water supplies in that ‘converting water and other public services into valuable corporate commercial activities’ (Sheil 2000, p. 3) raises social tensions between the subordination of public interest and community service for the achievement of profit and commercial imperatives.

This study shows that corporatisation as a key area of reform is generally supported by managers and providers of drinking water in Tasmania. The general rationale for supporting commercialisation and corporatisation was the limited levels of funding for local government to continue providing drinking water services. Participants indicated that, in many cases, it was not economically feasible to continue providing and managing safe drinking water. Therefore alliances with corporate water authorities and providers were viewed as the primary means of improving efficiency and effectiveness of utility operations. In one example, the corporate control of one local government water supplier was constructed as the only possible solution to continuing water provision and supply problems. For many others, fiscal partnerships already existed with corporate water authorities in the provision and management of drinking water supplies across the state. Shifting responsibility for drinking water to corporate water bodies was subtly presented as a way of minimising the threat of liability associated with some drinking water supplies. In effect, participants who took this view implied that the corporate control of drinking water was more likely to improve the quality of supplies and to minimise the possibility of public health risks associated with local government management. Only a small number of managers and providers were concerned about the conflict between the necessity of organisations to make profits and protecting social goals, such as the protection of public health, democratic access and environmental sustainability. These participants argued that the removal of responsibility for water services from local government made rate-payers and citizens less able to participate in local decisions about their drinking water, because corporatisation removes responsibility for water provision to a corporate not local level of accountability.

Because water corporatisation as a form of neo-liberal policy aims to ‘reduce the extent of government intervention in the economy and to rely more on markets to organise activity’ (Clarke 2000, p. 1) issues of public accountability and transparency should be increasingly paramount (Beder 1998). In Tasmania managers and providers supporting corporatisation showed little concern about corporatisation or whether the actions of corporate water providers in the state should be subject to an adequate level of public accountability and transparency. For many, corporatisation was viewed as a solution to problems with drinking water provision and was seen as an ideal model for controlling drinking water resources.

The implications of fiscal-driven corporatisation on the quality and management of drinking water in Tasmania were barely considered by managers and providers. Only a few participants spoke about the social and human health implications of water corporatisation. In all three cases reference was made to the contamination of Sydney’s drinking water supply, as a way of constructing and justifying concerns about corporatisation.

Over a period of three weeks in 1998, an outbreak of *Cryptosporidium* and *Giardia* in the drinking water supply of Sydney led to over three million residents being forced to boil their drinking water (Beder 1998; White 1998). The contamination followed the corporatisation of Sydney’s Water Board by the New South Wales Government in 1995. Corporatisation involves changing public water authorities ‘from a public instrumentality whose major purpose was to provide a service to the community...to a commercial organisation selling products to customers’ (Beder 1998, p. 63). In corporatising Sydney’s Water Board there was a focus on reducing operating costs by a quarter, the slashing thousands of jobs, an increase in water bills by over a third and the private outsourcing of

four treatment plants (Vassilopoulos 1998; White 1998), all key parts of managing safe drinking water. An ensuing government enquiry showed that corporate cost cutting, ineffective public health risk communication strategies between the water board and public health officials, an ability of water management to respond with accurate and reliable information and a limited level of corporate activity disclosure had ultimately contributed to the increased public health risks posed by the incident (Leiss & Hruddy 2007).

Consequently, the corporatisation of drinking water raises concerns over the protection of public health. For instance, where the producer or supplier has the exclusive rights to water there 'is less pressure on companies to provide a product that meets bare minimum quality and safety standards' (White 1998, p. 216). Governance frameworks based on disclosure, transparency and accountability are therefore seen as essential in any moves to corporatise or privately control the management, control or provision of drinking water (Sheil 2000).

The findings of this study reveal that most managers and providers accept national neo-liberal water reform as an inevitable part of the future provision and management of drinking water in Tasmania. This suggests that most participants did not conceptualise the provision of drinking water to be a public service or that the corporate control of drinking water had implications for the equitable distribution or safe management of drinking water. However, at closer examination the introduction of these economic reforms has inevitably changed how Tasmanian consumers are accessing and consuming drinking water resources across the state. The increasing commercialisation of Tasmanian drinking water supplies and the paying of dividends to the state government via corporatisation can be seen to have limited the rights of rate-payers as owners of public authorities by reducing them 'to the status of customers, whose only recourse is compensation when things go wrong' (Beder

1998, p. 5). By decreasing the democratic management of drinking water and by increasing the distribution of drinking water through market mechanisms 'rather than on the basis of communal assessment' (White 2002, p. 84) economic water reforms highlight the role of the 'instrumental and structural role of the state in maintaining and reproducing capitalist relations' (White 2002, p. 92). The economic aspects of commercialisation and corporatisation of drinking water and its provision and management are therefore inherently linked to the process of commodification.

6.3.2 Consumers not citizens: the localised effects of commodification

This study shows that, by using full cost recovery through water pricing and metering, drinking water supplies in Tasmania are being commodified.

The commodification of drinking water is a process whereby drinking water is produced (collected, treated and distributed) and evaluated (priced) in terms of the capacity for economic exchange. Through its commodification drinking water becomes reduced to monetary value (Miles 1998, p. 16) and the reasons for providing drinking water shift from basic public need to economically driven ones. The treatment of drinking water as an economic resource blurs the line between 'use value' (objects of need) and 'exchange value' (commodities produced purely for exchange) (Burkett 1999, p. 25).

The commodification of drinking water in Tasmania conceptualises and constructs citizens and rate-payers as 'consumers' in the sense that they buy and consume drinking water like other essential services, such as electricity or food, and that access to drinking water is provided on the basis of 'user pays' instead of a public service delivered free of charge. The notion of individuals as 'water customers' is based on the assumption that individuals are both willing and able to exercise choices about drinking water 'in the same

way that they exercise choice about restaurants, hairdressers or supermarkets' (Cook 2001, p. 99). In most cases water consumers have very little choice, because water is a natural monopoly (Moeller 2001). The risks associated with drinking reticulated water are not voluntary, but imposed by those responsible for providing, managing and regulating that water. Provision and consumption are further complicated by the idea that 'certain habits of consumption are intertwined with the pursuit of profit' (White 2002, p. 86). Consumer autonomy and freedom from the market in the use of services and resources are seen as a hallmark of economic development and efficiency (Clarke 2000; Cook 2001; Lazaro & Azcona 1996; Shah 2005). This form of neo-liberalism also advocates removing responsibility for water provision from governments and on to individuals, who must take responsibility for what water they choose to consume and use. The increasing global trend towards full cost recovery (Barlow & Clarke 2003; Castro 2002; Hall 1999; Whelan 2005) facilitates the capital and maintenance costs of water provision being passed on to the individual consumer. In effect, removing responsibility for drinking water provision away from governments reconceptualises drinking water so that it is no longer a public service or good.

This study's findings signal that capitalism and neo-liberalism have changed how drinking water is being provided and consumed in Tasmania. Many managers and providers believe that the promotion of the common good through market mechanisms, such as pricing and metering, are the most appropriate means of managing drinking water. By constructing water scarcity to support the pricing of drinking water, managers and providers saw the introduction of pricing as a way of forcing consumers to think more appropriately about the value of drinking water (CRC 2006; MacDonald 2004; Urban

Ecology Australia 2007). Scarcity is a key element of modern capitalism and economic rationalism (Marsden 2003) and the process of managing resource scarcity by imposing fiscal discipline is pervasive strategy both internationally and, increasingly, in Australia (MacDonald 2004).

Support for assigning market and exchange value to drinking water was viewed as a means to manage the sustainability of water resources. Demand management and notions of water scarcity emerged as a major consideration for many participants, particularly those working in rural areas. However, in many parts of Tasmania, the natural supply of fresh water is not constrained, which has implications for constructions of scarcity as a means to validate economic approaches to the provision of drinking water. This 'sustainable and rational' (Jacobs 1994) impetus for governing Tasmanian drinking water by commodification reflects a neo-liberal and capitalist agenda by presenting full cost recovery as a legitimate solution to water sustainability problems (Jacobs 1994). The suggestion of more traditional methods (Rijsberman 2004), such as the construction of better water storage infrastructure, was a sideline consideration in how managers and providers viewed solutions to water availability and sustainability. In this sense, support for adopting cost and pricing measures for drinking water shows that some managers and providers see economic markets as a solution to environmental degradation and also a mechanism for the allocation of human rights (Petrova 2006).

Even though access to drinking water has been established as a basic human right (International Covenant on Economic, Social and Cultural Rights 2002, p. 1), in Tasmania one of the most significant effects of water reforms (e.g. National Competition Policy and COAG-related policies) has been the introduction and prioritisation of water pricing based

on the principles of full cost recovery. A full cost recovery and a user-pays approach to drinking water provision moves responsibility for access from managers directly to the individual's consumption choices. For example, people who may not be happy with the quality of their reticulated drinking water have the choice to buy bottled water or to harvest their own water supply. Therefore there are social concerns whether commodification and a user-pays approach to drinking water are fair and equitable, because they make accessing safe drinking water less of a social right and more of a consumer right (Rothenberger, Truffer & Markard 2001). The disproportionate and potentially detrimental effect of commodification and pricing on households, individuals of lower socio-economic status, as well as cultural and ethnic minorities is a particular point of concern (Beltran 2005; Bullard 1993; Di Chiro 1995; Halfacre 2005; Pauw 2003; Whelan 2005).

This research reveals that there was little acknowledgment of or concern about the social consequences of commodification among managers and providers. Only a handful of participants expressed concern about access to drinking water being based on economic criteria, rather than social criteria – specifically, the human need for safe drinking water. One participant's acknowledgement that lower socio-economic consumers had been temporarily cut off from a reticulated supply due to the non-payment of water bills was evidence of the effects of global neo-liberal water reforms on the local provision of drinking water in Tasmania (Beltran 2002; Marsden 2003; Pauw 2003; Whelan 2005). In other parts of the world, the implementation of similar full cost recovery measures had led to communities being unable to access drinking water, because it was unaffordable. In some cases, the non-payment of water bills has led to citizens having no other choice than

to access unsafe drinking water supplies, leading to detrimental health outcomes (Castro 2002; Laifungbam 2003; Marsden 2003; Pauw 2003).

Benefits and objectives of 'setting a price' for drinking water often include economic efficiency, cost recovery, revenue maximisation, regional equity, ability to pay and demand management (Albanese 2007; CRC for Water Quality and Treatment 2006; MacDonald 2004; Urban Ecology Australia 2007). In Tasmania findings show that limited fiscal capacity to pay for drinking water provision, including the cost of improvements, is testament to the class distribution of risk and justice and is a source of regional inequity. It also supports claims that 'financially constrained and vulnerable citizens receive fewer or poorer quality goods and services than people with disposable incomes' (White 1999, p. 91).

Support for 'economies of scale' was a clear indication that the provision of safe drinking water to communities throughout the state was an economic not socially driven consideration that contributed to social inequities. According to the General Pricing Oversight Commission (2006, p. 6), economies of scale are achieved when natural monopolies, such as urban water supplies, are characterised by declining average costs as production increases. The unlikely achievement of economies of scale clearly emerged as the reason bulk water authorities in Tasmania were reluctant to manage and provide drinking water to rural and remote communities. A clear lack of commercial profitability and viability was cited as eliminating the future possibility of assisting in the part or whole management of drinking water resources in rural regions, once again indicating the dominance of fiscal concerns underpinning the governance of drinking water in Tasmania.

The introduction of water reforms in Tasmania was supposed to be uniform in its implementation under COAG and National Competition Reforms, and yet these findings show that there is regional inequity in pricing and full cost recovery measures in the state. Some municipalities have implemented full cost recovery, while, metres away, neighbouring municipalities have not. The reluctance of some local government councils to adhere to state and national pressures to implement water metering and full cost recovery signifies dissent in levels of government charged with responsibility for water provision. In some cases, the financial costs of implementing full cost recovery have meant that some municipalities in Tasmania are yet to introduce metering and two-part pricing of drinking water. In some parts of the state, neighbouring municipalities have different policies for the metering and pricing of drinking water, and, in some cases, houses only streets away from each other are subject to different water costing measures and instruments.

The Strategic Framework for the Efficient and Sustainable Reform of Water Resources detailed in National Competition Policy (Tasmanian Department of Treasury and Finance 2007) requires local government councils to progress reforms in achieving full cost recovery; a closer examination of this policy states that this should only be implemented 'where it is cost effective to do so' (Tasmanian Department of Treasury and Finance 2007, p. 2). This has led to regional inequities in the introduction of full cost recovery measures and increasing dissent among water providers, managers and consumers about its fairness. There has also been public resistance to the introduction of water metering and pricing, an increasing trend in other parts of the world (Barlow & Clarke 2003; Beltran 2002; Laifungbam 2003; Van Rooyen 1997). Managers and providers in affected Tasmanian municipalities constructed public resistance to economic water reforms as more of a social

hindrance than a reflection of citizens' view of drinking water as a public good that should be exempt from economic processes, such as commodification. This is also indicative of rights-based approaches to drinking water governance being subservient to economic considerations in Tasmania and highlights the need for governments to consider the capacity of people to pay and the regional and localised differences in the governance of drinking water. It is also essential that the state, as a predominant institution in the governance of drinking water resources and infrastructure, has legitimate reform objectives based on service improvement, efficiency, sustainability, conservation and inclusiveness (K' Akuma 2007).

6.4 Chapter Conclusion

This chapter has discussed and interpreted the findings of the research and has identified the key social structures and processes underpinning the governance of Tasmanian drinking water. These are: the institutional judgement of risk; risk assessment; the social distribution of risk; rurality; commercialisation; corporatisation; and commodification.

The chapter has revealed the dissonant nature of Tasmanian drinking governance by showing how decisions and institutional judgements regarding the safety and management of drinking water through the *Public Health Act 1997* are highly contested by managers, providers and regulators. It has shown that there are ongoing 'expert' disputes over the most appropriate way of governing drinking water in Tasmania and how the protection of public health, based on the definition, assessment and management of risk, is a considerable source of confusion and controversy. The chapter has also examined barriers to the management and provision of safe drinking water in parts of Tasmania and has pointed to the social distribution of risk and the need for a more integrated approach to drinking

water governance, as well as better support for local government providers. The chapter also identifies how neo-liberal economic water reforms and policies are affecting how drinking water is controlled, accessed and valued in Tasmania. Specifically, it has signified how the processes of commercialisation, commodification and corporatisation have changed the way that water is being valued as an economic resource, rather than a basic social need, which raises significant social justice concerns over the fair and equitable access to safe and plentiful drinking water in Tasmania.

7 Turning the tap: summary & conclusion to the thesis

Water links us to our neighbour in a way more profound and complex than any other.

John Thorson

7.1 Introduction

This research was prompted by the immediate experience of poor quality drinking water in Tasmania and the desire to understand the social conditions in which this was happening. Drinking water governance is a critical area of sociological inquiry. How our drinking water is managed, regulated and controlled has the capacity to positively or negatively affect the health, wellbeing and livelihood of individuals, communities and nations at all levels of global society and is therefore deserving of continuing sociological attention. This chapter will conclude the thesis. The following sections will briefly summarise the strengths and limitations of the research approach and the contribution of the thesis, and will conclude by pointing to the areas of future sociological inquiry and research into drinking water and recommendations for the governance of drinking water in Tasmania

7.2 Strengths of the research

This research offers the first qualitative and sociological account of drinking water governance in Tasmania and, as far as is currently known, in Australia. This thesis has amassed a wide range of ideas and information relating to the many dimensions of drinking water governance. Along with drawing on a wide range of secondary sources, the research has used semi-structured qualitative interviews to the study of drinking water governance in Tasmania. This approach is used in this thesis to draw attention to the key institutions, processes and practices, being used to manage and regulate water resources in Tasmania

and the ways in which drinking water governance is contested, negotiated and legitimated by different groups involved in the management, regulation, provision of drinking water. The thesis does not serve to offer a critique of comparison of realist and social constructionist approaches to drinking water governance, but rather supports Hannigan (2006) and White's (2008) view that drinking water is undeniably a real and existing social issue, however that is made 'knowable' through 'dynamic social processes of definition, negotiation and legitimation' such as regulatory decision making and policy (Hannigan 2006: 31).

In summary, the combination of primary and secondary data in this thesis has been essential to an in-depth understanding of drinking water as a social issues and by adequately interpreting each in light of each other, both have assisted in answering the research aims.

7.3 Limitations of the research

The findings of the study provide important insights into the processes underpinning drinking water governance in Tasmania and potentially in other Australian States and Territories. However, the meanings and interpretations Tasmanian managers, providers and regulators have ascribed to the processes may not be representative of the views of others in similar positions or responsibilities elsewhere. This is an inevitable outcome of interpretive qualitative inquiry, which is not concerned with testing validity or reliability, but seeks to create in-depth understanding of issues from the viewpoint of the research subject at a particular time. The use of thematic analysis allowed the interpretations, positions and views of participants to be analysed, enabling the establishment of patterns, consistencies and meanings (Gray 2004) surrounding the governance of Tasmanian drinking water to be

created as a way of addressing the research questions. A further limitation of the study arose from the need to maintain and protect the anonymity and confidentiality of all participants. At four stages throughout the data collection process, participants asked for the recording of the interview to be stopped for particular discussions to take place 'off the record'. In each case, the organisational and political sensitivity of their opinions made them reluctant to 'risk publicly sharing' these views, they preferred instead to disclose their positions and standpoints unrecorded. While this affected the nature of some drinking water governance issues to be inhibited in the formal analysis of the data, the use of a research diary enabled me to include these issues as part of the findings and discussions without attributing the concerns and or issues to a particular individual or organisation. However, it does raise questions about whether, given the inherently political nature of drinking water regulation and management, other participants may have 'self-censored' the ways they spoke about drinking water governance.

In regard to data collection, it should be acknowledged that there were constraints on the process of interviewing. Due to financial constraints, interviews were unable to be conducted in person with one island municipality. In regard to time, interviewing managers and providers from each of the local government municipalities in Tasmania took nearly eight months. This was in part due to the difficulties of recruiting some local government managers to be part of the project and also in arranging times which were convenient to the participants.

With respect to the use of complementary or alternative analytical and methodological frameworks, the use of discourse analysis and Foucauldian insights (Foucault 1972, 1980; Hoy 1986; Hunt 2004, Kendall and Wickham 1999, Rabinow 1991)

may have strengthened the theory and methodology of this thesis, and should be considered in future sociological work of this kind.

7.4 Contribution of the thesis

This thesis offers contributions to new knowledge about drinking water as a key social issue and area of sociological inquiry.

For policy makers and regulators this study and its findings provide an insight into how those involved in the 'local' and immediate management and provision of drinking water interpret the current processes of regulation in Tasmania and broader public health and environmental policy. It presents continuing challenges for the Tasmanian State Government in evaluating drinking water policy and legislation, and points to particular areas where future reform and research is needed.

For managers and providers, this research reveals the key concerns, issues and debates underpinning the governance of drinking water and shows how drinking water as a social and health issue is actively constructed and interpreted amongst managers, providers and regulators. For citizens, this thesis reveals the underlying assumptions about and processes of how people come to access and experience drinking water resources. It provides insight into those on the 'other end' of the water provision spectrum and the issues and challenges underpinning how drinking water is provided, as well as the wider social structures and forces impacting on people 'turning on their taps'. It also draws attention to the institutions who hold the greatest power in how drinking water issues are constructed and framed within public debate, and how these can often serve to marginalise the views of the lay public.

For sociologists, this thesis contributes to sociological understanding and dialogue regarding environmental and water governance. The thesis also contributes new knowledge to three emerging areas of environmental sociological scholarship cited by Buttel (1987); these are: environmental attitudes, values and behaviours; technological risk and risk assessment; and the political economy of the environment and environmental politics.

The findings draw attention to constructions and definitions of risk, the processes of risk assessment and the institutional judgements and decisions that underpin the governance of drinking water safety and quality. It provides new insight into the key contentions, ambivalences and dissensions surrounding the management and regulation of drinking water. The thesis also shows how global trends and policies, such as neo-liberalism and capitalism, are affecting how drinking and fresh water resources are being controlled, managed and provided. The study shows that commercialisation and commodification have changed how drinking water is being provided in Tasmania and has revealed the social inequities and risk positions that have sprung up as a consequence of these processes.

7.5 Where to from here? Future directions and recommendations

This section concludes the thesis by indicating future directions for water-related research and sociological inquiry and provides some recommendations for improving the governance of drinking water in Tasmania.

7.5.1 Future directions for sociology

Drinking water is a cornerstone of society. As a fundamental human need, the water we drink, the ways it is governed and the conditions under which we drink should be a continuing source of sociological attention. Therefore there is an ongoing need for inquiry

into drinking water as a critical social issue and real opportunities for the generation of new knowledge.

The findings of this thesis have obvious practical and theoretical implications for those involved in the governance of drinking water in the state of Tasmania and potentially offer insight into similar processes and understanding of governance in Australia and possibly in other nations. Simultaneously, it opens up areas for future sociological inquiry into drinking water and into the area of environmental governance more broadly.

An obvious sociological gap unable to be filled by the scope of this study is the need to explore the experiences of consumers in the consumption and provision of drinking water; the ways that 'lay publics' interpret environmental risks, conditions and governance is a growing area of sociological interest (Irwin 1995; 2001) that deserves more attention. Only limited research has been undertaken into understanding the localised effects of environmental activity and degradation on water quality in Tasmania (Cameron 1995) and the process of conducting this research has revealed a plethora of anecdotal evidence and experiences among members of the Tasmanian community, particularly those in rural and remote areas.

Another contribution to sociological inquiry lies in examining more thoroughly the ways in which water reforms, particularly issues such as corporatisation and commodification are occurring in the capitalist economic systems and how competing perspectives and viewpoints of these issues are negotiated and ultimately resolved, if at all.

A closer examination of the role of the media in influencing claims about environmental conditions and the quality and management of drinking water is also worthy of sociological investigation. The media is described as one of the key institutions through

which environmental knowledge and issues are presented to the public (Hannigan 1995). A media analysis may therefore be useful for the future study of drinking water and the claims-making institutions surrounding its governance and its consumption.

In addition, given the complex and rich history of environmental activism and debate in Tasmania and its continuing place in Tasmanian society, future studies of not only drinking water but environmental conditions generally should consider a comprehensive sociological analysis of these issues.

7.5.2 Recommendations

The findings of this thesis strongly suggest that providing and managing reliable and safe potable water to citizens is not an easy task. While it is acknowledged that thesis recommendations are not usually standard practice, the considerable practical, ideological and political outcomes of the research pointed to the need for tangible recommendations for Tasmanian drinking water governance. The following recommendations are based on thinking about improving the social conditions, under which safe drinking water is governed and ultimately consumed and accessed by citizens in Tasmania. Research and policy directions for drinking water governance in Tasmania need to consider, not only the economic and political drivers and influences, but also the social, moral and environmental aspects to providing and accessing drinking water. This means considering drinking water as an economic resource for commodification as well as a fundamental human need and right that requires due consideration of social equity and justice issues in its management, control, provision and regulation.

Recommendation 1: There is a pressing need for drinking water governance frameworks in Tasmania to embrace an integrated and comprehensive approach to the governance of drinking water in order to increase levels of safety and to minimise public health risks. This includes: the better protection and monitoring of drinking water sources and catchments; capital investment in drinking water distribution systems and infrastructure; the improvement of staffing levels and expertise; and more comprehensive water testing regimes.

Recommendation 2: The underlying principles of water governance in Tasmania could better ensure equal levels of safety for all drinking water supplies, regardless of their location. Improved federal and state funding frameworks for the local management and provision of drinking water may benefit Tasmania. These should include criteria for incremental capital and resource improvements for elements of drinking water management, provision and regulation. In rural and remote communities, specifically where small community water supplies exist, there may be need for more support for local government water providers before corporate control should be considered.

Recommendation 3: There is an urgent need for the integrated management of drinking water catchments in Tasmania and the need to develop greater catchment protection legislation. Integrated catchment management involves the improved monitoring and regulation of drinking water and fresh water catchments and the collaboration of catchment stakeholders, such as public health officials, industry, natural resource agencies, landowners, and community members, in the monitoring and sustainable use of drinking water catchments to maintain water quality and protect public health. Legislative power for public health officials in Tasmania may prevent detrimental water quality activity and

should involve the ongoing auditing of water catchments by public health regulators and water inspectors.

Recommendation 4: There may be greater social benefits from basing the provision of drinking water in Tasmania on the principles of social equity and justice, rather than by the ability to pay. Although improving the safety and quality of drinking water provision is paramount, the costs of improvements must be considered in regard to the needs of socio-economically disadvantaged and marginalised groups. The provision of safe and plentiful drinking water in Tasmania should be based primarily on the principles of social and public good, not economic rationalism and efficiency.

Recommendation 5: Better frameworks for community consultation are needed in Tasmania to underpin the governance of drinking water. Consultation with the community should include increased dialogue and public knowledge regarding the costs of drinking water, the ability of citizens to pay, community monitoring of water sources, the notification of a public health threat, information about drinking water testing and quality, and greater transparency of the processes of governance.

Recommendation 6: Greater ongoing consultation and dialogue between regulators of drinking water in Tasmania and managers and providers at the 'local' level, particularly those in local government may improve tensions and ambiguities underpinning the governance of drinking water. This may include regulators making the effort to visit Tasmanian municipalities and to promote a greater understanding of the immediate and diverse financial, environmental and organisational issues impacting on the ability of local governments to continue providing safe and plentiful drinking water to communities.

While these recommendations would ultimately improve the social conditions under which drinking water is being governed in Tasmania, it is important to acknowledge that a persistent climate of economic rationalism, de-regulation and erosion of drinking water as a social good by governments will likely impede on these recommendations ever being adopted. Specifically, this research has shown that drinking water governance in many parts of the world is being increasingly dominated by economic rather than social concerns, as the interests of government to reduce expenditure and liability rather than meet public need. Without the overt politicisation of water provision, there is little chance of substantial positive change. In Bolivia for example, neo-liberal water privatisation reforms were resisted through mass protest actions - eventually culminating in the election of a left-wing progressive to the Presidency, the first ever Indigenous person to be so.

Real social change will most likely emerge from community-based action, rather than through top-down benevolence or evidence-based rational choice. The contradictions and paradoxes of governance can only therefore be overcome through exercise of political will in support of a different political vision to that of neo-liberalism. There needs to be collective action around drinking water that includes citizens at the most basic levels of provision and management not only in the state of Tasmania, but in all parts of the globe.

This research started from the belief that sociologists have a substantial role to play in making sense of the parts of our life that we often take for granted and so, for me the water we drink and the conditions under which we drink couldn't be more important. Never before, has it been more important that sociologists continue to understand the social processes and conditions that underpin the most basic elements of our individual and

collective existence, and the management, provision, control and consumption of drinking water is an ideal starting point.

Postscript

At the time of completing this thesis, the Tasmanian State Government announced that a regulatory reform of water and sewerage in Tasmania would take place. The creation of the Ministerial Water and Sewerage Taskforce would lead the reform in ‘identifying ways of achieving major long term improvements in Tasmania’s water and sewerage services and infrastructure through a collaborative approach with local government’. The initial outcomes of the reform process have shown significant moves away from the control and provision of drinking water by local governments in Tasmania to more commercial arrangements between government-owned business enterprises. It is yet to be seen how this will impact on the state-wide control, regulation and provision of drinking water in Tasmania.

Appendices

Appendix A: Sample information sheet

Project: Tasmania's Drinking Water: A Sociological Analysis

We would like to invite you to participate in a study of Tasmania's drinking water. As part of the requirements for a PHD in Sociology at the University of Tasmania, this is a state-wide study that includes speaking with approximately thirty providers and managers of drinking water across Tasmania.

The aim of this study is to gather information from those involved in drinking water provision, regulation and management about the types of issues they see as important. With your assistance, the information gathered will help in developing a comprehensive picture of the processes and practices underpinning the management and provision of drinking water to Tasmanian municipalities. This information will also help in understanding the key issues and concerns faced by managers and providers in distributing safe drinking water in Tasmania.

The kinds of questions we wish to ask include how water is managed and treated, what public health guidelines you adhere to, what are the local issues if any impacting on your job and what have been the key issues for you in the past 5 years managing and providing drinking water. Your answers will help to ascertain specific issues with drinking water governance within Tasmania in order to assist in improving local resources and devising better policies.

All participation is completely voluntary, and what you say will be treated with confidentiality. Non names will be recorded and if there is no problem if you decide to withdraw from the interview at any time.

Both myself (Jessica Whelan) and my supervisor Professor Rob White are more than happy to answer any questions you might have about the project. If you would like more information, or have any concerns about the study, then feel free to contact Rob White on 0362 262877 or myself on 0363 243254/

This study has received approval from the Northern Social Sciences Human Research Ethics Committee (NTSSHREC), University of Tasmania. Feel free to discuss your participation in this study with the project coordinators at any time. However, should you have any complaints concerning the manner in which this PhD is conducted, please contact either the Executive Chair of the NTSSHREC on the following phone numbers.

Ms Amanda McAully

Executive Officer
Ph: 0362 262763

Professor Roger Fay

Chair of Ethics Committee
Ph: 0363 243576

Thank you for your time and cooperation

Jessica Whelan (March 2004)

Appendix B: Sample consent form

Project: Tasmania's Drinking Water: A Sociological Analysis

1. I have read and understood the 'Information Sheet' for this study
2. The nature and possible effects of this study have been explained to me.
3. I understand that the study involves the following procedure:
 - *Interview of no longer than one hour duration*
4. The interview will be recorded on cassette tape and my name will not be identifiable.
5. I understand that all research data will be treated as confidential and will be securely stored on the University of Tasmania premises for a period of 5 years. The data will be destroyed at the end of 5 years.
6. Any questions that I have asked have been answered to my satisfaction.
7. I agree that research data gathered for the study may be published provided that I cannot be identified as the subject.
8. I agree to participate in this investigation and understand that I may withdraw at any time with any effect to myself.

Name of participant _____

Signature of participant _____ Date _____

9. I have explained this project and the implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation.

Name of investigator _____

Signature of investigator _____ Date _____

Appendix C: Sample interview schedule

Background

What is your current position?

What are the main responsibilities of the position (including drinking water)

Who are you responsible to?

How long have you been employed within this position/ industry?

Do you have a previous background in environment/ drinking water management/ health?

What do you see as the main issues within your role associated with the management, provision, regulation of drinking water?

What area of Tasmania does your council/ water authority manage?

Is there regular testing of drinking water (who does it, how often, how are they trained?)

Are the results of testing available to the public (how often are they reported?)

How do you know if drinking water is safe or not? What do you do if it is not safe?

Who are you accountable to and how?

Do you think that drinking water regulation should be mandatory? What mechanisms or regulatory frameworks do you think are most appropriate for managing drinking water in Tasmania?

Do you think that there adequate public consultations surrounding drinking water governance in Tasmania?

Is your council aligned with a water authority/ bulk water provider in any way? If yes, how does this affect how you provide and manage drinking water?

How is drinking water here controlled, priced? What tariffs are placed upon water in your municipality, how is this done?

Do you think that consumers should pay more/less for drinking water?

What do you think about the use of water meters as a means of regulating supply and provision?

Have there been any significant changes in operational practices in recent years in relation to the private sector and or government reforms?

What do you see as the main issues for drinking water management, provision, regulation and control in the next 5-10 years in Tasmania?

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