CORPORATE WATER ACCOUNTING AND ACCOUNTABILITY IN AN AUSTRALIAN CONTEXT

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A thesis submitted in fulfilment of the requirements for the degree of
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Abstract

This thesis examines accountability for corporate water use in an Australian context and the role of accountants in the provision of sustainability information. The thesis employs both theoretical and empirical approaches to determine the optimal approach for corporate water disclosure practices, and regulation to improve accountability. The thesis includes four papers, each of which explores a different dimension of corporate water accounting and accountability.

The thesis employs philosophical inquiry to answer key normative questions regarding the role of corporations in society, and community rights to corporate information. The extent to which a corporation can be considered a moral agent, and therefore capable of voluntarily providing unbiased information, is considered in Paper 1, *The Amorality of Public Corporations*. This paper engages with the work of Friedman (1970) and derivative arguments, and argues that for-profit entities are amoral entities due to the constraints on corporate autonomy imposed by competitive markets; hence regulation is required to align corporate and societal interests. The question of what rights the community have to access water information is addressed in Paper 2, *Accounting as a Human Right – The Case of Water Information*. This paper follows the approach of Griffin (2008) and Sen (1993, 2004), and argues a detailed case that access to corporate water information may be regarded as constituting a human right, in part because of its centrality to the achievement of other important human rights. For this reason, regulation is appropriate to compel corporate water-related disclosures, but such disclosures may extend beyond corporate sustainability reports.

The empirical dimension of the thesis examines how a right to corporate water-related disclosures might best be realised in practice. One option is product labelling, which is explored in Paper 3, *Corporate Water Accountability – The Role of Water Labels Given Non-Fungible Extractions*. On the basis of a detailed review of literature on water footprinting, and interviews with water experts, the paper concludes that the potential of this approach is dependent upon improved water-measurement technology, and a universally accepted definition of water stress.

A more promising option is site-level reporting, which is considered in Paper 4, *Australian Corporate Water Accountability: a Site-Level Perspective*. On the basis of

interviews with water experts and evaluation of site-level reporting practices of Sydney's largest water users over the period 2005–2009, this paper concludes that site-level reporting is desirable and feasible, but is neither required nor practised under the prevailing reporting regime.

Taken collectively, these findings suggest that a community right to corporate water-related information exists, and is best realised *via* mandatory site-level reporting, facilitated by governmental water managers. The thesis therefore calls for this requirement to be included in both Australian and international water-reporting frameworks. More broadly, the thesis posits that accountants can make an important contribution to improving corporate sustainability reporting, but only by engaging with subject matter experts and jettisoning the belief that such reporting must mirror financial reports in terms of format and scope.

Declaration

I certify that the work presented in this thesis, entitled "Corporate Water Accounting and Accountability in an Australian Context", has not previously been submitted for a higher degree to any other university or institution.

I also certify that the thesis is an original piece of research, and that it has been written by me. Any help and assistance that I have received in my research work and the preparation of the thesis itself have been appropriately acknowledged.

In addition, I certify that the sources of information used, and the extent to which the work of others has been utilised, are acknowledged in the thesis. The research presented in this thesis was approved by the Macquarie University Ethics Review Committee (Human Research), approval number HE27MAR2009-D06366.

The following summarises my particular contribution to the joint paper in this thesis:

Paper 1: Hazelton, J. and Cussen, K. (2005), "The Amorality of Public Corporations", *Essays in Philosophy*, Vol. 6 No. 2: Conception 85%, writing 85%

Specific contribution of joint author: Dr. Ken Cussen: Discussion of conceptual ideas underpinning the paper, reviewing and editing paper drafts.

Signed

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Dear Mr Hazelton

FINAL APPROVAL

Title of project: Corporate water accountability

Thank you for your recent correspondence. Your response has addressed the issues raised by the Ethics Review Committee (Human Research) and you may now commence your research.

Please note the following standard requirements of approval:

1. Approval will be for a period of twelve (12) months. At the end of this period, if the project has been completed, abandoned, discontinued or not commenced for any reason, you are required to submit a Final Report on the project. If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. The Final Report is available at: http://www.research.mq.edu.au/researchers/ethics/human_ethics/forms

2. However, at the end of the 12 month period if the project is still current you should instead submit an application for renewal of the approval if the project has run for less than five (5) years. This form is available at http://www.research.mq.edu.au/researchers/ethics/human_ethics/forms. If the project has run for more than five (5) years you cannot renew approval for the project. You will need to complete and submit a Final Report (see Point 1 above) and submit a new application for the project. (The five year limit on renewal of approvals allows the Committee to fully re-review research in an environment where legislation, guidelines and requirements are continually changing, for example, new child protection and privacy laws).

3. Please remember the Committee must be notified of any alteration to the project.

4. You must notify the Committee immediately in the event of any adverse effects on participants or of any unforeseen events that might affect continued ethical acceptability of the project.

5. At all times you are responsible for the ethical conduct of your research in accordance with the guidelines established by the University http://www.research.mq.edu.au/researchers/ethics/human_ethics/policy

If you will be applying for or have applied for internal or external funding for the above project it is your responsibility to provide Macquarie University's Research Grants Officer with a copy of this letter as soon as possible. The Research Grants Officer will not inform external funding agencies that you have final approval for your project and funds will not be released until the Research Grants Officer has received a copy of this final approval letter.

Yours sincerely

pp.

Ms Karolyn White
Director of Research Ethics
Chair, Ethics Review Committee (Human Research)

Cc. Dr Ken Cussen, Graduate School of the Environment, Faculty of Science

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Status of Thesis Papers

This thesis includes four papers, the status of which is outlined below:

Paper 1. The Amorality of Public Corporations

Published as: Hazelton, J. and Cussen, K. (2005), "The Amorality of Public Corporations", *Essays in Philosophy*, Vol. 6 No. 2.
(ERA ranking: B)

Paper 2. Accounting as a Human Right: The Case of Water Information

Published as: Hazelton, J. (2013), "Accounting as a human right: the case of water information", *Accounting, Auditing & Accountability Journal*, Vol. 26 No. 2, pp. 267-311.
(ERA ranking: A*)

Paper 3. Corporate Water Accountability – The Role of Water Labels Given Non-Fungible Extractions

Shortened version accepted for publication by *Pacific Accounting Review*
(ERA ranking: B)

Paper 4. Australian Corporate Water Reporting: A Site-level Perspective

Presented at the Second French Conference on Social and Environmental Accounting Research, Montpellier, France, May 2013.

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Abbreviations and Acronyms

ABS	Australian Bureau of Statistics
ACCA	Association of Chartered Certified Accountants
AWAS 1	Australian Water Accounting Standard 1
AWS	Alliance for Water Stewardship
BoM	Bureau of Meteorology
CDP	Carbon Disclosure Project
CEO	Chief Executive Officer
CIMA	Chartered Institute of Management Accountants
CoAG	Council of Australian Governments
CSIRO	Commonwealth Scientific and Industrial Research Organisation
ED AWAS 1	Exposure Draft of Australian Water Accounting Standard 1
ED AWAS 2	Exposure Draft of Australian Water Accounting Standard 2
EDC	Every Drop Counts
EIRIS	Not an acronym – EIRIS is the name of a non-profit organisation
FOI	Freedom of Information
GRI	Global Reporting Initiative
IASB	International Accounting Standards Board
IPCC	Intergovernmental Panel on Climate Change
IUCD	International Union for the Conservation of Nature
MCA	Minerals Council of Australia

MDB	Murray-Darling Basin
MDBA	Murray-Darling Basin Authority
MDBC	Murray-Darling Basin Commission
NGO	Non-Governmental Organisation
NSW	New South Wales
NWC	National Water Commission
NWI	National Water Initiative
SEA	Social and Environmental Accounting
SWA	Standardised Water Accounting
TBL	Triple Bottom Line
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WACF	Water Accounting Conceptual Framework
WADC	Water Accounting Development Committee
WADCO	Water Accounting Development Committee Office
WASB	Water Accounting Standards Board
WASBO	Water Accounting Standards Board Office
WBCSD	World Business Council for Sustainable Development
WDP	Water Disclosure Project
WSAP	Water Savings Action Plan
WWAP	World Water Assessment Programme
WWDR	World Water Development Report

Chapter 1 - Introduction

A central aim of this thesis is to contribute to the ongoing discussion regarding the role of accountants in terms of the provision of sustainability information. Sustainability information is clearly crucial to address sustainability issues, but is currently collected and reported by various groups using a multiplicity of measurement and disclosure methods. Governments and communities are increasingly seeking environmental information from corporations as the impact of corporations in the environmental sphere becomes more evident. A key question is therefore which group is best equipped to provide such information, and a number of models are currently operating simultaneously.

One prominent body collecting sustainability information is of course scientists. At a global level, perhaps most prominent is the Intergovernmental Panel on Climate Change (IPCC) which collates scientific information from around the world regarding climate change; peak scientific bodies, such as the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Australia, are often charged with providing a better understanding of specific areas of environmental concern such as salinity or river health. Pollutant inventories such as the Toxic Release Inventory in the US and the National Pollutant Inventory in Australia (which require corporations to lodge emissions data with the regulator) are heavily science-based. Industry-specific manuals are utilised which provide emission factors per unit of production, derived from scientific studies.

In addition to scientists, most governments have bodies that produce governmental statistics on topics such as the performance of the economy and employment. Such bodies have increasingly been charged with producing environmental information – for example, in recent years the Australian Bureau of Statistics (ABS) has issued reports covering climate change, energy use, water and biodiversity. Some Non-Governmental Organisations (NGOs) also produce sustainability reports, such as the Worldwatch Institute that produces an annual

State of the World report and the Pacific Institute that provides a biannual *World Water Report*.

A further group that figures in the sustainability reporting arena, at least to some degree, is the accounting profession. Large corporations are increasingly producing sustainability reports, and such reports are often prepared with the assistance of accountants, and are increasingly assured by one of the "Big 4" accounting firms (PricewaterhouseCoopers, Deloittes, Ernst & Young and KPMG). While the accounting community does not presently feature as prominently in sustainability reporting as scientists and statisticians, accountants have built up an extensive set of reporting and disclosure standards relating to the financial performance of corporations, and it is possible that this expertise could be applied in relation to sustainability information.

To illuminate the possible trajectory of sustainability reporting, it is helpful to consider the origins of financial reporting. Historically, the separation of management and control of large corporations drove the necessity for the provision of financial information from managers to investors. This information enabled investors to be confident both in the performance of their firms and that management were discharging their duties as stewards of the firm. This information was also often subjected to audit by a third party – the justification for which (in the absence of regulation) being that an independently assured report increased the credibility of the report and hence reduced the risk premium that an investor would charge to a manager. In other words, it is actually the manager that benefits from more stringent reporting because investors are more willing to reward managers when they are more confident that managerial performance can be accurately measured.

It could be argued that sustainability reporting is facing similar circumstances to those early years of financial reporting. The users of sustainability data – such as citizens and regulators – might be considered to charge a 'risk premium' regarding corporate environmental performance, which manifests in forms such as increased regulation and citizen hostility to corporate expansion. It is

therefore in the interests of corporations (as well as society as a whole) to improve corporate sustainability reporting.

Given this imperative to improve corporate sustainability reporting, an important question is how this might be achieved, and what role accountants might play. One possibility is that accountants might take a lead role, bringing their expertise in setting consistent standards for the measurement and disclosure of financial information to bear on environmental issues, an example of which is provided by the creation of the Australian Water Accounting Standards (discussed further in Section 1.1.2). Another is that accountants play a very limited role, with the majority of the design and implementation of reporting regimes falling to scientists (such as in the pollution databases discussed above). With this context, this thesis considers the crucial issue of water, how corporate water disclosures might enhance corporate water-related accountability and the implications for the accounting profession. Before considering these dimensions, however, a brief introduction to water and the importance of water management to sustainability is provided in the following section.

1.1 Introduction to water

The prospect of an essential resource facing major disruptions to supply and major increases in demand has resulted in water management becoming one of the most critical issues on the sustainability agenda. While there has been recognition that access to water is a basic human right (United Nations General Assembly, 2010), the United Nations has described realisation of this right as one of the key challenges for the 21st century (United Nations Educational Scientific and Cultural Organisation (UNESCO), 2006, p. 524).

To monitor the achievement of progress on water-related goals, as well as to provide a report on water issues around the world, the United Nations World Water Assessment Programme (WWAP) began publishing the *World Water*

Development Report (WWDR) on a tri-annual basis in 2003. The fourth edition of the WWDR was released in 2012, and contends:

> Freshwater is not being used sustainably according to needs and demands. Accurate information remains disparate, and management is fragmented. In this context, the future is increasingly uncertain, and risks are set to deepen. If we fail today to make water an instrument of peace, it might become tomorrow a major source of conflict. (WWAP, 2012, p. vi)

An important theme of this report is that water, though in many ways far more locally contingent than say, carbon, cannot be considered as an isolated issue. As the report points out, "global interdependencies are woven through water, and decisions relating to water use on a local, national, river basin, or regional level often cannot be isolated from global drivers, trends and uncertainties" (WWAP, 2012, p. 2). Chief among these global drivers is climate change, with the potential to create a step change in water availability *via* radically altered rainfall events, both in terms of location and intensity, leading to increased risk of both drought and flood (Intergovernmental Panel on Climate Change, 2007, p11). Climate change may therefore render even historically accurate datasets useless; or, in the words of the WWDR, there is now "explicit recognition that the 'stationary hydrology' assumption can no longer be used as the basis for assessment of water availability" (WWAP, 2012, p. 8}.

To meet the challenges of effective water management, there are a range of possible steps on both the supply and demand sides of the water equation. Supply can be enhanced through better infrastructure, from sophisticated responses such as constructing new dams, desalination plants, or water recycling plants, through to much simpler measures such as replacing earth-water channels with plastic pipes to reduce evaporation. While popular, this approach can be problematic because of the large capital investment required, as well as the fact that changing climatic conditions may render options such as dams infeasible.

If there are limitations to bolstering supply, the alternative is to manage water demand. Demand can be reduced by direct measures, such as water restrictions,

often applied on a city-by-city basis. Other measures include water education programs, and technological developments such as improving the water efficiency of household and industrial machinery.

Water management might also be implemented *via* the price mechanism, and has been advocated by some commentators (Bate, 2006; Tooth, 2007). However, there are significant problems with water pricing, both on the supply and demand side. On the supply side, because of the huge investment in water infrastructure, it is highly unlikely that there will be significant competition in terms of supply. On the demand side, water demand is relatively price-inelastic due to the low proportion of costs represented by water both for consumers (Barrett, 2004; Hoffmann *et al.*, 2006, p. 367; Australian Conservation Foundation, 2007, p. 8; Productivity Commission, 2011, p. 171) and producers (New South Wales Government Department of Infrastructure, 2004, p. 16; Sydney Water Corporation, 2006, p. 4).

Given the myriad possible approaches to water management, and the fact that price signals and the market mechanism cannot fully determine for the allocation of water resources, an important part of any policy mix—and one central to this thesis—is information. As noted above, effective water information was noted as critical in *Agenda 21,* but concerns were raised regarding the adequacy of this information. The WWDP also highlighted the crucial role of information and the necessity for improvement: in her forward to the report, Irina Bokova, the Director-General of UNESCO stated:

> More than ever, we need Integrated Water Resources Management to provide coherent leadership. We need better information gathering and sharing on the state of freshwater, on the nature of demand and its use. We need better systems for measurement and control at the local, national and global levels. (WWAP, 2012, p. vi)

So important is water information to effective water management, an entire chapter of the WWDR is devoted to the subject (Chapter 6), which surveys many of the developments in the area, including the Australian experience discussed below.

In addition to the production of the WWDR, the United Nations has made a number of other commitments to water sustainability. In relation to corporate water use, perhaps most notable is the establishment of the CEO Water Mandate, which encourages large corporations to commit to sustainable water practices, as well as reporting their progress (United Nations Global Compact Office, 2009). In addition, the United Nations has sponsored a number of reports on water reporting, which consider the various options for corporate water disclosures (Pacific Institute, 2008; Morrison and Schulte, 2009, 2010; UNEP, 2011; United Nations CEO Water Mandate, 2012). These options have begun to attract academic interest, which is discussed in more detail in Section 4.

While much activity has taken place at the global level, as documents such as *Agenda 21* and the WWDR make clear, water management always takes place within a geographical context. Australia is in a rare position as being a relatively wealthy country, but with long-standing issues of water scarcity, and is therefore a leader in many aspects of water management and accounting (Slattery, 2008; Slattery *et al.*, 2012). The Australian context is discussed in more detail below.

1.1.1 Australian water sustainability

Contemporary Australian water issues largely mirror those at the global level, except that Australians enjoy almost universal access to clean drinking water and sanitation. In terms of jurisdiction, under Australian law the States are responsible for the regulation and management of water, while the Commonwealth is responsible for the regulation of trade. As regions of vital commercial interest cross State borders, (such as the Murray-Darling System, which includes areas within Queensland, New South Wales, Victoria and South Australia), there have been increasing calls for a coordinated national approach to water management. National coordination has been partly realised by the transition to Commonwealth oversight of the Murray-Darling under the *Water Act* (2007), (discussed further at the end of this section).

For Australian water management, diminishing availability and the impact of climate change are matters of great concern. In terms of surface water, average

annual run-off is 420 millimetres, compared with a global average of 660 millimetres (Pigram, 2006, p. 19). This rainfall is highly variable in terms of both time and location, with limited availability in the most heavily-populated regions in southern Australia. Run-off variability also causes variability in water quality, which is threatened by contamination by agricultural chemicals, and in particular, salinity (Pigram, 2006, p. 22). Given these conditions, much of Australia is dependent on groundwater resources: 60% of Australia's population is totally dependent on groundwater, and it is the dominant source for a further 20% (Pigram, 2006, p. 25).

The role of information in effective water management has also been recognised in Australia. A prominent lobby group—the Wentworth Group of Concerned Scientists—recommended that:

> [a] publicly available set of water accounts is created for each river valley and groundwater system across Australia so that water users, the community, and river managers can make informed decisions. (The Wentworth Group, 2003, p. 3)

This suggestion was repeated in *The State of Australia's Water* (The Wentworth Group, 2006, p. 7). More recently, the Group reiterated the importance of accounting to environmental management in their 2008 publication *Accounting for Nature*, which states that "Australia now needs to confront the challenge of managing our natural capital with the same discipline with which we manage our economy" (The Wentworth Group, 2008, p. 1).

There have been a number of governmental responses to such concerns, the most important of which was the 2004 *National Water Initiative* (NWI). The NWI is an agreement between the Commonwealth and States:

> [I]n recognition of the continuing national imperative to increase the productivity and efficiency of Australia's water use, the need to service rural and urban communities, and to ensure the health of river and groundwater systems by establishing clear pathways to return all systems to environmentally sustainable levels of extraction. (Commonwealth of Australia and the

Governments of New South Wales, Victoria, Queensland, South Australia, the Australian Capital Territory and the Northern Territory, 2004, p.1)

Important features of the NWI include:

- the creation of implementation plans by each of the States and Territories, where "substantial progress" was to have been made by 2010 (paragraph 8);
- establishing the National Water Commission (NWC) to assist with implementation (paragraph 10), and a separate agreement between the Commonwealth; and
- requiring relevant states to address the issues in the Murray-Darling Basin (paragraph 14).

Key elements of the plan were; a framework for water access entitlements and planning; water markets and trading; water pricing; integrated environmental management; water accounting; urban water reform; knowledge and capacity building; and community partnerships and adjustment (paragraph 24).

While the NWC initially made Australia "something of a pacesetter in the implementation of strategies directed towards efficient and sustainable management of water resources" (Pigram, 2006, p. 81), progress was considered too slow. In 2006, former Prime Minister John Howard created an Office of Water Resources within the Prime Minister's Department, upgraded to form part of the Department of the Environment and Water Resources in 2007. In early 2007 the Howard government announced one of the largest ever government environmental initiatives—a $10 billion National Plan for Water Security (Commonwealth of Australia, 2007). The plan contained a number of elements, but was primarily concerned with the management of the Murray-Darling Basin. Essentially the Federal Government linked water funding to a federal takeover of Basin management, which under the existing Murray-Darling Basin Commission had been a co-operative venture between the States. As Prime Minister Howard put it in his speech launching the plan:

> Criticism of the management of the Murray-Darling Basin is often seen as the Commonwealth blaming the states, or one state blaming the other. And there is no doubt that many errors have been made in the past. In the final analysis, however, the core problem is that the different states have competing interests. . . . my intention [is] to ask the relevant state and territory leaders for a reference of powers over the basin. At stake is nothing less than the economic, social and environmental health of one of Australia's most important regions. We must think and act as Australians and not as Queenslanders, Victorians or New South Welshmen. (Howard, 2007, p. 3)

A further important element of the plan was water information. The plan promised $480 million over a ten-year period to fund the Bureau of Meteorology to improve water information:

> As water becomes more scarce and subject to greater demands, it is imperative that we can accurately measure and monitor the resource and its use. This applies equally at the national and basin scales, as well as for individual farms. A national capacity for water data and forecasting services using common systems and standards is a priority. This will involve establishing new capacity in the Bureau of Meteorology (the Bureau) and will provide an improved basis for making informed policy decisions and judicious infrastructure investments. Critically, they will also enable us to evaluate progress being made in water reform. The Commonwealth Government will put in place legislation for data collection and reporting standards which will be mandatory across the nation. (Commonwealth of Australia, 2007, pp. 5-6)

The legislation that underpinned these initiatives is the *Water Act* (2007). Of the eight objectives of the Act listed in section 3, seven are concerned with improving management of the MDB. The final objective is to provide for the collection, collation, analysis, and dissemination of information about Australia's water resources (section 3(h)). Part 7 of the Act (Water Information) provides the details regarding information, including delegation of authority to the Bureau of Meteorology. Important features include the requirements of the Bureau to provide regular reports on the status and usage of Australia's water resources—including a National Water Account, and issuing National Water Information Standards (section 120); extensive powers for the Bureau to obtain water

information (section 126-127); and detailed information regarding the content and process for issuing National Water Information Standards (section 130-133). More controversially, there is also a prohibition on the Bureau from publishing information where such publication would not be in the public interest, or that expressly identifies a person's water usage (where the definition of 'person' is likely to include a corporation), unless this information is already in the public domain (section 123).

Reporting under the *Water Act* (2007) highlights the role of business as both a water user and a water manager. In some cases, large volumes of water are under the control of commercial organisations (such as hydro-electricity generators) and such organisations also have both environmental and social obligations for the management of their water. The varied and complex role of business in relation to water management is discussed in the following section.

1.1.2 The role of corporations in water management

The challenge of effective water management both affects and is affected by business. Water is often an essential component of business operations, and supply interruptions can therefore have highly material impacts (World Business Council for Sustainable Development, 2006, 2007; Barton and Morgan-Knott, 2010; ERIS, 2011). Exposure to water risks therefore extends far beyond changes to the (often immaterial) price of water.

Water management is affected by business, because firms may be in competition with other water users, such as the environment and local communities, for limited water supplies. The case of Coca Cola's operations in India provides a good example, where the reputation of one of the world's most valuable brands was threatened by operations perceived to place carbonated drink production ahead of the wellbeing of ordinary citizens (Hills and Welford, 2005; Burnett and Welford, 2007). This example underscores the issues related to using the price mechanism noted above, in that, while Coca Cola certainly had a far greater

ability to purchase water than the local community did, allocating water to produce soft drinks ahead of food seems a perverse outcome, to say the least.

Water scarcity might also be an opportunity for business, however, as governments look to business to build and operate infrastructure such as water pipelines and desalination plants, and also as water trading becomes more commonplace. Water privatisation has become an increasingly common feature of metropolitan water management, though not without controversy (Ogden, 1995, 1997; Ogden and Anderson, 1999). An important question therefore concerns what responsibilities businesses might be expected to assume in relation to water management, an issue explored later in this thesis.

Given the crucial role of business in water management, a number of reporting frameworks either have water disclosure as an important component, or are entirely devoted to water reporting. The Global Reporting Initiative (GRI) is arguably the dominant reporting framework, and water-related disclosures are included in all editions of the GRI Guidelines (Global Reporting Initiative, 2000, 2002, 2006, 2011, 2013) and the stand-alone Water Protocol (Global Reporting Initiative, 2003). Five G4 indicators directly relate to water usage: water withdrawn from the environment by source (EN8); water sources significantly affected by the impact (EN9); the recycling and re-use of water (EN10); water discharged by quality and destination (EN22); and the impact of discharges (EN26) (Global Reporting Initiative, 2013).

Demonstrating the importance of water to the business community, the GRI is just one of many water-related reporting standards: others include the Water Footprint (Hoekstra et al., 2011; UNEP, 2011; Hoekstra, 2012); the CDP Water Disclosure Project (Irbaris, 2009; Carbon Disclosure Project, 2011); the Water Stewardship Standard (Alliance for Water Stewardship, 2013); and various industry-specific reporting guides (*e.g.* Beverage Industry Environmental Roundtable, 2011; Minerals Council of Australia, 2012).

In Australia, following promulgation of the Water Act (2007), a pilot National Water Account was released in 2009, and National Water Accounts prepared for 2010 and 2011 (Bureau of Meteorology, 2009, 2011, 2012). These accounts draw

on an approach to water accounting which closely mimics financial accounting, in that for each region a balance sheet, profit and loss statement, cash-flow statement, and notes to the accounts, are essentially prepared, except that they are denominated in litres rather than dollars. This approach has been codified in Australian Water Accounting Standard 1, and the corresponding standard encompassing assurance—Australian Water Accounting Standard 2—has been released as an exposure draft. While these standards have to date been applied to geographic regions as opposed to organisations, they are also ultimately intended for application by large water users.

Both the Australian and global developments in water management and information have prompted considerable interest from researchers. Interestingly, much of this research has been from outside academia, though water-related accounting research is becoming a more prominent strand of social and environmental accounting (SEA). This research is discussed in the following section.

1.2 Water research within Social and Environmental Accounting

Social and Environmental Accounting (SEA) research into water-related reporting follows a long tradition of disclosure research. The broad findings of earlier, more general, reviews of corporate disclosures suggest that reporting is at best scant, and at times downright misleading (*e.g.* Deegan and Rankin, 1996; Adams, 2004; Cho and Patten, 2007; Cho *et al.*, 2010; Cho *et al.*, 2012a; Cho *et al.*, 2012b). Furthermore, reporting has been mostly at the discretion of management, with little in the way of stakeholder participation (Stark, 2001; Unerman and Bennett, 2004), despite such participation being central to the methods recommended by organisations such as the GRI and AccountAbility. There have been repeated calls for mandatory reporting of corporate social and environmental impacts (*e.g.* Gallhofer and Haslam, 1997; Gray, 2001; Gray and Milne, 2002; Adams, 2004; Adams and Zutshi, 2004; Gray and Milne, 2004), which have so far gone largely unheeded.

These themes are also present in corporate water disclosure studies. For example, Morikawa *et al.* (2007) reviewed the reporting practices of 139 global corporations (from eleven water-intensive industry sectors) and found that while 97% provided at least some information regarding water performance or management, there were wide variations in the quality of information. Particular deficiencies were noted in the reporting of water risks or risk management: there was limited contextual information, and only 18% disclosed local- or facility-level water performance information. Similarly, Morrison and Schulte (2009) and Barton and Morgan-Knott (2010) suggested that water reporting by global corporations was poor. Morrison and Schulte (2009) found that though over 80% of companies claimed to have used the GRI guidelines (and 56% of reports were verified by a third party) the study highlighted pervasive omissions in disclosures, such as stakeholder engagement and materiality assessment. In addition there were a number of errors in relation to reporting of both water quantity and quality, particularly in relation to omitting disclosure of water sources in contravention of EN8. Barton and Morgan-Knott (2010) found that only 63% of 100 public companies operating in water-intensive industries reported corporate data on direct water usage, and only 14 companies provided water usage broken down into site- or regional levels.

The global reporting practices noted above have been largely replicated in Australian water reporting. Jones *et al.* (2005) compared the reports from 2003 of the largest 100 Australian companies to the prevailing GRI indicators, and reported low levels of disclosure across all environmental indicators. In relation to water, only 14% of the 100 largest companies reporting provided even direct water usage information.

Taking an investor perspective, Prior (2009) examined the water risks of the largest 100 companies, including scarcity, managing excess water, managing disposal quality, and potential environmental impacts. A key finding was that the critical water risk was water availability rather than price. Increased water costs could be readily absorbed, (though may materially impact power generators and agriculturalists), but disruptions in supply could result in significant disruptions

in production. Despite this, there were few disclosures by corporations regarding the security of their water supply.

Studies by the Association of Chartered Certified Accountants (ACCA, 2010) and Egan and Frost (2010) have also noted the relatively limited disclosures of Australian firms. The ACCA (2010) reviewed water disclosures by 32 of the largest Australian companies in 2010. While water-related issues are frequently addressed in some form in the annual reports, the authors echoed Morrison and Schulte (2009) in suggesting that there was significant room for improvement on disclosure of both water risks and their management, particularly across the supply chain. Egan and Frost (2010) reviewed the water disclosures of companies within the water-intensive food and beverages industry. While noting that most companies engaged with water issues at some level in their reporting, the authors also identified significant room for improvement, including the provision of even basic water-use information in many instances.

There have also been a number of studies exploring water and other sustainability disclosures, specifically in the mining industry. Mudd (2008, 2009, 2012) has considered this issue in an Australian and international context, and provides an interesting illustration of the possibilities for independent analysis when relevant data is publicly available. For example, Mudd (2008) combines sustainability and production data to explore water efficiencies in Australian mine sites. Contrary to expectation, he finds that water efficiencies are no greater in larger operations, and repeats this finding in a later study of the global platinum mining industry (Mudd, 2012).

In relation to *Australian Water Accounting Standard 1* (AWAS 1) and the *National Water Account*, given the recent state of this work, the literature is limited but growing. Some researchers suggest that while there are certainly significant potential gains to be made from standardised measurement, reporting and terminology, questions remain as to the extent to which the standards as currently constituted will facilitate the discharge of water management accountability (Tello Melendez and Hazelton, 2009; Tello Melendez *et al.*, 2011) and even extend to whether reporting entities should be geographic regions

rather than legal entities (Sofocleous, 2010). The Australian national water accounting project has been lauded as playing "an important future role in understanding the risk profiles of entitlements, and how these profiles are affected by water trade, change in water use, irrigation efficiencies or government reform", (Slattery *et al.*, 2012, p. 23), and claimed to be in the public interest from a regulatory theory perspective (Chalmers *et al.*, 2012). However, an analysis of the potential benefits of adopting water accounting standards concluded that while such standards might be a good start, much work remains to be done, particularly in the area of accountability (Hazelton *et al.*, 2012): a view shared both by report preparers (Tello Melendez and Hazelton, 2009) and report users (Tello Melendez *et al.*, 2012). These concerns echo the comments by Muller (2012, p. 218) regarding the potentially ambiguous relationship between corporate water accounting and accountability:

> [W]ater accounting is not necessarily neutral . . . it can be used to promote sector-specific interests and to advance policies that are not supported by the communities concerned. There is a particular danger where there is capacity and power asymmetry that standards will simply be imposed on weaker parties.

In summary, previous water disclosure studies have typically focused on large corporations, and on sustainability reporting *via* annual reports. More broadly, from a theoretical perspective, previous studies have focused on voluntary reporting, and have been critical of the meagre corporate efforts to produce comprehensive sustainability reports.

This thesis seeks to make a number of contributions in relation to these issues: specifically, by clarifying the possible role of the corporation; the normative foundation for calls for increased disclosure; and the possible ways in which accountability for corporate water impacts might be realised *via* mechanisms other than corporate sustainability reports. The approach of the thesis is discussed in the following section.

1.3 Approach of the thesis

Given the importance of water management, the central role of corporations, and the prior research discussed above, this thesis explores three main questions. Firstly, the thesis explores the role of corporations in society, and what can be expected of corporate conduct. Secondly, it explores to what extent the community has a right to water-related information from corporations. Thirdly, it explores what form this information might take. These three elements are discussed in turn below.

The first two questions in the thesis are normative, and therefore addressed by philosophical inquiry, a research method with a chequered past within SEA. Up to the early 1970's, normative research was considered valuable enough to be published in the leading North American accounting journals. For example, in 1978, a paper by Barry Spicer titled *Investors, Corporate Social Performance and Information Disclosure: An Empirical Study* was published in *The Accounting Review.* The introduction would not be out of place in a contemporary work on social and environmental accounting:

> Over recent years there have been mounting social, political and economic pressures on corporate managements to pay greater attention to the wider social and environmental consequences of corporate activities in the decision-making process . . . These pressures, in turn, have resulted in a number of proposals aimed at the development and application of better methods of measuring, assessing, and controlling the social performance of private enterprise with respect to issues of social concern such as environmental protection, racial and sexual discrimination and consumer policies . . . One such proposal is for the accounting profession to develop the capacity, i.e., theories, criteria and methodologies, to measure and report on all or various aspects of corporate social performance. (Spicer, 1978, p. 94)

This paper makes it clear that debate over corporate social and environmental disclosures is a pressing matter of the day, not just for academics but also for accounting regulators and stock exchanges. Spicer's paper, however, is not the reason that scholars visit volume 53, issue 1 of *The Accounting Review*. The paper immediately following Spicer's is the (in)famous work by Watts and Zimmerman

(1978), who set out to devise Positive Accounting Theory. In this world, agency theory is generally invoked to explain the existence of accounting and accountability. The theory essentially casts organisations as comprising principals (investors in corporations) and agents (managers). The divergent interests of principals and agents mean that principals will require a higher cost of capital to compensate them for this risk. Production of reports is a mechanism whereby the agent can reduce the risk for the principal, and so lower the cost of capital. Holding oneself to account is therefore in the economic interests of the agent. This theory seeks to explain both the voluntary production of accounting information, and also the voluntary verification of such information. In both cases it is assumed that the benefits to the agent in terms of a lower-risk premium outweigh the incremental report production costs. From this perspective, reporting is therefore not within the field of moral enquiry, but rather a study in information costs and markets.

Critics such as Okcabol and Tinker (1990) point out a number of problems with this position, such as the belief that all individuals are solely motivated by economic gain; but a key element is the positivist attitude to normative research. Watts and Zimmerman certainly did not share Spicer's concerns regarding the development of social and environmental theory. Indeed, they did not believe such frameworks to be deserving of the term "theory" at all, but generously permitted this nomenclature to continue in use, so as to avoid "semantic debate":

> We would prefer to reserve the term "theory" for principles advanced to explain a set of phenomena, in particular for sets of hypotheses which have been confirmed. However, such a definition of theory would exclude much of the prescriptive literature and generate a semantic debate. (Watts and Zimmerman, 1979, p. 273)

Watts and Zimmerman did not elaborate on what might constitute such a "confirmed" theory, or engage with any of the literature concerning the philosophy of science, such as Kuhn (1996 [first published 1962]). Indeed, the means by which their position is expressed is both expressly and implicitly designed to avoid direct confrontation or sustained examination. The comment is placed in a footnote on the first page of the paper, so it could be considered an

aside, but it is an aside positioned where it is certain to be read. Watts and Zimmerman then attempt to pre-empt any objections by claiming that any debate regarding their proposal would be "semantic", implying that opponents would be quibbling or engaging in some esoteric discussion. Yet it is precisely the legitimacy of a linguistic construct that Watts and Zimmerman dispute, and this construct—what constitutes a rightful claim to being a "theory"—has profound implications for the status of alternative paradigms of accounting research.

Consider the following sentiment:

> We would prefer to reserve the term "human" for right-handed people. However, such a definition of "human" would exclude much of the population and generate a semantic debate.

Put in this light, such a sentiment is revealed as outrageous: it simultaneously expresses prejudice, while seeking to avoid any challenge to that prejudice. This becomes even more apparent if "right-handed" is replaced with a particular ethnic, religious or other category used to exclude an "other".

Watts and Zimmerman were explicit, however, in articulating the view that normative research was useless, because it is "generally concluded" (without citations) that normative research lacked impact on policy, methodological rigour, and consensus:

> The literature we commonly call financial accounting theory is predominantly prescriptive. Most writers are concerned with what the contents of published financial statements should be; that is, how firms should account. Yet, it is generally concluded that financial accounting theory has had little substantive, direct impact on accounting practice or policy research. Often the lack of impact is attributed to basic methodological weaknesses in the research. Or, the prescriptions offered are based on explicit or implicit objectives which frequently differ among writers. Not only are the researchers unable to agree on the objectives of financial statements, but they also disagree over the methods of deriving the prescriptions from the objectives. (Watts and Zimmerman, 1979, pp. 273-274)

Yet normative research is not so easily dismissed. Today, the social and environmental accounting community might make an almost identical critique of thirty years of positivist accounting research to that which Watts and Zimmerman made of the normative era, particularly in terms of lack of impact, (see for example Reiter and Williams, 2002). Even more fundamentally, as Putnam (1993) points out, the objectivity and rigour of positivist research is routinely overstated, while the same qualities of normative research are equally routinely understated. As Kuhn (1996 [first published 1962]) showed, scientific research has a strong sociological dimension. Equally, three thousand years of moral inquiry has developed a strong sense of what constitutes a sound normative approach, predominantly on the basis of logic and reason. Rachels (2003, p. 43) summarises this position:

> [W]e can support our judgements with good reasons, and we can provide explanations as to why these reasons matter. If we can do all this, and for an encore show that no comparable case can be made on the other side, what more in the way of 'proof' could anyone want? It is nonsense to say, in the face of all of this, that ethical judgements can be nothing more than 'mere opinions'.

This thesis therefore employs philosophical inquiry to answer the key normative questions outlined above: namely, the role of corporations in society, and community rights to corporate information. As discussed in the following section, within this broad method, specific methodologies are employed. For example, Paper 1 engages with the work of Friedman, whereas Paper 2 follows the approaches of Griffin (2008) and Sen (1993, 2004), to determine the extent to which access to water-related information may constitute a human right.

In addition to philosophical inquiry, this thesis also explores what form corporate water-related information might most usefully take *via* an empirical approach, whereby data is collected from interviewees and corporate reports. Whilst data collection is typically employed in a positivist context, (to explain the past and predict the future), in this thesis it nevertheless informs a normative concern, by exploring the desirability and feasibility of particular means by which a right to corporate water-related information might be realised. Ryan and Bernard (2000, p. 769) suggest that texts (in the broadest sense) constitute "a

window into human experience"; and as Krippendorff (2004, p. 89) attests, even content analysis, typically a positivist mainstay, is not incompatible with a qualitative research agenda. Indeed, the method for analysing interview data suggested by O'Dwyer (2004) and adopted in Paper 3 and Paper 4, is designed to extract the maximum richness from the interview text, and can therefore firmly support a normative research paradigm.

Further details regarding how each of the papers are developed, and contribute to the overall research aims of the thesis, are provided in the following section.

1.4 Development of the thesis

As noted above, this thesis explores three main questions. Firstly, it explores the role of corporations in society, and what can be expected of corporate conduct. Secondly, it explores to what extent the community has a right to water-related information from corporations. Finally, thirdly, it explores what form this information might take. The means whereby each of these elements is addressed is discussed below.

1.4.1 The role of corporations in society

Given the influence of corporations across all facets of life (Korten, 2001), including water corporations (Hepworth, 2012), an important question is the role that the corporate sector might play. One element of this role will be determined by whether corporations can be considered to be "moral agents": that is, entities which are capable of having moral deliberations, and hence moral motivations for their actions. If corporations are considered to be moral agents, then meaningful determinations could be made as to whether corporations are acting ethically, and appeals to corporations to adopt more ethical practices are appropriate. In contrast, if corporations are not moral agents, then there is little

point in expecting them to behave in ways other than as profit-maximising entities. Under this view, changing corporate actions requires changing the competitive landscape in which corporations operate, either *via* taxes and/or subsidies, or direct legislation.

Paper 1 addresses this question *via* a philosophical inquiry, whereby competing arguments are reviewed, and the one best supported by reason is adopted (Rachels, 2003, p.12). It considers in detail the moral argument of Freidman (1970), which has been the basis for much discussion about the role of the corporation within the business ethics literature (Chryssides and Kaler, 1993; De George, 1995; Grace and Cohen, 2001; Hartman, 2005). Paper 1 also disputes Friedman's account of the moral arguments for business to focus solely on profit maximisation, but it accepts Friedman's contention that business is constrained by competition for scarce resources—especially capital, labour and customers. Furthermore, as Bakan (2004) points out, corporations are constrained by their legal structure, which promotes shareholder primacy.

Paper 1 therefore contends that calls for more "ethical" corporations, such as the strong-form stakeholder theory proposed by Evan and Freeman (Evan and Freeman, 1993 (first published 1988)) are doomed to failure unless the competitive and/or regulatory landscapes are transformed. In relation to SEA accounting, the view of corporations as amoral entities is consistent with authors such as Tinker *et al.* (1991, p. 33) and Gray and Milne (2004, p. 73). Indeed Adams and Whelan (2009, p. 137) suggest that "[M]anagers of Anglo-American corporations are legally obliged and remuneratively encouraged to try to maximize shareholder wealth. This fact can thus be taken, more or less, as a given". This suggests that calls by authors such as McKernan and MacLullich (2004) for accounting based on love and justice are unlikely to be realised within the prevailing market structure.

More generally, the view of corporations as constrained profit-maximising entities suggests that the ongoing critiques of corporate sustainability reporting (*e.g.* Deegan and Rankin, 1996; Adams, 2004; Cho and Patten, 2007; Cho *et al*., 2010; Cho *et al*., 2012a; Cho *et al*., 2012b) are better directed at criticising state,

as opposed to corporate, inaction; and resonates with the call by Gallhofer and Haslam (1997) for greater political engagement by the SEA community.

1.4.2 The right to water-related information

The view that corporations are best perceived as amoral entities has a number of implications for water, which are considered in Paper 2. This view suggests that corporate water use will always primarily be constrained only when it impacts profitability—either directly through the cost of purchased water, or indirectly through reputational impacts (which might be highlighted by disclosure)—or is directly restricted *via* licensing. Further, profit-maximising corporations will only disclose information that furthers their own agendas.

An important question is therefore the extent to which corporations should be required to disclose water-related information, or, put slightly differently, what rights communities might have to access such information. This perspective posits a strong link between corporate accountability and information rights, which is also noted in the SEA literature: as Stanton (1997, pp. 694-695) notes, "[a]ccountability, according to Gray, is concerned with the right to receive information and the duty to supply."

Specifically, Paper 2 considers the extent to which community access to corporate water-related information might constitute a human right. This question explored the use of philosophical inquiry, and follows the philosophical methodology for evaluating human rights suggested by Griffin (2008) and Sen (1993, 2004). These authors derive key principles to determine whether potential right ought to be recognised: namely, when the candidate's right is consistent with "founding" human rights; it is a matter of utmost importance to society; and it is capable of being influenced by societal action.

Following this method, Paper 2 contends that access to water disclosures constitutes a human right on the basis that political participation is a founding human right; that water is a crucial global issue and subject of community

debate; and that information is required for such debate to occur. As noted above, effective water management is likely to be one of the great challenges of this century (United Nations Educational Scientific and Cultural Organisation (UNESCO), 2006, p. 524) due to both declining reserves, (Palaniappan and Gleick, 2009), and disruption to supply driven by climate change (Intergovernmental Panel on Climate Change, 2007; Turral et al., 2011). There is increasing realisation that information is required for effective political participation (Stec et al., 2000; Sand, 2002; Stiglitz, 2003) as evidenced by the adoption of Freedom of Information (FOI) laws around the world (Banisar, 2006). Many authors within SEA have also attested to the importance of accounting information for meaningful discourse (*e.g.* Power and Laughlin, 1996; Boyce, 2000; Lehman, 2001; Rahaman *et al.*, 2004; Unerman and Bennett, 2004; Rasche and Esser, 2006; Dillard, 2007).

An important element of Paper 2 is that it raises a number of possible options for reporting that may satisfy a right to information beyond the corporate sustainability report. Indeed, there are strong reasons to believe that the corporation is not the appropriate locus of analysis, and therefore corporate sustainability reporting, even if mandatory, would not be sufficient to realise corporate water accountability. The point that environmental boundaries are unlikely to meaningfully correspond with corporate boundaries has been previously made with SEA (Schaltegger, 1997; Gray and Milne, 2004; Leong and Hazelton, 2008; Gray, 2010) and is especially apposite in relation to water because of the criticality of water context (Falkenmark, 2004; Irbaris, 2009; Morrison and Schulte, 2009; Cote *et al.*, 2012; Minerals Council of Australia, 2012; Mudd, 2012; Saravanamuthu and Lehman, 2013). Papers 3 and 4 accordingly explore alternate options for corporate water-related reporting.

1.4.3 The form of corporate water-related disclosures

One option for the disclosure of water information is the labelling of products with their water footprint. Product labelling has at least some potential to

contribute towards sustainability, given that labelling schemes appear to influence consumers and producers (Weaver and Finke, 2003; Gracia et al., 2007; Roe and Teisl, 2007; Beekman, 2008; Siipi and Uusitalo, 2008; Unnevehr and Jagmanaite, 2008), though labelling also offers ample opportunities for corporate misinformation and greenwash (Voiceless, 2007; Australian Consumers Association, 2008). Labelling of the water impact of a particular product faces some particular challenges, however. The most important of these is that water extractions are contextually dependent, because regions vary markedly in their abundance of, and demand for, water (Falkenmark, 2004; Irbaris, 2009). Simply stating the total volume of water embedded in a particular product may therefore be misleading.

Given the potential contribution, but also challenges, of water labelling, Paper 3 considers the extent to which water labelling might realise the community right to water-related information established in Paper 2. The method comprised a review of pertinent literature regarding water management, the current operation of labelling schemes, and semi-structured interviews with water regulators and water users.

The findings of Paper 3 suggest that water footprint reporting could make a significant contribution to public water literacy, as while there are significant technical challenges, they are not insurmountable, particularly in relation to simpler products. Regarding the key challenge of context, Paper 3 suggests that progress is possible on this issue, given an extensive and growing literature as to how catchment stress should be assessed. For the purpose of labelling, a simple traffic-light system reflecting catchment stress might provide a framework for communication of the proportion of the water footprint sourced from water-scarce *versus* water-abundant areas.

An alternate corporate water accountability mechanism is water reporting at the level of the physical site, as opposed to reporting aggregated on the basis of legal ownership. Given the necessity of considering environmental issues using geographic, as opposed to legal, boundaries raised by a number of authors (Schaltegger, 1997; Gray and Milne, 2004; Leong and Hazelton, 2008; Gray,

2010), site-level reporting has received surprisingly little attention within SEA research.

Paper 4 therefore explores the extent to which site-level reporting might realise the community right to water-related information established in Paper 2. The method for this study comprised interviews with water experts and a review of the site-level reporting of large water-users within the Sydney Metropolitan area.

Interviewees considered site-level disclosures to be a promising mechanism for improving corporate accountability. In relation to the ability to provide site-level information, interviewees pointed out that this information was readily to hand for corporations, (especially within urban settings), and even more readily to hand for water providers. Indeed, in some locations a single organisation is responsible for water delivery to all users, and therefore ideally placed to provide basic water usage information. The monopoly position of water providers might therefore be harnessed to improve the accountability of their customers to the community.

The review of the reporting practices of Sydney's large water-users revealed, however, that site-level information was rarely provided: a finding consistent with more general reviews of corporate water disclosures (Morikawa *et al.*, 2007; Morrison and Schulte, 2009; Mudd, 2009; Prior, 2009; Barton and Morgan-Knott, 2010; Egan and Frost, 2010; The Association of Chartered Certified Accountants, 2010; CIMA (Chartered Institute of Management Accountants), 2011; ERIS, 2011; Mudd, 2012). In addition, the findings suggest that the intuition of Egan and Frost, (2010), regarding the disinclination towards disclosure by private companies is apposite, and is also consistent with the relative lack of sustainability reporting by smaller companies reported by Mudd (2009). The study also suggests that the historic SEA focus on listed companies may be problematic in the case of water, given that the majority of large Sydney water-users are not listed companies. The independence of size and impact may also apply to other dimensions of environmental and social performance, which has significant implications for existing SEA reporting frameworks, which are typically targeted at large organisations.

1.5 Contribution of this thesis

Collectively, these papers have a number of implications. As a critical player in both the management and use of water, the corporate sector faces increased scrutiny, and Paper 1 suggests that corporations are best conceived as entities with limited capacity to deviate from profit-maximising activities. Of course, not every water user is a corporation, and Paper 1 also points out that alternative organisational forms may offer a far wider moral capacity, and hence be better able to adapt to the increasingly-ambiguous moral terrain of modernity. However, although calls for new organisational forms have been made before, (Schumacher, 1979; Metcalf and Benn, 2012), it is also important to note that greater moral capacity includes the capacity for greater social and environmental harm as well as good. In turn, this means that the role of educational and other institutions responsible for the moral development of organisational decision-makers becomes even more important.

While novel organisational forms may indeed be the future, the present belongs to the corporation, (Korten, 2001), and Paper 1 suggest that regulation, as opposed to exhortation, is the key lever for improving corporate action. In relation to water, it is clear that disclosure is critical as a key enabler for informed community debate, and hence regulatory efforts should be focused in this arena. Water allocation is becoming a matter of increasing concern to citizens, and the price mechanism can never fully solve water allocation issues. This limitation arises for a number of reasons, including the fact that most water providers are monopolies, and that water is an essential commodity. The regulatory focus on water information is therefore likely to continue, and probably escalate, as citizens assert their right to information more strongly. As Paper 2 contends, access to water-related information can be plausibly considered to be a human right: a claim which carries considerable (though not absolute) normative force.

For corporate water accounting frameworks, a glaring omission is reporting in relation to wider water stress, and reporting of disaggregated, site-level water usage. The World Business Council for Sustainable Development has made considerable progress developing a tool to facilitate identification of corporate operations in water-stressed regions. However, use of this tool is voluntary, and the major water-reporting frameworks, namely the GRI, CDP Water Disclosure Project, and CEO Water Mandate, have limited disaggregated reporting requirements. Even the emerging Alliance for Water Stewardship standard, which emphasises site-level water accountability, does not require site-level reporting.

In any event, reporting of water stress and site-level information may both be better situated in government water accounting, but even one of the most advanced governmental reporting system—Australia's—does not include these aspects. Australian Water Accounting Standard 1 (AWAS 1), which currently governs the preparation of the annual National Water Account, has a geographic orientation, but does not currently require specific water stress or site-level disclosures. Adding these elements to the next iteration of the standard would represent a significant step forward.

In relation to SEA research, a key thrust of the studies is that the historic focus within SEA on corporate accountability *via* examination of corporate disclosures in annual reports needs to be broadened. One of the main findings of this thesis is that annual reports may not be the main, or even an important, lever for corporate accountability.

An emerging area of interest is in product labelling, and while there has been an explosion of both the scope and volume of social and environmental labels in the past decade, there has been surprisingly little SEA research. With the exception of recent studies by Gondor and Morimoto (2011) and Bicalho (2012), few SEA researchers have attempted to apply the insights of decades of SEA research to this field. As noted above, research in other fields reports that consumers are influenced by labels (Weaver and Finke, 2003; Gracia *et al.*, 2007; Roe and Teisl, 2007; Beekman, 2008; Siipi and Uusitalo, 2008; Unnevehr and Jagmanaite, 2008)

which suggests that future research is warranted. In relation to water labelling, the key insight from this thesis is that the problem of representing water context, though difficult, could conceivably be solved, and future studies could usefully explore how a traffic-light system might be created in practice.

Of the various approaches canvassed in the literature and in this thesis, however, the model of corporate reporting to a central government agency, which then provides this information to the general public, is the most attractive. The finding from this thesis supports those SEA researchers who have argued for some time that a corporate-centric view is misleading when considering sustainability issues (Schaltegger, 1997; Gray and Milne, 2004; Gray, 2010). Indeed, this "central database regime" approach (Leong and Hazelton, 2008) has proved most effective in other fields, particularly in relation to pollution reporting (Fung and O'Rourke, 2000; Sand, 2002; Stephan, 2002). In addition to enhancing comparability, site-level reporting can also include the oft-neglected SME sector, and opens new possibilities for effective assurance. Central database regimes—across the spectrum of social and environmental issues canvassed in the literature—therefore deserve wider attention within SEA research.

In relation to water, although Australia may have a leading position on water accounting (Slattery *et al*., 2012), many other countries are actively engaged in water reform (Andreu *et al*., 2012; Gan *et al*., 2012; Hughes *et al*., 2012; Lund, 2012; Squillace, 2012). An important trajectory for SEA research is therefore also to examine the contentions of this thesis in other geographical, cultural and political contexts.

The four papers described above are presented in turn in Chapters 2, 3, 4 and 5 of the thesis. Conclusions are provided in Chapter 6, which summarises the key elements of the papers, and elaborates on the contribution of the thesis, and areas for future research.

Chapter 2

Paper 1:

The Amorality of Public Corporations

Due to copyright laws, the following articles have been omitted from the thesis. Please refer to the following citations for details.

Hazelton, J. and Cussen, K. (2005), "The Amorality of Public Corporations", Essays In Philosophy, Vol. 6 No. 2.

Chapter 3

Paper 2:

Accounting as a Human Right – The Case of Water Information

Due to copyright laws, the following article has been omitted from the thesis. Please refer to the following citations for details.

Hazelton, J. (2013) "Accounting as a human right: the case of water information", Accounting, Auditing & Accountability Journal, Vol. 26 No. 2, pp. 267—311.

Chapter 4

Paper 3:

Corporate Water Accountability – The Role of Water Labels given Non-fungible Extractions

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Abstract

Purpose – This paper explores the potential for the labelling of the water footprint of products in an Australian context. It considers theoretical contribution and technical challenges of water labelling and in particular how non-fungible water extractions might be evaluated and communicated.

Design/methodology/approach – The paper examines the theoretical contribution of labels drawing on the sustainability typology articulated by Hopwood *et al.,* (2005) and more recent claims that access to product-level environmental information may constitute a consumer right (Beekman, 2008; Hazelton, in press). The paper also explores labelling empirically via an extensive literature review and ten interviews with water regulators and commercial water users.

Findings – Water footprint reporting could make a significant contribution to public water literacy. Significant technical hurdles remain, however, in appropriately distinguishing differing impacts of water extractions as well as in relation to measurement, allocation and information overload. This suggests labelling of complex products is currently infeasible but existing and emerging solutions to these issues suggest labelling of simpler products is a realistic possibility.

Research limitations/implications – Given the relatively small scope of interviews, the findings of this study might be triangulated with other research methods such as surveys and/or focus groups for the findings to be validated. Additionally, future research might focus on overcoming each of the challenges noted above for a particular product in order to bring water labelling closer to practical reality.

Originality/value – Labelling schemes offer improved corporate supply-chain accountability yet have received little attention in the social and environmental accounting literature to date. This paper therefore seeks to make a theoretical

and empirical contribution to this emerging field of labelling in the area of water, a key sustainability issue.

> [A] sustainable lifestyle must be an everyday life with a reduced throughput of everything materialistic, including consumer goods in general.
>
> Norgard (2006, p. 27)

4.1 Introduction

Water is an important issue both globally and for Australia. Water disputes have played a central role in conflicts throughout history (Gleick, 2006) and contemporary issues include lack of universal access to fresh water for human consumptive use (UN, 2008, p. 40), diminishing water availability (UN, 2008, p. 40) and worsening conditions as a result of climate change in the form of droughts and floods (IPCC, 2007, p. 11). Australian water issues largely mirror those at the global level, except that Australians enjoy almost universal access to clean drinking water and sanitation. Australia, as the driest inhabited continent on earth, has always been a site of fierce debates over water, and water is expected to be a significant issue for the foreseeable future (CSIRO Sustainable Ecosystems, 2002). Problems of water scarcity can suddenly turn into even worse problems of floods (Wahlquist, 2008) and climate change is predicted to have a significant impact, particularly for Australian agriculture (Heyhoe *et al.*, 2007).

Not surprisingly, water issues have received considerable attention from both community and government. In Australia, NGOs such as the Wentworth Group of Concerned Scientists have long called for improved water management and information (The Wentworth Group, 2002, 2003, 2006, 2008). The federally

sponsored National Water Initiative (NWI) of 2004 was a response to such calls, promising among other things a nationally consistent approach to water management which had previously been devolved to the States and Territories (Commonwealth of Australia and the Governments of New South Wales, Victoria, Queensland, South Australia, the Australian Capital Territory and the Northern Territory, 2004). Key elements of the NWI included a framework for water access entitlements and planning, water markets and trading, water pricing, integrated environmental management, water accounting, urban water reform, knowledge and capacity building and community partnerships and adjustment. Building on the NWI, the 2007 National Plan for Water Security (Commonwealth of Australia, 2007) earmarked $10 billion for a decade of accelerated water reform, particularly within in the Murray-Darling Basin, a region responsible for much of Australia's agricultural produce. The Plan also promoted improved water information and promised $480 million over a ten-year period to fund the Bureau of Meteorology in this regard (Commonwealth of Australia, 2007, pp. 5–6). These responsibilities were further crystallised in the *Water Act 2007,* which included the requirement for the production of an annual National Water Account by the Bureau. This account draws on a tradition of national water reports that began in the mid-1960s, (Vardon *et al.*, 2007) supported by agencies such as the Australian Bureau of Statistics (ABS) (ABS, 2004, 2006). Nevertheless, the National Water Account is a significant departure from conventional accounting as it applies accounting concepts such as a "balance sheet", "profit and loss account", "cashflow statement" and "notes to the accounts" to water reporting (Chalmers *et al.*, 2012), and research considering the usefulness of this information has now begun (Sofocleous, 2010; Tello Melendez *et al.*, 2011).

Less attention, however, has been placed on the overall "water footprint" of households, which are responsible for the consumption of products requiring large quantities of water to produce. In 2007, the Australian Conservation Foundation released *Consuming Australia*, a report prepared in collaboration with academics from Sydney University (Australian Conservation Foundation, 2007). This report discussed the water (and carbon) usage of ordinary Australians, and one of its most notable findings was that most of the water used

by Australians is not direct usage, such as showers or watering gardens, but rather is embedded in products consumed. The study found that household use accounted for just 23% of water usage – 16% direct usage, with the remainder water used on the garden and embedded in electricity consumption. Of the remaining 77%, food accounted for 46%, goods and services 28% and construction 3% (Australian Conservation Foundation, 2007, p. 6). Such work followed the broad approach of water footprinting, which seeks to calculate the total water consumption of a region, organisation, product or service (Hoekstra *et al.*, 2011).

The Australian Conservation Foundation report prompted a call from Dr. John Kaye, the Greens NSW MP, for water and carbon labelling on all products:

> Many consumers are completely unaware that common food items in their shopping trolleys like beef and soft drinks and many consumer durables form a major part of their household's contribution to both global warming and water usage … Every product should clearly display the water used and greenhouse gases emitted during its production. (Kaye, 2007)

This call echoed a number of recent initiatives in the broad field of "eco-labelling": the creation of environmental labels to inform consumer choices. Some commentators, however, see limited value in the concept. For example, in 2008 the Australian National Water Commission stated that "the measurement of virtual water has little practical value in decision making regarding the best allocation of Australia's scarce water resources" (National Water Commission, 2008, p. 7). Other commentators such as Frontier Economics (2008) have been similarly critical.

While eco-labelling has been extensively discussed within academia (Weaver and Finke, 2003; Gruere, 2006; Gracia *et al.*, 2007; Roe and Teisl, 2007; Beekman, 2008; Siipi and Uusitalo, 2008; Unnevehr and Jagmanaite, 2008), it has received surprisingly little attention in social and environmental accounting literature. Accounting disclosure studies that have moved beyond corporate sustainability

reporting have typically studied web-based communication (Adams and Frost, 2004; Lodhia, 2010; De Villiers and van Staden, 2011; Lodhia, 2012; Uyar, 2012) in response to ongoing calls for greater corporate accountability (Gray *et al.*, 1996; Gray, 2001; Gray and Bebbington, 2001; Gray and Milne, 2002; Milne and Gray, 2007; Gray, 2010). The particular issue of corporate accountability for water use is also an increasing area of interest for both practitioners and academics, but to date it has been explored predominantly in the context of corporate sustainability reports (Morikawa *et al.*, 2007; Morrison and Schulte, 2009; Prior, 2009; ACCA, 2010; Barton and Morgan-Knott, 2010; CDP, 2010, 2012; Egan and Frost, 2010; CIMA, 2011).

This paper therefore aims to extend the exploration of corporate sustainability reporting to a new site—that of the product—and explore the extent to which water labelling provides a mechanism for enhancing corporate water accountability. In particular, this paper seeks to engage with an especially challenging aspect of water, namely the non-fungible nature of water extractions. While the location of (say) carbon emissions is irrelevant to their contribution to climate change, water (and water demand) is unevenly distributed around the world. Smakhtin *et al.* (2004) shows that such variation results in differing levels of global water stress, which means that equivalent extraction levels will have very different implications at different locations. It is also the case that a particular location will usually have different degrees of water scarcity at different times of the year, and water levels at a particular time of year will vary considerably from year to year. This aspect of water disclosures therefore represents a particular challenge to any form of non-geographically aggregated water disclosures such as corporate- or product-level sustainability reports.

The remainder of the paper is structured as follows. Section 2 reviews relevant social and environmental accounting research, noting not only the key theme of improving corporate accountability but also the emphasis on triple bottom line reporting to achieve this end. Section 3 provides a theoretical frame for exploring the potential of labelling utilising the sustainability typology of Hopwood *et al.* (2005) and more recent claims that access to information may

constitute a consumer right (Beekman, 2008; Hazelton, in press). Section 4 describes the methodology of the study. Section 5 considers those issues common to all labelling schemes—measurement, allocation and information overload—and Section 6 explores the water-specific challenge of water extractions being non-fungible. Section 7 offers some concluding remarks.

4.2 Literature review

Within the social and environmental literature there have been ongoing calls for greater corporate accountability (Gray *et al.*, 1993; Gray *et al.*, 1996; Gray and Bebbington, 2001) that at a minimum requires disclosures far beyond merely providing a financial report. Historically, an important strand of this literature has focused on the reporting practices and motivations of companies making disclosures in social and environmental reports (Mathews, 1997; Gray, 2001; Deegan, 2002; Gray, 2002; Adams *et al.*, 2004). Academics have long been critical of the quality and quantity of these reports (Deegan and Rankin, 1996; Milne and Gray, 2007) and authors such as Adams *et al.* (2004) have called for the introduction of mandatory reporting regimes.

While there are a number of sustainability guidelines currently in operation (Adams and Narayanan, 2007), for reporting purposes the dominant framework is the Global Reporting Initiative (GRI), now into its third iteration with the fourth in a consultation phase. There are a number of limitations of the GRI approach (Moneva *et al.*, 2006; Brown *et al.*, 2009; Farneti and Guthrie, 2009), most fundamentally because while corporate activities are critical (Gray, 2010) in many instances a legally defined organisational boundary is not the salient level of analysis (Gray and Milne, 2004; Gray, 2010).

In relation to water, both reporting frameworks and prior studies have predominantly focused at the level of the corporation. The GRI G3.1 (and draft G4) guidelines, for example, prescribe water disclosures at the organizational level (Global Reporting Initiative, 2011b, 2012) via EN8 (water withdrawn from the environment by source – core), EN9 (water sources significantly affected by

the impact – additional), EN 10 (the recycling and reuse of water – additional), EN 21 (water discharged by quality and destination – core) and EN 25 (the impact of discharges – additional). The majority of the Water Disclosure Project survey questions relate to corporate water use (CDP, 2011), though this framework also requests regional information. The CEO Water Mandate similarly requires organizational commitment for water responsibility and reporting against this commitment (UN Global Compact Office, 2009). The emerging Alliance for Water Stewardship (AWS) standard (AWS, 2012) also has a corporate perspective, though it emphasizes site-level reporting for major operations. Site-level disclosures are also the focus of the Minerals Council of Australia (MCA) reporting guideless for the minerals industry (MCA, 2012).

The GRI G3.1 guidelines, however, also require some disclosures regarding product lifecycles. Indicator PR3 (type of product and service information required – core) mandates reporting of which elements of the product lifecycle are disclosed in product labels and the proportion of products containing such label disclosures. This requirement is justified on the basis that:

> Accessible and adequate information on the sustainability impacts of products and services (positive and negative) is necessary for customers and end users to make informed purchasing choices, and for these preferences to be reflected in the market (GRI, 2011a, p. 5).

This indicator remains unchanged in the draft G4 guidelines, and there are suggested additional disclosures in relation to the supply chain that may encourage product-level sustainability assessments. For example, the proposed G4 PR4 (additional) indicator requires disclosure of "[p]ercentage of monetary value of each type of materials, products and services purchased that have been verified or certified as being in accordance with credible, widely-recognized economic, environmental and social standards" (Global Reporting Initiative, 2012, p. 116). Product-level analysis is also the subject of question 9.2 of the CDP Water Disclosure Project, which requests "any available water intensity values for your company's products or services across its operations" (CDP, 2011, p. 7).

Perhaps the most important framework for product-level reporting, however, is the water footprint. The water footprint builds on the concept of the eco-footprint (Wackernagel and Rees, 1996) and attempts to calculate the total water consumption of a region, organisation, product or service. The Water Footprint Network (WFN) published the first version of the Global Water Footprint Standard in November 2009 and the second (current) version in February 2011 (Hoekstra *et al.*, 2011). In combination with the Water Footprint Assessment Manuals this standard provides guidance on goals and scope in water footprint assessment, definitions and methods for water footprint accounting, overview of water footprint response options, and ongoing challenges. The WFN undertakes research in addition to standards development, and the water footprint concept has been applied to products such as coffee and tea (Chapagain and Hoekstra, 2007), countries (Chapagain and Hoekstra, 2004; Hoekstra and Chapagain, 2007) and international "trade" in virtual water (De Fraiture *et al.*, 2004). Water footprinting is also prominently profiled in a recent United Nations publication exploring corporate water accounting (UNEP, 2011). Not all practitioners support this idea, however. In addition to the more general criticisms of the eco-footprint (Fiala, 2008; Kitzes *et al.*, 2009), the water footprint concept has been criticised on a number of points (Frontier Economics, 2008) but primarily on the grounds that it ignores the non-fungible status of water extractions discussed in the previous section.

Despite the development in product-level reporting frameworks, research into water disclosures has typically followed an organizational focus. In addition, in both an international or Australian context these studies typically find considerable room for improvement. For example, studies of large international corporations operating in water-intensive industry sectors by Morikawa *et al.* (2007), Barton and Morgan-Knott (2010) and Morrison and Schulte (2009) found that while almost all provided at least some information regarding water performance or management there was little detail, particularly in relation to geographic or supply-chain performance. In an Australian context, Jones *et al.* (2005) reviewed the 2003 reports of the largest 100 Australian companies

against the prevailing GRI indicators and found only 14% provided even direct water usage information. While more recent studies by Prior (2009), the Association of Chartered Certified Accountants *et al.* (2010) and Egan and Frost (2010) have found improved levels of disclosure, they still point to a lack of regionally disaggregated water information or supply chain analysis. Most recently, the Australian report of the CDP Water Disclosure Project (CDP, 2012) highlighted similar concerns. This report revealed Australian disclosure practices as slightly lagging their global counterparts in aspects such as board-level oversight of water strategy, a surprising result given the importance of water to Australian industry.

Organisational-level reporting of sustainability indicators is by no means, however, the only possibility for sustainability disclosures. Other options include full cost accounting (Bebbington and Gray, 2001; Antheaume, 2007), "shadow accounts" (Dey, 2007), and central databases such as the Toxic Release Inventory in the US and the Australian Electoral Commission political donations in Australia (Leong and Hazelton, 2008). While all these methods provide distinct advantages (and also disadvantages) over the GRI approach, the method that most explicitly attempts to address the problem of supply chain accountability is life-cycle assessment (LCA).

Early SEA literature concerning LCA suggested that it may be useful at the level of the organization: "[t]his analysis provides an overview of an organization showing all its physical inputs, its pollutions, leakages and wastes plus a specification of all its outputs. LCA then tracks each of these inputs and outputs to their source" (Gray *et al.*, 1996, p. 296). More usually, however, LCA is focused on the product as the primary locus of analysis rather than any particular organisation. As the term suggests, LCA attempts to measure the overall impact of a good or service over its entire life cycle, from production to eventual disposal. Gray and Bebbington (2001, p. 183) explain that "[t]he principle of considering the life cycle of any activity is essentially elementary. For illustration, consider a particularly simple product like a pencil … One starts from the product itself—the pencil—and then traces the life cycle forward and backwards."

Yet even with such a simple product as a pencil, the production process is astonishingly complex. Indeed, the pencil was the subject of the classic treatise on globalization and free markets by Read (2006 [first published 1958]). Gray and Bebbington therefore opine that "no LCA can be complete and comprehensive. It is unlikely to catch the majority of the biosphere-product interactions and, as a result, it will rarely have much claim to objectivity" (Gray and Bebbington, 2001, p. 185, emphasis removed). In conclusion, they suggest that "like budgeting and cost-benefit analysis, the principal benefit lies in the process of undertaking the exercise rather than in believing the answers that come out of the process … We in the West have enormous footprints … [and LCAs may] bring this essential ecological fact of life to the attention of the organization and to the forefront of management thinking" (Gray and Bebbington, 2001, p. 192).

Given LCA's orientation to products as the primary unit of analysis, an obvious application is in product labelling. Some years ago Gray and Bebbington (2001, pp. 110-111) summed up eco-labelling as follows:

> Eco-labelling has proved to be a process fraught with difficulty and conflict. In essence, the potential market impact of an eco-label leads companies to be anxious about the criteria adopted in determining the label. This, inevitably, leads to lobbying and conflict. The basis of the conflict is real enough – complex products (e.g. washing machines or cars) go through so many processes and are of dubious environmental value in their use such that establishing a single indicator of "environmental effect" is impossible … eco-labelling is an important plank of the "market mechanisms" approach to environmental performance improvement and whilst it remains a crucial and live issue eco-labels do not look to become widely, consistently and reliably adopted in the near future.

In the years since Gray and Bebbington's assessment of eco-labelling schemes, their prediction of problems of consistency and reliability have proved prescient. Eco-labels have become ever more prominent; reviewing energy labelling schemes throughout the world, Harrington and Damnics (2004) found energy

labels being used in over 50 countries. In Australia, for example, electrical and gas appliances are required to display energy efficiency labels, and similar requirements are in place regarding water efficiency for appliances such as dishwashers and washing machines (Wilkenfeld, 2003).

Unsurprisingly, eco-labels have also attracted regulatory attention. The European Aarhus Convention sets out a range of environmental information requirements for signatories and includes product labels as one important site for information disclosures. Article 5(8) requires that "[e]ach Party shall develop mechanisms with a view to ensuring that sufficient product information is made available to the public in a manner that enables consumers to make informed environmental choices". Product-level information is also discussed in the 2009–2014 Strategic Plan:

> The range of environmental information that is made available to the public is gradually widened, inter alia, by developing and implementing mechanisms enabling more informed consumer choices as regards products, thereby contributing to more sustainable patterns of production and consumption. (UN Economic Commission for Europe, 2008, paragraph 11(b))

Carbon labelling has also received significant commercial interest. In January 2007, Tesco announced that it would label all the products on its supermarket shelves with carbon information, stating that they would "begin the search for a universally accepted and commonly understood measure of the carbon footprint of every product we sell – looking at its complete lifecycle from production, through distribution to consumption. It will enable us to label all our products so that customers can compare their carbon footprint as easily as they can currently compare their price or their nutritional profile" (Leahy, 2007). In the UK Pepsico and Boots have also actively explored carbon labelling and in late 2008 the Japanese government announced similar measures (Chhabara, 2008; McCurry, 2008). The Japanese established a committee to develop a local system in line with efforts by the International Standards Organization to issue international eco-labelling standards (Japanese Ministry of Economy, 2008).

Such regulatory and commercial interest is supported by empirical studies that suggest labelling does impact consumer choices, which may resonate throughout the supply chain. Weaver and Finke (2003) reported a significant relationship between the use of the sugar component of food labels and reduced sugar intake. The Australian Water Efficiency Labelling Scheme, which requires household appliances such as dishwashers and washing machines to display water efficiency information, is estimated to save 87,200 megalitres of water per year by 2021 (Commonwealth Department of Environment and Heritage, undated). In relation to trans fats, Unnevehr and Jagmanaite (2008, p. 6) reported not only a significant consumer response to labelling but also changed production patterns to reduce or eliminate the use of trans fats in many packaged foods:

> The combined incentives created by mandatory disclosure of trans fat content, potential product liability, and threatened or actual ingredient bans have clearly brought about a strong response from the food industry ... it seems clear that most of the artificial trans fats in the diet are on their way out ... It took decades for use of partially hydrogenated oils to expand throughout the food industry, but it seems likely that they will be removed from the food supply within only a few years.

Similar findings were reported by Gruere (2006), who compared the impact of GM labelling in France (where it was mandatory) and Canada (where it was not). His findings were that in France GM food became unavailable, but in Canada GM foods predominated while non-GM foods were sold in specialty shops, suggesting that producers pre-emptively considered that consumers would shun GM-labelled foods and acted accordingly. An interesting corollary is that Gruere (2006) also reported significant changes to the supply chain, where developing countries avoided GM crops because of fears that they would be unable to sell into the EU given its strict labelling scheme.

Consumer surveys also suggest that purchasing decisions may be influenced by the provision of environmental information on product labels. Populus (2007, p.

5) reported that of the group of "concerned consumers" (roughly 50% of all consumers) only 23% would not take into account issues like ethical sourcing and sustainability when buying Christmas presents (compared to 66% who would take this into account to some extent and 11% to a great extent). In relation to carbon, L.E.K. Consulting (2007) reported that 56% of UK consumers would value information regarding a product's carbon footprint when making a buying decision and only 27% felt that it would not be of use. Further, when equipped with reliable information regarding the carbon footprint of a product or service, the study found that close to half of consumers (44%) would change their buying behaviour in some way. More recently Upham and Bleda (2009) provide a review of research relating to consumer attitudes to carbon labels undertaken by Pepsico and Boots as well as non-commercial research undertaken by Forum for the Future. This review finds general support for the initiative within these studies but also highlights some of the methodological challenges for labelling schemes discussed further below. These empirical studies resonate with the plethora of social and environmental claims made by the products on supermarket shelves, from recycled paper products to biodegradable detergent to free-range eggs and organic foods. Anecdotally, the fact that so many claims are made on so many products suggests that producers believe that at least some customers take these factors into account in making purchasing decisions.

Other studies confirm the extent to which voluntary labelling schemes allow the same opportunities for "greenwash" as voluntary sustainability reports. The Australian Consumers Association (2008) revealed a number of dubious practices in their survey of supermarket product labels, such as a claim of "30% recycled" referring not to the fabric softener in question but rather to the box in which it was sold! A report by the animal rights group Voiceless cites the mislabelling of hundreds of thousands of eggs as "free range" and suggests that the lack of prosecution "has provoked skepticism about the capacity of the current laws to prevent similar occurrences arising in the future" (Voiceless, 2007, p. 27).

An obvious but important limitation to the effectiveness of label reporting is therefore that of reliability. In a study concerning various models of GM food labelling in the US, Roe and Teisl (2007, p. 64) concluded that "both the message contained in GM labels and the messenger may have significant impacts on how successful such a labelling program might be" and suggested that Food and Drug Administration-endorsed labels would have the most impact. Similarly Gracia *et al.* (2007) found that Spanish consumers knowledgeable about labels both rated them as useful and supported the introduction of mandatory labelling schemes.

In light of the increase in interest in product labelling and the potential for corporate accountability at the level of the supply chain, it is somewhat surprising that eco-labels have received scant attention within the SEA community since Gray and Bebbington's 2001 assessment. An exception is Gondor and Morimoto (2011), who considered eco-labelling in Japan. This study considered the relative roles of the Marine Stewardship Council and the World Wildlife Fund in the labelling of seafood products and in particular the impact of MSC certification on consumers. The main findings were that while certification appeared to be a key determinate of price for some products, follow-up interviews with consumers revealed that country of origin was the most important product characteristic and that many consumers were unaware of what the MSC certification meant. While mindful of opportunities for greenwash (and therefore calling for increased regulatory oversight) Gondor and Morimoto (2011, p. 227) consider that "[c]ontinued market penetration of the MSC label, further opportunities to make connections with domestic NGO's and consumer advocacy groups as a result of overlapping interests, combined with the increased visibility of the fisheries crisis is a foreseeable trend for the future".

Given this lack of prior research, further enquiry into the potential of labelling for improving corporate water accountability is warranted, and this paper seeks to contribute to our understanding of the theoretical potential and practical limitations of labelling in the context of water. The following section develops this inquiry by analysing the theoretical potential of labelling schemes across the continuum of conceptions of sustainability.

4.3 Theoretical perspectives on labelling schemes

As noted above, Gray and Bebbington (2001, pp. 110-111) characterised eco-labelling as belonging to the "market mechanisms" class of sustainability solutions. This section utilises the typology of sustainability approaches developed by Hopwood *et al.* (2005) to extend this characterisation and provide a more nuanced evaluation of the potential of labelling schemes. Hopwood *et al.* (2005) categorise sustainability proponents into three camps: those supporting the "status quo" who suggest that market forces with minimal government regulation are sufficient to drive social and environmental outcomes (such as the World Business Council for Sustainable Development), the "reformists" who believe that significant government intervention is required but that the liberal democratic systems are fundamentally sound (such as the Club of Rome), and "transformationists" who believe that fundamental change is required (such as neo-Marxists and deep ecologists). In social and environmental accounting, this transformationist position has been strongly advanced by scholars such as Tinker *et al.* (1991), Tinker and Gray (2003) and more recently Spence (2009) and Molisa (2008). This latter school has been particularly critical of many attempts at social and environmental accounting and argued that social and environmental accounting might even undermine efforts for sustainability, not only because it may be appropriated by powerful corporate interests but also because it may present a false veneer of progress and therefore delay or eliminate genuine steps towards more fundamental transformation.

In broad terms, labelling schemes are likely to fall somewhere within the status-quo and reformist camps and are unlikely to be transformationist. In other words, they will first and foremost inform markets (a "status quo" position) though this information may ultimately lead to (or coincide with) regulatory changes (a "reformist" outcome) such as health warnings on cigarettes leading to outright bans in certain locations. Labelling schemes will therefore be useful if they improve market efficiency in some way, and as noted above a number of studies indeed suggest an impact of labels on consumer decision-making (Weaver and Finke, 2003; Gruere, 2006; Gracia *et al.*, 2007; L.E.K. Consulting,

2007; Populus, 2007; Roe and Teisl, 2007; Unnevehr and Jagmanaite, 2008; Upham and Bleda, 2009).

In relation to the transformationist concern, it is difficult to answer definitively whether labels might constitute a veneer of progress that masks more fundamental inertia. The illusory case might be argued on the grounds that the problems of production—and in particular agricultural production—are deeply rooted in the current capitalist system. The food crises, for example, where the world's poor find it increasingly difficult to afford staples at least partly have been attributed to rich countries' desire for biofuels and greater ability to purchase large swathes of agricultural land to assail their environmental conscience (Von Braun, 2008). To suggest that product labelling will address these deep structural issues is overly optimistic. Yet it might also be argued that such labelling may play a role, albeit minor, in exposing the inequities of the current system. For example, as global freshwater supplies dwindle, a label stating the thousands of litres used to produce a cut of beef might raise uncomfortable questions in the minds of consumers in the manner that Gray and Bebbington (2001, p. 192) suggest.

Fundamentally, however, ethical consumption can supplement but not supplant environmental debate within the political sphere. As Sagoff (1988) points out, while markets respond well to consumer "wants", they cannot be completely relied upon to accommodate "beliefs". The distinction between wants and beliefs is described by Sagoff (1988, p. 28) as follows:

> Our environmental goals—cleaner air and water, the preservation of wilderness and wildlife, and the like—are not to be construed, then, simply as personal wants or preferences; they are not interests to be "priced" by markets or by cost-benefit analysis, but are views or beliefs that may find their way, as public values, into legislation.

Sagoff points out that the means by which markets mediate preferences is not discursive but simply aggregates consumer demands. If we liken markets to a

voting process, proponents of a particular position can at best achieve proportional representation. In other words, if 60% believe that a particular product should use recycled water, the best that can be hoped for is that markets adapt to provide 60% of these products. However, for those advocates who believe that 100% of the products should be using recycled water, the market offers no possibility for them to achieve this outcome. In practice, the amount offered by the market may be substantially less than the 60% of possible demand, due to imperfect information of producers, "lumpy" investment decisions (e.g. there are only two factories, so either 50% or 100% of the products must use recycled water) and so on. Further, the market responds to consumers, so the more a person consumes (which is closely correlated to their wealth) the more votes they receive. This is especially problematic in the context of conservation, where non-purchasing decisions (or null-votes) are of relatively low power. For example, while the vast majority of people may consider the creation and use of private jets and helicopters a waste of resources, the "votes" of a few very wealthy individuals are sufficient to sustain these industries. This problem is even more acute in the context of international trade, where the "few" might be overseas recipients of the resources of the "many". Such problems can only be resolved via environmental debate within the political sphere. Yet this debate requires information, which leads to the assertion by some commentators of a right to information, discussed in further detail below.

4.3.1 The right to information

A related but distinct theoretical perspective on labelling schemes suggests that the provision of certain information may be considered a consumer's —or a citizen's—right. Calls for disclosure of environmental information might be considered in the context of the broader phenomenon of "ethical consumption", broadly conceived as the modification of market preferences by a moral framework. The majority of religious traditions, for example, preclude consumption of some types of food, sometimes permanently and sometimes at different times of the year. Other instances include "ethical" investment (Haigh and Hazelton, 2004; Haigh, 2006a, b) and firms such as The Body Shop and Ben

and Jerry's, which largely trade on ethical reputation. More recently, social and environmental claims have become *de rigueur* across industries from financial services to apparel, mining to manufacturing and everything in between.

From this perspective, information is not merely important to facilitate the operation of markets; it instead constitutes a consumer right. For example, Beekman (2008) develops a number of "non-superficial" values regarding food (including concerns about health, justice, the environment and so on) and suggests that governments have a moral obligation to regulate where there is a consensus on values and provide information to enable ethical decision-making where there is not. Similarly Siipi and Uusitalo (2008, p. 360), considering consumer autonomy in the context of genetically modified (GM) food, stated that "respecting autonomy of choice is strongly associated with the right to information." This perspective posits a strong link between accountability and information rights (Stanton, 1997, pp. 694–695).

In relation to water, Hazelton (in press) argues that access to water information may even constitute a human right and identifies product labels as one potentially promising site for the provision of such information. This paper draws on Griffin (2008) and Sen (1993, 2004) who provide principles to determine whether potential right ought to be recognized, namely, when it is consistent with "founding" human rights and is both important to and may be influenced by societal action. The case for water disclosures constituting a human right is essentially that political participation is a founding human right, that water is a crucial global issue and subject of community debate and that information is required for such debate to occur. Many authors within SEA have also attested to the importance of accounting information for meaningful discourse (e.g. Power and Laughlin, 1996; Boyce, 2000; Lehman, 2001; Rahaman *et al.*, 2004; Unerman and Bennett, 2004; Rasche and Esser, 2006; Dillard, 2007), and the recognition that information is essential for political participation is now well established (Stec *et al.*, 2000; Sand, 2002; Stiglitz, 2003).

This section suggests that labelling has at least some potential to contribute towards sustainability, currently from the "status quo" and possibly moving toward the "reformist" perspective. Research suggests that labels have influenced consumers (and producers) in some instances (Weaver and Finke, 2003; Unnevehr and Jagmanaite, 2008), and consumer studies generally find support for the provision of environmental information (L.E.K. Consulting, 2007; Populus, 2007; Upham and Bleda, 2009), suggesting that labelling schemes may facilitate markets. From the perspective of "ethical consumption", provision of information might also constitute a right (Beekman, 2008; Siipi and Uusitalo, 2008; Hazelton, in press) and is trusted when from reputable sources such as government agencies (Gracia *et al.*, 2007). This analysis must be carefully caveated, however, in that successes often rely on labelling initiatives acting in concert with multiple other forces and that labelling also offers ample opportunities for corporate misinformation and greenwash (Voiceless, 2007; Australian Consumers Association, 2008).

The current study seeks to contribute to the understanding of product labelling by considering the specific instance of water labelling. As discussed further below, in addition to the general issues around product labelling, disclosure of a water footprint along the lines proposed by Kaye (2007) offers a particular challenge in terms of context. The following section describes the method adopted to explore these issues.

4.4 Method

The analysis provided in sections 5 and 6 was undertaken based on a review of pertinent literature and ten semi-structured interviews. Documents included materials that directly related to water labelling and application of the water footprint (Lenzen and Foran, 2001; Chapagain and Hoekstra, 2004; De Fraiture *et al.*, 2004; Australian Conservation Foundation, 2007; Chapagain and Hoekstra, 2007; Hoekstra and Chapagain, 2007; Kaye, 2007; Frontier Economics, 2008; National Water Commission, 2008; Hoekstra *et al.*, 2011; Stockholm

International Water Institute, 2011; UNEP, 2011) as well as documents reviewing water reporting and accounting more broadly (Council of Australian Governments, 2000; National Land and Water Resources Audit, 2001; The Wentworth Group, 2003; Commonwealth of Australia and the Governments of New South Wales, 2004; Bate, 2006; Bouguerra, 2006; Gleick, 2006; Lowe *et al.*, 2006; Pigram, 2006; Sinclair Knight Merz, 2006; The Wentworth Group, 2006; World Business Council for Sustainable Development, 2006a, b; Cordery *et al.*, 2007; World Business Council for Sustainable Development, 2007; O'Dea and Cooper, 2008; Pacific Institute, 2008; Cote and Moran, 2009; Gleick, 2009; Irbaris, 2009; Prior, 2009; United Nations Educational, Scientific and Cultural Organization, 2009; World Business Council for Sustainable Development and International Union for the Conservation of Nature, 2009; Kurland and Zell, 2010; Morrison and Schulte, 2010; Sofocleous, 2010; Fisher and Russell, 2011; AWS, 2012; WWAP, 2012).

In addition to the review of literature, ten interviews were conducted in 2009–2010 in order to provide further analysis as to the desirability and feasibility of product-based water labelling. Semi-structured interviews were selected as the data collection tool in that common questions were asked to interviewees but supplemented by unique follow-up questions. This approach facilitated both the comparability of data available from structured interviews and the possibility of unique data from unstructured interviews (Fontana and Frey, 2000). Interviews were in-depth and durations ranged from 60 to 156 minutes with an average duration of 90 minutes. Eight interviews were conducted in person and two by telephone.

Interviewees were from a range of backgrounds and locations. The researcher was independently commissioned by the Australian Bureau of Meteorology to assist with the development of National Water Accounting Standards and therefore had access to senior water practitioners in both regulatory and commercial roles. Interviewees were based in the Australian Capital Territory (4), New South Wales (2), Tasmania (1), Victoria (2) and Western Australia (1). Their current roles were water regulators (6) and large water users (4). Of the

six regulators, two had previous extensive experience in water management roles whilst the remaining four were from a commercial and/or accounting background. Three interviewees were female and seven male.

All interviews were recorded. Hayes and Mattimoe (2004, p. 361) suggest that the recording decision should be based on the following criteria: (a) the nature of the research topic; (b) the willingness of the interviewee to be taped; (c) the interviewer's preference and competence with either technique; and (d) the benefits and drawbacks of the techniques themselves. For the present study, the topic under investigation was relatively well structured, suggesting that note-taking was feasible. However the relatively uncontroversial nature of the topic meant that interviewees were willing to be recorded. In order to minimise the risk of resistance (Hayes and Mattimoe, 2004, pp. 362–364), interviewees were informed that the tape could be stopped at any time, and interviewees did on occasion request to speak "off the record" regarding particular examples or anecdotes. The interviewer also took hand-written notes both as a record of the interview for later analysis and as a prompt for follow-on questions.

The interviews explored various options in relation to corporate water accountability, including reporting using organizational-based mechanisms such as the GRI, catchment-based reporting and specific issues in relation to water labelling. The precise allocation of time between these topics varied between interviewees but each received roughly equivalent attention.

The analysis phase began with obtaining interview transcriptions, which yielded 144,461 words or 425 pages of transcript. Once transcribed, all interviews were analysed drawing on methods outlined by Ryan and Bernard (2000), Silverman (2000), O'Dwyer (2004) and O'Dwyer *et al.* (2011). Initial codes were determined based on the issues identified from the analysis in Sections 3 and 4 above (such as issues of extraction measurement and identification of contextual factors). In the first coding pass these codes were applied and new codes added as additional dimensions of data were identified. Handwritten notes were also scanned and reviewed for any additional information. All transcripts were

reviewed for these themes in the second pass and a mind map prepared as a final tool for organising interview themes. NVivo was used as the primary coding tool. NVivo is one of the most popular qualitative data analysis tools and in a recent review Zapata-Sepúlveda *et al.* (2011) conclude that NVivo facilitates the development of qualitative thematic content analysis, simplifying the coding, analysis and display of data, particularly when working with large quantities of information. As the interviews also considered non-labelling approaches to sustainability reporting (such as the GRI and catchment reporting), not all data was relevant to the current paper.

The results of the documentary analysis and interviews are presented below in sections 5 and 6. Section 5 provides an analysis of aspects of water labelling that are common to all labelling schemes, such as the right to information, allocation of inputs to products and so on. Section 6 examines the particular issue that differentiates water labelling – the criticality of extraction context – in depth.

4.5 Water labelling – issues common to all labelling schemes

The concept of the ecological footprint, developed by Wackernagel and Rees (1996), is now well known. Various criticisms are levelled at this concept, however, such that the footprint misses important aspects of sustainability (such as pollution) and that weightings of factors such as carbon emissions are misleading (Fiala, 2008). Though these criticisms are vigorously rebutted by footprint proponents (Kitzes *et al.*, 2009), the related concept of the water footprint has been similarly controversial. As noted in section 1, the water footprint attempts to calculate the total water consumption of a region, organisation, product or service (Hoekstra *et al.*, 2011) and has been extensively applied (Lenzen and Foran, 2001; Chapagain and Hoekstra, 2004; De Fraiture *et al.*, 2004; Chapagain and Hoekstra, 2007; Hoekstra and Chapagain, 2007). This section provides a more detailed analysis of the issues around water labelling common to other labelling schemes; namely the ability of labels to realize

consumer rights to water-related information, measurement, supply-chain allocation and information overload.

4.5.1 Rights to information

A persistent theme in water literature is that markets cannot be the sole determinants of water allocation and that better water information is therefore required. There are two main barriers to appropriately managing water via markets. First, for some products water costs may not form a significant component of total costs, meaning that even large increases in water costs provide negligible price signals to producers or consumers. In investigating the impact of changing prices on domestic demand, Hoffmann *et al.* (2006, p. 357) concluded that while increasing prices may have some impact on consumption the relative inelasticity of demand suggests that water rationing is likely to be a much more effective policy tool. Likewise, while the Australian Conservation Foundation found a correlation between income and embedded water consumption, the linkage was weak because most of this consumption is in diet and dietary choices are relatively price-inelastic (Australian Conservation Foundation, 2007, p. 8). An international study which corroborates this finding is Chapagain and Hoekstra (2004, p. 61), who plotted national meat consumption compared to average GNP. This work suggests average annual incomes must be less than around $US5,000 for income reductions to make a significant difference in national meat consumption. In the corporate sphere, Prior (2009) reviewed exposure to water risk by ASX 100 corporations and found that the critical water risk was water availability as opposed to price. Increased water costs could be readily absorbed (though may materially impact power generators and agriculturalists), but disruptions in supply could result in significant disruptions in production.

A second distinct but related issue is that water is notoriously difficult to price. While many commentators have suggested that "real" pricing is the solution to problems of water scarcity (Bate, 2006; Tooth, 2007), the inherent variability of water availability in many regions, monopolies in supply, government ownership

of water assets, political expediency and an inability to trade water have resulted in historically unrealistic water prices. Given these price difficulties, concerns have also been expressed that Australian water resources are being exported with insufficient returns to the Australian people (Lenzen and Foran, 2001). The recent *World Water Development Report* articulates these difficulties as follows:

> While economic theory suggests that pricing policies may be useful for achieving targets, in practice, prices serve several conflicting purposes: financing of water service-related infrastructure, incentives for efficient use of scarce resources, and fairness and distributional justice … Simply monitoring water prices does not necessarily provide a useful indication of policy success, unless it is done in a manner that reflects the real-life objectives of improved water management. (WWAP, 2012, p. 168)

While some interviewees believed that price was a relatively minor element of water management, most considered that it has been and remains a major issue. Low levels of water pricing stymie investment in water efficiency technologies and therefore require government grants to stimulate interest in such projects. The move towards higher water prices was noted by a number of interviewees; the following quote is representative:

> Fundamentally we've got a major and deeply embedded and historical mispricing of water, and what we've been gradually moving towards, I guess, is catch up whereby we charge for water the price, a fair price for water in terms of its production costs. (Interviewee 4)

Yet moving to a new price regime is problematic:

> I think water has been almost a free resource, it's been…it's been treated as something that's always there and you know as opposed to energy for example. And so because it's seen as a free resource people are very reluctant to actually pay increasing amounts for it. (Interviewee 1)

Due to these difficulties, there was widespread agreement that improved water information is important. Partly this was driven by the importance of water itself:

> It's not like any other resource, let's get that straight. It's simply not like any other resource. It's one of five nature's gifts on which all life on earth depends and that's the fundamental it should never be forgotten. It is pretty fundamental, all forms of life depend on one of five things and water is one of them… . Rivers are the report cards of our civilization. If we f--k our rivers, what are we doing here? (Interviewee 3)

The criticality of information for engaged public discourse was also noted:

> Water is one of the most valuable resources and it's part of a good management practice I think to be open and transparent about; it's good to talk about licenses and it's also good to talk about what was actually used as well. And I think being transparent about those kind of things can assist other stakeholders in their kind of decision-making processes and make up their minds … you may have on a particular catchment users may feel like every single drop is being extracted in a particular catchment but you know, we don't have available information to say, you know, what potential you would have if the catchment versus what's actually being taken, its hard to actually have an educated discussion about that. (Interviewee 7)

Yet while information was considered important, many interviewees highlighted a present lack of understanding of water information. This was of great concern due to the importance of water issues facing the community and the requirement for community participation in order to make good decisions and also to hold decision-makers to account.

Labelling was generally considered one of the most promising forms of water information in terms of engaging the ordinary citizen following studies by the Australian Conservation Foundation (2007), comments by Kaye (2007) and extensive use of the concept of the water footprint (Lenzen and Foran, 2001;

Chapagain and Hoekstra, 2004; De Fraiture *et al.*, 2004; Chapagain and Hoekstra, 2007; Hoekstra and Chapagain, 2007; Hoekstra *et al.*, 2011; UNEP, 2011). Interviewees generally agreed that information was useful about categories (such as rice, cotton etc.) as it enabled consumers to better understand the implications of their purchasing decisions and further water literacy. This point was well articulated by interviewee 3:

> [T]he concepts involved in the thinking are incredibly important, because they are about through a whole chain where is the dependency on water, and how can that be understood? So I think one of the big challenges with water information is not providing the absolute; it's providing the relative information about how significant the quantum is … conceptually it [labelling] is quite a powerful way of illustrating the water dependence of goods and services … Let me just give an example. You could describe the supply chains and the water dependency in the supply chain without necessarily being able to say: "and as a result this means that this range of products has this much embedded water". (Interviewee 3)

A related theme was in bringing together the worlds of city and country:

> I think it's very useful information because people in the city are disconnected from the bush [and] disconnected from the methods of production that are needed… in many cases it's very large quantities of water. A kilo of carrots is about 14 megalitres of water per hectare, which is big. (Interviewee 8).

At this broad level, then, it seems that the water footprint concept has value. The water footprint does not constitute the entirety of water information—as Langford (2005) points out, we do not need to know how many litres it takes to grow an orange to argue for access to water as a fundamental human right—but this analysis suggests that knowledge of the relative footprint of goods and services can bring a useful dimension to water debates.

Moving to a greater level of specificity was more controversial. While most water footprints attempt to determine the water embedded in product types (such as

rice or cotton production), water labels seek to determine the water embedded within a particular bag of rice or shirt. Some interviewees questioned whether such labels would have a substantial impact on consumer purchasing decisions. Though labelling studies have pointed to the impact of labels in consumer choice (Weaver and Finke, 2003; Unnevehr and Jagmanaite, 2008) such examples relate more to issues of health than environment, and there was some skepticism as to how much impact such labels would make. As one interviewee put it:

> All these thing are good like food labelling - it's good for the consumers to know, but they buy because it is [the] cheapest good … [though] they might talk of being environmentally sound, I mean you think about it – still people buy a lot of eggs from caged chickens. (Interviewee 5)

Yet there have been some examples of labelling schemes in relation to water; in Australia, electrical and gas appliances are required to display water (and energy) efficiency labels (Wilkenfeld, 2003). The *Water Efficiency Labelling and Standards Act* 2005 (Commonwealth) requires labelling of showers, taps, toilets, washing machines and dishwashers, and the scheme's promotional brochure suggests that by 2021 Australians can save more than 87,200 megalitres of water per year (Commonweath Department of Environment and Heritage, undated). To put the potential WELS water savings in context, by 2050 Australian water consumption is estimated to increase by 16 million megalitres from 1996/97 levels (CSIRO Sustainable Ecosystems, 2002, p. 204), but the outcome nevertheless suggests some efficacy of labelling. It might be argued that the scheme also appeals to the economic aspect of consumers as water-efficient appliances will result in lower water charges, but given the low water costs noted above this seems unlikely to account for the totality of behaviour change.

4.5.2 Measurement

Measurement of many facets of the environment is challenging. In relation to carbon emissions, for example, significant uncertainties exist in relation to carbon reporting at the level of the firm or even the nation, as direct

measurement of emissions (by sampling the chemical composition of discharges from smokestacks, for example) is often prohibitively expensive. For this reason estimation manuals are utilized based on production factors. As Zahar *et al.* (forthcoming, Ch. 3) point out, this introduces two elements of uncertainty: activity uncertainty (volume of coal consumed by the power station or the number of cars on the road), and factor uncertainty (emissions per tonne of coal or per car). The upshot is that significant errors can occur, poignantly illustrated by a recent comparison of Chinese emissions as reported by the national government with the aggregation of emissions reported by the provinces that reveal discrepancies of over one gigatonne (Guan *et al.*, 2012).

In relation to water, all interviewees considered accurate measurement of water to allocate to products to be a challenge, and suggested that a robust methodology was essential for a footprint label to be credible:

> I reckon, it [labelling] would be very useful, very hard to do and very hard to regulate … I think that you will have a hard time getting people to put those stickers on there and you get a hard time assessing their accuracy. (Interviewee 1)

Given the water cycle means that water isn't lost or destroyed, some questioned the very concept of water "use":

> Water lost to the sea isn't actually a loss, so portraying water as consumption using a footprint mentality is misleading. (Interviewee 6)

While this point might seem somewhat esoteric, the question of what elements of water inputs and outputs constitute "use" is nevertheless complex. For an industrial user these problems are less acute, as water typically arrives via a metered pipeline and wastewater is then output via a separate system. Hence, water use is known with relative certainty. However, even measuring the volume of water utilised in a production process may be difficult. At its most basic, measurement errors can occur because of inaccuracies of water meters. The NWI

(clause 88) requires national standards to be developed regarding water meter accuracy (Commonwealth of Australia and the Governments of New South Wales, Victoria, Queensland, South Australia, the Australian Capital Territory and the Northern Territory, 2004). In 2007, the Natural Resource Management Ministerial Council agreed that Standards Australia and the National Measurement Institute would assist the Metering Expert Group in developing non-urban water metering standards, adopting ±2.5 per cent in-laboratory and ±5 per cent in-field accuracy requirements which may significantly improve the ability to track water usage, but in the interim, studies such as Kirby *et al.* (2008) suggest large inaccuracies exist in models of the other elements of the water cycle (such as evaporation and seepage) which makes even assessing the accuracy of existing meters difficult.

In a rural setting water may arrive via a pipeline, but it may also arrive via rainfall or by accessing on-site storage such as farm dams. In addition, a major element of the water cycle is water in the soil, which may vary depending on the relative level of extractions from crops and additions from rainfall or irrigation. In relation to the identification of water utilised in an agricultural production process, a number of interviewees suggested that measuring non-metered water use, such as from rainfall or run-off onto on-farm storage, is more difficult. Higher levels of rainfall will result in lower demand for irrigated water but not necessarily lower levels of water usage overall. Interviewees were concerned regarding the accuracy of such measurements:

> You should include evaporation. And runoff coming in. You could make it simple and limit it just to extractions, but I just think it's a hard one … as soon as you start playing with rainfall and evaporation you're going to get some big variances in numbers. (Interviewee 5)

One interviewee nominated the considerable technical problems in relation to the measurement of soil moisture, which is a large component of the terrestrial water cycle:

> We do have a legitimate technical issue with soil moisture and that it is notoriously hard to measure in a cost effective way. Short of putting soil moisture probes at very close increments, the other issue is soil moisture probes can only give you limited information on the depth differential … it's not just a two dimensional aerial thing. So we need some method … basically we need a methodological breakthrough that can enable us to estimate soil moisture accurately over large areas and do it quickly and repeatedly. (Interviewee 4)

Yet such problems are not insurmountable. The primary concern of water users and regulators is the availability of water within a system and therefore the amount of water extracted from a system that is not available to other water users. Hence, it is the direct extractions via pipelines that are the most important variable (given appropriate regulation of interceptions such as farm dams or crops such as pine trees).

One method that organisations have adopted to minimize these direct extractions is the use of lower quality or recycled water. Determining water quality is itself complex; while it is obvious that saltwater is undrinkable, salinity is only one of a number of characteristics that determine whether water is potable (i.e. of drinking water quality). Internationally, potable water quality is set by the World Health Organisation, which releases regular guidelines (World Health Organization, 2011). The Australian equivalent is the guidelines set out in the National Water Quality Management Strategy Australian Drinking Water Guidelines 6, 2011 (National Health and Medical Research Council, 2011). These guidelines set out water quality in three dimensions: microbal quality (such as the prevalence of bacteria, protozoa, viruses, helminths and cyanobacteria), physical and chemical quality (such as the colour, turbidity, hardness, dissolved solids, pH, temperature, taste and odour, dissolved oxygen) and radiological quality (the level of radiation present in the water). Interviewees noted the importance of these differences and the opportunities this might provide to organisations to communicate their moves to use lower quality or recycled water supplies:

> I think what water quality is something you should definitely be able to say. You know, if you are able to use recycled water or non-potable water or something in the production of your product because you are a genius, or on the other hand, if you are using saline or desalinated water then maybe you are having a justification for the high price because desalinated water will cost more…. (Interviewee 1)

This point was endorsed by one of the industry interviewees who was involved in just such a scheme:

> Because all of our sites are urban, our key focus is around on-site potable water use. So the targets we set are to reduce potable water use … [at one site] the volume of water has been reduced – we were using five megalitres a day and we're now using three megalitres a day. But the biggest saving we have done is to move that three megalitres a day over to recycled water so it's not potable water … so we are taking ourselves off the drinking water system. (Interviewee 9)

While the use of non-potable water might be highlighted, as the above quote demonstrates the impact of such initiatives are lower consumption of potable water. Therefore measurement of potable water use implicitly captures this dimension.

Measurement issues are clearly relevant when it comes to water labelling. However, the above discussion suggests that the challenges may be met. The replacement of inaccurate water meters is a priority of the NWI and concerns over measuring aspects of use difficult to quantify (such as runoff or changes in soil moisture) are irrelevant if the focus is on water extractions from shared water sources. Further, moves to use lower quality or recycled water are implicitly captured via lower levels of high quality water extraction.

4.5.3 Supply chain allocation

A further challenge to water footprint labelling is identifying and allocating water consumption within the supply chain. This is an issue common to Life-Cycle Analysis, where setting the boundaries on a product can be difficult but make a substantial difference. For example the Greenhouse Gas Protocol (World Business Council for Sustainable Development and World Resources Institute, 2004) distinguishes between three sources of carbon emissions: direct, indirect via energy consumption and other indirect emissions (for example arising from employee travel to and from work). The latter "Scope 3" emissions may be substantial but are both subjective and difficult to estimate.

In relation to water, many interviewees raised the difficulty of tracking all the different inputs into production. For example, interviewee 3 stated:

> It's the how do you trace the products and services back through their individual bits and there'll be so much apportionment potentially you know?

Clearly for complex products, allocation requires both detailed calculations and the cooperation of the supply chain:

> It's a huge administrative load to be able to get to that stage, and it is all down to pushing back on your supply chain. (Interviewee 10)

A need for information by global trading partners was a point also raised by interviewee 2 in the context of Australian rice production:

> The Australian rice farmers reckon they're really efficient you know like … they've got so many tones per megalitre of water, much more efficient than a lot of the Asian countries are. So, everyone screams and they say "you're using our water for rice – it's ridiculous" … [but] in New South Wales or Victoria or whatever you'd say "well that's much better than that one coming from Korea or Thailand or whatever it might be". But is that the case? I don't know because we don't know what water they're using over there and how they use it.

Such allocation becomes less challenging for simpler products, such as agricultural staples. For example, interviewee 5 pointed to the high degree of knowledge farmers have in relation to water use:

> Even on the face of a quite crude looking irrigation apparatus, irrigators are actually quite sophisticated in their own farm allocation decisions. Generally there's a high amount of knowledge on the differences between individual paddocks in terms of the drainage characteristics of each paddock, and my observation has been that irrigators…make quite sophisticated decisions based on what crops they've got and where … in fact you can be amazed at their level of detail; at each stage of the crop they'll be able to tell you more or less how much it needs per day which is to me just extraordinary. So they've got a great deal of operational knowledge as to what the requirements are. (Interviewee 4)

Allocation is likely to represent a pervasive issue for efforts to determine product-level water footprints. Progress by supermarkets such as Tesco to determine the carbon footprint of products has been slow (Hall, 2007; Leahy, 2007; Tesco plc, 2008). Yet water footprint methodology has also received considerable attention in academia, and an established methodology has gradually been developed (Hoekstra *et al.*, 2011). This methodology is now being codified into an international standard ISO/CD 14046, currently under development. Whilst footprint calculations would still be complex, this standard would at least enable consistency and hence comparability of data.

Developments in waterfootprinting methodology suggest that for simple products allocation is feasible. However the cost of performing an assessment are non-trivial and likely to vary considerably between products. Hence, the determination of whether costs outweigh benefits is unlikely to be possible at a general level and can best be determined by considering specific products. Such analysis is an opportunity for further research.

4.5.4 Information overload

A further key issue is that water is unlikely to be the only dimension of sustainability that consumers might be interested in. As noted in Section 3, a conceptual difficulty with labelling schemes is that products reflect a bundle of inputs and production processes. For example, while it takes 7,458 litres to produce one dollar's worth of rice compared to only 379 litres for vegetables and fruit, it takes only 11.6 megajoules of energy for one dollar's worth of rice compared with 15.3 megajoules for vegetables and fruit (CSIRO Sustainable Ecosystems, 2002, p. 193).

Many interviewees raised this issue:

> It's not just about water because you could have a product that has been made using very little water, but it could be made out of plastic and, you know, could be created in a very unsustainable way and it may not be recyclable … So, I suppose the water is [a] component of that. On its own [it] probably is not of great use because there could be other aspects of that product that are completely unsustainable. (Interviewee 7)

> It's like the debate about clothing and we debate, you know, child labour and the people in sweatshops and that hen - was it a battery hen with no feathers on it versus a free range—yeah it's all those value judgments about where the thing came from. (Interviewee 3)

> But how long is a piece of string – where do you stop? Do you then start looking at all the other resources that have gone into each product? Aluminium, zinc, nickel…. (Interviewee 10)

Interviewees also noted the issue of greenhouse emissions in a number of contexts, such as indicating that carbon was the environmental priority of many organisations. In the context of bundling, carbon impacts were also raised:

> Why should it [water] be singled out? … [T]he classic [is] what's the embedded water in a bottle of water … the production of the plastic and all that sort of stuff. … I think that the energy should be in that too. (Interviewee 2)

One of the most interesting responses was to view this issue not necessarily as a negative, but rather a segue into broader product-level reporting:

> This pair of shoes has a lower water footprint than the other pair of shoes, but it has a higher carbon emission, which one is better? And if we go to pick a single metric and judge every thing by that metric we have a danger … So it is a more broad life cycle system, rather than just looking for a water footprint. We need to continue with this process, the evolution of trying to define what a water footprint is so that we can send better information into a broader lifecycle assessment. (Interviewee 9)

Others, however, were less convinced:

> I think that's pie in the sky. I mean, how big do these labels have to be? (Interviewee 5)

One response to this challenge is to acknowledge that purchasing *is* complex, and more extensive labelling merely reveals reality, albeit a reality some may prefer to ignore (Gracia *et al.*, 2007). As consumers we make trade-offs between incommensurable items all the time, though perhaps not always consciously. To reduce or mediate this complexity out of "concern" for consumers is paternalistic at best and might even be conceived as a form of censorship. Indeed, some commentators suggest that the quarantining of everyday items from their production methods is one of the pathologies of modernity—for example, that few people who regularly eat meat have ever killed an animal or seen the conditions in which they are kept, and if they did their purchasing decisions may be radically altered (Voiceless, 2007; Beekman, 2008). The absurdity of selective labelling can be seen in "dolphin friendly" labels on tuna cans, stating how the fishing methods allow the dolphins to roam free but stating nothing about how

the tuna might be wrenched from the ocean and decimated in order to wind up in the "dolphin friendly" tin!

Technology may also play an increasing role in managing this complexity. For example, organisations such as the Australian Consumers Association are developing mobile phone applications that enable product reviews to be accessed that include environmental dimensions. Similarly smartphone applications such as "Additive" enable consumers to look up food additive codes found on product labels to understand exactly what they are. It is therefore conceivable that a range of environmental information could be stored remotely and then accessed by interested consumers.

This section has examined issues around water labelling common to other environmental dimensions of products such as carbon or recyclability. Overall, there are significant challenges but these are not necessarily insurmountable, particularly when the concept is applied to relatively simple products such as basic agricultural produce. Given that such produce comprises the majority of water consumption this limitation is not as significant as it might appear. A further, and fundamental, issue in relation to water, however, is the non-fungibility of water extractions. This issue is considered in the following section.

4.6 Water context

A key criticism of the concept of water footprinting is that it ignores the context of water extractions. As noted above, water is distributed unevenly around the world. Yet it is not only unequal distribution of water that is relevant but also key water consumers, including the environmental, urban, rural and commercial sectors. Smakhtin *et al.* (2004) show that such variations result in differing levels of global water stress, which means that equivalent extraction levels will have very different implications at different locations. It is also the case that a particular location will usually have different degrees of water scarcity at different times of the year, and water levels at a particular time of year will vary

considerably from year to year. For example, the Lower Gascoyne River in Western Australia, where round and surface water extractions are unrestricted when certain climatic conditions are met (the brief period when surface water flows along the Gascoyne River (Water and Rivers Commission, 2004, p. 1) as this water would otherwise run to the ocean. During the remainder of the year, however, extraction limits are in place.

Contextual issues were recognised in the Carbon Disclosure Project report *The Case for Water Disclosure* (Irbaris, 2009), which suggests that "water disclosure will have to contain qualitative information on the specific watersheds where water is taken. This will have to include social impacts, water policy decisions and wider issues of price, water rights and allocative efficiencies" (Irbaris, 2009, p. 11). The draft G4 GRI guidelines similarly emphasise the importance of context and of supply chain in the proposed new definition of reporting boundaries:

> "Boundary" refers to the range of value chain elements or areas covered in the report for each material topic. In setting the boundaries for material topics, an organization should consider impacts throughout its entire value chain, regardless of whether it exercises control or influence over the elements in its value chain. Boundaries vary based on the topic being reported (Global Reporting Initiative, 2012, p. 20).

Contextual considerations have important implications for the production of water-intensive crops such as rice. As noted above, the water intensity of one dollar's worth of rice is much larger than that of vegetables and fruit. Yet it does not necessarily follow that consumers should abandon rice for less water intensive crops. In regions where water is abundant, water not utilised for rice may simply run out to sea. In water scarce regions, however, with multiple competing claims for water use, the argument for rice production might be less persuasive. But even here, it might be argued that reporting of total water usage might be misleading without accompanying efficiency information.

According to Frontier Economics (2008), the consequences of ignoring context are that the footprint assumes that all sources of water are of equal value, whereas in fact use of recycled water, say, may have much lower impact than other sources; that it implicitly (and incorrectly) assumes that water that would be released by reducing a high water-use activity would necessarily be available for use in a less water-intensive activity; and that it both fails as an indicator of environmental harm and does not provide any indication of whether water resources are being used within sustainable extraction limits. An interesting example of such criticism is from the Australian National Water Commission, which included a discussion of the concept of "embedded" or "virtual" water in a 2008 newsletter and concluded that it was unhelpful:

> The measurement of virtual water can not provide a useful and reliable benchmark for choosing between alternative uses of the nation's scarce water resource. Two examples illustrate this:
>
> An irrigator's decision on whether to plant rice or wheat. The "virtual-water" measure would rank wheat and rice applications together (around 1,000 litres per kilogram of either rice or wheat), and takes no notice of the many other considerations that should be factored in if the best allocation is to be made. These considerations include the cost of other inputs required to make the rice or the wheat, and the different values of selling the kilogram of wheat versus the kilogram of rice. Considerations such as these are omitted entirely from the "virtual-water" numeraire.
>
> A decision for a Catchment Management Authority (CMA) between watering two alternative wetlands this season. The wetland that uses the least water per hectare, would receive the highest ranking under a "virtual water" benchmark. Consider the case of two wetlands in the CMA's region - one which was an internationally-recognised and highly valued wetland but which required (say) 1% more water per hectare of wetland, than did a second wetland area which had low environmental value. In this situation, the "virtual water" benchmark would produce the perverse result of ranking the second low-value wetland as a preferred user of the CMA's seasonal water resources.

> For these reasons, the NWC considers that the measurement of virtual water has little practical value in decision making regarding the best allocation of Australia's scarce water resources (National Water Commission, 2008, p. 7).

While there are important issues relating to water context (discussed further below) the Commission's rationale and examples for rejecting the notion of virtual water do not engage with the core of this debate. The first example is that of the irrigator trying to decide whether to plant rice or wheat. The example uses litres per kilogram of production as the virtual water measure. Yet using water per kilogram is patently meaningless, and making this the only virtual water measure reduces the example to a straw man. From the irrigator's perspective, water usage per dollar of output would be a far more useful measure, particularly if water was the limiting factor on production. For example, in the Murray-Darling Basin, water entitlements are announced at the beginning of the growing season, and while it is possible to buy water through trading such water is expensive. In such conditions knowing the "water yield" of a particular crop may be extremely useful both for making economically optimal decisions and as an efficiency benchmark.

The second example is even less convincing. The Commission compares two wetlands and states that if one wetland required 1% less water per hectare the virtual water benchmark would rank this as the preferred user of water resources. In this example, the denominator of water is area, without consideration of environmental value. Given this choice, an outcome that is "perverse" from an environmental perspective is hardly surprising. Yet if the denominator included even a crude measure of environmental utility, comparing the volume of water required for creating this utility in different regions would be useful. Indeed, this is exactly what environmental managers are required to do by the very nature of their roles.

Further, both examples overlook the fact that a basic argument for virtual water measurement is not only to help irrigators or wetland managers make decisions but also to help consumers reduce their water footprint. As noted above, the

argument is that informed consumers will change their purchasing patterns, which then changes the competitive landscape for producers. In other words, it may be a demand-pull approach, not a supply-push one. It therefore seems odd that the Commission would dismiss the concept without engaging with a key justification. Philosophically, the Commission's position seems somewhat at odds with the considerable attempts to introduce appropriate price signals for water consumption (though the discussion on pricing shows the considerable political and practical limits to "efficient" water markets). Such faith in the market mechanism for direct water consumers, however, does not appear to translate into similar concern for indirect water consumption.

Though the Commission's analysis may be suspect in this instance, there are legitimate concerns with water labelling relating to context. A number of interviewees agreed that the measurement of water extraction significance depended not only on the level of extractions but also on the water stress of the host catchment. As interviewee 2 stated:

> The argument that the rice growers mount is that yes we use a lot of water per for our product but we only use it when it's abundantly available. Because the way that the allocations and things work, they only grow rice when there's excessive water. Someone else might argue by whose definition is that excess but nevertheless I think that that that's reality. But the fact that it uses a lot of water on its own shouldn't be just the deciding factor as to whether or not rice is grown.
>
> I'm not just saying rice, but it could be cotton or whatever as the thing that [people say] shouldn't be grown. And as governments in terms of planning and whatever we've always been very careful not to say you should grow this or grow that or not grow this or grow that because it's inefficient. If you get those settings right that you know how much water should be used and when it can be used and you allocate and all that sort of stuff and you charge the right amount for it then it's up to the holder of the license to decide what they're going to grow with it. So they need to turn around afterwards and say, "But that rice used X litres per kilogram - don't buy it." To me, that's not a right decision.

The point being made by interviewee 2 is that aggregate water consumption alone should not drive purchase decisions, primarily because this information does not take account of extraction context. Others made similar points:

> You know you can aggregate data that's [made] so average that it's meaningless … You aggregate five factories [but only] four of them are killing species day by day because of the water they take …[yet] all have been scored the same … So the absolute is sometimes not that useful. (Interviewee 3)

Interestingly, one of the industry interviewees commented that they wished to disclose more details of their water extractions where these took place within a catchment stressed environment but were unable to find an appropriate definition:

> Looking at where would we go to get a global definition of what is a water-stressed area and what is not, I haven't been able to found anything yet which says Australia is a water-stressed area … [but] I think its reasonable to say Australia is water stressed, particularly the eastern part of Australia. (Interviewee 9)

Some interviewees, however, considered that while such contextual factors were important, they might not be insurmountable:

> If you've got the water reporting based around sources of water based on catchment or other logical things, it shouldn't be that difficult. (Interviewee 3)

Interviewee 4 also suggested that a crude measure of stress could be made relatively easily using rainfall data:

> In terms of thinking about having differential labels for a degree of catchment stress you need some index, and I guess the most unambiguous criteria that you could use to brand different catchments would be on the basis of the incident

> rainfall. So you can clearly distinguish from high rainfall areas that might be able to support higher intensity agricultural activities than lower rainfall areas.

Evaluating water stress based on rainfall data undoubtedly has merit, but there are many other methods of estimating water stress. An overview of this developing literature is proved by Brown and Matlock (2011) who group approaches to estimating water stress in three main categories: evaluation of total water availability to meet basic human needs, evaluation of renewable availability to meet current needs and evaluation of availability to meet ecosystem needs. Indeed the WBCSD has developed a tool to assist organisations with reporting in relation to catchment stress. The Global Water Tool (GWT) was developed in 2007 (and last updated in 2012) and comprises a spreadsheet that enables organisations to input their water data and then exports this data in accordance with reporting frameworks such as the Global Reporting Initiative (World Business Council for Sustainable Development, 2012). The tool also captures location information and provides water stress estimates for the present as well as projections for 2025 and 2050. These estimates utilise data from over 30 data sources, including the United Nations Food and Agricultural Organisation, Aquastat and the World Resources Institute and facilitate the various options for water stress evaluation outlined by Brown and Matlock (2011). Taken together, this literature and GWT suggest that water stress evaluation and categorisation is clearly possible.

A next step in this process would be to develop consistent categories, perhaps using a traffic-light type system. In this typology "Green" extractions would be from areas where water is abundant, there are few competing uses and/or the water used is recycled. "Red" extractions would be from areas designated as either currently water-stressed (meaning that there is insufficient water for ecosystem health or basic human needs) or likely to become so within the next decade. "Yellow" extractions would be the remaining extractions, namely where there are multiple competing users and limited availability but where the area is currently able to support the water extracted by each of its stakeholders. In

circumstances where multiple sources were used, it would be feasible to provide a percentage of the water extraction (i.e. 20% Green, 80% Red).

Though classification of extractions will of course be somewhat arbitrary, such a scheme might achieve a number of purposes. For consumers, it would enable a more informed assessment of the water-related impact of the product or service. More subtly, it might also have the effect of aligning the interests of catchment managers and water users, an issue implicit in the commentary of many interviewees. For example, interviewee 4 considered that focusing on sustainability at the catchment level was critical:

> I think to be in the long-term interest of sustainability we need to be thinking at catchment scale and about individual catchments learning to live within their own means when it comes to water.

A related point was made by interviewee 5, who suggested that extractions from a water-stressed catchment were presumably sanctioned by a water manager who had determined such extractions as sustainable:

> If on a label it said this water was taken from a stressed catchment area, then (I mean this is cynical, but) I would immediately discount and say, well, if it was so stressed, if it's stressed, I would assume that the manager has taken that into account, that this is still a responsible product to grow based on the fact that if you took too much water, it would be inefficient to grow it in a stressed catchment area.

A similar point was expressed by interviewee 9 from the perspective of a commercial water user:

> If we have a license to extract ten megalitres of green water I think we have an obligation to minimize their water use and all those things, but I think the obligation to make sure that ten megalitres doesn't adversely impact on the water course lies with the regulator.

This assumption seems optimistic, however, as many catchments in Australia have been over-allocated and ecosystems significantly degraded because politics as opposed to science may be a primary influence in allocation decisions. As interviewee 4 points out:

> It is certainly the case in New South Wales that water planning happens in a completely different sphere of government activity to regulatory activity and there is a disconnect there which means that the regulatory regime that is developed is not necessarily optimal for driving good public policy decisions in relation to water planning. In a lot of instances you can see the direction of regulation being driven by quite separate agendas to what water planners would like.

Presently, managers of water-stressed catchments have the unenviable task of persuading irrigators and other bulk water users that their allocations should be reduced for the benefit of ecosystem health. While many irrigators undoubtedly have an environmental conscience, it is perhaps asking for supererogatory behaviour for them to sacrifice individual returns for the collective good. Under a traffic light system, there would at least be some tangible benefit of increased environmental allocations for such users—moving their catchment from red to at least yellow—that may translate to the ability to more attractively brand their products.

Such a system may also have the ability to enable large retailers to implement water efficiency policies in relation to their suppliers. As noted above, perhaps the most significant innovation of the GRI G4 guidelines is the emphasis on supply chain responsibility and accountability. An interesting example of reporting in this context is Unilever, who in their sustainability reports has consistently pointed to the fact that in relation to their food products the vast majority of impacts are from their suppliers, while for their consumer products the vast majority of impacts are from consumer use (Unilever, 2007, p. 22; 2008, p. 23; 2009, p. 25; 2010 p. 14; 2011, p. 23). Yet it is difficult for even well meaning companies to "ethically" source water-intensive products. Establishing

water stress benchmarks may facilitate such companies requiring that supplies be from areas of lower water stress or even co-investing in catchments to promote ecosystem health in the same way that companies might co-invest in factories to ensure a minimum standard of labour conditions.

Utilisation of tools to evaluate water stress will also assist in overcoming the related criticisms of the water footprint outlined by Frontier Economics (2008). The criticism that the water footprint assumes that water that would be released by reducing a high water use activity would necessarily be available for use in a less water-intensive activity is addressed because stressed catchments are those for which there are competing demands for water, and hence a reduction in extraction from those catchments by one stakeholder means that more is available for others. Similarly the criticism that the water footprint fails as an indicator of environmental harm and does not provide any indication of whether water resources are being used within sustainable extraction limits is addressed by the category of water-stress indicators that incorporate environmental measures. While this approach might not be applicable to all goods, given that most of the world's water is used by agricultural products, which have relatively simple supply chains, the job might not be as daunting as it first appears.

4.7 Conclusions, limitations and areas for future research

Water is an increasingly acute global issue and highly significant for Australia (CSIRO Sustainable Ecosystems, 2002) particularly given the likely impact of climate change (Heyhoe *et al.*, 2007). There have been a number of suggestions for improving water-related information (The Wentworth Group, 2002, 2003, 2006, 2008), and following the revelation that much water consumption is indirect (Australian Conservation Foundation, 2007) such calls have included proposals for labelling the embedded water of consumer products (Kaye, 2007). Yet despite this approach resonating with international frameworks (such as Article 5(8) of the European Aarhus Convention) it has received scant attention

in the social and environmental literature since being discussed by Gray and Bebbington (2001).

This paper has therefore examined the possible contributions of water labels to sustainability, drawing on the sustainability typology articulated by Hopwood *et al.* (2005) and more recent claims that access to information may constitute a consumer right (Beekman, 2008; Hazelton, in press). This analysis suggests labelling has at least some potential to contribute towards sustainability as labelling schemes do seem to have influenced consumers and producers (Weaver and Finke, 2003; Gracia *et al.*, 2007; Roe and Teisl, 2007; Beekman, 2008; Siipi and Uusitalo, 2008; Unnevehr and Jagmanaite, 2008) and their efficacy is generally supported by consumer research (L.E.K. Consulting, 2007; Populus, 2007; Upham and Bleda, 2009). Such an assertion must be carefully caveated, however, in that successes often rely on labelling initiatives acting in concert with multiple other forces and that labelling also offers ample opportunities for corporate misinformation and greenwash (Voiceless, 2007; Australian Consumers Association, 2008). Based on a combination of documentary and interview data, the analysis considers those issues common to all labelling schemes—measurement, allocation and information overload—as well as the water-specific challenge of water extractions being non-fungible.

The findings support the assertion of a consumer right to information and suggest that water footprint reporting could make a significant contribution to public water literacy. While there are significant technical challenges, they are not insurmountable, particularly in relation to simpler products. For example, while precise measurement of water inputs is difficult the accuracy of water meters is improving, and concerns regarding measurement of aspects of the water cycle such as water in soils can be mitigated by focusing on direct extractions, which are in any event the most important. Water allocation will always be challenging, and this challenge may render allocation for highly complex goods infeasible, but a methodology has been established and work is underway for codification of an international standard. In relation to the problem of information overload, it is a reality is that all products are a bundle of

environmental, social and financial impacts but perhaps this complexity must be embraced rather than ignored. Practically, the use of online databases and smartphone applications provide a plausible mechanism for relevant information to be available in real time to the concerned consumer.

The key challenge particular to any water labelling scheme is the criticality of context, as the uneven distribution of water resources and demand is likely to make water extractions from different catchments non-fungible. The findings suggest that progress is possible on this issue, given suggestions made by interviewees and an extensive and growing literature as to how catchment stress should be assessed. For the purpose of labelling, this paper suggests that consideration of a simple traffic-light system reflecting catchment stress might provide a framework for communication of the proportion of the water footprint sourced from water-scarce versus water-abundant areas. This proposition may seem radical, but perhaps not more so than other "new" methods of reporting proposed in SEA literature (Bebbington and Gray, 2001; Guthrie and Boedker, 2006; Day, 2007).

The study suffers from a number of limitations stemming from its exploratory nature. Given the relatively narrow scope of interviewees, the findings of this study might usefully be triangulated with other research methods such as consumer surveys for the findings to be validated. Additionally, future research might individually focus on each of the labelling aspects discussed above (measurement, allocation, information overload and context) to explore them in more depth and to consider these issues in relation to a particular product. In particular, future research might further explore the proposal of a "traffic light" system presented in this paper. Such investigations are vital to ensure that the land of drought and flooding rains—and its international equivalents—does not ultimately confound water managers and well-meaning consumers alike.

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Chapter 5

Paper 4:

Australian Corporate Water Accountability – A Site-level perspective

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Abstract

Purpose: This paper seeks to explore key issues in relation to corporate water disclosures identified by previous research, responding to calls for the improvement of corporate water reporting (Morrison and Schulte, 2009; ACCA, 2010; WWAP, 2012, Chapter 6), particularly via the implementation of consistent water reporting standards (Prior, 2009; ACCA, 2010).

Design/Methodology: Ten semi-structured interviews were conducted in 2009 to 2010 with water regulators and operators. Interview data was transcribed and analysed drawing on the methods suggested by Ryan and Bernard (2000), Silverman (2000), O'Dwyer (2004) and O'Dwyer *et al.* (2011). The paper also analyses the characteristics and site-level water reporting practices of Sydney's 219 largest water users (identified in the Water Savings Order 2005 (NSW), Schedule 1) over the period 2005-2009, focusing on site-level reporting.

Findings: Overall, interviewees suggested that citizens had a right to corporate water disclosures, particularly in relation to water use data. Catchment managers might most usefully perform such reporting with annual reports performing a supporting role. It is evident that significant issues remain in relation to reporting of water efficiency, access and price. In relation to large Sydney water users, low levels of water use disclosure are observed, particularly in respect of private companies. Company type (private versus public) is of greater importance than industry in determining water disclosure levels. Very few companies of any type provide site-specific water use data.

Originality/Value: This study provides qualitative interview data, which has not been obtained previously in the context of water disclosure studies. The disclosure review focuses on large water users as opposed to large, listed companies that are the typical focus of disclosure research. It also focuses on site-specific water disclosures, which are critical from a water management perspective but which have not been evaluated in prior studies. The study therefore offers a contribution to the emerging literature questioning organisation-centric sustainability reporting.

Key words: water accountability, water disclosure

Paper type: Empirical

5.1 Introduction

Water management is an increasingly important issue for citizens, governments and corporations. Almost three billion world citizens suffer from lack of even basic water supplies (UN, 2008, p. 40) and water is often the catalyst for conflict (Gleick, 2006, Ch.1). A human right to water has been recognised (UN General Assembly, 2010) but realisation of this right will be one of the key challenges for the 21st century (UNESCO, 2006, p. 524). This challenge will only be exacerbated by the impact of climate change, which is expected to adversely affect both the quantity and distribution of rainfall (IPCC, 2007; Lewis and Russell, 2011; Turral *et al.,* 2011).

As water management becomes an increasingly acute challenge for governments, it also becomes an increasingly acute business issue. For business, water might be both opportunity and threat; opportunity as governments look to business to build and operate infrastructure such as water pipelines and desalination plants; threat because water is often an essential component of business operations, and supply interruptions can therefore have material impacts (WBCSD, 2006, 2007; Barton and Morgan-Knott, 2010; EIRIS, 2011). Following from such issues, water disclosures have become an important element of general sustainability reporting frameworks (such as the Global Reporting Initiative) and the sole focus of a number of more recent reporting frameworks (such as the CDP Water Disclosure Project and the Alliance for Water Stewardship).

Water reporting is increasingly of interest to academics (both within and outside the field of social and environmental accounting) and civil society more broadly. The United Nations World Water Assessment Programme (WWAP) notes that interest in water reporting is becoming mainstream:

> The interest from governments and corporate water users is also beginning to be complemented by an interest from the broader public. Civil society organizations such as the World Resources Institute have included access to information about water resources in their overall programme to promote greater public access to environmental information – a programme that has

> traditionally focused on more contentious natural resources such as minerals, land and forests. (WWAP, 2012, p. 169)

The findings of general reviews of corporate disclosures, namely that reporting is scant at best and downright misleading at worst (Allartdt, 1993; Deegan and Rankin, 1996; Adams, 2004) with little in the way of stakeholder participation (Stark, 2001; Unerman and Bennett, 2004) have been replicated in dedicated studies of water reporting (Morikawa *et al.*, 2007; Morrison and Schulte, 2009; Prior, 2009; Egan and Frost, 2010; ACCA, 2010). Recent studies have also considered the nexus of water and climate change (Lewis and Russell, 2011), water-related governmental policy (Cashman, 2011; Fisher and Russell, 2011), and the efficacy of emerging Australian National Water Accounting standards (Tello Melendez and Hazelton, 2009; Sofocleous, 2010; Tello Melendez *et al.*, 2011; Bureau of Meteorology, 2012; Chalmers *et al.*, 2012; Deloitte Access Economics, 2012; Hazelton *et al.*, 2012; Slattery *et al.*, 2012). Studies (and reporting frameworks) have also focused on particular industries, most notably mining (Mudd, 2008; Cote and Moran, 2009; Mudd, 2009; Cote *et al.*, 2012; MCA, 2012; Mudd, 2012) and food and beverages (Egan and Frost, 2010; Beverage Industry Environmental Roundtable, 2011).

Yet few studies have explicitly considered the question of which disclosures may be most useful, for example by venturing beyond annual reports by corporations. While contextual (i.e. site-specific) water information is also recognised as critically important (Irbaris, 2009; Cote *et al.*, 2012; Minerals Council of Australia, 2012; Mudd, 2012), few studies have examined the availability of site-level water information. Hence, calls for reporting with a boundary based on the locus of an issue as opposed to the legal form of an organisation have gone largely unheeded (Gray, 2010; Lewis and Russell, 2011).

The current study aims to address this gap and calls for the improvement of corporate water reporting (Morrison and Schulte, 2009; ACCA, 2010; WWAP, 2012, Chapter 6), particularly via the implementation of consistent water reporting standards (Prior, 2009; ACCA, 2010). The study draws upon two data sources – interviews with water experts concerning the optimum model for

corporate water disclosures and the reporting practices of large metropolitan water users.

The context of the study is Australia, which is at the vanguard of engagement with water issues (Slattery, 2008). Since European settlement two hundred years ago, water has always been recognised as a scarce resource (Pigram, 2006, p. v) given the relatively low quantities and high variations in rainfall (Pigram, 2006, p. 19). The importance of water information for effective water management was highlighted by the 2004 National Water Initiative, Section 24 which referred to the need for water accounting in order to support the various aspects of water reform, and in particular water trading. More recently Part 7 of the *Water Act* (2007) set out details regarding information collection and dissemination responsibilities of the Bureau of Meteorology, including the requirement to prepare a National Water Account (Section 120), which utilises Australian Water Accounting Standard 1.

The paper proceeds as follows. Section 2 argues that a right to water information exists, but that the means for the optimal realisation of that right remains a matter of conjecture. Section 3 examines extant literature on water disclosures and suggests that there is a need to examine what disclosures are required in a more nuanced fashion. Two phases of research are then presented. Section 4 details the approach and findings of ten semi-structured interviews canvassing the appropriate mechanisms for corporate water accountability. One of the key themes emerging from this phase is the importance of site-specific water information. Section 5 explores this issue further and reviews the reporting practices of large water users in the Sydney metropolitan region. Section 6 offers conclusions, limitations and areas for future research.

5.2 Theoretical framework

This paper is based the premise that there is a normative right for citizens to have access to water-related information. A human right to corporate water-related information is argued by Hazelton (2013) and briefly summarised here. One reading of SEA literature is that accountability corresponds to information rights: "[a]ccountability, according to Gray, is concerned with the right to receive information and the duty to supply it" (Stanton, 1997, pp. 694-695). Yet while it may be generally true that information enhances accountability, the question of whether a right to particular information exists is more difficult to establish. Following Griffin (2008) and Sen (1993, 2004) a potential right might be recognised when it is consistent with those "founding" human rights within the human rights tradition, and that it is both important and may be influenced by societal action.

The case for water disclosures constituting a human right is that political participation is a founding human right, that water is an issue of contemporary importance and a critical subject of political debate, and that there is increasing recognition that information is required in order for political participation and that the state is in a position to require such disclosures. As noted above, effective water management is likely to be one of the great challenges of this century (UNESCO, 2006, p. 524) due to both declining reserves (Palaniappan and Gleick, 2009) and disruption to supply driven by climate change (IPCC, 2007; Turral *et al.*, 2011). There is increasing realisation that information is required for effective political participation (Stec *et al.*, 2000; Sand, 2002; Stiglitz, 2003) as evidenced by the adoption of Freedom of Information (FOI) laws around the world (Banisar, 2006).

Given their ability to both collect and disseminate information, states have long been identified as key players in providing citizens with appropriate, available information (e. g. UN, 1992, Principle 10). Mendel (2003) explicitly links the notion of human rights with modern FOI legislation, arguing that there is both a passive right of access to information held by governments as well as an active obligation on states to publish information that will be of interest to their

citizens. Such claims are supported by the recent UN World Water Development Report, which devotes an entire chapter to water information. Indeed the theme of the report itself is uncertainty, largely driven by of the lack of reliable water data.

Many authors within SEA have also attested to the importance of accounting information for meaningful discourse (*e.g.* Power and Laughlin, 1996; Boyce, 2000; Lehman, 2001; Rahaman *et al.*, 2004; Unerman and Bennett, 2004; Rasche and Esser, 2006; Dillard, 2007). Realisation of the right to information may, however, not be achieved solely via corporate reporting in annual accounts and websites. While the actions of organisations are critical (Gray, 2010) it does not necessarily follow that corporate sustainability reports contribute to accountability, as the organisation may not be the salient level of analysis (Gray and Milne, 2004; Gray, 2010). In relation to water, a number of alternatives exist, such as reporting at the level of the product, or, more promisingly at the geographic level of the catchment.

In relation to product-level reporting, labelling has at least some potential to contribute towards sustainability given that labelling schemes appear to influence consumers and producers (Weaver and Finke, 2003; Gracia *et al.*, 2007; Roe and Teisl, 2007; Beekman, 2008; Siipi and Uusitalo, 2008; Unnevehr and Jagmanaite, 2008), though labelling also offers ample opportunities for corporate misinformation and greenwash (Voiceless, 2007; Australian Consumers Association, 2008). Labelling of the water impact of a particular product faces certain challenges, however, principally driven by the non-fungible nature of water extractions. Hazelton (forthcoming) considers these challenges in detail and concludes that product labelling is likely to be a longer-term proposition, though a potentially valuable tool for increasing the current, unacceptably low level of public water literacy.

If products are unlikely to be the primary site for compliance with the obligation to provide citizens with corporate water-related information, the remaining primary candidates are corporate annual reports and/or catchment reports which report on corporate activities. Corporate annual reports have been a

primary research interest of social and environmental accounting researchers for some time (Mathews, 1997; Gray, 2001; Deegan, 2002; Gray, 2002), but geographically based reporting has been identified as critical for water disclosures given the critical nature of the water context (Irbaris, 2009; Cote *et al.*, 2012; MCA, 2012; Mudd, 2012; Hazelton, forthcoming). More broadly, geographically based reporting is the cornerstone of the US Toxic Release Inventory Database (TRI), which has been hailed as highly successful in curbing corporate emissions (Fung and O'Rourke, 2000; Sand, 2002; Stephan, 2002).

Though the claimed successes of the TRI are disputed by some researchers (Natan and Miller, 1998; Koehlera and Spenglera, 2007), the TRI model has been replicated throughout the world and deserves greater attention within the social and environmental accounting literature (Leong and Hazelton, 2008). The question of the potential for corporate accountability via annual reports versus through geographically based reports collated by a third party is therefore an important dimension of research, and is explored in the following sections.

5.3 Water disclosure frameworks and prior research

As noted in the introduction, the burgeoning interest in water management has been a catalyst for the expansion of both water reporting frameworks and water accounting research. These elements are discussed in turn below.

5.3.1 Water disclosure standards

A recent joint publication of the World Business Council for Sustainable Development (WBCSD) and the International Union for the Conservation of Nature (IUCN) identifies no less than sixteen current initiatives and tools for the improvement and reporting of business operations in respect of water use (World Business Council for Sustainable Development and International Union for the Conservation of Nature, 2009). This paper considers the main reporting frameworks of the Global Reporting Initiative (GRI) G4 Guidelines (GRI, 2013a, b) and the CEO Water Mandate (UN Global Compact Office, 2009) as well as the

emerging frameworks of the CDP Water Disclosure Project (Irbaris, 2009) and the Alliance for Water Stewardship (AWS, 2013). The paper also considers recent industry-specific frameworks developed for the mining sector by the Minerals Council of Australia (MCA, 2012), and for the beverages sector by the Beverage Industry Environmental Roundtable (2011).

Another often-cited framework is the Water Footprint, which attempts to calculate the total water used in a particular region or product. As this framework has limited application to site level reporting it is not within the scope of the current paper. But there have been extensive discussions of the application and merits of this approach elsewhere in the literature (Frontier Economics, 2008; Hoekstra *et al.*, 2011; Chapagain and Tickner, 2012; Hoekstra, 2012; Hazelton, forthcoming).

The Global Reporting Initiative (GRI) is the most popular corporate reporting framework, though it is certainly not without its critics (Moneva *et al.*, 2006; Brown *et al.*, 2009a; Farneti and Guthrie, 2009). Water-related disclosures are included in all iterations of the GRI Guidelines (Global Reporting Initiative, 2000, 2002, 2006, 2011, 2013b) and stand-alone Water Protocol (Global Reporting Initiative, 2003). Five G4 indicators directly relate to water usage: water withdrawn from the environment by source (EN8), water sources significantly affected by the impact (EN9), the recycling and reuse of water (EN10), water discharged by quality and destination (EN22) and the impact of discharges (EN26) (Global Reporting Initiative, 2013b).

While these disclosures may seem to be relatively straightforward, there are a number of aspects that warrant further attention. First is the requirement to disclose withdrawals by source. It is important to note that it is not a requirement to disclose withdrawals by location, but rather by category; namely surface water, ground water, rain water, waste water and water from utilities (Global Reporting Initiative, 2013a, p. 97). Therefore while the GRI makes the consideration of sustainability context a core principle (Global Reporting

Initiative, 2013a, p. 10) there remains a crucial omission of an explicit requirement to report disaggregated water extractions by location.

Indeed, the extent to which aggregated results should be reported has been treated with increasing ambivalence in GRI documents. The GRI Boundary Protocol suggests disaggregated reporting is the solution to changes in corporate ownership of companies or plants distorting results (Global Reporting Initiative, 2005 p. 19). In the G3.1 Guidelines, while the importance of disaggregated results was recognised in certain instances, such disclosures were not prescribed:

> Reporting organizations will need to determine the level of aggregation at which to present information. This requires balancing the effort required against the added meaningfulness of information reported on a disaggregated basis (e.g. country or site). Aggregation of information can result in the loss of a significant amount of meaning, and can also fail to highlight particularly strong or poor performance in specific areas. On the other hand, unnecessary disaggregation of data can affect the ease of understanding the information. Reporting organizations should disaggregate information to an appropriate level using the principles and the guidance in the reporting Indicators. Disaggregation may vary by Indicator, but will generally provide more insight than a single, aggregated figure. (GRI, 2011, p.40)

In the G4 Guidelines this passage has been removed, and the discussion regarding aggregation is limited to the following:

> The level of aggregation of information may also affect the clarity of a report, if it is either significantly more or less detailed than stakeholders expect. (Global Reporting Initiative, 2013a, p. 16)

Indicator EN 9 recommends reporting of "significant" water withdrawals (Global Reporting Initiative, 2013a, p. 98). Such withdrawals meet one or more of the following criteria: 1) Withdrawals that account for an average of 5 per cent or more of the annual average volume of a given water body; 2) Withdrawals from

water bodies that are recognized by professionals or experts to be more particularly sensitive due to their relative size, function or status as a rare, threatened or endangered system; or 3) any withdrawal from a Ramsar-listed wetland or any other nationally or internationally proclaimed conservation area regardless of the rate of withdrawal. The reporting organisation should then state the total number of significantly affected water sources according to the criteria above and state the size of the water source; whether or not the source is designed as a protected area; and the biodiversity value of the source. The GRI suggests that information on the characteristics of a water source or protected area "can be obtained from local or national water-related ministries or government departments, or research such as environmental impact assessments" (GRI, 2013a, p. 98). [1]

The CEO Water Mandate (UN Global Compact Office, 2009) is a public-private initiative under the auspices of the UN Global Compact. It requires signatories to assess and improve their water performance and includes transparency as a core principle. This initiative, however, has been criticised as being far more about style than substance. Sethi and Schepers (forthcoming, p. 12) contend that "this is by far the worst initiative promoted under the umbrella of enhancing corporate social performance and serving greater public good while earning economic gains" primarily because the Mandate requires no stakeholder consultation and provides no incentives for efficient water use. Further, in terms of reporting, while the Mandate requires regular reports it does not review the reports and does not provide for commentary from NGOs who are actively monitoring the corporations in question. The only sanction possible under the Mandate – de-registration of corporations – can only occur when reports are not lodged on time. Sethi and Schepers (forthcoming, p. 15) therefore conclude that the UN Global Compact is "long on promises, short on performance, and mostly silent on transparency and objective reporting . . . [p]erhaps the most honorable approach would be for the UNGC to admit its failure and dissolve itself".

The Carbon Disclosure Project (CDP), an NGO that conducts annual surveys on the carbon usage of large corporations, launched the Water Disclosure Project

(WDP) in 2009 on the basis that "Water scarcity is a growing problem that affects governments, businesses and individuals in many parts of the world. The actions of business will have a significant impact on the scale and impact of such scarcity and on the development and implementation of potential solutions" (Irbaris, 2009, p. 1). The WDP mirrors the organisation's previous approach to capturing carbon data, namely that a survey is sent out to large corporations requesting them to report on various aspects of their operations, and a consolidated report is then issued by the organisation.

There have been only minor adjustments to the pilot reporting framework originally proposed in 2009 for the latest (2012) survey. Compared to the GRI, there is a much greater emphasis on both the supply chain and geographically based water reporting. For example, Question 7.1(a) asks for water withdrawals by "Country or geographical reach", and geographical information is also requested in relation to recycling (7.2(a)), significantly affected water sources (7.4(a)), as well as discharges (8.2(a) and (b)). This information is also requested in relation to more general questions relating to water risks and opportunities (questions 2-6). The WDP also requests water intensity measures in both financial terms (9.1) and product terms (9.2). In terms of supply chain reporting, the survey asks whether the organisation contributes to downstream water risk (2.5, 3.4) and also whether the organisation requires suppliers to report on their water use, risks and management (3.3).

The Alliance for Water Stewardship (AWS) released the "Beta" version of the *AWS International Water Stewardship Standard* in March 2013 (AWS, 2013). This framework is notable in that it focuses attention at the site level and attempts to incentivise water stewardship by allocating points to various water efficiency activities and then grading corporations as either Core, Gold or Platinum based on their aggregate points. In terms of reporting, Section 6 of the (Beta) Standard requires disclosure of governance, risk assessment and compliance at the site level, but in terms of water use data requires only that a corporation comply with either GRI or CDP reporting standards (Section 6.6). This compliance is considered an "advanced" as opposed to "core" activity.

There have also been efforts by industry groups to develop water accounting frameworks at an industry level. For example, the food and beverages industry has developed a guide to assist water footprint calculations within the sector (Beverage Industry Environmental Roundtable, 2011). Of more relevance to the current paper, the peak industry body for the Australian mining sector has developed the *Water Accounting Framework for the Minerals Industry* (MCA, 2012). This framework comprises a detailed set of reporting requirements that are notable not only for their depth but also for their selection of the site as the appropriate unit of analysis.

In an account of the pilot study of the MCA framework, Cote *et al.* (2012, p. 96) suggest that the appropriate boundary is defined:

> [L]ocally by the operation (or reporting/accounting entity) based on consultation with stakeholders, and alignment with other reporting requirements as necessary . . . [i]t must be spatially explicit, readily communicated and sensible.

The current iteration of the standard is somewhat less explicit, however; the "operational boundary" for reporting is defined in Section 2.1 as:

> The boundary of the Operational Facility is defined by the mining company to meet its reporting requirements as necessary. Typically it will consist of the mine site including mineral processing operations if present.

While the above discussion demonstrates that there are a number of reporting frameworks currently available, it should be noted that these are all voluntary. For example, various Australian inquiries have rejected calls for mandatory sustainability disclosures (Public Accounts Committee, 2005; Parliamentary Joint Committee on Corporations and Financial Services, 2006). The only exception is a limited requirement under section 299(1)(f) of the *Corporations Act* (2001) for companies to report significant environmental laws to which they are subject and their performance in relation to these laws. This provision appears to have increased reporting (Frost, 2007), but falls far short of anything that might be considered a comprehensive sustainability reporting regime. Further, as Daniel and Sojamo (2012, p. 653) point out, corporate water reporting frameworks are

being developed by large multinationals which lack democratic legitimacy.

While governments are also increasing their water reporting regimes, these tend to be separate from corporate reporting requirements. In Australia, for example, water reporting has traditionally been conducted by bodies such as the Australian Bureau of Statistics (ABS) (Vardon *et al.*, 2007), which releases water information at the national level (*e.g.* ABS, 2004, 2006a, 2011, 2012) as well as summary reports on water use in contexts such as farms (*e.g.* ABS, 2006b) and experimental work on the economic value of water (ABS, 2007a, b).

In addition, Australian Federal, State and Territory departments report geographically-based water information via studies such as the Australian Water Assessment 2005 (National Water Commission, 2006) and its predecessor, the National Land and Water Resources Audit 2000 (National Land and Water Resources Audit, 2001) as well as through regular State of the Environment reporting. More recently, drawing on the work of Sinclair Knight Merz (2006), a water accounting methodology has gradually been developed which draws extensively on financial accounting principles and include such items as a balance sheet (a "Statement of Water Assets"), a profit and loss account (a "Statement of Changes in Net Water Assets") and a cash flow statement (a "Statement of Physical Flows") together with accompanying notes to the accounts. The current iteration of this method (currently unique to Australia) is detailed in *Australian Water Accounting Standard 1* (AWAS 1), issued by the Bureau of Meteorology, and an exposure draft has been released for the accompanying standard relating to assurance: *Australian Water Accounting Standard 2*. As with their corporate counterparts, compliance with these standards is currently voluntary, though AWAS 1 is being adopted by the federal Bureau of Meteorology to produce National Water Accounts, required annually under the *Water Act* (2007).

This Section has shown that there is no shortage of reporting frameworks in relation to water. Yet it is evident that there are varying levels of engagement with the contextual or site-specific nature of water impacts. While some frameworks mention this dimension of water sustainability, only the CDP WDP

and the MCA frameworks specify site-level reporting. Of course, even with such requirements the voluntary nature of these frameworks means that the extent of actual disclosures may vary considerably. Research examining the quality of reporting is reviewed below.

5.3.2 Water disclosure research

Research into water-related reporting follows a long tradition of disclosure research. The broad findings of earlier, more general reviews of corporate disclosures suggest that reporting is scant at best and downright misleading at times (*e.g.* Deegan and Rankin, 1996; Adams, 2004; Cho and Patten, 2007; Cho *et al.*, 2010; Cho *et al.*, 2012a; Cho *et al.*, 2012b). Reporting has also been mostly at the discretion of management with little in the way of stakeholder participation (Stark, 2001; Unerman and Bennett, 2004), despite such participation being central to the methods recommended by organisations such as the GRI and AccountAbility. Against this backdrop, it is hardly surprising that there have been repeated calls for mandatory reporting (*e.g.* Gallhofer and Haslam, 1997; Gray, 2001; Gray and Milne, 2002; Adams, 2004; Adams and Zutshi, 2004; Gray and Milne, 2004) though as noted above, in the Australian context at least, such calls remain unheeded.

These broad findings have by and large been replicated in more focused studies concerning water reporting. For example, Morikawa *et al.* (2007) reviewed the reporting practices of 139 global corporations (from 11 water-intensive industry sectors) and found that while 97% provided at least some information regarding water performance or management, there were wide variations in information quality. Particular deficiencies were noted in the reporting of water risks or risk management, and there was limited contextual information. Only 18% disclosed locality- or faculty-level water performance information.

Similar findings were reported by Morrison and Schulte (2009) who analysed the water-related information provided in the corporate responsibility reports of 110 companies from 2006 to 2008 across twenty criteria that corresponded with

the six elements of the Water Mandate (i.e. direct operations, supply chain and watershed management, collective action, public policy, community engagement and transparency). Overall, Morrison and Schulte suggested that reporting was poor. Though over 80% of companies claimed to have used the GRI guidelines (and 56% of reports were verified by a third party), the study highlighted pervasive omissions in disclosures such as stakeholder engagement and materiality assessment. There were also a number of errors in relation to reporting of both water quantity and quality, particularly in relation to omitting disclosure of water sources in contravention of EN8.

Few companies disclosed contextual information (such as the withdrawals or impacts by region) though there were some instances of water efficiency metrics both in terms of financial and production considerations. Consequently, Morrison and Shulte called for increased conformity with existing reporting guidelines, as well as the development of sector-specific water indicators and further analysis of disclosure practices in relation to country-specific regulation.

Such findings were replicated by Barton and Morgan-Knott (2010) who reviewed the water related disclosures of 100 public companies operating in water intensive industries during the 2008 fiscal year. Overall, water reporting was poor. Even in terms of basic water use data, key information was missing. Only 63% of companies reported corporate data on direct water use, and only 14 companies provided withdrawals broken down into site or regional levels (Barton and Morgan-Knott, 2010, p. 31). A key recommendation of the study was for:

> [W]ater accounting data that puts performance in context. Aggregate data on corporate-wide water use and discharge is insufficient to provide investors with insight on key areas of risk. Companies should provide data broken down to the facility level for operations in water-stressed regions, and puts the company's risk exposure in context by disclosing the percentage of facilities operating in areas of water stress. (Barton and Morgan-Knott, 2010, p. 38)

The global reporting practices noted above have largely been replicated by Australian water reporting. Jones *et al.* (2005) reviewed the 2003 reports of the largest 100 Australian companies against the prevailing GRI indicators and reported low levels of disclosure generally. In relation to water only 14% of the 100 largest companies reporting provided even direct water usage information. Taking an investor perspective, Prior (2009) examined the water risks of the largest 100 companies including scarcity, managing excess water, managing disposal quality and potential environmental impacts. A key finding was that the critical water risk was water availability as opposed to price. Increased water costs could be readily absorbed (though may materially impact power generators and agriculturalists) but disruptions in supply could result in significant disruptions in production. Instances when this had already occurred included 2003 (where Rio Tinto's aluminium output in Gladstone was reduced by 25% due to drought) and 2007 (where Tarong and Swanbank were forced to reduce power output when water availability was restricted). Her analysis, however was "complicated by the lack of a widely accepted reporting approach" (Prior, 2009, p. 11) and she reported a lack of basic water use disclosure even from this sample.

More recently, studies by the Association of Chartered Certified Accountants (ACCA, 2010) and Egan and Frost (2010) and have confirmed the relatively limited disclosures of Australian firms. ACCA (2010) reviewed water disclosures by 32 of the largest Australian companies in 2010. While water-related issues are frequently addressed in some form in the annual reports, the authors echoed Morrison and Schulte (2009) in suggesting there was significant room for improvement on disclosure of both water risks and their management, particularly across the supply chain. Overall the results were disappointing with the average score for the 32 companies of 28 out of a possible 100, and a top score of 56. The "consumption" aspect of disclosure was one of the higher scoring attributes, but only 14 companies provided reporting on the "breakdown of water use". This is even more surprising given such a "breakdown" constituted GRI-style water type (fresh, potable, recycled or reused water, intensity of consumption, and disclosure of water sources (mains water, reservoirs, aquifers,

bores, etc)) as opposed to WDP-style geographic disclosure (ACCA, 2010, p. 20). A key recommendation from the research was the call for improved reporting, particularly through development of a common standard on water disclosure (ACCA, 2010, p. 26).

Egan and Frost (2010) reviewed the disclosure practices of companies within the water-intensive food and beverages industry. While noting that most companies engaged with water issues at some level, they also identified significant room for improvement. Particularly striking was the lack of basic water use information:

> A fundamental observation is that limited detail is provided on the total water usage by each organisation as well as total water disposed. The failure to provide significant insight into total water volumes used, including a dissection of where those volumes are used in the business, may suggest concern about exposure considering Australia's drought threatened supplies. (Egan and Frost, 2010, p. 21)

In terms of water standards, Egan and Frost also mention the Australian National Water Accounting Standards discussed above, and suggest that large water users, at least, should be brought within the auspices of this standard:

> At the very least, "water accounting" should not be the responsibility only of water utilities and related organisations. It should also be the responsibility at least of the larger water consumers as well. (Egan and Frost, 2010, p. 22)

There have also been a number of studies exploring water and other sustainability disclosures in the mining industry. Mudd (2008, 2009, 2012) has considered this issue in an Australian and international context and provides an interesting illustration of the possibilities for independent analysis when relevant data is publicly available. For example, Mudd (2008) combines sustainability and production data to explore whether water efficiencies in Australian mine sites have generally increased over time and are greater in larger operations. He answers both questions in the negative, findings that are consistent with a later study of the global platinum mining industry (Mudd,

2012). These studies support the observation by Muller (2012, pp. 208-209) that the availability of corporate water use information facilitates comparability, but contradict his contention that such disclosures contain no information regarding the sustainability of water usage.

Of particular relevance to the present study are Mudd's comments on the availability of water-related information and the shortcomings of the GRI for this type of investigative analysis. Four major weaknesses are described. First, the voluntary status of EN 10 (recycled water use) is problematic as many companies do not report on this indicator but mine sites typically recycle water to some degree. Therefore determining water use on the basis of EN8 (water consumption) alone is problematic (Mudd, 2008, pp. 142-143; Mudd, 2012, p. 56)}. Second, few disclosures are made regarding the quality of water consumed (and therefore its opportunity cost) or the quality of water discharged (and therefore its impact) (Mudd, 2008, p. 143; Mudd, 2012, p. 56). Third, EN9 (the impact of operations on water bodies) is vague. Few companies make any discloses (Mudd, 2009, p. 381) and none are quantitative (Mudd, 2008, p. 139). In particular, large volumes of discharges can be excluded from reporting if they are not considered "hazardous" (Mudd, 2009, pp. 383-384; 2012, p. 18). Finally Mudd (2012, p. 5) points to the criticality of site-level information and the lack of this information in most sustainability reports:

> A major issue which is perhaps not immediately obvious is the lack of site data given by some companies, mainly the larger diversified companies. In order for any data to be materially useful, individual site data is best and should be reported. This is common practice for production.

Despite the criticality of site data, Mudd (2009, p. 391) contends that such data is often missing entirely, or else reported months or even years after the main sustainability report.

Cote *et al.* (2012, p. 104) also critique the GRI in relation to recycled water disclosure requirements of EN10 as follows:

> Another major issue is that the definition of EN10 states that if 20ML (mega litres) of water was recycled three times in a reporting period then 60 ML should be reported. This implies that an operation knows the cycle number of worked water, which is very unlikely.

Endorsing Mudd's perspective on the importance of site-level information, Cote *et al.* (2012, p. 92) state "the gap between a site's operational water balance and a GRI report card for water use remains vast."

An important objection to such calls for the disclosure of site-level water information is on the basis of materiality. An entity might consider that such disclosures are immaterial (and therefore unwarranted) because they do not affect the decisions of users; and therefore that providing aggregated water information is sufficient.

In financial reporting, the concept of materiality is relatively straightforward in that items are considered in relation to the investment decisions of users and there are well-established guidelines to determine what constitutes information material to these decisions. According to Australian Accounting Standard AASB 1031, items are material due to either their amount or their nature. In terms of amount, items are considered material when they are above 10% of the relevant base (such as a particular asset) and immaterial when below 5%, with the range of 5-10% a matter for professional judgement. In terms of nature, the primary concern is one of stewardship and the exercise of fiduciary duty by management and directors, which means that items such as transactions with related parties must be disclosed regardless of the amount involved.

Whilst materiality is relatively straightforward in terms of financial reporting, the issue is more complex in relation to sustainability information. Primarily this complexity arises from the multiplicity of potential report users and their decisions. Whilst the users of financial reports are predominantly investors, sustainability reports might be relevant for a variety of stakeholders, including

customers, citizens, NGOs, governments, ethical investors and even employees (Morsing, 2006; Pietras-Jensen, 2006). Further, whilst in financial reporting the decisions that stakeholders make are simply whether to buy, sell or hold a given security, the decisions of sustainability report users are diverse, such as customers deciding whether to buy the product, the community deciding whether to support a development application, NGOs deciding whether to begin a media campaign, governments deciding whether to introduce new legislation and employees deciding whether to remain working with the organisation.

The discussion of the concept and application of materiality in the GRI G4 guidelines underscores these complexities. The GRI (2013, p. 11) provides the following principle under the heading of "Materiality":

> The report should cover Aspects that:
>
> - Reflect the organization's significant economic, environmental and social impacts; or
> - Substantively influence the assessments and decisions of stakeholders

The guidelines further elaborate that:

> A combination of internal and external factors should be used to determine whether an Aspect is material, including factors such as the organization's overall mission and competitive strategy, concerns expressed directly by stakeholders, broader social expectations, and the organization's influence on upstream (such as supply chain) and downstream (such as customers) entities . . . [i]mpacts that are considered important enough to require active management or engagement by the organization are likely to be considered to be significant (GRI, 2013, p. 11).

This discussion in the GRI guidelines illustrates the highly subjective nature of determining materiality in relation to sustainability disclosures. In relation to water, however, it seems difficult to argue that disclosure of water use by a large water user in a water scarce area, routinely subject to water restrictions and where billions have been invested to boost water supply via desalination is not a matter of community concern. Further, the increased reputational element of water (and to a lesser degree financial considerations) have resulted in

increasingly active water management by Sydney's corporate water users (Egan, 2009). Given the twin elements of both community concern and active management, water would be considered a material disclosure under the GRI, and as noted above, due to the contextually dependent nature of water extractions and discharges, it is only site-level disclosures that are meaningful in this regard.

From the perspective of national water information, lobby groups such as the Wentworth Group of Concerned Scientists have long called for improved water reporting, particularly at the level of the water catchment (The Wentworth Group, 2002, 2003, 2006, 2008). Water information deficiencies have also been highlighted by Engineers Australia (Kaspura, 2006; Cordery *et al.*, 2007). Of particular concern is corporate appropriation of what was previously public data: "[i]n many situations, the only data in a whole region was collected by a body that has been privatised and this body now cites "commercial-in-confidence" claims to restrict access to collected data" (Cordery *et al.*, 2007, p. 258).

In relation to Australian Water Accounting Standard 1 (AWAS 1) and the National Water Account, given the recent nature of this work it is premature to assess the impact it will have on water reporting. On this matter, the Bureau of Meteorology has wide-ranging powers to collect information and the first tranche of entities required to provide information have been identified in the *Water Regulations* (2008). While there are certainly significant potential gains to be made from standardised measurement, reporting and terminology, questions remain as to the extent to which the standards as currently constituted will facilitate the discharge of water management accountability (Tello Melendez and Hazelton, 2009; Tello Melendez *et al.*, 2011).

These questions even extend to whether reporting entities should be geographic regions rather than legal entities (Sofocleous, 2010). The Australian national water accounting project has been lauded as playing "an important future role in understanding the risk profiles of entitlements and how these profiles are

affected by water trade, change in water use, irrigation efficiencies or government reform" (Slattery *et al.*, 2012, p. 23) and are claimed to be in the public interest from a regulatory theory perspective (Chalmers *et al.*, 2012). However an analysis of the potential benefits of adopting water accounting standards concluded that while such standards might be a good start, much work remains to be done, particularly in the area of accountability (Hazelton *et al.*, 2012), a view shared by both report preparers (Tello Melendez and Hazelton, 2009) and report users (Tello Melendez *et al.*, 2012). These concerns echo the comments by Muller (2012, p. 218) regarding the potentially ambiguous relationship between corporate water accounting and accountability:

> [W]ater accounting is not necessarily neutral . . . it can be used to promote sector-specific interests and to advance policies that are not supported by the communities concerned. There is a particular danger where there is capacity and power asymmetry that standards will simply be imposed on weaker parties.

5.3.3 Water disclosure frameworks and prior research conclusions

A number of themes are evident from the review of water reporting frameworks and practices in Sections 3.1 and 3.2. Before turning to these themes it is worth noting that these studies have almost exclusively focused on the disclosure practices of public companies, which may not be reflective of large non-public water users. Indeed, this point is made by the one study that included non-public companies in its sample, Egan and Frost (2010, p. 21). This aspect of disclosure therefore constitutes an important area for future research, discussed further in Section 6.1.

In relation to the current reporting frameworks, it is evident that there is currently a wide array of approaches to water reporting. This diversity is noted (and even celebrated) in the current World Water Development Report:

> This diversity of approaches could be seen to reflect confusion. However, it

> should be understood as an important and encouraging indicator of the renewed global interest in the state of water resources, their management and use. (WWAP, 2012, p. 172)

While diversity may indeed reflect interest, it nevertheless invites confusion for report users, and belies consistent calls for increased uniformity in corporate reporting, ideally utilising a common standard (Irbaris, 2009; Morrison and Schulte, 2009; Prior, 2009; Barton and Morgan-Knott, 2010; Egan and Frost, 2010; ACCA, 2010).

Perhaps the most pressing issue relates to the most basic of disclosures – water use. All studies discuss deficiencies in the reporting of this indicator, and of most contention is the degree to which contextual water factors are taken into account. As Morrison and Shulte (2009, p. 27) point out, "impacts of water use vary drastically depending on the context in which they occur". The WDP suggests "water disclosure will have to contain qualitative information on the specific watersheds where water is taken. This will have to include social impacts, water policy decisions and wider issues of price, water rights and allocative efficiencies." (Irbaris, 2009, p. 11). As noted in Paper 1, while information *about* corporate water use is critical, information *at the level of the corporation* may be much less important, or even completely irrelevant if provided solely in aggregation without context, as pointed out in relation to the BHP 2007 Sustainability Report by Ernst and Young (BHP Billiton, 2007, p. 67).

A further dimension of this discussion is who should actually be reporting. Frameworks such as the GRI and WDP assume that the corporation is the appropriate locus of sustainability reporting, and indeed corporate reporting has also been the predominant locus of social and environmental research, notwithstanding the qualms of some scholars that environmental problems may not necessarily package themselves into corporate solutions (Milne and Gray, 2007; Gray, 2010). On the other hand, national water management, reporting and accounting has largely adopted a geographic focus. For example, the Australian Water Resources Assessment 2000 divided surface water into 12

drainage divisions, 246 component river basins and 325 surface water management areas as a basis for reporting water availability, use and allocation. Likewise, 538 groundwater management units were determined and aggregated into 69 groundwater provinces as groundwater management units (i.e. aquifers) often overlie each other (Natural Heritage Trust, 2000, p. 3). The GRI suggestion in relation to reporting of water impacts – to obtain help from the relevant water manager – underscores this problem.

Disclosure research to date also raises important questions regarding water pricing and access. Analysts such as Prior (2009) suggest that price is of limited materiality to large corporations, though it is likely to be significant to operators such as irrigators who may be large water users but small companies. However, price is most certainly relevant to regulators (O'Dea and Cooper, 2008, Tooth, 2007) though the extent to which pricing will address problems of water allocation remains hotly contested (Barrett, 2004; Nataraj and Hanemann, 2011). The extent to which price information should be included in corporate disclosures is therefore unclear. Similarly, security of access was identified as a common requirement for investors seeking to better understand corporate exposure to water risk (Prior, 2009; Barton and Morgan-Knott, 2010) but it is less clear exactly what corporations could report on this aspect.

Such complex questions are unlikely to have easy solutions, but may usefully be explored through discussions with water regulators and operators. The current study therefore aims to contribute to our understanding of the optimal approach to water disclosures through two research phases. Phase 1 canvassed the views of water experts on both the nature and process of water disclosures, specifically focused on the issues raised above; namely the appropriate location for disclosures (in a sustainability report or some site-level reporting), the content of such reports (in terms of the reporting of withdrawals and discharges as well as matters of water efficiency and pricing). Phase 2 then examined the reporting practices of large water users in the Sydney metropolitan region, with an emphasis on reviewing the extent to which site level reporting was performed. The phases are discussed in detail in the following Section.

5.4 Phase 1 - Interviews

5.4.1 Phase 1 methods

Ten interviews were conducted in 2009-2010 in order to provide further analysis as to the desirability and feasibility of corporate water disclosures. Semi-structured interviews were selected in order to enable both comparable and unique data (Fontana and Frey, 2000) and the interview guide is provided at Appendix A. Interviews were in-depth and durations ranged from one hour to two and a half hours (60 to 156 minutes) with an average duration of an hour and a half. Eight interviews were conducted in person and two by telephone.

Interviewees were from a range of backgrounds and locations. Interviewees were selected in order to provide a broad range of perspectives that included both private and public sectors. The researcher was independently commissioned by the Australian Bureau of Meteorology to assist with the development of National Water Accounting Standards [2] and therefore had access to senior water practitioners in both regulatory and commercial roles. Interviewees were based in the Australian Capital Territory (4), New South Wales (2), Tasmania (1), Victoria (2) and Western Australia (1). Their current roles were water regulators (6) and large water users (4). Of the six regulators, two had previous extensive experience in water management roles whilst the remaining four were from a commercial and/or accounting background. Three interviewees were female and seven male.

All interviews were recorded and the interviewer took notes, following the method suggested by Hayes and Mattimoe (2004, p. 361), given the relatively well-structured nature of the topic under investigation and the willingness of participants to be recorded. However, interviewees were given the option for recording to be ceased whenever they wished (and some interviewees exercised this option) so as to reduce the possibility of interviewee resistance (Hayes and

Mattimoe, 2004, pp. 362-364). Interviewees were informed that the tape could be stopped at any time.

The analysis phase began with obtaining interview transcriptions, which yielded 144,461 words or 425 pages of transcript. Once transcribed, all interviews were analysed drawing on methods outlined by Ryan and Bernard (2000), Silverman (2000), O'Dwyer (2004) and O'Dwyer *et al.* (2011). Initial codes were determined based on the interview questions, identified in turn from the analysis in Section 3 above (such as issues of extraction reporting, reporting entities and pricing). In the first coding pass these codes were applied and new codes added as additional dimensions of data were identified. Coding was undertaken using NVivo, which has been reported to facilitate (though not, of course, guarantee) speed and accuracy of the coding process (Weitzman, 2000) and development of qualitative thematic content analysis (Zapata-Sepúlveda *et al.*, 2011). Handwritten notes were also reviewed for any additional insights.

All transcripts were reviewed for these themes in the second pass and a mind map prepared as a final tool for identifying, organizing and relating interview themes. These themes were developed from the topics discussed in the previous Section, namely the right to water information and the content and location of water-related disclosures. The results of this analysis are presented in the following Section.

5.4.2 Phase 1 results

5.4.2.1 Rights to water information

Overall, interviewees expressed a conviction that the community has a strong claim for water information to be provided from both water managers and users. While this is in itself not surprising, given that interviewees were involved to some extent in the provision of water information, interviewees nevertheless expressed this idea in more nuanced terms discussed below. In other words, while there may be a right to water information, interviewees did not believe that this was a "blank cheque" giving the community the right to any water information held by water users.

The main justification for public provision of water information was the importance of water for the community, which Interviewee 4 summed up as "I think that there's a special [reporting] obligation there because it is a commons resource – and particularly because it's a limited commons resource – that there is a wider public good consideration there." Perhaps most interesting was that commercial water users shared this view:

> [W]ater belongs to everybody and through the licensing and through the government we have been offered the opportunity to, to use it for the benefit of individuals, but also for society. Therefore it should be no problem at all for us to report on how we are using that water and that we are good custodians and making proper use of it. (Interviewee 8)

The role of water information in informing public discourse was also a theme among interviewees. Again, even commercial water users recognized that information was critical for communities to participate in decision-making and believed this was an appropriate outcome of water disclosures:

> [information users] could be community groups, it could be lobby groups . . . and they have right to know what we do and to, I guess, try and lobby us to improve our performance. That's their role. (Interviewee 10)

The degree to which rights and commercial considerations existed varied considerably depending on the specific information in question, and is considered further below. In general, however, interviewees provided some suggestions for the mitigation of commercial sensitivities such as through lagged reporting and/or reporting in bands rather than providing specific data. By using these techniques interviewees had relatively little concern that information critical for community participation would be commercially sensitive:

> You've got to weigh up how beneficial that is, people knowing that information to the cost of commercial in confidence; I think that over time that it will be weighed up in the favour of reporting . . . You might have sort of exceptional

> cases . . . maybe they report six months after it actually occurs, so it does not affect pricing. (Interviewee 1)

> The community argument is: do we want that [water using] business in Australia or in Victoria or in New South Wales or wherever we're talking about. And that might be something we are looking at with the coffee plantations or the rice growing or something like that. The argument around that is not so much about efficiency and things like that; is that appropriate industry for the driest continent on Earth, and that is a different social argument . . . Knowing within a band . . . or something like that, on an annual basis – that's enough information to inform to the level necessary. (Interviewee 9)

The main fear, however, seemed to be community misunderstanding as opposed to commercial sensitivity. Many interviewees were concerned that misleading information could be worse than none at all. On a related point, opinions were divergent as to the current level of community water literacy, with some interviewees suggesting that many citizens had very little knowledge of water issues – as Interviewee 3 suggested, "You know it's a bit like the footy. Everyone can have an opinion, but . . . the general knowledge is very poor". Others contended that water report users tended to be self-selected water experts and therefore had the requisite knowledge to interpret water reports. A middle view was that both more information and community training was required, as Interviewee 4 suggested, "It may take a few years before the audience for that information is sufficiently skilled up to be able to interpret it properly".

However, there are of course many different disclosures that might be made, and interviewees distinguished between types of information that the public might reasonably have access to. While these are explored in more detail immediately below, the flavour of the discussions is summed up by the following quote:

> I think what the community has the right to know is: Who are the big water users out there. And talking specifically about water, the information I would like from the community perspective, I would like to know do they have a water management plan or some process in place to be checking out efficiencies,

> because that is what the interest might be, not that they are using a lot of water. Chemistry is chemistry so sometimes you will need to use a lot of water but are you being efficient? And are you seeking opportunities to improve your efficiency? (Interviewee 9)

5.4.2.2 Water withdrawals and discharges by source

Given the arguments around the rights to information discussed above, most interviewees believed that some sort of water disclosures by source was required. The exception was Interviewee 8, a commercial water user, who stated that while he supported reporting disclosures in aggregate from a water source he did not believe that disclosures by smaller individual organisations was warranted. In relation to larger organisations, this interviewee was less certain, stating that "everyone should be looking to do better, you know" but without specifically endorsing water disclosures. The other current commercial water users believed that site-level disclosure of water was warranted, though as noted above. Interviewee 9 believed disclosures should be done in bands to prevent commercial disadvantage.

Interviewees frequently explained this view both in terms of water being a resource that ultimately belonged to the community, which placed a corresponding obligation on users of this resource (in terms of extractions and discharges) to give an account of their actions. This view was expressed by both regulators and operators and was augmented by the observation by some interviewees that price alone was an insufficient determinant of water allocation, due to the significant externalities involved which can never be adequately priced and also the historic and continuing under-pricing of water (a point discussed further below). Such information was considered relevant to a host of user groups:

> Interviewee 7: I think [reporting at] the catchment level would be very useful . . . [to] anybody who's working in kind of a water planning, water development, water management kind of role. So, it could be anything from, you know, tank water suppliers, people who are looking at yield analysis, those kind of

> stakeholders. You may have some kind of special interest groups that may also be interested in that information, catchment management groups . . .

Some interesting specific examples of users were in relation to improving community water literacy, particularly in relation to the "myths" of large water users:

> That's a bit like South Australia saying those bloody cotton producers or the rice producers or whatever it might be, they are causing us problems. But they bandy around this anecdotal sort of stuff. If they had the information as to where the big water users really were, it might help them a lot because there hasn't been any rice produced in the last sort of four years. But they still say those big rice producers are the ones that are causing the problems. (Interviewee 2)

Users of extraction information might also extend to other water users, as already occurs in some groundwater systems:

> Knowledge of who's where. The big water users are [would] enable them to maybe come to an agreement on who pumps what and where. That in fact it does happen in groundwater-type areas because you've got situations there where everyone can use a certain amount. But if you all pump at a certain time then suddenly where your bore is, it cavitates [forms low-pressure cavities it the water]; no one can access it until it replenishes again and that doesn't do anyone any good. So they get together as a group of users, work out who's doing what and when and whatever and make decisions on how water should be taken but that's a kind of a mutual or users group type of decision. I mean it's a sort of a model for how maybe rules could be set if you had that information. (Interviewee 2)

Interviewees noted, however, that disclosure of agricultural water use was more difficult if "use" was broader than water extractions such as from a bulk irrigator. Such water might include rainfall, runoff and depletion of previously existing water in soils. As noted in Hazelton (forthcoming) water in soil, in particular, is important but presents major measurement challenges.

Interviewees similarly believed that the community had a right to reporting of discharges, though some believed that existing licencing requirements meant that some information may already be available.

> People are licensed to discharge. So if there's a company or something that extracts water and has a license to discharge water then that license requires water to be discharged at a certain charged [via] volume, in a certain quality. So if they don't discharge it at the quality that they're allowed to then they've got to put in some kind of process that ensures it cleans it all up and puts it back in. But that information should be readily available and generally I reckon it would be through environment departments and looking at their licensing. (Interviewee 2)

Others were less certain of the reporting obligations, and a commercial water user suggested that in practice, discharges relied more on the integrity of licensees:

> [D]isclosure that's helpful is disclosure of [whether we] comply with that trade waste agreement but that's not really very well monitored . . . we are not like a big industrial site where there is a trade waste testing of the sewage water. We don't have that because we are not considered to be an industrial site and as such there is no reporting on what now trade waste contains. It's an assumption that we behave well. (Interviewee 10)

While reporting extractions and discharges was deemed critical, it was also recognised that reporting aggregate amounts was unhelpful due to the highly contextually dependent nature of water impacts. Indeed, both regulators and operators pointed to both the inefficiency and impracticality of corporates attempting to report the impact of each withdrawal by source as currently recommended by the GRI. Reporting by the catchment manager was most often identified as a possible solution to supplement, but not necessarily replace, corporate-centric sustainability reporting. It was pointed out that in relation to water withdrawals data on major users, it is often held by a very small number of

entities, such as the metro water supplier or bulk irrigation supplier, and therefore disclosure of major water users could be facilitated with relatively low cost. Interviewee 9 put this point most eloquently, pointing to benefits both in terms of efficiency and reliability:

> [T]here is a government authority that sends us every [water] invoice so they have the information anyway and they can produce it . . . [For example, in relation to energy reporting] we buy energy from the companies which have licenses from the government; if the government put a simple clause to say you [the energy supplier] must provide us with all your customer energy usage data – problem solved. . . . Why doesn't the government just go to them and ask for that data? And then I can't cook the books, I can't fudge the figures, I can't do anything that people are always going to be accusing others of doing.

Interestingly (and somewhat to the surprise of the researcher) interviewees still believed that reporting at the level of the corporation still had an important role to play, though some interviewees felt that even if the same information were reported, if it were in the format of a catchment report it may be perceived as being more reliable:

> The annual report would be your first step, then you would be able to then tie the annual report into the catchment reports. (Interviewee 1)

> In some ways that's why it might be that the two are complimentary and if you can design a water report that links back then it might feed in as a part of annual report so it's in its full context in that world, but in the other world it doesn't lack for some context in terms of what's being reported. (Interviewee 3)

> I'm not sure if it is correct but certainly the perception is that company annual reports are somehow less reliable than a trusted government source. So a lot of this comes down to credibility and as I said it could be completely perceptual. I know that there are lot of very high quality company annual reports. But the perception is that if the information was available in a centralized repository that was administered by a trusted agency that was applying standards that that would somehow be more trustworthy information and hence higher quality than

> just relying on a company's individual annual report. (Interviewee 4)

While most interviewees believed that water extractions and discharges should be reported, the reporting of other elements of water operations, such as water efficiency and water pricing was more contentious. These elements are discussed below.

5.4.2.3 Other disclosures

As noted above, objections to disclosures generally stemmed more from fear of misunderstanding of such information by the community (and media) than appropriation by competitors. This point was most starkly evident in relation to efficiency measures, such as expressing water use per dollar of sales or per unit of production, which are both recommended disclosures under the WDP (Carbon Disclosure Project, 2011). Interviewees were generally supportive of such disclosures in principle, but were concerned that they may do more harm than good, especially when coupled with the relatively low level of water literacy of current and potential report users.

One of the main arguments for efficiency disclosures is what many perceive to be an under-pricing of water, which meant that there was insufficient monetary incentives for corporations to manage water use efficiently. This point was neatly summarised by Interviewee 2:

> [W]e're giving you this as a public good – there's no way that you're paying what [it] really costs us to provide it. So you've got a public good here pal you better report that you're being efficiently using this . . . so if water continues to be the public good that is then used for private benefit then there's probably a right to demand that there's a report on how efficiently that water that's been given to them (or, you know, subsidized or whatever) is being used.

Some interviewees also suggested that water pricing effectively subsidises big water users, because large investments in infrastructure such as desalination plants were required to meet the demand from such large users, but the costs

were spread across the entire water-using cohort. Further, existing price levels do not encourage efficiency from such users and government interventions focus on reducing urban demand from residents rather than corporations:

> We can't really allow the markets to totally function like with price signals and all that sort of stuff because there's still a tendency for governments to step in, particularly in urban areas like metropolitan areas and say you can't water your lawn or you can only use water every second day. [But] some big company – that's a hell of a lot more water they're using than it might take for a thousand people to water their lawns – they don't get told they can only use their water every second day. And the signal that they've been given in terms of water costs isn't really strong enough for them to make a decision as to whether they would reduce the water . . . (Interviewee 1)

Most interviewees considered that disclosure of the price corporations paid for water was unnecessary, primarily on the basis that this was separately publicly available and the same for all users in the region. Yet two interviewees suggested that water pricing was not in fact uniform, and that certain organisations may be able to negotiate more favourable terms, about which the public had a right to know:

> It should be [disclosed] particularly if there's a sweetheart deal involved, and I think that there's still traditionally carryover deals . . . I mean this is just my feeling and I know it happens with energy as well that may have had a special deal to encourage that industry to set up in a particular area you know. Might be a local government body waived rates or . . . allowed them to use large amounts of water and for a special subsidy or whatever in comparison to other users. So what they actually paid for the water I think that should be open knowledge . . . (Interviewee 2)

> Interviewer: Some people have suggested there's legacy deals that have been done in terms of attracting particular organizations to some region where they've been given breaks on water or exceptions for price and water. Do you think that's a significant issue or not really?

> Yes, I think it is. I think it goes back to what we were talking about, the debate, the fundamental dependencies on water and whatever. I think the institutional arrangements that provide access to water should be a publicly known thing. (Interviewee 3)

Against this background of unease with water pricing levels, and a certain suspicion as to the uniformity of water pricing, the argument for water efficiency disclosures as an effective accountability tool resonated with many interviewees:

> It [intensity measures] could be easy and could be very useful for those organizations that have to report to justify their movements . . . and show where people are using water inefficiently, if they are increasing water use, but not increasing sort of their delivery. (Interviewee 1)

While there was some support for efficiency disclosures in principle, interviewees noted that there was no universally appropriate "driver" that would enable efficiency comparisons across industries, and driver selection was even problematic within industries. Some were concerned about leaving the selection to corporations, and others raised the issue of commercial confidentiality:

> I would be loath to let them define it [driver] simply because they could just choose whatever they want, you know, kind of report and sort of things like, if you, if you make the choice of the driver voluntary, they will choose the driver that's the best. (Interviewee 1)

> [M]ost companies in the modern era collect internally for their own business analytical purposes quite a large amount of information on their operations. That's certainly best practice; so I think that the information potentially is already there. The only issue is the extent to which those individual corporations would feel comfortable disclosing them. (Interviewee 4)

However, commercial interviewees disclosed some sorts of efficiency measures, and cited complexity as opposed to commercial confidentiality as the primary

barrier. A common theme was that meaningful information required a level of complexity likely to be overwhelming for the report users:

> [F]rom the general public's point of view, they will probably say the most important information, as the total water use or the total water used against the easy to digest and understandable KPI, but I think that the reality is much more complicated. While it's probably most practical and visible for the public to get a total volume . . . that's not necessarily reflective of what's really happening. (Interviewee 10)

> Normally in the report that we've put up there it will come down to kilo litres or mega litres per ton of output. That's the best we have been able to come up with. But in some ways, it's a bit misleading . . . A ton of aluminium tin is very different to a ton of paper which is very different to a ton of corrugated board, to a ton of carton, a ton of glass bottles, a ton of flexible films. So the report breaks everything up to tons then reports in terms of tons and kilolitres per ton does not really make sense. We just put them together and say you know that is how it is. It's a very difficult aspect. . . . [disclosing in more detail] there is the commercial sensitivity aspect to it. But I think we could probably find a way around that. I think it would come down to, it would be seen as something that's too confusing. . . . And if we go the wrong way we shall put some context around it. To say, last year we made 200,000 products and packages this way if we made 500,000 and we put the water use as the same; you can do things like that. But it's not as straightforward and simple as a lot of people would think. (Interviewee 9)

In a similar vein to arguments against more broad social and environmental disclosures, some interviewees suggested that publication of voluntary targets may encourage mediocrity:

> If water reduction targets are mandatory then they should be disclosed. If they are voluntary then I think it's completely voluntary for them to be disclosed. I don't see that it would be particularly helpful for an organization to be forced to publish voluntary targets because all that makes you do is go, "Oh well, we won't make them too unachievable". (Interviewee 10)

Finally, one of the most controversial aspects of disclosure concerned water availability. Interviewee 3 argued that this was the most important disclosure for stakeholders concerned about the sustainability of the organisation itself:

> Where does it take an external user if you know the efficiency ratio or something? Water inputs, so much produced or water consumed per employee or, you know, circulated per widget produced. It's useful . . . [but] more important to know – regardless of the quantum – is it likely to be sustained?

Interviewee 3 also made the point that supply was critical not just to organisations directly, but also to their supply chain:

> [Corporates find] water access was more important to suppliers than to they themselves… that's not just the use in their factory, in their sites, but it's those supplying it. (Interviewee 3)

For corporations, however, there was difficulty in determining what should – or could – be disclosed. For example, one commercial water user saw the issue in standard risk terms, suggesting that availability fell within the category of standard operational risks and therefore was not a matter of community concern. Others considered that it was a matter for the catchment manager to report, perhaps as part of the licencing provisions discussed above. Finally, there was the issue of what it was possible to report. Interviewee 9 contended that there was no universally accepted definition of regional water stress, which would be one way to identify the relative water supply risk of geographically dispersed operations while others noted that all you could do is provide a historic record, albeit climate change is reducing the efficacy of such records:

> You can really have a grab on the historical record . . . [but] that is changing so rapidly . . . as of now what you could really do, would be to, to do it in that context, to say, we are looking at a full historical record. (Interviewee 8)

5.4.3 Phase 1 conclusions

A strong theme of the interviews was that current levels of water disclosure are deficient in many regards, echoing the results of prior studies (Kaspura, 2006; Cordery *et al.*, 2007; Morikawa *et al.*, 2007; Morrison and Schulte, 2009; Prior, 2009; Barton and Morgan-Knott, 2010; Egan and Frost, 2010; ACCA, 2010) and calls for reporting reform (The Wentworth Group, 2002, 2003, 2006, 2008; Morrison and Schulte, 2009; Prior, 2009; Egan and Frost, 2010; ACCA, 2010). There was broad agreement that extractions and discharges were a matter of public interest (though some interviewees noted that discharge information may be available via the licencing regime). The question of the commercial sensitivity of water disclosures, raised by a number of prior studies (Cordery *et al.*, 2007; Egan and Frost, 2010; Hazelton, 2013) was also explored, and interviewees concerns related more to the potential for information to be misunderstood than reduced competitive advantage. This concern was especially evident in relation to water efficiency measures, which were considered important due to the under-pricing of water, but problematic due to the difficulty in selecting appropriate and comparable drivers. Given the potential of such benchmarking to inform both water operators and report users further research into this area is warranted, perhaps following the suggestion of Morrison and Schulte (2009) for the development of industry-specific benchmarking tools.

In terms of information usefulness, two of the more contentious elements of disclosure related to access and price. Water access is clearly a critical issue for investors (Prior, 2009; Barton and Morgan-Knott, 2010) and organisations, but one over which they have little control. Opinion was therefore divided as to whether disclosure by organisations is appropriate. In relation to water pricing, most interviewees considered pricing is a major issue as low levels of water pricing stymie investment in water efficiency technologies. Some interviewees also raised the issue of whether historic arrangements remain in force which privilege some water users. Nevertheless, water users did not support the idea of disclosing water prices, both from philosophical and practical grounds, particularly given that price information is often already in the public domain.

While there were some differences in terms of what should be reported to improve the quality of water disclosures, a particularly important dimension of the discussion was the view that catchment-level reporting is critical. The justification for catchment level reporting was generally consistent with the typology suggested by Stephan (2002), who posited that the success of regimes such as the US Toxic Release Inventory was driven by the ability of users (such as the community and media) to compare the relative performance of organisations with relatively low information costs. In relation to water, this observation underscores the current gap in the literature regarding examination of the availability of catchment-level water information. Indeed, the debate over the appropriate method for corporate reporting is highlighted in the latest *World Water Development Report*:

> There is implicit competition between these different approaches, with one focusing specifically on corporate water use while others seek to engage and understand the resource in its catchment context: "beyond the factory fence". However, both approaches to monitoring and evaluating the state of water resources and their use are effective in that they depend on the availability of sufficient data to draw well-substantiated conclusions. (WWAP, 2012, p. 168)

The logical place for such catchment level reports may be as part of the National Water Account and through Australian Water Accounting Standards, as suggested by Egan and Frost (2010). The advantage of this approach is that a regulatory structure is already underway, and is largely geographic in focus. However, reporting of corporate water use, or indeed of any information relating to large water users within a region, is not part of the current standards and may even be legally problematic. Section 123(2)(b) of the *Water Act* (2007) prohibits the Bureau of Meteorology from publishing information regarding a person's water use unless that information is already published or otherwise publicly available. While the term "person" is not explicitly defined in the legislation, it is described by both the Bureau's explanatory document and the subsequent *Water Regulations* (2008) as including both natural persons and organisations, meaning

that the Bureau would be precluded from publishing details of, say, large water users if they were not published elsewhere.

Following from the importance of catchment level-reporting, the next Section provides an exploratory study in the extent of such reporting by large water users in a major metropolitan region.

5.5 Phase 2

A key theme from the interviews conducted in Phase 1, and a theme consistent with prior research (Irbaris, 2009; Cote *et al.*, 2012; MCA, 2012; Mudd, 2012; Hazelton, forthcoming) is the importance of water context. In the context of corporate water disclosures, unless operations are restricted to a particular location, total water usage is a meaningless statistic as the same water usage can have little environmental impact in areas where water is abundant or a catastrophic impact in areas where it is not. The same arguments apply to water discharges. Yet few water-related studies have focused on this issue by considering the extent to which corporate water-related information is available within a particular catchment. With the exception of Gouldson and Sullivan (2007), few SEA studies have considered site-level reporting at all. This phase therefore examines what water-related information is provided by major water users within the Sydney catchment. A background to the catchment and the water savings activities required of large water users is provided below, followed by the method of the study, results and conclusions.

5.5.1 Background to Sydney water supply and Water Savings Action Plans

Urban water delivery in Australia is relatively straightforward conceptually, but differs in practice across different jurisdictions. The majority of systems (including Sydney) are single pass, in that rain falls in catchments and is collected in dams. This water is then treated and pumped into the cities, where it is piped to individual households and businesses. Wastes are pumped out

through a separate piping system and treated before being deposited in the sea (or otherwise disposed of in the case of inland urban settings). The water for Sydney is ultimately regulated by the New South Wales (NSW) government, as under the Australian Constitution, responsibility for water vests in the States. The Sydney Catchment Authority is the entity responsible for the health of the sources of Sydney's water and Sydney Water Corporation is the entity responsible for delivery and billing of water. The NSW Independent Regulatory and Pricing Tribunal is responsible for pricing.

The water management regime in Sydney has been set out in a series of Metropolitan Water Plans. The first plan was released in 2004 against a backdrop of declining water supplies and concerns about future unmet demand. In terms of business demand management, the 2004 Metropolitan Water Plan outlined a strategy whereby the top 200 water users would be required to prepare a Water Savings Action Plan (WSAP). While WSAPs may encourage large water users to reduce water use, implementation is not mandatory. This is explicitly stated in the legislation under s34V(3):

> Nothing in this Division requires a designated water user or designated energy user to implement any savings measures specified in a savings action plan submitted by the user and approved under this Division unless the regulations so provide.

The 2006 Metropolitan Water Plan provided details of the WASP project. Savings of 20% per organization were expected (NSW Government, 2006, p. 56). In terms of mandatory implementation of the WSAPs, it was noted that the Minister for Water Utilities has the power to mandate implementations and that while this power was not currently utilised "[a]s part of the ongoing monitoring of the Metropolitan Water Plan, consideration may be given in future to use this power to encourage further water savings" (NSW Government, 2006, p. 56). In addition to the WSAPs, the main mechanism for reducing commercial water use is the "Every Drop Counts" (EDC) programme. EDC began in 2001 and is now a major component of the expected water savings, second only to leak reduction. The

basic idea behind the EDC programme is that Sydney Water assists a participating organization in performing a diagnostic review of their water management practices and developing an improvement plan. This plan is then implemented and the results communicated to SWC.

The 2010 Sydney Metropolitan Water Plan (NSW Government, 2010) similarly highlights the impact of the various industrial water savings achieved through participation in the EDC programmes as well as via funding available through programmes such as the NSW Green Business Programme and WaterSmart. However, the report also highlights the fact that EDC participation is voluntary and carefully avoids stating that WSAPs have been implemented: "Water Savings Action Plans have been developed for large water using businesses, 34 government agency sites and 44 local councils, identifying cost effective actions to save water" (New South Wales Government, 2010, p. 44).

In summary, Sydney's water supply has been an issue receiving much government attention. In terms of reducing corporate water demand, the main initiatives are provision of government grants for water saving projects, voluntary participation in the EDC programme and mandatory creation of WSAPs for large water users (though implementation of the plans is voluntary). This study examines the site-level disclosures of such water users as described in the following Section.

Before proceeding, it should be noted that the other major initiative undertaken by Sydney Water was the creation of a desalination plant, on the basis of a feasibility study completed in 2005, and by 2006 Sydney Water had acquired a suitable site and the NSW Government had invested around $120 million in "preparatory works" (NSW Government, 2006, p. 92). This plant became fully operational in 2010 at a cost of $1.9 billion (Sydney Water Corporation, 2010, p. 5). Recent media reports have suggested that the creation of the plant has led both to significant cost increases and (in conjunction with higher rainfall) a lessening of pressure on corporate water efficiency (Hasham, 2013).

5.5.2 Phase 2 methods

As noted above, the 2004 Metropolitan Water Plan outlined a strategy whereby the top 200 water users would be required to prepare Water Savings Action Plans (WSAPs) by March 2006 and implement "cost effective measures to improve water efficiency" by September 2007 (NSW Government Department of Infrastructure, 2004, p. 16). These plans were mandatory under amendments made in 2005 to the *Energy and Utilities Administration Act*, 1987 (NSW). Part 6A of the Act was enacted to govern water (and energy) savings plans. Under the Act, "designated water users" are required to prepare WSAPs that describe current water usage and propose savings measures (including costs and timeframes) (Section 34R). Plans must be approved by the minister (Section 34S) and last for a maximum of four years (Section 34T). Section 34A defines "designated water users" as local councils with areas located within a water savings area or any other person or body prescribed by a savings order that uses water in a "water saving area" (essentially the area of operation of Sydney Water).

5.5.2.1 Sample selection

Entities and sites required to prepare plans were listed in the Water Savings Order 2005 (NSW), Schedule 1. Schedule 1 lists 305 sites, of which most sites (261) were point sites (such as factories, golf courses and so on). Of these, 219 were corporate entities and the remaining 42 were operated by government agencies, primarily comprising sites such as hospitals and prisons. In addition to point sites, Schedule 2 of the Order lists 44 local councils (stretching as far as Wollongong City Council) as comprising high water users and therefore required to prepare WSAPs. This study reviewed the 219 corporate sites only, leaving disclosures by government agencies and local councils as areas for future research.

5.5.2.2 Annual Report analysis

For each corporate site, web searches were undertaken to identify the owner of each site. For entities within the sample, ownership possibilities comprised

overseas owned companies (via publicly listed or private firms) or Australian operations (publicly listed or private). As noted above, a single entity might also operate multiple WSAP reporting sites, such as a shopping centre manager owning multiple shopping centres. For each entity the websites were reviewed and reports (annual reports and/or sustainability reports) obtained from 2005-2009.

The Dun and Bradstreet database Company360 was used to find the ultimate parent company of each commercial entity listed in sites in the Water Savings Order 2005 (NSW), Schedule 1. The Company360 database also provided industry, size and revenue information for the Australian operations of the firm. From this information web searches were then used to identify the parent entity websites and consequent reports.

For each entity forming part of the sample, reports were first obtained in PDF format and then interrogated for references to water using Adobe Acrobat and Apple Preview, with keyword searching on "water". Matches were then reviewed to ensure they actually related to water (as opposed to subsidiary or auditor names containing the word "water") and then reviewed to determine whether they contained site-level or aggregated water information. Specifically, reports were reviewed to determine whether they contained water use information in relation to the sites listed in the Water Savings Order 2005 (NSW), Schedule 1, aggregate water use of the reporting entity or other water-related disclosures.

A research assistant was employed to find company websites, download the annual reports and perform an initial search and coding of the reports. The researcher then followed up any companies for which annual reports could not be found and reviewed the annual reports to ensure the integrity of the coding process.

5.5.2.3 Statistical analysis

In addition to descriptive results, statistical analysis using probit and logit models was undertaken to determine the significance of industry, company type, location and size on disclosure practice. As noted above, industry codes were obtained by the Dun and Bradstreet Company360 database and companies were aggregated into eight industries (mining, food and beverage, property management, drugs and consumer goods, services, hotels and motels, and sports and recreation clubs). In relation to company type, companies were split into public and non-public entities. In relation to location, companies were coded as either Australian or non-Australian (which meant the parent company was overseas). For size, revenue and number of employees of the site were used, sourced from the Company360 database.

Probit and logit models were chosen as the dependent variable as it is dichotomous (i.e. firms either disclose or do not disclose data).[3] This approach represents a departure from previous literature. Prior studies on water have not adopted a statistical approach, instead providing a qualitative review of quality against an ideal benchmark such as the GRI or CEO Water Mandate (Morikawa *et al.*, 2007; Morrison and Schulte, 2009; Prior, 2009; Barton and Morgan-Knott, 2010; Carbon Disclosure Project, 2010; Egan and Frost, 2010; The Association of Chartered Certified Accountants, 2010; CIMA (Chartered Institute of Management Accountants), 2011; Carbon Disclosure Project, 2012). This approach has also been adopted by more general studies of reporting quality (Jones *et al.*, 2005; Lynch, 2010).

Outside of water reporting, many previous studies have used word count as the primary dependent variable, and therefore treated this characteristic as a continuous variable and applied Ordinary Least Squares (OLS) regression techniques, e.g. (Deegan and Gordon, 1996) (Ratanajongkol *et al.*, 2006; Kathyayini *et al.*, 2012). While this provides insight into disclosure practices, it is limited in two important ways. First, this method assumes quantity is a proxy for quality, a well-known weakness (Deegan and Gordon, 1996). Some researchers

have attempted to control for this weakness by using sentences instead of words (Milne and Adler, 1999; Amran and Devi, 2008). Others consider additional dimensions of disclosures such as "good news" (Allartdt, 1993; Alexander, 2008), whether disclosures were monetary, non-monetary or declarative (Nussbaum, 1993; Alexander, 2008), the amount of non-SER voluntary disclosures (Gray *et al.*, 1995), and the amount of mandatory SER (Gray *et al.*, 1995).

More fundamentally, however, regarding disclosure as a continuous variable is not appropriate when the main research question is whether a company has made disclosures on a particular issue or not. Counting words (or sentences) assumes the difference in significance of a firm disclosing, say, ten words as opposed to no disclosures is equivalent to the difference of a firm disclosing twenty words as opposed to ten. But where the most important issue is whether disclosures have been made or not, there are only two possible responses – yes or no. Further interrogation of disclosure quality is certainly possible, but many such additional dimensions (e.g. disclosures of bad news) are also more accurately represented as dichotomous. In such cases probit (or logit) models are more appropriate (Train, 2009).

An item of note with probit (or logit) analysis relates to the determination of goodness-of-fit, or the R^2 of the model. Unlike a traditional OLS regression, an R^2 cannot be directly estimated as logistic regression estimates maximum likelihood values through an iterative process as opposed to the OLS approach of minimising variance. However, many "pseudo" R^2 approaches have been developed with the objective of providing an estimate of the model goodness-of-fit, the most common of which is the McFadden R^2 (Veall and Zimmermann, 1996, p. 244). This measure, however, is conservative, in that it is likely to understate the fit of the model compared to an OLS equivalent (Veall and Zimmermann, 1996, p. 250). While the absolute values of such measures must be interpreted with caution, relative values are robust, in that the goodness-of-fit of equivalent can be ranked using Pseudo R^2 values (Veall and Zimmermann, 1996, p. 256).

5.5.3 Phase 2 results

In terms of geographic location, Table 5.1 below shows that the majority of sites are owned by Australian companies, but also that overseas parents account for approximately one-third of all sites. Not surprisingly, the foreign ownership of listed companies is much higher, with almost half of such companies having overseas parents. In terms of geographic region, ownership is predominantly from the Americas and Europe but also has representation from parts of Asia.

Table 5.1 Parent entity location and type

Country	Public	%	Non-Public	%	Total	%
Australasia						
Australia	**69**		**80**		**149**	
New Zealand	**1**		**-**		**1**	
Total	**70**	55%	**80**	87%	**150**	68%
Americas						
USA	**21**		**8**		**29**	
Canada	**-**		**1**		**1**	
Total	**21**	17%	**9**	10%	**30**	14%
Europe						
UK	**12**		**-**		**12**	
Germany	**7**		**-**		**7**	
France	**3**		**-**		**3**	
Netherlands	**2**		**-**		**2**	
Italy	**1**		**-**		**1**	
Belgium	**-**		**1**		**1**	
Total	**25**	20%	**1**	1%	**26**	12%
Asia						
Japan	**8**		**-**		**8**	
Malaysia	**1**		**-**		**1**	
Singapore	**1**		**2**		**3**	
Hong Kong	**1**		**-**		**1**	
Total	**11**	8%	**2**	2%	**13**	6%
Total	**127**	100%	**92**	100%	**219**	100%

In terms of corporate structure, Table 5.1 shows that 127 of 219 sites (58%) were owned by publicly listed companies. The remaining 42% comprised private companies and community organisations (such as sporting clubs).

Combining the elements of location and ownership, Table 5.1 therefore shows that only 69 of 219 sites (32%) are owned by Australian publicly listed companies. This finding illustrates the problem of attempting to regulate environmental disclosures by regulating local public listed companies – in the Sydney region less than a third of large water users would be required to report under such provisions.

Table 5.2 Industry type

Industry	Sites	Percentage
Food & beverage	42	19%
Shopping centre	38	17%
Light industrial	31	14%
Hotels	30	14%
Office building	23	11%
Sports	18	8%
Heavy industrial	15	7%
Education	12	5%
Other	10	5%
Total	**219**	100%

Table 5.2 shows that operations within the food and beverage, light industrial and heavy industrial sectors are significant water users. Of more surprise might be the relative importance of shopping centres, hotels, office buildings and sports fields. Education facilities also figure in the list.

Tables 5.3 and 5.4 below list aggregate disclosures by year, industry and corporate type.

Table 5.3 Disclosure practices by industry

	Food & beverage		Shopping centre		Hotels		Light industrial		Office building		Heavy industrial		Sporting facility		Education		Other		All	
2005																				
Site	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	**0**	**0%**
Agg	1	2%	0	0%	2	7%	2	7%	1	4%	10	48%	0	0%	0	0%	0	0%	**16**	**7%**
Discl	9	21%	16	42%	0	0%	6	22%	7	30%	3	14%	0	0%	4	33%	0	0%	**45**	**21%**
Nil	32	76%	22	58%	28	93%	19	70%	15	65%	8	38%	18	100%	8	67%	8	100%	**158**	**72%**
Total	42	100%	38	100%	30	100%	27	100%	23	100%	21	100%	18	100%	12	100%	8	100%	**219**	**100%**
2006																				
Site	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	8%	0	0%	**1**	**0%**
Agg	7	17%	0	0%	2	7%	3	11%	0	0%	9	43%	0	0%	0	0%	0	0%	**21**	**10%**
Discl	3	7%	20	53%	5	17%	4	15%	8	35%	4	19%	0	0%	4	33%	0	0%	**48**	**22%**
Nil	32	76%	18	47%	23	77%	20	74%	15	65%	8	38%	18	100%	7	58%	8	100%	**149**	**68%**
Total	42	100%	38	100%	30	100%	27	100%	23	100%	21	100%	18	100%	12	100%	8	100%	**219**	**100%**
2007																				
Site	0	0%	1	3%	0	0%	0	0%	0	0%	0	0%	0	0%	1	8%	0	0%	**2**	**1%**
Agg	8	19%	1	3%	2	7%	5	19%	1	4%	10	48%	0	0%	0	0%	0	0%	**27**	**12%**
Discl	4	10%	19	50%	8	27%	7	26%	8	35%	7	33%	0	0%	7	58%	0	0%	**60**	**27%**
Nil	30	71%	17	45%	20	67%	15	56%	14	61%	4	19%	18	100%	4	33%	8	100%	**130**	**59%**
Total	42	100%	38	100%	30	100%	27	100%	23	100%	21	100%	18	100%	12	100%	8	100%	**219**	**100%**

	Food & beverage		Shopping centre		Hotels		Light industrial		Office building		Heavy industrial		Sporting facility		Education		Other		All	
2008																				
Site	0	0%	1	3%	0	0%	0	0%	0	0%	0	0%	0	0%	3	25%	0	0%	**4**	**2%**
Agg	9	21%	1	3%	4	13%	6	22%	2	9%	12	57%	0	0%	0	0%	0	0%	**34**	**16%**
Discl	6	14%	15	39%	5	17%	7	26%	6	26%	6	29%	0	0%	5	42%	0	0%	**50**	**23%**
Nil	27	64%	21	55%	21	70%	14	52%	15	65%	3	14%	18	100%	4	33%	8	100%	**131**	**60%**
Total	42	100%	38	100%	30	100%	27	100%	23	100%	21	100%	18	100%	12	100%	8	100%	**219**	**100%**
2009																				
Site	0	0%	0	0%	0	0%	0	0%	0	0%	1	5%	0	0%	2	17%	1	13%	**4**	**2%**
Agg	9	21%	5	13%	7	23%	7	26%	3	13%	13	62%	0	0%	2	17%	0	0%	**46**	**21%**
Discl	5	12%	18	47%	2	7%	8	30%	8	35%	2	10%	0	0%	3	25%	0	0%	**46**	**21%**
Nil	28	67%	15	39%	21	70%	12	44%	12	52%	5	24%	18	100%	5	42%	7	88%	**123**	**56%**
Total	42	100%	38	100%	30	100%	27	100%	23	100%	21	100%	18	100%	12	100%	8	100%	**219**	**100%**

Table 5.4 Disclosure practices by company type

	All		Public company		Private company		Non profit		Other	
2005										
Site	0	0%	0	0%	0	0%	0	0%	0	0%
Aggregate	16	7%	16	13%	0	0%	0	0%	0	0%
Disclosure	45	21%	39	31%	1	2%	5	14%	0	0%
Nil	158	72%	72	57%	52	98%	31	86%	3	100%
Total	219	100%	127	100%	53	100%	36	100%	3	100%
2006										
Site	1	0%	0	0%	0	0%	1	3%	0	0%
Aggregate	21	10%	21	17%	0	0%	0	0%	0	0%
Disclosure	48	22%	43	34%	0	0%	5	14%	0	0%
Nil	149	68%	63	50%	53	100%	30	83%	3	100%
Total	219	100%	127	100%	53	100%	36	100%	3	100%
2007										
Site	2	1%	0	0%	0	0%	2	6%	0	0%
Aggregate	27	12%	27	21%	0	0%	0	0%	0	0%
Disclosure	60	27%	52	41%	0	0%	8	22%	0	0%
Nil	130	59%	48	38%	53	100%	26	72%	3	100%
Total	219	100%	127	100%	53	100%	36	100%	3	100%

	All		Public company		Private company		Non profit		Other	
2008										
Site	4	2%	0	0%	0	0%	4	11%	0	0%
Aggregate	34	16%	34	27%	0	0%	0	0%	0	0%
Disclosure	50	23%	43	34%	1	2%	6	17%	0	0%
Nil	131	60%	50	39%	52	98%	26	72%	3	100%
Total	219	100%	127	100%	53	100%	36	100%	3	100%
2009										
Site	4	2%	1	1%	0	0%	3	8%	0	0%
Aggregate	46	21%	44	35%	0	0%	2	6%	0	0%
Disclosure	46	21%	38	30%	3	6%	5	14%	0	0%
Nil	123	56%	44	35%	50	94%	26	72%	3	100%
Total	219	100%	127	100%	53	100%	36	100%	3	100%

Three main themes are evident from Tables 5.3 and 5.4. First, consistent with other studies, the overall level of disclosures is increasing. In 2005 72% of organisations made no disclosures, whereas by 2009 this amount had reduced to 56%.

Second, the quality of reporting remains poor. Recall that these are the largest water users in a major metropolitan city. Yet almost half of these corporations made no disclosures at all. Further, only 2% of water users made site-level disclosures, and these were only because the users in question happened to provide water use information and only operated at a single site.

Third, while there were certainly major differences in disclosure levels by industry, the overwhelmingly significant determinate in water disclosure was organisational type. For example, in 2009, industry disclosures ranged from the lower end such as sporting organisations (where there were no disclosures) through hotels and food and beverage (where less than a third of organisations made some sort of disclosure) to heavy industrial where three quarters made some form of disclosure). But when examined by organisational type, 65% of public companies made disclosures in 2009 compared to only 28% of non-profits and only 6% of private companies. This suggests that company type is a key determinate of water disclosure.

This suggestion is supported by the statistical analysis presented in Table 5.5 below.

Table 5.5 Probit and Logit regression results

Probit	2005			2006			2007			2008			2009		
	Co-eff	t-stat	p-value	Co-eff	t-stat	p-value	Co-eff	t-stat	p-value	Co-eff	t-stat	p-value	Co-eff	t-stat	p-value
Food & Beverage	-0.42	-1.00	0.32	-0.41	-0.97	0.34	-0.90	-2.19	**0.03** **	-0.87	-2.08	0.04 **	-0.49	-1.21	0.23
Property management	-0.90	-1.48	0.14	-0.16	-0.30	0.76	-0.67	-1.35	0.18	-1.18	-2.21	0.03 **	-0.52	-1.07	0.29
Drugs and consumer goods	-0.83	-1.58	0.12	-0.69	-1.32	0.19	-0.38	-0.80	0.43	-0.83	-1.72	0.09 *	-0.07	-0.15	0.88
Services	-0.51	-1.10	0.27	-0.19	-0.42	0.67	-0.62	-1.35	0.18	-1.53	-2.96	0.00 **	-0.73	-1.57	0.12
Hotels and Motels	-1.08	-1.63	0.11	-1.07	-1.61	0.11	-0.99	-1.71	0.09	-1.21	-2.06	0.04 **	-1.13	-1.98	0.05
Sports and recreation clubs	-4.36	-0.05	0.96	-4.26	-0.05	0.96	-4.78	-0.05	0.96	-4.97	-0.05	0.96	-4.98	-0.05	0.96
Public listed	0.73	1.91	0.06 *	0.86	2.29	0.02 **	0.78	2.23	0.03 **	0.77	2.18	0.03 **	0.74	2.18	0.03 **
Overseas parent	0.29	0.81	0.42	-0.02	-0.07	0.94	-0.17	-0.52	0.60	-0.19	-0.57	0.57	0.42	1.33	0.19
Aust revenue $'000	0.00	1.84	0.07 *	0.00	0.79	0.43	0.00	1.16	0.25	0.00	1.65	0.10 *	0.00	1.46	0.15
Aust Employees	0.14	1.49	0.14	0.24	1.88	0.06	0.15	1.37	0.17	0.20	1.64	0.10 *	0.14	1.30	0.20
McFadden R-squared	0.27			0.24			0.26			0.32			0.28		
Estrella R-squared	0.30			0.27			0.32			0.39			0.35		

Logit	2005			2006			2007			2008			2009		
	Co-eff	t-stat	p-value	Co-eff	t-stat	p-value	Co-eff	t-stat	p-value	Co-eff	t-stat	p-value	Co-eff	t-stat	p-value
Food & Beverage	-0.69	-0.97	0.33	-0.70	-0.98	0.33	-1.54	-2.18	0.03 **	-1.42	-2.03	0.04 **	-0.79	-1.18	0.24
Property management	-1.56	-1.35	0.18	-0.23	-0.26	0.80	-1.10	-1.30	0.20	-1.91	-2.05	0.04 **	-0.85	-1.02	0.31
Drugs and consumer goods	-1.37	-1.51	0.13	-1.16	-1.28	0.20	-0.58	-0.77	0.44	-1.33	-1.69	0.09 *	-0.10	-0.12	0.90
Services	-0.86	-1.06	0.29	-0.33	-0.43	0.67	-0.99	-1.30	0.20	-2.74	-2.86	0.01 **	-1.22	-1.56	0.12
Hotels and Motels	-1.77	-1.50	0.14	-1.81	-1.51	0.13	-1.57	-1.63	0.11	-1.92	-1.96	0.05 **	-1.84	-1.89	0.06 *
Sports and recreation clubs	-8.65	-0.20	0.84	-8.67	-0.20	0.84	-8.71	-0.33	0.74	-8.97	-0.34	0.74	-9.53	-0.22	0.82
Public listed	1.18	1.70	0.09 *	1.44	2.21	0.03 **	1.30	2.20	0.03 **	1.35	2.19	0.03 **	1.20	2.15	0.03 **
Overseas parent	0.55	0.90	0.37	-0.01	-0.02	0.99	-0.29	-0.53	0.60	-0.32	-0.53	0.59	0.73	1.40	0.17
Aust revenue $'000	0.00	1.81	0.07 *	0.00	0.80	0.43	0.00	1.12	0.27	0.00	1.70	0.09 *	0.00	1.46	0.15
Aust Employees	0.00	0.00	0.00	0.40	1.90	0.06 *	0.26	1.37	0.17	0.33	1.56	0.12	0.23	1.29	0.20
McFadden R-squared	0.27			0.24			0.26			0.32			0.28		
Estrella R-squared	0.29			0.27			0.33			0.39			0.36		

* Significant at 10% level
** Significant at 5% level

Table 5.5 shows that the characteristic of public ownership was consistently statistically significant, much more so than either size or industry effects or ownership location. A concentration of reporting by public companies is consistent with prior research but nevertheless problematic from an accountability point of view given that the sample comprises only those companies that are significant water users.

In relation to the industry effect, the descriptive statistics presented in table 5.3 reveal some apparently large industry effects but these are not statistically significant. Rather than casting doubt on the industry effect observed by other researchers, it seems more likely that the sample sizes within each industry were insufficient to obtain a statistically significant result. Noise in relation to the industry effect is also evident in relation to the 2008 results, which show a statistically significant result for most industries. Yet there was little difference in the number of companies disclosing, and only nine companies changing their disclosure practices. This suggests that this result must be interpreted with caution given the relatively low sample size.

A review of the narrative of reports also reveals some interesting aspects to the challenge of water disclosures. First, while data might be assumed to be readily available for water use (via water bills sent by Sydney Water) such information may be difficult to obtain for organisations sharing premises. For example, the 2006 Westpac Stakeholder Impact Report stated:

> Unfortunately, our property management suppliers, United Group and Mowlem Sodexho, were again unable to provide reliable water consumption data this year. So we have again withdrawn water data from this report. To resolve this issue, we are planning a roundtable discussion with United Group, Sydney Water and members of our sourcing and property teams in 2007. (Westpac Backing Corporation, 2006, p. 43)

Second, consistent with the findings of Morrison and Schulte (2009) some companies claim to be compliant with GRI requirements but do not report

disaggregated information. For example British American Tobacco, (2008, p. 12) provides a table headed "EN8 Total water withdrawals by source" but discloses only aggregate water withdrawals of five million cubic meters. Neither geographic nor corporate details are provided.

Third, while the results indicate very low levels of site-level water disclosures, the magnitude of providing such information for organisations should not be under-estimated. For example, hotels featured prominently in the list of Sydney's large water users, and for those hotel chains that have larger hotels, many such entities may be material water users within their particular catchments. Reporting on each hotel via annual report disclosures would be a daunting task, however. For example, the Accor group (owner of two hotels in the sample) own almost three thousand establishments worldwide (Accor, 2009, p. 42).

The implications of the Phase 1 and Phase 2 findings are discussed in the following Section along with limitations and areas for future research.

5.6 Conclusions, limitations and areas for future research

Overall, the results support the repeated calls for mandatory reporting within SEA in general (e.g. Gray, 2001; Gray and Milne, 2002; Adams, 2004; Adams and Zutshi, 2004; Gray and Milne, 2004) and the call for a water reporting framework in the Australian context (ACCA, 2010). Yet the style of such reporting must be carefully considered. The move toward catchment-level management suggests that geographically based water reporting is appropriate, echoing calls by the Wentworth Group (The Wentworth Group, 2002, 2003, 2006, 2008) and the current approach of national water accounting under the framework being developed by the Australian Bureau of Meteorology (Godfrey, 2007; Slattery, 2008; Bureau of Meteorology, 2009).

Though the disclosure of site-level information might enable some degree of inter-entity comparisons, to fully realise the potential of disclosure to drive

change envisaged by Stephan (2002) further information may be required, as comparing water use of even equivalent industries can be complex. As Barton *et al.* (2010, p. 8) point out:

> To be helpful for investors, company disclosure requires more than just a mention of water and its risks. Measuring and reporting water-related risks and opportunities is complex, and the methodologies and standards for doing so are still nascent. Nevertheless, there is growing consensus in business and investor circles regarding the most critical elements of water reporting. What is central to useful water reporting is its inclusion in company financial filings – annual 10-Ks (or 20-Fs or 40-Fs for non-U.S. companies) – rather than just sustainability reports. Also critical is discussion of relevant management systems and strategies, provision of water accounting data that puts performance in geographic context, and inclusion of supply chain water risks in the analysis.

This paper has argued that site-level water disclosures are required for meaningful water-use accountability. The selection of the site (as opposed to a corporation) as the unit of analysis was the determinant of requirements for Sydney water users to prepare WSAPs and also mirrors the approach of pollutant databases such as the US Toxic Release Inventory (and the Australian equivalent National Pollutant Inventory) credited with much success (Fung and O'Rourke, 2000; Sand, 2002; Stephan, 2002). This is also the approach of greenhouse gas reporting under the Australian National Greenhouse and Energy Reporting Act (2009). Within SEA accounting this might be a promising avenue of future enquiry as this approach may overcome the disquiet over selection of the corporation as the primary unit of analysis (Gray and Milne, 2004; Leong and Hazelton, 2008; Gray, 2010) and has previously been called for by Mudd (2008; 2012).

While the approach of WSAP selection might be appropriate, the lack of mandatory reporting is more contentious. This study shows that very few companies disclose this information voluntarily. It therefore confirms the general tenor of previous studies of corporate water use (Morikawa *et al.*, 2007; Morrison and Schulte, 2009; Prior, 2009; Egan and Frost, 2010; The Association

of Chartered Certified Accountants, 2010) and site-level reporting (Gouldson and Sullivan, 2007; Mudd, 2009, 2012).

In particular, the findings suggest that the intuition of Egan and Frost (2010) regarding the disinclination of disclosure by private companies is correct, and it is consistent with the relative lack of sustainability reporting by smaller companies reported by Mudd (2009). The findings also suggest that the historic SEA focus on listed companies may be problematic in the case of water, given that the majority of large Sydney water users are not in fact listed companies. This skew may also apply to other dimensions of environmental and social performance, as well as the reporting frameworks themselves. In relation to the GRI in particular, in a review of the history of the enterprise, Brown *et al.* (2009b, p. 573) relate that "[s]mall and medium size enterprises (SMEs) have never been visible in the GRI field".

This study suffers from a number of limitations. In relation to the interviews conducted in Phase 1, while interviews were in-depth the number of interviews was only ten, and the themes arising must therefore be treated with some caution. Future research might usefully focus on a particular user group, such as regulators, users and community members to deepen the analysis presented here. The complexities of water disclosure suggest such further exploration is warranted along a number of trajectories. The disclosure of water usage from a catchment perspective, including the identity of large water users, is clearly a large and complex undertaking, and one which needs much further exploration with report users, regulators and operators. In relation to the disclosures analysed in Phase 2, the study examined major water users using the 2005 listing, which would exclude major users who began operation after that date. More broadly, the study considered a single location and therefore generalisation of results may not be valid. In relation to disclosures, a major limitation was that internet disclosures were not recorded, at a time when they have become an increasingly important form of disclosure (Adams and Frost, 2004; Lodhia, 2010; Lodhia, 2012). Investigation of this dimension of disclosure therefore constitutes an important avenue for future research.

One theme deserving particular attention involves the concerns regarding the difficulty of comparing the efficiency of water uses. While efficiency metrics are currently required by the WDP and reported by many organisations, there is a legitimate concern that they might be unhelpful at best and misleading at worst. Morrison and Shulte (2009) suggest creation of industry-specific reporting templates to address this issue, and Mudd (2008; 2012) has attempted (with some success) to calculate efficiency metrics for the mining industry. While encouraging companies to disclose efficiency metrics certainly warrants consideration, a more comprehensive solution might be to develop typical water use profiles of particular activities, such as bottling plants, and then to report both site water use and variation from the benchmark.

Whilst development of such profiles might seem utopian, this is broadly the method used for reporting pollution data under schemes such as the US Toxic Release Inventory and the Australian National Pollutant Inventory. Under these schemes, "handbooks" are used to convert production data into pollutant amounts that must be reported (Commonwealth Department of Sustainability, 2011) as direct monitoring for pollutant levels is generally prohibitively expensive. Given that profiling is already taking place for pollution outputs per unit of production, it is conceptually a relatively small step to profile production inputs such as water (and for that matter, energy). This is an area that might usefully be explored in further research.

Water pricing remains a vexing issue, and one likely to resist any simple solution. Certainly further investigation into the role of pricing in demand management appears warranted, particularly in light of the equity issues raised in the study. This is an interesting facet of water pricing not typically taken into account in water pricing studies which generally focus on demand elasticity estimation as opposed to pricing equity (Barrett, 2004; Independent Pricing and Regulatory Tribunal, 2004; O'Dea and Cooper, 2008). This conclusion resonates with the recent *World Water Development Report*:

> While economic theory suggests that pricing policies may be useful for achieving targets, in practice, prices serve several conflicting purposes: financing of water service-related infrastructure, incentives for efficient use of scarce resources, and fairness and distributional justice . . . Simply monitoring water prices does not necessarily provide a useful indication of policy success, unless it is done in a manner that reflects the real-life objectives of improved water management. (WWAP, 2012, p. 168)

Price issues are also related to the problems of identifying efficient water users noted above, in that it is difficult to reward (or punish) efficient (or inefficient) users. Development of robust efficiency measures would significantly assist regulators in this regard. A more radical option would be to approach corporate activity from a social contract point of view, and grant baseline water allocation based on proxies for societal contribution, such as taxation payments and/or payroll. Premium water allocation could then be traded within the urban catchment using the same process as for rural water use.

Finally, the disclosure studies to date, both those canvassing international companies and their overseas counterparts, have *almost exclusively focused on large companies as opposed to large water users*. While there may be a relationship between these dimensions, the correlation may not always hold. Large service organisations (banks, insurance companies, accounting firms and so on) will have limited water impacts, whilst smaller organisations (such as irrigators) may have large impacts. We therefore do not know the reporting practices of smaller organisations that are large water users, and similarly do not know the extent to which information might be available in order to provide an informed view of water use within a particular catchment. The one study that included non-public companies in their sample was Egan and Frost (2010) who suggested that this dimension may have important implications for reporting quality. Further research exploring environmental (and social) accountability for non-public companies is therefore critically important for improved environmental outcomes.

Endnotes

[1] The GRI also issued a specific "Water Protocol" in 2003, labelled "Pilot Version 1.0" (Global Reporting Initiative, 2003). This Protocol provides additional detail regarding water-related disclosures (but is not referred to at all in the G3 Guidelines). For example, the Protocol recommends that organisations report on various "common water / wastewater quality parameters": biological oxygen demand (BOD5); total suspended solids (TSS); chemical oxygen demand (COD); nitrate nitrogen and phosphorous. In addition, organisations should also "consider the relevance" of reporting on metals, hazardous substances and persistent organic pollutants (GRI, 2003, p.14). These requirements resonate with the pollution inventories developed in many countries that mirror the US Toxic Release Inventory, such as the Australian National Pollutant Inventory. The Water Protocol also discusses the issue of water withdrawals in its context in much greater detail than the G3 guidelines, which merely suggests (via EN9 discussed above) that "significant" withdrawals be disclosed. The Water Protocol suggests that withdrawals be disclosed as a ratio of renewable supplies, which would therefore require utilising other environmental data sets:

> The indicator is the ratio of the total water withdrawn (EN5a) to the total renewable quantity available in the source of water from which the withdrawal was taken. Estimates of the annual average renewable supply are best obtained from local or national level water-related ministries or government agencies. For facilities located in the United States, information can be obtained from the EPA website Surf Your Watershed at: http://www.epa.gov/surf . . . Histograms should be created to show the ratios by number of sites. (GRI, 2003, p.17-18)

[2] Given that the researcher was also acting as a consultant for the Bureau of Meteorology it is possible that interviewees were biased towards endorsing the water accounting approach being explored by the Bureau. Two aspects of the study mitigated this risk – first, all interviewees were explicitly made aware that interviews were not part of the researcher's consulting role but constituted PhD research both by the researcher and by Bureau staff. This fact was also clearly stated in the ethics forms signed by interviewees. More fundamentally, the topic

areas of the interviews were largely independent of the researcher's work for BoM, as the role of the researcher was to assist with the exploratory phase of National Water Accounting Standards development, but the interviews addressed disclosures appropriate at the corporate level. When the interviews were conducted corporate disclosures were not the primary focus of Australian Water Accounting Standards and this position persists to the time of writing. A converse risk of interviewee bias is that the researcher may be biased due to his ongoing relationship with the Bureau and with some interviewees and thus jeopardise the "vital minimum" level of independence necessary for scholarship (McSweeney, 2004). Though such bias can never be eliminated, this risk is minimized by following the strict data analysis protocol described in Section 4.1 and to the relatively unambiguous data collected, as is clear from the responses quoted in Section 4.2.

[3] Logit differs from probit in that probit assumes normal and logit assumes logarithmic variable distribution (Train, 2009). As there is some uncertainty regarding disclosure distribution in this study both models were employed and they provided similar (though not identical) results.

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Chapter 6 - Conclusions

6.1 Introduction

This thesis has explored a number of questions relating to the provision of corporate water-related information. The importance of water as a key concern is well established both globally (United Nations Development Programme, 2006; United Nations Educational Scientific and Cultural Organisation (UNESCO), 2006; United Nations Educational, 2009; United Nations General Assembly, 2010; United Nations Educational, 2011; WWAP (World Water Assessment Programme), 2012) and for Australia (National Land and Water Resources Audit, 2001; CSIRO Sustainable Ecosystems, 2002; National Water Commission, 2006; The Wentworth Group, 2006). Water is also of increasing interest to the corporate sector, in their roles both as users of water and of providers of water-related services (World Business Council for Sustainable Development, 2006; World Business Council for Sustainable Development and International Union for the Conservation of Nature, 2009; Newborne and Mason, 2012).

Water information is recognised as a central element of effective water management (Slattery, 2008; Pretorius and Turton, 2012; Slattery *et al.*, 2012; WWAP (World Water Assessment Programme), 2012) and a number of standards have been released to provide guidance for the disclosure of corporate water-related information (Global Reporting Initiative, 2000, 2002, 2006, 2011d; UNEP, 2011; Carbon Disclosure Project, 2012; Minerals Council of Australia, 2012; Alliance for Water Stewardship, 2013; Global Reporting Initiative, 2013b). Corporate water reporting has also become an increasing area of interest to researchers (Cordery *et al.*, 2007; Pacific Institute, 2008; Cote and Moran, 2009; Mudd, 2009; Morrison and Schulte, 2010; CIMA (Chartered Institute of Management Accountants), 2011; UNEP, 2011; Alliance for Water Stewardship, 2012; Hazelton *et al.*, 2012; Schornagel *et al.*, 2012; Squillace, 2012; Meteorology, undated).

Given this context, this thesis has examined three main questions in relation to corporate water-related disclosures. First, the thesis explored the role of corporations in society, and what can be expected of corporate conduct. Second, the thesis explored to what extent the community has a right to water-related information from corporations. Third, the thesis explored what form this information might take. Fundamentally, these are normative questions, which seek to explore how things *should be* as opposed to explaining or predicted how they are or will be. Whilst normative questions have come under fire in SEA from positivists (Watts and Zimmerman, 1978, 1979) such criticisms have been rebutted both within SEA (Okcabol and Tinker, 1990) and more generally (Putnam, 1993; Rachels, 2003).

Adopting a method of philosophical inquiry, and taking Friedman (1993 (first published 1970)) as starting point, Paper 1 explored what expectations communities might have in relation to corporate conduct. Paper 1 argued that corporations should fundamentally be considered amoral entities, which suggests that they should not be expected to self-impose limits to their operations. This view has a number of implications, and in relation to water it suggests that corporate water use will always primarily be constrained only when it impacts profitability, either directly through the cost of purchased water or indirectly through reputational impacts (which might be highlighted by disclosure), or is directly restricted via licencing.

Given the role of corporations established in Paper 1, Paper 2 explored the extent to which the community has a right to demand access to corporate water-related information. Paper 2 followed the method of philosophical enquiry and adopted the approach of Griffin (2008) and Sen (1993, 2004) to determine whether a given right might constitute a human right. Paper 2 contended that because water is a fundamental issue facing much of humanity, that access to corporate water-related information might indeed be considered not only desirable but to constitute a human right. Various options as to how this right might be realised were discussed but not definitively answered, and additional research called for.

Papers 3 and 4 explored different means by which a right to corporate water-related information might be realised. Given the ability of product labels to influence decision-making (Weaver and Finke, 2003; Gracia *et al.*, 2007; Roe and Teisl, 2007; Beekman, 2008; Siipi and Uusitalo, 2008; Unnevehr and Jagmanaite, 2008) Paper 3 drew on archival and interview data to analyse product-level water footprint reporting. Paper 3 concluded that whilst water footprint reporting at the product level might be desirable, it is limited on practical grounds in relation to measurement of water extractions and in particular of catchment water stress, a crucial dimension given the non-fungible nature of water extractions (Falkenmark, 2004; Irbaris, 2009).

Paper 4 drew on interview data and reporting from Sydney's largest water users to explore the potential and practices of site level water reporting. Paper 4 argued that due to the contextually dependent nature of water extractions, corporate accountability is best realised via site level reporting, echoing the sentiments of previous SEA researchers calling for greater attention to geographic as opposed to organisational reporting boundaries (Schaltegger, 1997; Gray and Milne, 2004; Leong and Hazelton, 2008; Gray, 2010). Paper 4 contended that this reporting is feasible, especially by drawing on information which water providers already hold. Finally Paper 4 argued that site-level reporting is currently inadequate in the Sydney Metropolitan region, and that given the poor level of corporate water reporting noted in other studies (e.g. Jones *et al.*, 2005; Morikawa *et al.*, 2007; Morrison and Schulte, 2009; Prior, 2009; Egan and Frost, 2010; The Association of Chartered Certified Accountants, 2010) there is no reason to believe this finding is an anomaly.

The following sections consider the collective implications of this thesis in terms of water regulation and disclosure as well as broader implications for SEA research. For corporate water accounting frameworks, a glaring omission is the local orientation in relation to both reporting in relation to wider water stress and the site-level. In any event these aspects are both better situated in government water accounting, but even the most advanced governmental

reporting system – Australia's – does not include these aspects. In relation to SEA research, a key thrust of the studies is that the historic focus within SEA on corporate accountability via examination of corporate disclosures in annual reports needs to be broadened. One of the main findings of this thesis is that annual reports may not be the main, or even an important, lever for corporate accountability. Of the various approaches canvassed in the literature and this thesis, the model of corporate reporting to a central government agency that then provides this information to the general public is the most attractive. In addition to enhancing comparability, this approach can also include the oft-neglected SME sector and opens new possibilities for effective assurance. These matters are considered in turn below.

6.2 Implications for water regulation

One of the most important themes of this thesis is that of the importance of information for resolving water issues. Paper 1 made the case that corporations are amoral entities, and therefore regulation is critical to align societal and corporate interests. Yet as the previous discussion points out, regulators cannot rely on price signals to drive optimal behaviour. Given the varied interests of stakeholders, community deliberation is necessary, and as Paper 2 argued, the importance of water means that community participation in water-related deliberations is a core right. Since access to water-related information is critical to meaningful participation, this access too becomes a core community right.

Having established a community right to corporate water-related information, the critical question becomes how this right might be realised. Though SEA research has typically focused at the level of the corporation, Paper 2 endorsed the contentions of some commentators (Schaltegger, 1997; Gray and Milne, 2004; Leong and Hazelton, 2008; Gray, 2010) who suggested that the corporate locus might not be the most useful for community information. This charge is particularly pertinent in the case of water, because the uneven distribution of water demand and of water resources drives radically different levels of water stress – and hence the significance of water extractions and discharges – in

different locations (Irbaris, 2009). From a water management perspective, the key unit of analysis is the catchment (Falkenmark, 2004; Pigram, 2006). Water might therefore be considered a 'global/local' issue, in that it is of global significance but must be evaluated and managed on a local level. Aggregation is largely meaningless; and the Australian *National Water Account* (discussed further below) therefore comprises consistently prepared but separate accounts for different geographic locations as opposed to a single aggregated report (Bureau of Meteorology, 2011, 2012b).

Mindful of the criticality of water context, Papers 3 and 4 explored new options for corporate water reporting. Given the increasing interest in the area of the water footprint and virtual water (Frontier Economics, 2008; Hoekstra *et al.*, 2011; UNEP, 2011; Chapagain and Tickner, 2012; Hoekstra, 2012) together with evidence that labelling schemes do seem to have influenced consumers and producers (Weaver and Finke, 2003; Gracia *et al.*, 2007; Roe and Teisl, 2007; Beekman, 2008; Siipi and Uusitalo, 2008; Unnevehr and Jagmanaite, 2008) and are generally supported by consumer research (L.E.K. Consulting, 2007; Populus, 2007; Upham and Bleda, 2009), Paper 3 investigated the feasibility of water labelling of products.

An important finding of Paper 3 was that while the concept of the water footprint was viewed as useful at a general level, technical limitations prevent it from being applied to specific products. The main limitations were around water measurement – particularly in relation to soil moisture – and also to catchment stress. Given the importance of the unit of the catchment to water analysis, it is increasingly apparent that a generally accepted measure of catchment stress will be a cornerstone of an effective water reporting framework. A number of measures of water stress are reviewed by Brown and Matlock (2011), and their work reveals there are many plausible methods available. The World Business Council has developed a tool to assist corporations evaluate water stress (World Business Council for Sustainable Development, 2012), boasting integration of information from over 30 data sources. Yet the complexity and importance of this task are such that responsibility to evaluate water stress seems to fall more

appropriately on water managers than water users. After all, it is water managers who are responsible for administering water licences and determining water allocations, which both require evaluations of water stress, and these managers are also (usually) charged with environmental responsibilities as well.

Though Muller (2012, pp. 212-213) cautions against reliance on a single measure of water stress, a comparable global assessment of catchments around the world could be utilised by regulators, water users and the community to evaluate and report on water use. At a minimum, it would enable water users to evaluate what constitutes a 'significant' water withdrawal when reporting against GRI Indicator EN9, which requires disclosure of withdrawals that have significant impact on a water resource. One possibility is that a supra-national agency might take the lead on this issue. The UN would seem ideally positioned for this task given the long-standing interest in water and production of the tri-annual *World Water Development Report* (WWDR). Going forward, the WWDR might also include an assessment of major catchments around the world and their relative levels of water stress. This is clearly an important matter for future research.

Paper 4 then considered reporting at the site level, an aspect that has received surprisingly little attention within SEA research. Water experts considered site level disclosures within catchments as a promising mechanism for corporate accountability. The importance of site-level water information is consistent with more recent work performed on water disclosures, particularly in the mining sector. As Muller (2012, p. 208) points out:

> If [water use] reports were available for all water users, further information could be compiled to put this water use into context. Examples of information that could be compiled include how much water is used in a particular geographical area and the proportion of that use attributed to a particular user.

Though Muller distinguishes such a measure from corporate sustainability, Mudd (2008) provides an example of how such information might be utilised, by evaluating the relative water efficiency of mine sites both to each other and over time. Such comparative capability is possible in relation to pollutant reporting

regimes such as the US Toxic Release Inventory and its international equivalents, which have been credited with such success (Fung and O'Rourke, 2000; Sand, 2002; Stephan, 2002). This issue is discussed in section 3 further below.

In relation to the ability to provide site-level information, the analysis in Paper 4 showed that (especially within urban settings), this information was readily to hand for corporations, and even more readily to hand for water providers. Indeed in some settings a single organisation is responsible for the delivery to users, and therefore ideally placed to provide basic water usage information. In this sense the monopoly position of water providers might be harnessed to improve the accountability of their customers to the community. The review of Sydney's large water users revealed, however, that site-level information was rarely provided, a finding consistent with more general reviews of corporate water disclosures (Morikawa *et al.*, 2007; Morrison and Schulte, 2009; Mudd, 2009; Prior, 2009; Barton and Morgan-Knott, 2010; Egan and Frost, 2010; The Association of Chartered Certified Accountants, 2010; CIMA (Chartered Institute of Management Accountants), 2011; ERIS, 2011; Mudd, 2012).

In non-urban sectors more work is required for usage information to be consistent. In relation to the extractive industries Cote *et al.* (2012, p. 93) suggest that while site level information is captured for virtually all mine sites, the presentation of this information may be disparate, even within a single organisation. Mudd (2008, pp. 142-143) also points out that estimating mining water use becomes more complex when dealing with measuring non-metered water use (e.g. from rainfall) and of recycled water. These difficulties are also likely to be significant in relation to the agricultural sector. Nevertheless, reporting at a site level seems to be the most promising avenue for corporate water accountability.

Interestingly, site level reporting is beginning to be more prominent within water reporting frameworks. The GRI is deficient in this regard; as Paper 4 points out, the term 'source' in GRI Indicator EN8 is not a reference to location, but rather to category; namely surface water, ground water, rain water, waste water and water from utilities (Global Reporting Initiative, 2011b, p. 14), a situation that remains under the

GRI G4. The 2012 CDP Water Disclosure Project Survey (Carbon Disclosure Project, 2011) provides a much greater emphasis on both the supply chain and geographically based water reporting. For example, Question 7.1(a) asks for water withdrawals by 'Country or geographical reach', and geographical information is also requested in relation to recycling (7.2(a)), significantly affected water sources (7.4(a)) as well as discharges (8.2(a) and (b)). This information is also requested in relation to more general questions relating to water risks and opportunities (questions 2-6). The (beta) AWS Water Stewardship Standard (Alliance for Water Stewardship, 2013) focuses on site level stewardship and reporting, but in terms of water use data, section 6.6 requires only that a corporation comply with either GRI or CDP reporting standards. The most detailed example of site-level reporting requirements is the *Water Accounting Framework for the Minerals Industry* (Minerals Council of Australia, 2012). This framework comprises a detailed set of reporting requirements for 'operational boundary', which '[t]ypically . . . will consist of the mine site including mineral processing operations if present' (section 2.1). While giving some wriggle-room, this is the currently the clearest requirement for reporting site level data within a water accounting framework.

A means to overcome the deficiencies in the current corporate water accounting frameworks is the imposition of greater site level reporting requirements, and that is certainly one implication of this study. However there are two important caveats on the effectiveness of this approach. The first is that the frameworks discussed above are voluntary. While compliance with such frameworks might drive improved performance in some instances, extensive reporting is often *inversely* related with positive environmental outcomes (Deegan and Rankin, 1996; Cho and Patten, 2007; Cho *et al.*, 2010; Cho *et al.*, 2012a; Cho *et al.*, 2012b) as organisations attempt to legitimate themselves (Deegan, 2002). The second limitation is that the organisations that typically comply with voluntary sustainability reporting frameworks are large (Milne and Gray, 2007), and those that have their reporting externally verified even larger (Owen, 2007). As Brown *et al.* (2009, p. 573) point out '[s]mall and medium size enterprises (SMEs) have never been visible in the GRI field'. Yet the study of Sydney water users confirmed the supposition by Egan and Frost (2010) that SMEs may be both significant water users and under-reporters.

In addition to modifying corporate reporting frameworks, a key conclusion is therefore to modify governmental water reporting practices. In an Australian context, calls to improve geographic level water reporting have been long voiced (The Wentworth Group, 2002, 2003, 2006, 2008), though these have not included a focus on site level and/or corporate water use. A promising avenue for such reporting is via modification of *Australian Water Accounting Standard 1* (AWAS 1), which currently governs the preparation of the annual National Water Account. AWAS 1 requires setting a reporting boundary that satisfies the needs of report users and does not currently require site-level disclosures. While some studies content the existing iteration of the standard meets the needs of users (Sofocleous, 2010) others have been more critical (Tello Melendez *et al.*, 2012). A benefits analysis of the standard conducted by BoM together with Deloitte, Ernst and Young and Macquarie University (Bureau of Meteorology, 2012a; Deloitte Access Economics, 2012; Ernst & Young, 2012; Hazelton *et al.*, 2012) concluded that the long-term benefits of implementation outweighed the costs, but emphasised that the current standard was only the beginning of a much longer journey. Modification of the standard is therefore not merely possible but expected. Any future modifications to require more detailed reporting will have to overcome certain legislative challenges, however; as noted in Paper 4, Section 123(2)(b) of the *Water Act* (2007) prohibits the Bureau of Meteorology from publishing information regarding a person's water use unless that information is already published or otherwise publicly available. While the term 'person' is not explicitly defined in the legislation, it is described by both the Bureau's explanatory document and the subsequent *Water Regulations 2008* (Cwth) as including both natural persons and organisations, meaning that the Bureau would be precluded from publishing details of, say, large water users if they were not published elsewhere.

While site-level reporting, organised by catchment, was the central theme of Paper 4, an interesting additional finding was support for this information to also be included in organisational reports. This position resonates with the contention of Gray (2010). While critical of organisational sustainability reports as presenting 'the' account of organisational (un)sustainability (primarily on the

mismatch of organisational and environmental boundaries discussed above), Gray (2010) nevertheless supports the pluralist production of organisational reports using a variety of methodologies (including the ecological footprint). This suggests that geographically based reporting should not be considered primarily as an alternative for organisational reporting as suggested by Leong and Hazelton (2008) but rather as a complement to it.

While this thesis focused on the particular issue of water, the results of the papers both individually and collectively have important implications for SEA research more generally. These implications are discussed in the following section.

6.3 Broader implications for SEA research

In relation to SEA research, three broad themes are evident from this thesis. First, the argument that corporations are profit maximising entities means that looking to the corporate sector to improve their performance is unreasonable, and puts the spotlight on improved regulation, or more radically, looking to new organisational forms. Second, the argument that access to certain corporate information may constitute a human right might extend to a variety of social and environmental domains. Third, the exploration of the most likely form of disclosures to realise these rights to information leads to the conclusion that geographic or site-level reporting is a more promising disclosure mechanism than traditional corporate sustainability reports. These themes are considered in turn below.

6.3.1 The corporation as a profit maximising entity

Paper 1 argued that corporations should be considered amoral entities due to a lack of autonomy, a position consistent with many authors both within SEA (Tinker *et al.*, 1991; Gray and Milne, 2004; Adams and Whelan, 2009) and externally (Danley, 1993; Bakan, 2004). As noted in Paper 2, institutional theory

provides some challenge to this position by arguing that institutional change is driven by factors other than competitive pressures (such as mimicry of exemplars). Nevertheless, Schumpeter's famous description of capitalism as 'creative destruction' is apt; the average lifespan of even a Fortune 500 company has been estimated to be between 40 and 50 years (de Geus, 1997, p. 7).

While the idea of creative destruction is not unique to capitalism – Reinert and Reinert (2006) trace the idea back to Hindu origins - and whilst obviously not all corporate behaviour can be explained by the necessity to maximise profits, it seems absurd to ignore the 'commercial realities' of corporate life. Indeed Rothschild (1995) conceives business enterprise as a Darwinian battle for the survival of the fittest, with businesses constantly competing for scarce resources and evolving to adapting to changes in the regulatory and competitive landscape.

Considering the question of corporate autonomy in the context of water, Newborne and Mason (2012) review the potential of public-private partnerships and caution about expecting 'normative' shifts from corporations in relation to water conservation given their legal form, though they acknowledge country-level differences in the legal constitution of corporations may permit differing levels of divergence from shareholder primacy. Nevertheless, they point out that:

> [R]esponsibility resides with governments for *setting* and *overseeing* the legislative and policy frameworks within which national systems of water resources management function . . . The core of that public role is water allocation between different, often competing, uses – the expectation of citizens (or, in some countries, their aspiration) is that the state, or equivalent public authority, will act as arbiter in issues of appropriate allocation of public goods (Newborne and Mason, 2012, p. 606 [emphasis in original]).

Other authors also highlight the implications of profit maximizing actors operating within water decision-making structures. Hepworth (2012, p. 544) notes the poplar notion of 'shared water risk', meaning that both public and

private sectors suffer from water shortages, but also points to the potential for misalignment between the goals of corporation and citizen:

> 'Stakeholder engagement' is used to describe a wide range of activities ranging from collaborative projects targeting information-sharing, basin-restoration and water supply and infrastructural improvements, to participating or convening platforms for discussion and oversight, to influencing policy. Activities which explicitly intend to influence governance include advocacy, lobbying, partnership, financial support, facilitation, or institutional strengthening at the local, watershed, state or national level (WWF, 2009). These are at the sharp end of corporate engagement on water policy, both in terms of the potential to drive progress, reputational risks for companies involved and the risk of public policy processes and outcomes being captured by corporate interests (Hepworth, 2012, p. 549).

In relation to information, Newborne and Mason (2012) also note that that critical water information might be in the hands of the private sector. They cite the example of Coca Cola making data available to the World Resources Institute (Newborne and Mason, 2012, p. 612). While this might be an act of generosity, the theme of private collection of water information critical to the public good is considered less sanguinely by Cordery *et al.* (2007, p. 258): '[i]n many situations, the only data in a whole region was collected by a body that has been corporatised and this body now cites "commercial-in-confidence" claims to restrict access to collected data'(Cordery *et al.*, 2007, p. 258)(Cordery *et al.*, 2007, p. 258)(Cordery *et al.*, 2007, p. 258)(Cordery *et al.*, 2007, p. 258). A key question is therefore to what extent communities have a right to this information; a second theme discussed below.

6.3.2 A broader conception of establishing and realising rights to information

Paper 2 provided a detailed argument for access to corporate water-related information to constitute a human right. More broadly, Paper 2 outlined a

method for determining whether a candidate right might constitute a human right following the approach of Griffin (2008) and Sen (2004), and also considered the extent to which a corporate right to privacy might be regarded as a valid objection. Apart from theoretical interest, this work was motivated by the observation that human rights claims have moral force (Clapham, 2007) and might therefore be of use to academics and activists wishing to engage more actively with policy, an activity called for by Gallhofer and Haslam (1997). While there is burgeoning interest in corporate observation of human rights (Gowri, 1998; McIntosh, 2000; Stoll, 2005; Grear, 2006; Ruggie, 2008, 2009; Bishop, 2012; Cragg *et al.*, 2012; Wettstein, 2012; Wood, 2012) and corporate reporting of human rights (Cooper *et al.*, 2011; Frankental, 2011; Gallhofer *et al.*, 2011; Global Reporting Initiative, 2011c; Gray and Gray, 2011; McPhail and McKernan, 2011; Sikka, 2011), there remains little research concerning information as a human right.

Yet access to information, particularly governmental information, is a critical issue around the world. Singh and Khan (2012, p. 274) state that at least 85 countries around the world have enacted legislation that grants citizens rights to information. Accounting principles of reliability, timeliness, relevance, decision-usefulness and so on could be deployed to evaluate the success (or lack thereof) of such initiatives, particularly in relation to the information citizens might require regarding corporate actors that is collected by government agencies. An obvious candidate in this regards is carbon, but there are also many others, biodiversity and pollutants in the environmental realm, and diversity and political donations in the social to name just a few. Such disclosures could be tested following the methodology applied in Paper 2; namely by considering the extent to which the candidate right is consistent with 'founding' human rights and both important and may be influenced by societal action (following Sen, 1993, 2004; Griffin, 2008). Due to the widespread recognition of human rights, demands for improved reporting of information grounded in this way might have additional moral force.

The thesis has also explored means to realise such information rights, a task begun in Paper 2 and then continued in more depth in Paper 3 and Paper 4. A critical observation common to all three papers is that rights might be realised via means other than corporate sustainability reports. This contention is consistent with many SEA researchers, where the dissatisfaction within TBL reporting (Moneva *et al.*, 2006; Farneti and Guthrie, 2009; Gray, 2010; Milne and Gray, forthcoming) has led to increasing calls for alternative methods to be adopted. One of the most promising methods is geographic reporting, discussed below.

6.3.3 Geographic reporting

As noted in Papers 3 and 4, while footprinting and labelling is certainly of interest, the disclosure regime of more immediate promise for improved corporate water accountability is geographic, or location-based reporting. After all, the most successful disclosure model so far developed appears to be the TRI and its international equivalents, including the Canadian *National Release Inventory* (1993), the Indonesian *Program for Pollution Control Evaluation and Rating* (1995), the Australian *National Pollutant Inventory* (1998) the UK *Pollutant Inventory* (1998), the Philippine *Eco-watch* (1998) and Chinese *Green-watch* (1999). This thesis has identified both opportunities and challenges when it comes to geographic reporting which are discussed in turn below.

6.3.3.1 Opportunities of geographic reporting

The analysis of Papers 2 and 4 has identified that the database approach offers two key advantages over competing models: comparability across firms and the ability to require meaningful disclosures from small and medium enterprises (SMEs).

In his analysis of the success of the TRI, Stephan (2002) identifies various elements (including public outrage, improved return on regulatory capital and appropriate media scrutiny) but all hinge on inter-firm comparability. By way of

contrast, when the GRI cites comparability, it does so in the context of inter-temporal comparability within a single firm (Global Reporting Initiative, 2011d, p. 14). But the question of boundaries is inherently highly problematic for the TBL model, both because of the irrelevance of the legal form to many stakeholders, the arbitrary aspects of consolidation and to the deleterious impact on disclosure of changes in the composition of legal entities over time. Even those advocating corporate-wide bans typically do so in the name of particular instances, such as Shell in Nigeria (Boele *et al.*, 2001b, a; Wheeler *et al.*, 2001), Nike in Indonesia (Mayer, 2007; Nesteruk, 2007) and Coca Cola in India (Hills and Welford, 2005; Burnett and Welford, 2007). Therefore it is disclosures at such local levels that are of primary interest to local communities, a key stakeholder group.

As noted above, some SEA researchers have noted that environmental issues rarely map neatly onto corporate ownership structures (Schaltegger, 1997; Gray and Milne, 2004; Leong and Hazelton, 2008; Gray, 2010). A similar point might be made regarding corporate accountability. The experience of the TRI suggests that communities are concerned about corporate activities in a particular region or instance rather than in aggregate. For a company to assert that overall emissions per unit of production are lower than the industry average is cold comfort to those living next to a site belching pollutants. Of far more value is knowing how that plant compares to others, and how the level of pollution experienced by residents compares to safe levels.

Financial accounting has long struggled with determining the appropriate level of disaggregated reporting. The most relevant standard is IFRS 8 - *Operating Segments*, which permits organisations wide discretion as to the basis for reporting segments. The composition of segments may be determined either on geographic or product lines, disclosure is only required when information is available, and there are no requirements regarding the level of disaggregation necessary save for the provision in paragraph 8.15 that at least 75% of an entity's revenue must be accounted for in segment disclosures.

As noted in Papers 2 and 4, the GRI is similarly ambiguous when it comes to setting local boundaries, stating merely that '[r]eporting organizations will need to determine the level of aggregation at which to present information' (Global Reporting Initiative, 2011d, p. 40). In relation to segments, the GRI (Global Reporting Initiative, 2011a, p. 3) suggests that organisations follow the financial accounting approach in relation to economic indicators (though the reference is to the superseded IAS 14), but in terms of environmental and other indicators it is largely silent, offering merely a general principle that '[d]isaggregation may vary by Indicator, but will generally provide more insight than a single, aggregated figure' (Global Reporting Initiative, 2011d, p. 40). This approach remains in the new G4 Guidelines, though the renewed emphasis on stakeholder-driven reporting means that boundaries and levels of aggregation should be determined by stakeholder needs (Global Reporting Initiative, 2013a, p. 36).

Geographic, site-level reporting overcomes these issues because it allows stakeholders access to information at the most granular level, and enables them to aggregate or compare this information. The successes of the TRI have been attributed to this feature, as it allows individuals, NGOs, the media and regulators to identify sub-standard performers much more easily (Fung and O'Rourke, 2000; Sand, 2002; Stephan, 2002), a point reiterated by interviewees described in Paper 4.

An important additional advantage of database reporting is that it makes visible the contribution of SMEs. Because SMEs do not typically disclose social and environmental information and fall outside of reporting samples, their absence is invisible from most SEA disclosure studies. Yet as Paper 4 demonstrates, just because organisations might be small, privately owned or both does not necessarily mean that they are not significant in environmental (or social) terms individually as well as collectively. While it might be supposed that there might be a more robust correlation between organisational size and carbon impact than was the case for water, this is yet to be established empirically. In any event, with SMEs playing a significant role in most economies, the impact of the sector as a whole on any social or environmental matter is likely to be substantial.

Given the importance of SMEs, any 'new accountings' (Bebbington and Gray, 2001) must encompass SMEs to provide a substantial improvement on existing corporate TBL accounts. The advantage of databases is that reporting thresholds can be calibrated at levels of detail not possible for other reporting regimes. The Australian National Pollutant Inventory, for example, details separate reporting thresholds for each of the 93 pollutants covered by the regime (Commonwealth Department of Sustainability, 2011). This means that it is impact, defined at a fine-grained level, as opposed to organisational size, that is the trigger for reporting and hence enhanced accountability.

For all these advantages however, the thesis has also identified two key challenges for geographic reporting, namely issues of measurement and the necessity to provide qualitative context. These are discussed below.

6.3.3.2 Challenges of geographic reporting

A key challenge to geographic reporting is the difficulty of measurement, a topic considered in Papers 3 and 4 in relation to water. Whilst focusing on a single numeric item makes compiling and assuring disclosures considerably more feasible than attempting to do so on an entire sustainability report, when compared to most financial transactions such reporting is inherently problematic. The main measurement issue that financial accounting tends to encounter is that of judgement. Estimation of appropriate provisions for doubtful debts, obsolete inventory or outstanding claims may materially impact the financial position of an entity, and the best that an auditor can do is ensure that a reasonable process has been followed. For the majority of transactions, however, the accountant has a measurable sum of money that has changed hands, and that only needs to be processed in accordance with (generally) well-defined rules.

As explored in Papers 3 and 4 and discussed in section 2 above, measuring even a simple water metric such as water use can be complex. Moving beyond water

to pollutants, measurement issues are similarly challenging, in that conversion factors from operations through to carbon equivalent are difficult and the conversion factors themselves subject to change (Olson, 2010, p. 941). The primary difficulty is that it is expensive to measure actual emissions generated by an activity. This means that two techniques are employed – either direct estimation using a sample period or the use of ratings books that estimate pollution per unit of production based on historic experience. Obviously both options introduce significant margins for error, and this is particularly applicable to Australian organisations using ratings books as such books are often based on US measurements which may not correspond to Australian experience due to differences in geology (and therefore the chemical composition of production inputs such as coal). Concerns regarding measurement echo the issues described in relation to water quality. More research is certainly needed into measurement issues, and the accounting community would seem well placed to provide expert analysis.

While measurement is difficult, possibly an even more important issue for database-type reporting concerns the quantitative focus of this approach. While such reporting constitutes one of the key strengths of the initiatives, it also opens the possibility for inappropriate vilification by the community and/or media, as organisations have limited opportunity to explain results. In relation to water this point was made by a number of interviewees and discussed in Papers 3 and 4, where concerns were raised regarding the potentially misleading nature of quantitative information being provided without sufficient qualitative context. Of course, organisations could conceivably provide some commentary through their usual communication channels (press releases, websites and reports) but relying on media and the public to investigate to this level may (unfortunately) be unwise. Therefore a key issue that accountants might also engage in is how such narrative elements might be incorporated within such a model.

The findings from this thesis discussed in sections 2 and 3 above have highlighted a number of areas for future research in relation to product-level

reporting, site-level reporting and the corporate form. These areas are discussed in further detail below.

6.4 Additional areas for future research

6.4.1 Product level reporting

The idea of the ecological footprint as a possible alternative or additional reporting line to TBL results is emerging in some SEA literature (Gray, 2010, p. 5; Milne and Gray, forthcoming). From the discussion provided in Paper 3, both some potential pitfalls and promising lines of enquiry within the broader footprint paradigm are apparent. The main pitfall is to believe that the ecological footprint (and derivative ideas such as the water footprint or carbon footprint) resolves the well-documented problems of aggregation that bedevil the triple bottom line concept (Norman and MacDonald, 2004; MacDonald and Norman, 2007; Pava, 2007). Yet the ecological footprint entails similar aggregation, for example of carbon and waste, and therefore sparks similar debates regarding both the completeness and accuracy of the calculation (Fiala, 2008; Kitzes *et al.*, 2009). These issues remain even at lower levels of granularity, such as the calculation of water or carbon footprint. Paper 3 explores these issues in depth in relation to the non-fungibility of water extractions, and in relation to carbon the relative weighting of greenhouse gases into a single carbon equivalent, and the selection of the appropriate time horizon, is similarly controversial (Salbe, 2011).

SEA academics could make a strong contribution to this debate, which is currently mostly occurring in other disciplines (e.g. Vanham and Bidoglio, 2013). Some industry groups are engaging with LCA to the extent of releasing accounting guides addressing the issue (Beverage Industry Environmental Roundtable, 2011). Within SEA there is emerging interest with analysing footprinting issues (Bicalho, 2012) though there has been little exploration of product labelling (Gondor and Morimoto, 2011). Future work would be helpful

in this regard; as noted in Paper 3 and above, product labelling is an under-researched area within SEA, and given the empirical support to the decision-usefulness of product labels an area that deserves further attention. For example, the extent to which labels have promoted accountability and the assurance of such labels are all areas ripe for future exploration, and whilst there has been some exploration of these issues in relation to labelling schemes such as Fair Trade (Hira and Ferrie, 2006; Gibbon, 2012), few of the insights from the body of SEA work have yet been brought to bear on this important area.

In relation to the specific issue of water, Paper 3 suggests consideration of a simple traffic-light system for catchment stress might provide a framework for communication of the proportion of the water footprint sourced from water-scarce versus water-abundant areas. Future research along these lines might involve further development of the system in collaboration with the scientific community and subsequent trials with both report preparers and users. In particular, a standardised method of establishing water stress would be extremely helpful. Though there are a number of options available (Brown and Matlock, 2011), the provision of an agreed measurement, perhaps by an agency such as the UN as part of their four-year water reporting cycle, would greatly facilitate the adoption of a product level water disclosure regime.

6.4.2 Site-level reporting

An important theme emerging from the thesis, and particularly Paper 4, is the importance of site-level and geographic disclosures. While acknowledged as important (Schaltegger, 1997; Gray and Milne, 2004; Leong and Hazelton, 2008; Gray, 2010) such reporting has received little sustained attention within SEA. Future research might include reviewing the extent of site-level reporting requirements and practices in other geographic locations and/or industries, as well as further exploration of user perspectives on site-level reporting. In addition, which site-level reporting is critical for water because of the contextually dependent nature of the impact of water extractions, future research might also consider the extent to which other indicators are similarly

contextual. For example, whilst carbon emissions are prima facie fungible, other dimensions of environmental reporting are not, such as biodiversity. Similarly it may be that social indictors such as child labour, though universally important, might be far more useful in promoting corporate accountability when provided at a site level.

One of the main potential advantages of database reporting is comparability. As discussed in Paper 4, water efficiency measures are useful for report users in theory but problematic in practice due to the different drivers used by different firms. There is a similar necessity for the evaluation of carbon efficiency (Bebbington and Larrinaga-González, 2008) and efficiency metrics are built into surveys by NGOs such as the Carbon Disclosure Project, but because efficiency drivers selection is left to individual firms there is limited scope for comparability.

One possible solution proposed in Paper 4 that could be explored further is to utilise the approach of the NPI with respect to ratings tables to establish industry specific baseline efficiency measures. Due to the impracticality of attempting to directly measure 93 separate pollutants from production activities, NPI emissions are almost invariably estimated using rating tables. These tables are based on research involving sampling outputs from hundreds of different activities and are complied in detailed technical handbooks and organised at a deep level of industrial granularity (Commonwealth Department of Sustainability, 2011). But if it is possible to estimate the pollutants generated by the average abattoir, or bottling plant, or power station, then surely it is also possible to estimate the water use and greenhouse emissions at a similar level of detail.

For water and energy, however, this estimate would not be assumed as actual usage, but could rather be compared with actual usage and therefore highlight better and worse performers. Such benchmarks could also readily be adapted into pricing. For example, there might be a tolerance of say 10% from the benchmark, and any resource use above this amount would be charged at a

higher price. Similarly any reductions below the benchmark might receive a bonus. Such benchmarks might also form the basis of initial allocations within a cap and trade scheme. This would seem to be a fairer approach then either providing past polluters with equivalent permits or ignoring the relative carbon impact of differing operations, because it effectively means that the incentives for improving efficiency are equivalent across the board and therefore maximises the possibility for innovation and trading. Future research might further assess the potential of such a scheme, which could potentially greatly enhance water accountability.

Visibility requires more that merely site level reporting by organisations, however; it also requires an intermediary to collate this information and present it in an accessible and searchable form. As Stephan (2002) notes, reducing information costs is another important contribution of TRI regimes, a point discussed in relation to water in papers 2 and 4. Indeed this approach has been applied to social as well as environmental information, most notably by the Australian Electoral Commission, which collects corporate political donation information and presents this information in a form searchable by political party and corporation. This not only enables direct use by interested citizens and the media, but also enables NGOs such as Democracy4Sale to further analyse and recast this data (for example by industry) to highlight possible instances of undue influence. Of course this approach is not perfect – for a critique see Leong *et al.* (2011) – but it demonstrates the wider applicability of the 'database' approach. Within SEA, however, scant attention has been payed to this possibility for accountability. For example, despite the success of the TRI, within SEA, pollutant database data been used in only a few studies (Clarkson *et al.*, 2011; Cho *et al.*, 2012a), and none of these studies have evaluated the pollutant reporting regime in terms of contribution to corporate accountability. Given the potential importance of pollution as an element of sustainability, and the potential contribution of such regimes, further work in this area is critical.

Aligned with this are concerns about privacy and the ability of corporations to opt out of providing information. Certainly privacy concerns are a legitimate area

of interest for corporations, many of whom invest substantial sums in areas such as research and development and operations. Providing competitors with data that can be reverse-engineered to estimate production volumes, say, seems unfair, particularly if competitors are not subject to similar requirements, or where competitor operations are structured in such a way (such as a factory producing multiple goods rather than just one) that prevents such analysis.

Taking this argument a step further, from a societal perspective society is better off because corporate success benefits them, primarily in their roles as shareholders, customers, employees or suppliers. Yet balanced against this is the duty to provide information such that appropriate decisions can be made by people in their role as citizens. These issues were discussed in the context of water in Paper 2, and could be usefully extended to other aspects of corporate disclosure. The Australian NGER rules, for example, permit non-disclosure of energy and carbon emissions where the publication of such data would reveal a trade secret (*National Greenhouse and Energy Reporting Act*, 2007, Section 25).

6.4.3 The corporate form

An interesting and important question is whether clashes between corporate and public interests can ever be resolved, or whether they are inevitable skirmishes in an endless war. Paper 1 pointed to the inherent limitations of the corporate form, and speculated on the possibility of other organisational forms taking over from the corporation, Indeed, innovative organisational forms have been proposed for at least thirty years without gaining mainstream recognition. For example Schumacher (1979) details the Scott-Bader Corporation, which was a UK department store owned by a trust, where the trust deed required that the trust operate for the benefit of current and future store employees. Semler (1995) describes a Brazilian company structured as a participative democracy where workers have both a financial stake in the company and the ability to vote their bosses in (and out). Socially and environmentally responsible companies like the Body Shop have attempted to rewrite the rules of business, but have

found the move to becoming a public company problematic because of the relentless pressure of financial markets for monetary returns (Roddick, 2000).

Cooperatives provide an alternative in this regard, which are free from the legal and moral constraints of following profitability. However greater moral autonomy means the capacity to do greater 'evil' as well as 'good'. Such expansion of capacities might be seen as wholly positive from a Nietzschean perspective which regards the expansion of capability, or power, the ultimate end of all human endeavour (Reinert and Reinert, 2006; van Meerhaeghe, 2006). Yet the adverse social and environmental outcomes of 'community' organisations centered around, say gambling (such as the Australian example of membership-based clubs receiving millions of dollars in revenue from poker machines), should give pause for thought.

A recent initiative is US 'Benefit' or 'B' corporations, where a third party NGO (B Lab) certifies the social and/or environmental credentials of a corporation, in much the same way Fair Trade certifies a product. Part of the certification process to remove any requirement for shareholder primacy in the governing laws of the corporation, though they remain for-profit companies. According to the 2012 Annual Report there are now over 500 certified B Corporations, operating across a wide range of service and manufacturing industries (B Lab, 2012, p. 6).

In the academic literature, Metcalf and Benn (2012) provide an overview of the tensions between the corporate form and community expectations of enhanced social and environmental responsibility from business. They conclude that the corporation is "an ailing social technology that could be better designed by improving social cohesion and adaptivity" (Metcalf and Benn, 2012, p. 206) and suggest that future research should be focused in the area of organisational leadership and education in order to improve organisational design. While a more Critical perspective would emphasise the structural dynamics of capitalism, this analysis points to the future contribution of academics in both research and teaching.

In terms of research, further work might be done in evaluating the social and environmental impact of corporations with alternate organisational forms, for example through the use of external metrics (e.g. environmental awards versus fines) or by interviewing internal and external stakeholders. More radically, an action research approach might be adopted where academic involvement extended from observation to assistance with the development of new organisational forms, in a similar vein to the creation of new reporting forms chronicled by Bebbington and Gray (2001).

In terms of teaching, Metcalf and Benn (2012, p. 206) contend that their study:

> [S]uggests a role for the business school and management training practices in enabling these approaches and to give real context to the teaching of business ethics or CSR rather than ubiquitous prescriptions which lack real meaning or context.

Boyce (2008; 2013) extends this notion by suggesting that courses such as business ethics and accounting having a key role to play not just in addressing the problems within capitalism but also exposing the problems of capitalism as a system. Hence such courses can enhance the possibility of transformation not only at the level of an individual or firm, but also at more systemic level. The creation and delivery of such transformational courses therefore offers an exciting and important area for contribution by the academic community.

6.5 Final remarks

Along with the environmental movement, environmental accounting has moved from the fringe to the mainstream in the past few decades and is now at the centre of many global conversations. Accountants are uniquely placed to make a contribution to governance at both organisational and governmental levels by engaging with the reporting mechanisms being proposed or implemented for resources, ecosystems and human communities.

In exploring water resources, this thesis has identified both challenges and opportunities for improved water accounting that are also applicable to other dimensions of environmental and social reporting. Within all this work perhaps the most important single message is this: for accountants to realise their potential contribution the corporate annual sustainability report must be regarded as just one reporting outlet in a constellation of possibilities; perhaps relevant to some users but almost certainly irrelevant to many others. It is only starting with a deep understanding of the particular social or environmental issue to be addressed that the possible contribution of reporting can be determined, and unless the problem is expressed very narrowly it is difficult to envisaged how a corporate sustainability report could be the total solution (and may not even be part of the solution).

More broadly, this thesis has important implications for how the accounting profession might position itself in the ongoing debate of how to improve the provision of sustainability information. In sum, this thesis suggests that accountants possess a variety of technical and non-technical skills that could be highly relevant to the provision of sustainability reporting but must engage with sustainability experts and be prepared to apply their skills to forms of reporting beyond a corporate-centered annual report.

The technical skills of accountants most relevant to sustainability reporting might be categorised in three domains: information measurement, reporting and assurance. Currently, much sustainability reporting is not measured nor reported consistently and assurance is minimal at best. Paper 4 demonstrated the paucity of corporate water reporting, and similar problems plague sustainability reporting in other domains. In terms of governmental reporting, in Australia different levels of government produce State of the Environment reports, but there is little consistency between them, and no independent assurance is provided. Even relatively structured reporting regimes such as the National Pollutant Inventory suffers from inconsistencies as while a national database is complied, reporting is managed by State and Territory government

agencies which means there is no consistent verification regime in place. The accounting profession could offer important insights for improving these areas.

In addition to wrestling with the technical issues of measurement, reporting and assurance, the accounting profession also has a long experience with the wider dimensions of establishing a regime to ensure accountants perform their function appropriately. For example, for many years the profession has been drafting accounting standards to ensure practitioners, with over fifty accounting standards and interpretations potentially applying to Australian companies in 2013. Most recently, this experience has been applied in a global arena as the process of national accounting standards converging to a single set of international standards unfolds. As noted in Paper 2, this expertise has been utilised in the creation of Australian Water Accounting Standards, and could be extended to other dimensions of sustainability.

The accounting profession also has longstanding experience of creating and managing an educative regime, that aims to equip practitioners with specific subject-matter knowledge, an integrated understanding of the various elements of the discipline and a sensitivity to the ethical dilemmas they are likely to encounter. This regime includes elements managed specifically by accounting bodies as well as integrated into other educational provides, predominantly universities. The national imperative of establishing 'ecological literacy' might therefore be accelerated by delivering sustainability education as part of this regime, either to broaden the skills of practicing accountants or even by creating a new category of accredited environmental accountants.

Indeed, to be relevant accountants must either obtain the knowledge of specific environmental domains (such as water or climate change) or partner with those that do. The challenges of this approach are many – O'Dwyer *et al.* (2011) describe conflict within an accounting firm between the sustainability assurance team (comprising both accountants and non-accountants) and their own legal department (operating from a traditional assurance paradigm) – but such collaboration is vital to advance sustainability reporting.

Even more fundamental then blending skills, however, is the necessity for the accounting profession to apply their skills to different types of reporting. This thesis has demonstrated that the corporate-centric sustainability report is likely to provide limited value for many users, and it follows that corporations will provide only correspondingly limited resources for the production of such reports. For the accounting profession to add value to sustainability reporting, it needs to locate and focus on those sustainability reports that actually influence decisions. It seems likely that product-level reporting and site-level reporting fall into this category, and there may be other examples that currently exist or emerge over time. The accounting profession must be alert to these alternative reporting sites and consider them with the same level of seriousness as traditional financial reporting. Only then can the accounting profession facilitate the creation of sustainability reporting regimes with the same level of rigour and professionalism as that of financial reporting.

From this perspective, perhaps the most destructive force of corporate sustainability reports is not that they have escaped the attention of accounting regulators (Gallhofer and Haslam, 1997; Gray, 2001; Gray and Milne, 2002; Adams, 2004; Adams and Zutshi, 2004; Gray and Milne, 2004) but rather how they have captured the attention of accounting practitioners and academics. Unlike corporations, however, accountants have autonomy! We can therefore broaden our horizons to explore (and perhaps even help create) those reporting regimes that will bring us one step closer to establishing a sustainable civilisation.

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