THE ROLE OF STANDARDISED WATER ACCOUNTING IN ENHANCING THE ACCOUNTABILITY OF AUSTRALIAN WATER MANAGEMENT

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Declaration

I certify that the work presented in this thesis entitled "The Role of Standardised Water Accounting in Enhancing the Accountability of Australian Water Management" has not previously been submitted for a higher degree to any other university or institution other than Macquarie University.

I also certify that the thesis is an original piece of research and 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 Macquarie University Ethics Review Committee.

Signed

_____

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Abstract

This thesis explores the role of what I call Standardised Water Accounting (SWA) in enhancing the accountability of Australian water managers. SWA is intended to improve water information by applying financial accounting methodology and principles. SWA can be considered as a 'new accounting' which Bebbington and Gray (2001) describe as one of the 'camps' into which research on sustainability accounting falls. To evaluate SWA I extend Gray *et al.*'s (1996) accountability model by identifying three critical components in the context of national water accounting standards: *Clarity of Relationship*, *Transparency* and *Power of Accountees*.

The thesis comprises three papers. **Paper 1** explores the development of SWA in Australia from the perspective of practitioners using the accountability framework. Overall, it was found that SWA might enhance the accountability of water managers, but it is unlikely to be fully realised in the second iteration of the standard (known as ED AWAS 1) due to the limitations identified during the data-collection phase.

Paper 2 explores the perceptions of potential users of General Purpose Water Accounting Reports (GPWAR). The study suggests that accountability of water managers is unlikely to be fully realised in this iteration of SWA. Users agree that the benefits of applying SWA to account for and report on water will outweigh the costs; however, they are unsure about whether these reports will discharge the accountability of water managers.

Finally, **Paper** 3 studies Australian groundwater accounting and reporting under SWA and explores the extent to which groundwater accounting reports under SWA will discharge the accountability of groundwater managers. The application of ED AWAS 1 to prepare groundwater reports poses challenges and concerns to potential report preparers. It is concluded that accountability for groundwater management is unlikely to be fully realised under the second iteration of the standard.

Overall, it is concluded that is unlikely to fully realise accountability under SWA in its present form as there are several limitations discussed throughout the papers. Chalmers *et al.* (2012) argue that SWA (which they term as the GPWAR process) has the potential to serve the public interest as the credibility and quality of information to external and internal parties can be increased. However, it is difficult to argue that an accounting standard is in the public interest when the public have not been heavily involved in the development of the standard. An alternate explanation is that SWA is connected to auto-communication; that the end-user of SWA reports is actually the preparer of these reports.

Abbreviations and Acronyms

ABS:	Australian Bureau of Statistics
BoM:	Bureau of Meteorology
CoAG:	Council of Australian Governments
DWENR:	Department of Environment, Water and Natural Resources
ED AWAS 1:	Exposure Draft of Australian Water Accounting Standard 1
GPWAR:	General Purpose Water Accounting Report
GRI:	Global Reporting Initiative
IASB:	International Accounting Standards Board
MDB:	Murray Darling Basin
MDBC:	Murray Darling Basin Commission
NPM:	New Public Management
NRMMC:	Natural Resource Management Ministerial Council
NSW:	New South Wales
NWADp:	National Water Accounting Development Project
NWI:	National Water Initiative
PAWAS:	Preliminary Australian Water Accounting Standard
PPP:	Public-Private Partnership
SA:	South Australia
SEA:	Social and Environmental Accounting

SEEAW:	System of Environmental and Economic Accounting for Water
SWA:	Standardised Water Accounting
SWAC:	Statement of Water Accounting Concept
UN:	United Nations
UNESCO:	United Nations Educational, Scientific and Cultural Organisation
WACF:	Water Accounting Conceptual Framework
WADC:	Water Accounting Development Committee
WASB:	Water Accounting Standards Board

INTRODUCTION

1. Overview

Water is a life-sustaining element (Shiklomanov, 1998; World Water Assessment Programme, 2003; World Water Assessment Programme, 2006; World Water Assessment Programme, 2009; United Nations Statistics Division, 2012b; World Water Assessment Programme, 2012b). Throughout history, human beings have used freshwater to satisfy their basic needs. However, freshwater is also necessary for the functioning of all ecosystems on Earth. At the beginning of the 21st century, there is a water crisis worldwide (Frederiksen, 2003; World Water Assessment Programme, 2006; World Water Council, 2009; Bigas, 2012) which also affects Australia (AWA, 2007; Slattery *et al.*, 2012).

Section 2 introduces the realm of water into this study by including a description of the resource worldwide and in Australia. The drivers of the current water crisis are discussed in order to introduce Standardised Water Accounting (hereafter SWA) as a possible solution to counter one of the drivers of the crisis in particular; water misuse due to the mismanagement of water resources.

Section 3 explores Sustainability, Social and Environmental Accounting and Standardised Water Accounting. The notion of sustainability and sustainable development is described in Section 3.1 along with its application to the use of freshwater resources. In section 3.2, the link with Social and Environmental Accounting is presented by explaining why SWA can be considered as a new accounting approach about a specific resource (water). Section 3.3.1 describes Standardised Water Accounting in depth and its evolution within the Australian context. The 'Water Accounting Project', in which I took part along with one of my supervisors, is the driving force of the whole thesis.[1] SWA can be considered as a useful tool to improve water information so by having better water information, water management could be improved. Hence, it is necessary to look at is the accountability for water resources.

Section 4 introduces the theoretical framework underlying this study: Accountability. This framework is explored in depth by analysing its evolution, its significance and controversies. Since in Australia, water management and administration is in the hands of the public sector

[1] 'The Water Accounting Project', or case study-participant observation, was facilitated by the former Water Accounting Development Committee during mid-2008 to early-2009 and allowed me to collect data in the field.

(Pigram, 2006), in section 4.1.1, the analysis of accountability translates into the public sector. Gray *et al.'s* (1996) Accountability Model which will be used throughout the study is introduced in Section 4.2 and the research question driving this study is outlined.

2. The Realm of Water

2.1. Water as a Natural Resource

Water represents life in all its shapes and forms (World Water Council, 2000; World Water Assessment Programme, 2003; World Water Assessment Programme, 2006; World Water Assessment Programme, 2009; World Water Council, 2009; United Nations Statistics Division, 2012b; World Water Assessment Programme, 2012a). Fresh water on Earth is a vital product of the water cycle (see Figure 1.1), which represents the endless circulation of water between land, ocean and the atmosphere driven by the sun (National Water Commission, 2012).

[Insert Figure 1.1 here]

Precipitation (either in the form of rain, sleet or snow) falls on the ground and is either intercepted by plants and transpired or transformed into overland flow to surface water or groundwater aquifers (National Water Commission, 2012). The water cycle connects the vast reservoirs of the ocean with the lithosphere, the earth's surface and the atmosphere, with the lithosphere 'act[ing] as a retarding and storage link, smoothing the natural variations of the precipitation input, thereby enhancing the longer-term availability of renewable water' (Vrba and Verhagen, 2011 p. 19). The water cycle creates fresh water reserves for humans, aids in the functioning of ecosystems and also affects the temperature on Earth (Seiler and Gat, 2007).

Water is the most distributed substance on Earth and plays an important function in the surrounding environment and human life (Shiklomanov, 1998). On Earth, water accounts for about 1.386 x 10^9 km^3, and while the majority of it is liquid, some occurs as ice and in the form of vapour (Seiler and Gat, 2007). Even though 71% of the Earth's surface is covered by water, not of it is fit for human use. Saltwater oceans hold approximately 97.5% of all water and the remaining 2.5% (or a global volume of 35.2 million cubic kilometres) is fresh water (World Water Assessment Programme, 2006). Approximately, two thirds of that fresh water

is held in glaciers and permanent snow cover (World Water Assessment Programme, 2006). Therefore, only one third of the world's fresh water at this point in time is available for human consumption (Economist, 2003). According to Rosegrant (1997 p. 1), 'there are 37 million cubic kilometers of freshwater, and three-fourths of this is in glaciers and icebergs. About 8 million cubic kilometers of freshwater is stored in groundwater.' This is called 'in-storage' water and even though a large volume of it exists, it is necessary to assess the renewable annual water flows and their movements through the water cycle (World Water Assessment Programme, 2006). According to the World Water Assessment Programme (2003 p. 8), 'man-made storage in reservoirs adds a further 8,000 cubic kilometres' to the available fresh water in rivers, lakes, and aquifers. Evidently, fresh water is the backbone of sustaining human life.

Even though water is a renewable resource, some freshwater resources, such as some groundwater areas, are non-renewable (World Water Assessment Programme, 2003). Renewable freshwater resources can be made non-renewable by, for example, mismanaging watersheds, over-pumping, land subsidence or aquifer contamination (Gleick, 1998). Water resources are replenished during the water cycle; however, factors such as pollution and climate change affect this cycle and, therefore, affect the total amount of the resource from one period to another. The amount of fresh water is further reduced due to overuse (for example, by extracting water from aquifers at excessive rates).

Being a life-sustaining element does not guarantee that the availability of fresh water is free from problems. Around the world, water supplies are being affected due to increasing demand. There are worldwide problems that currently affect freshwater availability and those problems need to be addressed if a sustainable future is to be achieved. Actions to address water problems at the global level have been taken since the latter part of the twentieth century (World Water Assessment Programme, 2003). The Mar del Plata conference in 1977 is considered one of the milestones in terms of global activities addressing water (World Water Assessment Programme, 2003). Later in 1992, the four Dublin Principles set out in the International Conference on Water and Environment recognised the importance of water for humanity, its scarce nature, its economic value, the role of women in water consumption, and recommended a participatory approach on water development and management (World Water Assessment Programme, 2003). One of the main breakthroughs in Sustainable Development was Agenda 21, which was produced at the UN Conference on the Environment and Development (UNCED) in 1992. In regards to water, Agenda 21 'helped to mobilize change

and heralded the beginning of the still very slow evolution in water management practices' (World Water Assessment Programme, 2003 p. 5). Moreover, the United Nations Educational, Scientific and Cultural Organisation (hereafter UNESCO) has been working intensively in the realm of water, investigating its problems and recommending solutions. In line with its role, the World Water Assessment Programme (which is a division of UNESCO) produced the First World Water Development Report in 2003 with subsequent editions released in 2006, 2009 and 2012.

Addressing environmental challenges is one the most important tasks facing humanity today, because if our 'species failed to manage the global ecology sensibly, then as a species, we would have no future' (Gray *et al.*, 1996 p. 294). Natural causes and continuing human engagement relating to economic growth and urban development each affect water systems (World Water Assessment Programme, 2009). The World Water Assessment Programme (2003) strongly argues that of all social and natural crises, the water crisis lies at the heart of the survival of humanity. Hence, the necessity to manage water resources sustainably represents one of the most pressing environmental challenges in existence today. Experts suggest that the current situation reflects a water crisis on a global scale which is triggered primarily by the geographic distribution of the resource, misuse, pollution, population growth and climate change. Moreover it is suggested that the global water crisis could become a threat to humanity, even more than the reduction of energy resources (Economist, 2008).

2.2. The Water Crisis

A thorough investigation of several studies, reports and articles on water (e.g. Rosegrant, 1997; Kumar, 2000; Baron *et al.*, 2002; Economist, 2003; Frederiksen, 2003; World Water Assessment Programme, 2003; Pigram, 2006; World Water Assessment Programme, 2006; Barnes, 2007; Economist, 2007; PMSEIC Working Group, 2007; Economist, 2008; World Water Assessment Programme, 2009; World Water Council, 2009; Godfrey and Chalmers, 2012; Vidal, 2012; World Water Assessment Programme, 2012a) identifies five drivers of the current worldwide water crises: location, misuse, pollution, climate change and population growth.[2] These key drivers have an impact on both the resource itself and the way it is managed.

[2] Rosegrant (1997) describes the current water crisis from two perspectives - the supply side and the demand side. Both of them create drivers that affect water resources. On the supply side, Rosegrant (1997) mentions

In terms of locality, the geographic distribution of water favours some nations over others. For example, Austria, Canada and Ireland have more water than they need for consumption, whereas others, such as Australia, China and countries in the Middle East, have too little (Economist, 2003). The high transportation costs of moving water to places of water scarcity exacerbate this problem, particularly as many areas of water scarcity are poor. Seasonality is also a major factor due to the fact that in some countries, such as Bangladesh and India, rainfall occurs within a relatively short timeframe (Economist, 2003).

Freshwater resources are also threatened by pollution, as 'humans have long used air, land and water resources as "sinks" into which we dispose of the wastes we generate' (World Water Assessment Programme, 2006 p. 137). This pollution degrades ecosystems affecting precipitation, surface waters, and groundwater resources. One result of pollution, for example, is acid rain. Acid conditions develop in surface water and groundwater resources as a result of atmospheric contamination from vehicle emissions and industrial plants. Water quality in lakes and rivers is negatively affected by acid deposition as high concentrations of aluminium and increased acidity destroy terrestrial ecosystems and aquatic life (World Water Assessment Programme, 2006). Acid rain is considered as a transboundary problem as it can carry over long distances and across countries and continents.[3]

Climate change represents a further threat to global freshwater resources and must be analysed and incorporated into current decision making processes (Barnes, 2007). In particular, climate change poses a challenge because of the changes it produces in precipitation amounts and patterns (Seiler and Gat, 2007). These changes produced by climate change modify the water cycle and the amount of water available on continents. Therefore, the issue of climate change affects the water cycle significantly. According to the World Water Assessment Programme (2006 p. 6), 'warming temperatures, rising sea levels, uncertain effects on ecosystems and increased climatic variability are just some of the changes expected to have a disproportionate and significant impact on developing countries'. The impacts of climate change on freshwater systems are due to increases in temperature, sea level

groundwater depletion, waste and pollution while acknowledging that the demand for freshwater has increased, and will increase, in the next twenty years.

[3] For example, according to the World Water Assessment Programme (2006), Japan is affected by emissions from China and Korea.

and precipitation variability (IPCC, 2007). Overall, the IPCC (2007) concludes that the negative impacts of climate change on freshwater resources outweigh the benefits.

Even though global warming may increase productivity in some regions and habitats, there is general consensus on the negative impacts of climate change on aquatic ecosystems (World Water Assessment Programme, 2006). Surface water availability, groundwater recharge and soil moisture are affected by changes in weather patterns, precipitation and the hydrological cycle produced by climate change (World Water Assessment Programme, 2006). According to Barnes (2007), the impact on water resources from climate change is predicted to include shifts in rainfall patterns in different parts of the world, intense storm activity and rising sea levels. Overall, 'recent estimates suggest that climate change will account for about 20 per cent of the increase in global water scarcity' (World Water Assessment Programme, 2003 p. 10).

Climate change is affecting all countries worldwide; therefore, measures have to be taken to counter its harmful effects and somehow take advantage of its negative effects. Scientists predict that South East Asia will be hit by more intense and frequent droughts and floods caused by climate change.[4] However, this situation created by climate change also brings economic opportunities provided by their successful adaptation (Than, 2012). For example, recently some people in the South East Asian region have shifted from rice production to shrimp farming (Than, 2012).[5]

The next driver of the water crisis is population growth. Kumar (2000 p. 55) states that 'the population has increased as the earth's natural resources have receded….the rapid population growth in the past several decades have [has] multiplied the need for cropland, grazing land and forest land'. For the World Water Assessment Programme (2006), population growth affects the supply of water. Anecdotal research shows that a growth in population means an increase in the demand for resources, not only for water directly, but more importantly for food (which requires large volumes of water for agricultural production). Additionally, the majority of these people concentrate in urban areas, which creates a problem due to capacity constraints in terms of supplying water to these areas. According to the World Water

[4] South and South East Asia are home to more than 30% of the world's population and are important areas of global agricultural production (mainly due to rice production) (Than, 2012).

[5] Similarly, some wineries in Australia moved to lower and cooler areas to counter the effects of global warming on grapes.

Assessment Programme (2006 p. 89), 'in 1900, million cities (cities with more than one million inhabitants) were unusual and cities with over 10 million unknown; by 2000, there were 387 million cities and 18 with more than 10 million inhabitants'.[6]

Population is growing rapidly and is expected to increase even more in the next decades. In fact, Vidal (2012) mentions that population is expected to reach nine billion people by 2050. According to Vidal (2012), the main source of proteins for humans is derived from animal-based products and such products require freshwater supplies; hence, if current trends on food consumption are not changed, there will not be enough available water on croplands to produce food for the expected nine billion inhabitants by 2050.

Water misuse is related to water governance. The World Water Assessment Programme (2003) suggests that the current water crisis is one of governance caused by the way in which people mismanage water, and this position is echoed by many organisations (World Water Council, 2000 p. xix-xxi; World Water Assessment Programme, 2003 p. 4; World Water Assessment Programme, 2006 p. 1; Global Markets Institute, 2008 p. 5; World Water Assessment Programme, 2009 p. xix). Management of water arises as an important aspect for governments to be aware of because the viability of some nations depends on the sufficiency of their water supplies (Frederiksen, 2003). The World Water Assessment Programme (2003) suggests that wasteful misuse of water is mainly due to a lack of governance in water management. This lack of governance is reflected in the 'lack of adequate water institutions, fragmented institutional structures, upstream and downstream conflicting interests regarding riparian rights and access to water, diversion of public resources for private gain, and unpredictability in the application of laws, regulations and licensing practices, which impede markets' (World Water Assessment Programme, 2003 p. 30). While there seems to be agreement in recognising mismanagement of water as a key driver of the current water crisis, there is less common ground in terms of solutions, though information is a key element, explored further below.[7] The importance of freshwater resources in Australia in the light of the current water crisis is explored next.

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[6] Population in Australia is projected to be 35 million people by 2050; however, Australian water supplies are expected to cope with population growth. According to Gill (2011), careful planning is necessary so as to enhance the existing infrastructure and satisfy the needs of the growing population.

[7] For some experts the solution stems from treating water as an economic good, 'subject to the laws of supply and demand…Yet throughout history, and especially over the past century, it has been ill-governed and, above all, colossally underpriced…the best way to deal with water is to price it more sensibly' (Economist, 2003),

2.3. Water in Australia[8]

Similar to other countries, water challenges for Australia are many, but distinct as well due to the unique characteristics of the country. Vardon *et al.* (2007) state that water in Australia is scarcer than in any other continent except Antarctica. Australia is a dry continent because of its low rainfall, high evaporation and low runoff (Habermehl, 1985; Pigram, 2006; Vardon *et al.*, 2007; Wahlquist, 2008). According to Lenzen (2004 p. 1), 'Australia experiences a spatially and temporally highly variable climate that includes periodic drought, leading to a relatively unpredictable water supply'. In fact, Australia has the highest year-to-year variability of rainfalls (Vardon *et al.*, 2007). The variability in rainfall patterns affects the availability of the resource and could worsen given that Australia has the highest per capita use of water in the world (Slattery, 2008). Frequent and widespread droughts affect Australia as well as flooding that is less recurrent, but equally devastating (Pigram, 2006). However, according to Gill (2011), reality seems to show that Australia is not as dry as many researchers believe. Not only does water withdrawn represent less than 10% of Australia's renewable fresh water resources, but 85% of the population live in urban areas close to the coastline where rainfall is quite high. Gill (2011) argues that the challenge for Australia is not the amount of rainfall, but its variability. In other words, Australia has a dual characteristic of being a wet and dry country at the same time.

Even though Australia is considered as a dry continent, it has enormous underground supplies of water (namely the Great Artesian Basin, one of the most important sources of groundwater); however, it is unknown how much water lies below the surface (Wahlquist, 2008). Nonetheless, Wahlquist (2008) suggests that most of Australia's problems are caused by a lack of proper planning; for instance, constructing dams in areas of variable rainfall. Randall (2008) explores whether Australia is on a sustainability path. Randall's (2008)

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whereas the World Water Assessment Programme (2003 p. 29) stresses educating individuals about the rational use of water as 'knowledge is accepted as one of the keys to development, improved livelihoods, environmental participation and stronger democracies'. Additionally, in the International Conference on Water and the Environment in 1992, a participatory approach on water development and management was recommended. This approach involves users, planners, and policymakers (World Water Assessment Programme, 2003).

[8] Australia is a nation-state considered as a federation comprising six states (New South Wales, Victoria, Western Australia, South Australia Queensland and Tasmania) and two territories (Northern Territory and Australian Capital Territory); each with its own government. Government is divided into three levels: federal, state and local.

findings were possible by assessing the status of water, assessing the status of other resources (forests, biodiversity, soil depletion and degradation and atmospheric resources), assessing productivity in agriculture and by evaluating the economic indicators and conclude that Australia is on a weak sustainability path. Randall (2008 p. 93) suggests applying 'a framework that would prescribe weak sustainability policies for business-as-usual, with strong sustainability exceptions for particular, credible threats of resource exhaustion'.

In 2000, the NLWRA (2001 p. 3) assessed Australian water resources and divided them into surface water (12 drainage divisions, 246 component river basins and 325 surface water management areas) and groundwater (69 groundwater provinces and 538 groundwater management units). Of all of these areas, the Murray Darling Basin (hereafter MDB) is the most important because it accounts for more than 50% of water use and is the most important agricultural area in the country (Lenzen, 2004). There are 501 large dams in Australia, the majority built between 1970 and 1990 (AWA, 2007)[9]. New dams have been built in the last decade mainly in Western Australia and Queensland (AWA, 2007).

As one of the most important water systems in Australia, the Murray Darling Basin covers almost 1 million square kilometres (or 14% of the total area of Australia), contains important groundwater systems and contains 23 river valleys (Murray-Darling Basin Authority, 2008). The MDB crosses five states and territories and is managed cooperatively by the governments of South Australia, Victoria, New South Wales, Queensland, Australian Capital Territory and the Commonwealth through the Murray-Darling Basin Authority (Murray-Darling Basin Authority, 2008). The two main rivers that form the MDB are the Murray and the Darling (each of them with many tributaries), which together represent the longest river system in Australia. Driven by agriculture, the basin generates 39% of the national income (Murray-Darling Basin Authority, 2008). The drought that affected Australia in the early 2000s also affected the MDB. By 2007, this river system had experienced at least 'seven years of drought, and many more years of over-exploitation, and pollution [being in a situation that it] no longer carries enough water to carve its own path to the sea' (Economist, 2007). Fortunately, the drought has now ended and the MDB has started to recover.

As noted above, one of the most important groundwater areas in Australia is the Great Artesian Basin. Underlying 22% of the country, this formation is up to 3000 meters thick and

[9] According to the AWA (2007), a large dam is one that has a reservoir capacity of more than 1,000 ML and a wall height greater than 15 metres.

roughly 1.7 million square kilometres in extent (Pigram, 2006). The Great Artisan Basin extends under parts of New South Wales, South Australia, Northern Territory and Queensland (AWA, 2007). Containing important natural and cultural heritage values, the Great Artisan Basin is the largest artesian basin on Earth with estimated water storage of approximately 8700 million mega litres (Pigram, 2006). Water from the Great Artisan Basin represents approximately 10% of total water used annually in the country (AWA, 2007). Problems also affect the Basin; for this reason, the GAB Sustainability Initiative was adopted in order to address issues such as extreme extraction, waste of water, more efficient water use and uncontrolled discharge (Pigram, 2006). Such problems accentuate as groundwater use has increased in Australia with the Northern Territory and Western Australia as the users of the highest proportion of water originating as groundwater (AWA, 2007).

By 2006 each mainland state capital was facing water restrictions as water supplies were not sufficient to satisfy demand[10] (Wahlquist, 2008). Reasons for the crisis of water supply in Australian urban areas are diverse and include the 'historic reliance on surface water supplies, the continuing growth of population in major urban areas, the effect of climate change, and the failure to recognise these forces' (PMSEIC Working Group, 2007 p. viii). It is interesting to note however that Sydney and Melbourne, which are Australia's largest cities, receive more water per year than other cities such as Madrid, Berlin and London (Gill 2011). Each state and territory in Australia has unique features in terms of water availability. Of all states and territories, only South Australia can be considered as having poor water reserves (Pigram, 2006).

The Council of Australian Governments (2004) remarks that water is considered as natural capital in Australia as it serves important economic, social and environmental objectives. Water is vested to the relevant state governments (Council of Australian Governments, 2004); however, the Murray-Darling Basin is now under federal control since the enactment of the Water Act 2007. In Australia each state and territory has its own arrangement in terms of the management of surface and groundwater systems with individual states having prime responsibility (Pigram, 2006).[11] Such a situation contributes to the fragmentation of the water

[10] In Australia, the most common source of water used to be dams with large storage capacities, but in the last 20 years new technologies such as water recycling and desalination have been developed offering new water sources (Gill 2011).

[11] According to the National Water Commission (2012), these entities are: the NSW Office of Water (New South Wales), the Department of Sustainability and Environment (Victoria), the Department of Environment and

industry. Responsibility for water resources policy is in the hands of the minister whereas at least two agencies share a common arrangement for administrative responsibility (Pigram, 2006). One agency deals with urban water supply whereas the other deals with the development and assessment of other water resources.[12] The Federal government is not directly involved in water-matters; however, it can intervene when there are implications for defence or interstate trade (Pigram, 2006). Nonetheless the role of the Federal government has been important because it 'has played a leading role in establishing collaborative organisations to manage river systems and developmental projects of importance to more than one state' (Pigram, 2006 p. 45). An example of these organisations is the Murray-Darling Basin Authority. According to Egan (2009), in recent decades there has been pressure on state-owned urban water authorities to reform their organisational structures and their water supply policies.

Against this backdrop of global and Australian water challenges, robust water information has emerged as an important strand of water management. It is argued that by having better water information, water management will be improved and hence water will not be misused as much as it currently is. As a result, one of the drivers of the water crisis can be treated. In this light, the following section traces Social and Environmental Accounting, the development of 'water accounting' (a term generally used by non-accountants to describe water information) and the development of what I term Standardised Water Accounting.

Resource Management (Queensland), the Department of Water (Western Australia), the Department of Environment, Water and Natural Resources (former Department of Water) (South Australia), the Department of Primary Industries, Parks, Water and Environment (Tasmania), the Department of Environment, Climate Change, Energy and Water (The Australian Capital Territory) and the Department of Natural Resources, Environment, the Arts and Sport (Northern Territory).

[12] According to Pigram (2006), the use of Statutory Authorities is the dominant feature in the agency that deals with the development and assessment of other water resources.

3. Sustainability and the Development of Standardised Water Accounting

3.1. The Sustainable Use of Water Resources[13]

It is necessary to explore the meaning of 'sustainability' and 'sustainable development' in order to understand its context regarding the use of water resources. Sustainability and Sustainable Development are terms that are often used interchangeably by most researchers and academics.[14] These concepts came to prominence thanks to the Brundtland report (prepared by the World Commission on Environment and Development). In this report, Sustainable Development is defined as development that 'meets the needs of the present without compromising the ability of future generations to meet their own needs' (World Commission on Environment and Development, 1987 p. 8). Even though this definition has originated debate among scholars, Gray (2010 p. 53) considers Sustainable Development as a good thing as 'it involves the preservation and/or maintenance of a finite and crucial environment and incurs some duty of social justice – between and within generations'. According to Bebbington and Gray (2001), there is no disagreement about the desirability and the necessity of sustainability; however, disagreement between interested parties is created by what sustainability entails.

The meaning underlying Sustainable Development is not very clear due to the different aspects involved in the concept. Sustainability is more than just a word to describe the environment and the definition of Sustainable Development given in the Brundtland report is under-specified because it does not cover the constituents of global sustainability (Bebbington and Gray, 2001). There are two different aspects that need to be considered in the pursuit of Sustainable Development. The first is a focus on ecological space and the carrying capacity of ecosystems and the second is a commitment to equity (Unerman *et al.*, 2007 p. 345). This commitment to equity is based on both intra- and inter-generational criteria because it means

[13] For the purposes of this study unless otherwise specified, 'water' refers to fresh water (as distinct from seawater.)

[14] However, Gray (2010) mentions that some researchers consider sustainability and sustainable development as distinct. Gray (2010 p. 53) adds that 'sustainability' could be considered as a state whereas 'sustainable development' could be considered as a process through which a move could be made towards (or away from) sustainability. For the purposes of this research, both terms will be considered synonyms.

fulfilling mankind's needs in the present without affecting those of future generations. There is concern for future generations in Sustainable Development and this concern complicates the equation. Fortunately, equity in this context does not look at the differences between developed and developing countries. Analysing differences between developed and developing countries is important because economic development in the last 25 years has moved global society further away from equitable distribution of the benefits and costs of such development (Bebbington and Gray, 2001).

Bebbington and Gray (2001) mention that the Sustainable Development concept is anthropocentric as human beings are place in the centre of debate. Sustainable Development is concerned with the sustenance of natural ecology and the equity and justice in the use of natural ecology (Bebbington and Gray, 2001). Additionally, it is concerned with needs and not wants. These two ideas have different results if they are taken into consideration, because satisfying a need is not similar to satisfying a want. The definition of Sustainable Development means not only connecting the environmental, the economic and the social, but also incorporating other aspects, like justice, equity and timeframe (Unerman *et al.*, 2007). Bebbington and Gray (2001) suggest that the world, as a whole, appears to be following an unsustainable path (in both developed and developing countries).

Managing freshwater resources sustainably involves maintaining the availability of water for future generations without affecting its quality (Ahmad *et al.*, 2010). According to Gleick (1998), sustainable management of water involves sustainable use of water and the application of sustainable plans which consider the availability of water resources as an integral part of long-term planning. Gleick (1998) discusses seven sustainability criteria that should be included in long term water planning and management.[15] In this context, both freshwater and water infrastructure play a pivotal role in the future of sustainable water management (Sofocleous, 2010). Sustainable water use has been defined as 'the use of water that supports the ability of human society to endure and flourish into the indefinite future without undermining the integrity of the hydrological cycle or the ecological systems that depend on it' (Gleick *et al.*, 1995 p. ES-3). The core of this definition overlaps with the

[15] These criteria include guaranteed access to a minimum amount of water necessary to maintain human health and to sustain ecosystems, basic protections for the renewability of water resources, water quality to meet certain minimum standards, data on water resources available to all parties, democratic process in water planning and decision making and institutional recommendations for planning, management and conflict resolution (Gleick, 1998).

definition of sustainability. Words such as ‘endure’ and ‘indefinite’ match with the idea of meeting the needs of future generations found in the definition of sustainability.[16]

Likewise, accounting assists the economic system by providing accounting information; one way that accounting can assist water sustainability is through the provision of water information. This water information can be shaped by accounting through SWA. Recall that water information is a necessary tool for sound water management: attempts at recording and presenting water information have existed for some time. However, these attempts are different from the concept of SWA in both conceptual and practical terms. Before discussing in depth what SWA is, let us explore water information and Social and Environmental Accounting.

3.2. Social and Environmental Accounting

There is a long tradition of considering how accounting might relate to sustainability and the environment (Mathews, 1997; Deegan, 2002). Mathews (1997) summarises the evolution of the Social and Environmental Accounting (Hereafter SEA) literature during the period 1971-1995. One of the areas of major growth was accounting for the environment (mainly from the early 1990s). Even though the SEA movement grew significantly during the period 1971-1995, it was not accepted by the mainstream accounting academia (Mathews, 1997). Moreover, Mathews (1997) notes that the development of SEA was perceived as an alternative form of accounting instead of a form of legitimation of capitalist interests. Likewise, Deegan (2002) recognises the growing trend of SEA research, especially since the mid-1990s. Research on SEA issues is not new; however, the development of SEA and accountability practices is still in its infancy so it allows experimentation (Deegan, 2002). Even the emergence of Sustainable Development, which requires social and environmental issues to be addressed, has had an increasing influence in the accounting literature (Gray, 2010).

On the other hand, some critical theorists such as Tinker *et al*. (1991) have significant concerns as to how successful accounting could be in relation to the environment and sustainability. Criticisms were made to proponents of SEA because it was argued that they do

[16] Gleick (1998) argues that understanding what sustainable use of water is could be gained by understanding what unsustainable use of water is.

nothing, or do little, to change the status quo. Following this line, Tinker *et al.* (1991 p. 47) contend that 'despite its critical pretensions, its acceptance of the basic tenets of neo-classical economics stymied the possibility of fundamental change'. Aligned with this criticism, Mathews (1997 p. 500) mentions that one of the major items noted during the period 1971-1995 by writers in the critical theory field is that new developments did not often challenge the status quo. Much attention was given to disclosures instead of actions that could/should create a change in the underlying system.

The accounting literature on sustainability and accounting is classified by Bebbington and Gray (2001) as falling into four camps. Bebbington and Gray (2001 p. 561) state that in the first camp 'we find well-argued cases that state that accounting should stay away from nature, ecology and sustainability because there is nothing in accounting that can offer anything other than a pernicious malignity that can only poison the preciousness of life'. In the second camp, there is a literature that illustrates sustainability, ecology and nature reduced to contingent liabilities, provisions and impaired assets. The third camp contains 'non-analytical, professionally orientated managerial literature in which an unquestioning style assumes environmental management and environmental accounting will deliver holy grails' (Bebbington and Gray, 2001 p. 561). In the final camp, 'there is a group which suggests that accountants and accounting may be able to support the pursuit of Sustainable Development, but that how this could be done is problematic' (Bebbington and Gray, 2001 p. 561). It is this camp that is considered as involving the development of 'new accountings'.

Bebbington and Gray (2001) give more light on the fourth camp by stating that an example is their Sustainable Cost Calculation project which attempts to develop a praxis in which accounting is turned upon itself. An attempt to explain the nature of accounting as being more than simply a provider of accounts is found in research by Arrington and Francis (1993). They describe accounting as a practice which goes beyond its common nature. The practice of giving economic accounts is part of human practice. This practice is what all people do in diverse social, cultural, political and economic settings (Arrington and Francis, 1993). Providing an economic account is compared to the process of donating intelligibility, meaning and understanding to the moral and economic dimensions of people. The fourth camp

involves looking beyond current practices of accounting and investigating concrete alternatives.[17]

Currently SEA is mainly voluntary; Frost (2007) investigates environmental reporting by an analysis of the introduction of s299(1)(f) of Australia's Corporations Law which mandates Australian companies to report on environmental issues. In recent decades the frequency of sustainability reporting has increased; companies are reporting more on SEA issues through their reports. In the Australian context, Frost (2007 p. 209) observes that 'prior research has observed a long-term continuing increase in total disclosures…while such an increase was observed, for the total sample it was not consistent. However, once firms with a stand-alone environmental report were excluded from the analysis, a consistent increase was observed.' However, it seems that this increase is not directly proportional to the quality of the information being disclosed.

There is an ongoing discussion among scholars about whether SEA reports should be either mandatory or compulsory. Criado-Jimenez *et al.* (2008) examine the extent to which 78 Spanish companies comply with the ICAC-2002 standard. Under this standard, companies are compelled to make environmental disclosures in their financial statements. Criado-Jimenez *et al.* (2008) suggest that the quality and volume of environmental disclosures can be enhanced by improving regulation via enforcement. This persistent discussion is followed by calls for mandatory SEA reporting due to the low levels of voluntary SEA reporting. Jones *et al.* (2005) find that there is a low level of discrete reports being prepared by companies. Regarding their data sample of private sector companies, Jones *et al.* (2005 p. 19) find evidence that 'only a small proportion of listed entities prepare discrete reports on sustainability/TBL issues'. Their results contrast with the growing trend toward corporate social responsibility.

To date there has been significant and growing research within SEA regarding water disclosures (e.g. see Morikawa *et al.*, 2007; Morrison and Schulte, 2009; Prior, 2009; Barton and Morgan-Knott, 2010; Egan and Frost, 2010; Morrison and Schulte, 2010; The Association of Chartered Certified Accountants, 2010; Carbon Disclosure Project, 2012); however, these studies are about corporate accounting and reporting for water. However, this

[17] For example, one type of these 'new accountings' can be reports prepared under the Global Reporting Initiative guidelines (which include water in their disclosure components), another example is a form of accounting called 'Accounting for Sustainable Development' or Triple Bottom Line reporting.

study is about reporting under SWA which is water reporting using financial accounting principles and methodologies. SWA can be considered as an example of these 'new accountings' and aims at the sustainable use of water resources. SWA deals with the application of accounting principles to report on water with the objective of SWA improving water information. The idea is to develop a system of water accounting as an accounting sub-discipline, analogous to financial accounting, to guide intra-national and national decision making (Chalmers *et al.*, 2010). In the next section SWA and its relation with water accounting are explored in depth.

3.3. Water Accounting

In Section 2.2, the main obstacles that affect our water resources were discussed. One way to face these problems is through an effective water management program which in turn requires water information. Such information is, somewhat confusingly, often referred to as *water accounting*; however, its similarity to conventional financial accounting in terms of methodology or presentation varies considerably. According to Godfrey (2008 p. 5), 'with good water accounting, much more information about water will be reported, so that water users...will be better able to discern hyperbole from fact'. Water accounting development is one of the eight major areas of reform in the Australian National Water Initiative. In fact, SWA can be considered as an evolved form of water accounting.

For the purposes of this study, W*ater Accounting* refers to all efforts made to account for water. Accounts are used to manage, control, plan and assess the accountability of organisations in charge of managing water. Although *Water Accounting* is an important tool for water management, it will not resolve any water crisis by itself as it is a decision-making tool and not a solution (Godfrey, 2011). From the *Water Accounting* concept, two further concepts are derived: 1) *General Water Accounting* which does not involve the use of financial accounting principles and 2) *Standardised Water Accounting* which implies the application of financial accounting principles to account for water.

General Water Accounting refers to all efforts to prepare water accounts which do not follow financial accounting methodologies. The prime example of *General Water Accounting* is the construction of water accounts following United Nations (hereafter UN) principles. These water accounts have focused mainly on physical water flows. There has been considerable research on *General Water Accounting* (e.g. see Lange, 1997; Lange, 1998; Lenzen, 2004;

Peranginangin *et al.*, 2004; Zhu *et al.*, 2004; Lowe *et al.*, 2006; Arntzen and Setlhogile, 2007; Cordery *et al.*, 2007; Hambira, 2007; Hazelton, 2007; Lange *et al.*, 2007; Vardon *et al.*, 2007; Ahmad *et al.*, 2010; Vardon *et al.*, 2012). Water accounts under UN guidelines can be defined as 'a method of organising and presenting information relating to the physical volumes of water in the environment and economy as well as the economic aspects of water supply and use' (Vardon *et al.*, 2007 p. 650). Such information can also be provided in monetary units. *General Water accounting*, as described here, includes 'field monitoring, storage, management and analysis of data, and leads to procedures for analysing the uses, depletion and productivity of water' (Cordery *et al.*, 2007 p. 257).

Over the last few decades, the UN has been active in the area of water measurement and valuation as it published a manual on Natural Resource Accounting called *System of Environmental and Economic Accounting* (hereafter SEEA) in 1993, then in 2001 the operational guidebook and a revised handbook in 2003 (Arntzen and Setlhogile, 2007). The System of Environmental and Economic Accounting for Water (hereafter SEEA-Water) is a sub-system of the previous SEEA and provides 'agreed concepts, definitions, classifications, tables and accounts for water and water-related emission accounts' (United Nations Statistics Division, 2012a). SEEA-Water was prepared by the United Nations Statistics Division in collaboration with the London Group on Environmental Accounting (United Nations Statistics Division, 2012b). Its development has been progressive since its final draft was first released at the UN Committee of Experts in 2005 and part one was adopted in 2007 (United Nations Statistics Division, 2012b). This system is a conceptual framework for the organisation of physical and economic information consistent with the concepts in the 1993 System of National Accounts. The SEEAW consists of two parts: the first comprises accounts for which there is significant practical experience and international consensus whereas the second comprises more experimental accounts (United Nations Statistics Division, 2012c). The System of Environmental and Economic Accounting attempts to incorporate environmental matters into conventional national accounts (United Nations Statistics Division, 2012a).

Water accounts under SEEA provide information on stock and flow accounts in physical and/or monetary units. The water stock accounts specify 'the amount of water available at the start of the year (1st of January), inflows and outflows during the year and the end stock (31st of December)' (Arntzen and Setlhogile, 2007 p. 1222) whereas 'water flow accounts measure the supply and use of water by detailed economic activities and households' (Lange *et al.*,

2007 p. 663). According to Lange *et al.* (2007), it is argued that flow accounts are more useful for policy and management because they provide a more detailed level of information; for instance, information on consumption patterns over time. These consumption patterns are useful as they permit to identify who the main users of water are.[18]

Water accounts prepared under the United Nation's guidelines seem to have been useful in the application of water management programs in different countries (see for example Lange, 1998; Peranginangin *et al.*, 2004; Hambira, 2007). In Australia, the ABS follows the UN guidelines to prepare water accounts. Such guidelines are also applied by other countries such as Denmark, France, Germany, Italy, Netherlands, New Zealand, Spain, Botswana, Namibia, Moldova, the Philippines, and South Africa (Lange *et al.*, 2007). In her research on the benefits of using water accounts in water management in Namibia, Lange (1997) recognises the importance of constructing water accounts in the design of sustainable development strategies over the long term.

By further elaborating the framework SEEA released in 2003, SEEA-Water has been developed 'with the objective of standardising concepts and methods in water accounting [and] provides a conceptual framework for organising economic and hydrological information' (United Nations Statistics Division, 2012b p. 2). Two important features of SEEA-Water in comparison to other information systems for the environment are: 1) it directly links water data to the economic accounts via a shared structure and a set of definitions and 2) it covers all the relevant environmental-economic interactions. Additionally, SEEA-Water provides a set of standard tables which can be used by countries with harmonized concepts, definitions and classifications (United Nations Statistics Division, 2012b).[19]

[18] Some scholars (e.g. Arntzen and Setlhogile, 2007) suggested improvements to water accounts under UN guidelines (and following SEEA) such as the inclusion of wastewater accounts in order to show how wastewater is being used; for example, treatment losses, discharge in the environment, re-use, and recycling. In their research about the pros and cons of incorporating wastewater accounts in Botswana, Arntzen and Setlhogile (2007 p. 1230) find that their inclusion would be useful in policy making that aims at water efficiency as 'such accounts could change the negative perception of wastewater from nuisance that needs to be safely disposed to a resource that can be re-used and recycled'.

[19] SEEA-Water presents quality accounts and the following information: a) Stock and flows of water to the environment, b) Pressures from the economy to the environment in terms of abstractions and emissions, c) Supply of water and its use, d) The reuse of water within the economy, e) Costs including collection, purification, treatment and distribution, f) The financing of these costs, g) The payment of permits for access to abstract water and h) The hydraulic stock in place (Department of Economic and Social Affairs, 2012a pp. 3, 4).

General Water Accounting is not new in Australia as large-scale information on water resources has been compiled since the mid-1960s (Vardon *et al.*, 2007). The Australian Bureau of Statistics (hereafter ABS) is the entity in charge of producing water accounts in Australia. The ABS has produced Australian Water Accounts for the periods 1993-1994, 1996-1997, 2000-2001, 2004-2005, 2008-2009, 2009-2010 and 2010-2011. All accounts follow UN guidelines. In terms of the 2010-11 account, their annual water account follows the UN's SEEA and provides information on water use and consumptive practices by main industries and households (Australian Bureau of Statistics, 2012). This information is on the supply and use of water in the Australian economy in physical and monetary terms. The main focus of all these accounts is on the interactions between water users and the environment. Such accounts provide an overview of water resource use and enable 'the quality of existing data to be assessed (and improved) as well as data gaps to be identified' (Vardon *et al.*, 2007 p. 656). The ABS explored the provision of economic water information in its 'Experimental Monetary Water Account' for the periods 2003-04 and 2004-05 (Australian Bureau of Statistics, 2007b; Australian Bureau of Statistics, 2007a). However, Lenzen (2004) considers that water accounts under UN guidelines cannot be considered comprehensive due to the uncertainties and errors that are inherent in the collection process such as measurement errors on precipitation or missing data.

In the last years, calls for the construction of an evolved form of water accounts have been made by different scholars (e.g. Wentworth Group of Concerned Scientists, 2008). While Australian water reporting has been in operation for some time, there have been persistent calls for the improvement of Australian water information. For example, in 2003 the high-profile Wentworth Group called for 'a publicly available set of water accounts [to be] created for each river valley and groundwater system across Australia so that water users, the community and river managers can make informed decisions' (Wentworth Group of Concerned Scientists, 2003 p. 3). This suggestion was repeated in *The State of Australia's Water* (Wentworth Group of Concerned Scientists, 2006 p. 7). Most 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' (Wentworth Group of Concerned Scientists, 2008 p. 1). The Group called for annual national, state/territory-wide and regional scale reports to underpin government

planning decisions and improve the cost effectiveness of public and private environmental investments.

Currently Australia is trying to implement a new water reporting framework which I term *Standardised Water Accounting* and is the focus of this study. *Standardised Water Accounting* can be considered as an innovation in Australian water accounting; that is, water accounting that mimics financial accounting in methodology and presentation and which is created in accordance with water accounting standards. *General Water Accounting* has existed in Australia for decades, but it has been used for internal management purposes with low external scrutiny and the lack of an enhanced format (Slattery *et al.*, 2012). Because of National Water Initiative reforms, it was necessary to improve the water accounting system and that led to *Standardised Water Accounting*.

3.3.1. The development of Standardised Water Accounting in Australia

One of the reasons for the development of SWA in Australia was the period of water scarcity that affected Australia in the early 2000s. Various steps were taken at all levels of government to meet Australia's water challenges, including the National Water Initiative (NWC, 2012), National Plan for Water Security (Commonwealth of Australia, 2007) and the Water Act 2007 (Cwlth). These measures have addressed a wide range of water issues, including water management, trade and water information. The start of national water reform in Australia is reflected in the agreement reached by the Council of Australian Governments (hereafter CoAG) in 1994 (Slattery *et al.*, 2012). Such agreement was reinforced by the Intergovernmental Agreement to the National Water Initiative (hereafter NWI) which was signed by the Commonwealth and States and Territories between 2004 and 2006 (Slattery *et al.*, 2012). According to Chalmers *et al.* (2012 p. 1004), the NWI 'was a significant milestone that provided the impetus for the current Australian system of water management and water accounting'. The NWI defines the water reform agenda in Australia and 'represents a shared commitment by governments to increase the efficiency of Australia's water use, leading to greater certainty for investment and productivity, for rural and urban communities, and for the environment' (Council of Australian Governments, 2004). Under the NWI, governments across Australia have agreed on action to achieve a more consistent approach to the way Australia manages its water resources. One of the objectives of the National Water Initiative (Council of Australian Governments, 2004 p. 4) is 'water accounting which is able to meet the information needs of different water systems in respect to planning, monitoring, trading,

environmental management and on-farm management'. In the NWI eight areas of reform are outlined which will enable the achievement of a nationally managed system of groundwater and surface resources for rural and urban use that maximises social, economic and environmental results (Slattery *et al.*, 2012).[20] Subsequently, the Australian government approved a AUD $12.9 billion program called 'Water for the Future' which aims at securing long term water supply in Australia (Chalmers *et al.*, 2012).

The NWI was supplemented by the Water Act 2007 (commenced on 3 March 2008 and amended on 25 September 2008) which implemented key reforms for the management of water in Australia, predominantly in regard to the federal management of the Murray-Darling Basin agricultural region. The Act also contains important provisions in regard to water information, the responsibility for which has been assigned to the (federal) Bureau of Meteorology. The provision of water information is set out in Part 7 of the Water Act 2007 (Cwlth). Under Section 130, the Act states that water information standards may deal with all or any of the following: 'collecting water information, measuring water, monitoring water, analysing water, transmitting water information, accessing water information, retaining and storing water information, water accounting, any other matter related to water information that is specified in the regulations' (Commonwealth of Australia Law, 2007 p. 137). An important aspect of this legislation is that the Bureau of Meteorology has been assigned responsibility for the provision of a National Water Account (which commenced in 2010 after a pilot program in 2009) and delegated authority to issue National Water Information Standards (Bureau of Meteorology, 2012).

An important milestone in the development of SWA was the commissioning of Sinclair Knight Merz (SKM) by the Department of Agriculture, Forestry, and Fisheries to undertake a stocktake and analysis of water accounting practice in Australia. The project was supervised by the multi-jurisdictional National Water Initiative Committee of the Natural Resource Management Ministerial Council. It involved thirty-eight organisations nominated by the jurisdictional representatives of the Expert Advisory Panel and included the central water agencies of each State and Territory as well as an array of water service providers (SKM,

[20] According to Slattery *et al.* (2012 p. 22), the eight areas of the reform mentioned in Section 24 are: '(1) Water Access Entitlements and Planning Framework; (2) Water Markets and Trading; (3) Best Practice Water Pricing; (4) Integrated Management of Water for Environmental and Other Public Benefit Outcomes; (5) Water Resource Accounting; (6) Urban Water Reform; (7) Knowledge and Capacity Building; and (8) Community Partnerships and Adjustment'.

2006). The project was intended to move toward 'the development of standards and guidelines to underpin a national water accounting system, and processes which would support consistent water measurement, monitoring, accounting and reporting at all levels of water management' (SKM, 2006 p. 1). It comprised four parts:

- Development of the information requirements of accounting systems at the different levels of water management;
- A stocktake of the current water accounting systems of jurisdictions and water service providers in all states and territories;
- An analysis of the information collected in the stocktake and identification of best practice, information gaps and areas for improvement; and
- Provision of recommendations for the development of water accounting standards, principles for environmental water accounting and guidelines for reporting and information, including priorities for standards, guidelines and systems development.

Overall, while some signs of good practice were found, water accounting was found to be at an immature phase. SKM (2006 p. 2-11) made twelve recommendations to progress on the establishment of water accounting in Australia. These recommendations included the implementation of the working definition of water accounting; the observance of necessary steps such as the development of a conceptual framework, standards, and chart of accounts; and the establishment of a Water Accounting Development Committee to supervise the development of water accounting. Collectively, these steps were intended to create a new discipline of water accounting.

The National Water Accounting Development Project (hereafter NWADp) was endorsed by the Natural Resource Management Ministerial Council (hereafter NRMMC) on 24 November 2006.[21] In February 2007 the NRMMC created the Water Accounting Development Committee (hereafter WADC) as part of the National Water Accounting Development project. In the period from late 2007 to early 2009, the WADC (with the support of the Jurisdictional Reference Panel and the Water Accounting Development Committee Office) undertook two major tasks. The first task was the development of the Water Accounting

[21] The Project was funded under the Raising National Water Standards program (part of the Australian Government Water Fund) managed by the National Water Commission and provided for $5 million of Commonwealth funding matched by $5 million of in-kind support from the States over a three-year period.

Conceptual Framework, which comprises eight Statements of Water Accounting Concepts.[22] The second major task was to pilot SWA in multiple locations around Australia. Six pilot sites were identified by the jurisdictions to engage with SWA and prepare prototype water accounts, with the objective of identifying (and where possible overcoming) the challenges of implementing SWA. These pilot sites included differing water conditions and management practices, and comprised surface water systems in South Australia, Queensland, New South Wales and Victoria and a river and groundwater system in Western Australia. A system managed by the former Murray-Darling Basin Commission formed the sixth pilot site. Participants at the pilot sites were mainly professionals from the water industry and while some pilot teams included financial accountants others did not. I, along with one of my supervisors, was engaged by the WADC to assist with this pilot process in early 2008, and from mid-2008 to early 2009 visited five of the pilot sites. Chalmers *et al*. (2012) mention that the findings of the pilot project corroborate the usefulness of using analogies and principles from financial accounting for the development of SWA.

At the same time, advances in legislation continue to occur, with the enactment of the Water Act in September 2007 as the most notable example. The CoAG Working Group on Climate Change and Water presented a report on the state of water reform in March 2008. In the report, among other things, they suggested the prompt adoption of a national water accounting framework and recognized the necessity for the states to be more active in the adoption and application of water accounting standards (Bureau of Meteorology, 2012). In November 2008, the responsibilities of the NWADp were transferred to the BoM and the WADC became the advisory body for the BoM (Bureau of Meteorology, 2012). In early 2009, the WADC was superseded by the Water Accounting Standards Board (hereafter WASB) which is in charge of overseeing and coordinating the development of water accounting standards. The result of the water accounting standards is the preparation of General Purpose Water Accounting Reports (hereafter GPWARs) by the water report entities. As of October 2012, the WASB has released the Statement of Water Accounting Concepts and three iterations of the Standard (the Preliminary Australian Water Accounting Standard, the Exposure Draft of Australian Water Accounting Standard 1 and the Australian Water Accounting Standard 1). It is worth mentioning that the third iteration of the standard is the final version of Australian Water

[22] The WADC engaged a team of academics (led by Professors Jayne Godfrey and Keryn Chalmers from Monash University and Associate Professor Brad Potter from the University of Melbourne) to draft and refine these concepts, which to date have been completed.

Accounting Standard 1 (see Table 1.1 in the Appendix for a timeline of the evolution of SWA).

[Insert Table 1.1 here]

SWA is advantageous because 'separate tables of river flows and extraction volumes do not link information together meaningfully, and do not show where all the water has come from or gone to, and do not demonstrate the same accountability for the management of the resource' (SKM, 2006 p. 127). Although non-SWA accounts may be easier to prepare, extra information provided in SWA accounts could be worthy of the extra effort. As far as is known, it is the first time that accounts have been attempted to be prepared utilising a format and methodology so closely modelled on financial accounting, but applied to a physical resource.

Godfrey (2008) argues that SWA, as presented here and currently under development in Australia, has the potential to radically transform water policy; though, whether SWA will be considered either mandatory or voluntary remains an open question. However, discussion on the political aspects of the development of SWA is beyond the scope of this study. Chalmers *et al.* (2012) describe the governance arrangements of SWA and state that different stakeholder groups will benefit with its development. Chalmers *et al.* (2012) suggest that, internationally, water industries may lead the early development of SWA in the public interest and that the regulatory capture of water industry and accounting experts will not be in conflict with the public interest.

Even though it can be considered as an emerging discipline, there has been research on *Standardised Water Accounting* (e.g. see Godfrey and Chalmers, 2007; Lowe, 2008; Ahmad *et al.*, 2010; Sofocleous, 2010; Godfrey, 2011; Kirby, 2011; Chalmers *et al.*, 2012; Slattery *et al.*, 2012) although not to the degree as *General Water Accounting. S*KM (2006) notes that there is a clear contrast between a style of report that follows accounting procedures (called *Standardised Water Accounting*) and a table of statistics (called *General Water Accounting*). Ahmad *et al.* (2010) analysed what has been disclosed by Australian water authorities, and conclude that their disclosures provide only limited information about water-related issues including quality and valuation. Ahmad *et al.* (2010) acknowledge that SWA has the potential to address a part of this information gap; however, valuation and quality are still ignored in the Water Accounting Standards Board's Conceptual Framework. Accountability for water is important because water usage is critical in Australia (Pigram, 2006; Godfrey, 2011;

Chalmers *et al.*, 2012). It is necessary to manage freshwater resources equally and rationally as they are not indefinite. After a thorough review of the literature, there is a need to fulfil the gap of limited research on accountability for water resource management in the light of SWA. Having accountability in mind, the research question proposed is: Overall, does Standardised Water Accounting enhance the accountability of water managers? The research question will be answered by the sum of the results identified in each of the three research papers. The next section discusses the framework that drives this study, Accountability.

4. The Accountability Framework

This study adopts Gray *et al.'s* (1996) accountability model and identifies three critical components based on the elements of the model. In each of the three research papers, the critical components of the model are discussed. The findings of each paper inform the model in the context of water accounting. This section provides an overview of accountability research. In Australia, governments are vested with the control of water (Council of Australian Governments, 2004); for this reason, public sector accountability is also explored. Finally, Gray *et al.*'s (1996) accountability model is introduced.

4.1. Overview of Accountability

According to Gray (2007), there is no single definition of theory, but theories 'construct and help formalise the way in which we perceive – and thereby address – the world' (Gray, 2007 p. 18). Gray (2007) groups theories as Meta-Theory, Meso (or Middle) Theory and Micro or Narrow Theory wherein accountability, which is considered prescriptive in nature, is considered as a Meso Theory. This theory focuses on the general area of intended enquiry leaving major assumptions about the world and society as 'assumed' (Gray, 2007). However, Spence *et al.* (2010) consider that accountability itself is not a theory but rather an underspecified idea and that accountants interested in accountability have spent more time discussing other theories than developing the concept.

This thesis explores the extent to which accounting is a useful tool that can be used in reporting on water resources; therefore, the first question is to know what accounting involves. Accounting involves much more than the production and reproduction of meaning (Roberts and Scapens, 1985); it involves constructing reality (Hines, 1988). Accounting information is created by every organisation, whether public or private. Information

constructed through accounting has an impact in shaping and maintaining particular patterns of accountability within organisations (Roberts and Scapens, 1985) and also between the organisation and external stakeholders. Accountability is an important part of accounting. Roberts and Scapens (1985, p. 448) state that 'the practice of accounting institutionalises the notion of accountability; it institutionalises the rights of some people to hold others to account for their actions'. However, accountability is more than a system of reciprocal rights and obligations. According to Bovens (2005), historically the accountability concept is closely associated with accounting. Understanding what accountability means is important to this study as water is traditionally seen as a public good. (A seminal discussion about public goods can be found in Hardin's 'Tragedy of the Commons'.) Consequently, water can be misused due to mismanagement unless accountability mechanisms are in place. Hardin's model predicts an overexploitation or degradation of shared resources (Feeny *et al.*, 1990). Surface and groundwater resources can be considered as common-property resources. Common-property resources share two characteristics: excludability (or control of access) and subtractability (or rivalry). For example, 'if one user pumps more water from an aquifer, other users will experience an increase in pumping costs as aggregate use approaches or exceeds recharge capacity' (Feeny *et al.*, 1990 pp. 3-4). For the purpose of evaluating accountability in the use of water resources, Gray *et al.*'s (1996) model is used to evaluate accountability in this particular context of water accounting.

Gray *et al.* (1996) believe that the accountability framework is useful to analyse accounting information transmission in general (more specifically corporate social responsibility information), but other authors (such as Puxty, 1986; Tinker *et al.*, 1991) have criticised the potential affiliation of this framework with liberal economic democracy. Tinker *et al.* (1991) state that in spite of social accounting's critical pretensions, by accepting the main tenets of neo-classical economics, the possibility of any major change is thwarted, whereas Puxty (1986) states that both accounting and social accounting are driven by demands of powerful interests in society. Moreover, Puxty (1986) considers that the existence of social accounting standards cannot be justified on the basis of defined social welfare criteria. On the other hand, Gray *et al.* (1996 p. 33) argue that accountability 'is the necessary link between a neo-pluralist view of how our world is currently ordered and a democratic view of how it should be ordered'. Not only can social and environmental accounting disclosures be tools by which accountability can be achieved, but also, as Spence (2010) suggests, social and environmental accounting should encompass a goal beyond accountability.

The nature of accountability has transformed over time and has become multi-faceted (see Sinclair, 1995; Shaoul *et al.*, 2012). Bovens (2005) mentions that the roots of the contemporary accountability concept can be traced back to the reign of William I of England in 1085 who required all property holders in his kingdom to provide a count of their possessions. There are different discipline-specific uses of accountability; however, a common ground is given by the general sociological meaning of the concept (Messner, 2009). Sociologically, accountability refers to the exchange of reasons for conduct which means to provide reasons for and to justify one's behaviour (Messner, 2009). Social norms define who is expected to account for something, to whom and how. The sum of these implicit and explicit expectations denotes accountability. Therefore, it can be argued that 'accountability is a morally significant practice, since to demand an account from someone is to ask this person to enact discursively the responsibility for her behavior' (Messner, 2009 p. 920).

Roberts (2009) explores the motivation for providing an account. Accountability means becoming a *subject* who will provide an account. Accountability is explored by Roberts (2009) as subjection by linking to Freud's account of guilt and Lacan's account of the dynamics of recognition. Roberts (2009) also investigates Althusser's version of accountability which is described as *interpellation*. Roberts (2009) relates the idea of interpellation with guilt and recognition to explore the complexity of accountability as a social practice. The psychoanalytic views of recognition and guilt reflect the inter- and intra-processes of accountability (Roberts, 2009).

What exactly is accountability? In its simple form, accountability is a concept. Llewelyn (2003) considers *concepts* as one of the five levels of theorising available to qualitative empirical researchers. Concepts are useful because they create meaning by linking the objective and subjective domains of experience (Llewelyn, 2003).[23] Giddens (1984) argues that accountability is a concept that involves interpretative schemes and norms which are part of a social system. In general, accountability is a normative concept and, as such, it looks at how the world should be from a particular point of view.

If accountability is a concept, is it an unrealistic concept? Spence *et al.* (2010) conclude that accountability is not entirely a realistic concept. Moreover, Archel *et al*. (2011) argue that accountability is a fine ideal; however, it is hard to implement due to the dominant power of

[23] Llewelyn (2003) states that, as a concept, accountability reflects specific practices. Concepts are essential tools in social science because they serve to observe and represent the world and serve to act and work in it.

specific interest groups in the political process.[24] It is argued that accountability can be considered as a useful tool to transmit reality, like an accounting mechanism. This idea can be linked to Hines (1988) who argues that reality can be constructed through accounting. It is assumed that the reason for accountability is to generate change and that such change is meant to improve and make amendments.

It is not simple to define accountability as it is considered as a multi-faceted and 'murky' term that cannot be defined precisely (Sinclair, 1995). One reason why accountability is multi-faceted is the fact that understanding accountability changes through experience (Gibbon, 2012). Even within the accounting field, there is a lack of consensus about what *being held accountable* actually means (Cooper and Owen, 2007). Thus, understanding accountability is not an easy task, as reflected in Sinclair's (1995 p. 219) perception of accountability as 'a cherished concept, sought after but elusive'. Accountability is constructed in a subjective manner and changes depending upon context. The accountability of one person is different from another (depending upon his/her role). Sinclair (1995) states that 'accountability is a responsiveness and ownership of outcomes which goes beyond the idea of just holding to account'. Even though there are discussions on what accountability entails and how it should be delivered, there are scholars who go further by analysing the benefits of accountability in the bigger picture. Gray *et al.* (1996), for example, state that through accountability the unequal distribution of power in society will be reduced.

Gray *et al.* (1996 p. 38) provide a broad definition of accountability as the 'duty to provide an account (by no means necessarily a financial account) or reckoning of those actions for which one is held responsible'. However, Gray *et al.*'s (1996) definition is not considered comprehensive as it does not explain how information can be utilised effectively by recipients and it does not explain the differences in power between the accountor and the accountee. Accountability involves the provision of information which means that the accountee (principal) has the right to call upon the accountor (agent) to give an account of his/her

[24] Archel *et al*. (2011) analyse the stakeholder consultation processes of recent government-led corporate social responsibility initiatives in Spain.

activities.[25] Taking Gray *et al.*'s (1996) definition as a reference, Joannides (2012) states that accountability can be framed based on four interrelated questions:

1. *who is accountable?,*
2. *to whom are they accountable?,*
3. *for what are they accountable?* and
4. *by which means are they accountable?*[26]

Gray *et al.* (1996 p. 33) see accountability as a connecting piece between what is and what should be as 'accountability...is the necessary link between a (neo-pluralist) view of how our world is currently ordered and a democratic view of how it should be ordered'.

Based on Gray *et al.*'s (1996) definition of accountability, it can be deduced that one important aspect of accountability is *responsibility*. This deduction is consistent with Boland and Schultze's (1996 p. 62) definition of Accountability as 'the capacity and willingness to give explanations for conduct, stating how one has discharged one's responsibilities'. Accountors are held responsible for those actions taken and such actions affect accountees. The connection between *accountability* and *responsibility* has been highlighted by different scholars (e.g. see Jones, 1977; Stewart, 1984; Kamuf, 2007; Messner, 2009; McKernan, 2012). Jones (1977) explores the meaning of responsible government and perceives accountability as part of responsibility. He considers responsibility as a multi-faceted concept comprising four elements: accountability, causation or authorisation, obligation and concern for consequences. In terms of accountability in particular, Jones (1977) defines it as a liability to provide an account for what has been or has not been done. By explaining accountability as a liability, Jones (1977) relates the concept to an obligation from the accountor to the accountee. Basing his analysis on Derrida's work on responsibility, McKernan (2012 p. 258) states that 'accountability relies on responsibility but that the rendering of accountability tends to undermine responsibility'.[27] Therefore, McKernan (2012) suggests reconfiguring

[25] Stewart (1984) mentions that accountability not only involves information, but also the evaluation of such information and, correspondingly, praise or blame could be applied. Furthermore, the accountability concept involves both rendering and judging as a basis for action.

[26] Questions *on who, for what* and *by which means* have been explored in multiple studies whereas the *to whom* question seems under-explored.

[27] McKernan (2012 p. 259) states that the 'aporia of accountability can be understood in terms of a conflict between the singularity of moral responsibility, secured by secrecy, and the generality of ethics'.

accountability as testimony (because it opens a relationship with the other) and as gift (the gifts of accounts beyond any type of obligation). Accountability is not always based on a linear form of responsibility. It goes beyond that because, according to Shaoul *et al.* (2012), accountability involves: giving an account, holding to account, a judgement process and the application of sanctions and responsiveness to citizens.

Traditionally, in business and finance, accountability has been interpreted as corporate accountability to shareholders. As an example of corporate accountability, accountability involves for instance the relationship between the shareholders and a company. Company managers are entrusted to manage the resources and provide an account. Hence, the annual report and the financial statements are mechanisms to discharge accountability in this simple example. Brennan and Solomon (2008) discuss the mechanisms of accountability in private corporate governance by describing two aspects related to accountability: *relationship* and *transparency*. Brennan and Solomon (2008) discuss accounting research carried out on relationships in the private sector and also discuss mechanisms of transparency (of mainly financial reporting). Reasons for the development of accountability systems in organisations include the possibility of developing closer relationships between constituents, as a necessary tool to bring power back to the people of the nation, and more organisational transparency (Gray, 1992). Spence (2007) states that the term *accountability* is widely used by corporations, but is hard to implement in practice. Companies think that they discharge their accountability by publishing reports; however, they do not. Therefore, it can be argued that they are misleading the public (Spence, 2007).

It seems that current forms of corporate accountability are dependent on the discourse of neo-classical economics. For this reason, Shearer (2002) argues that corporate accountability is not adequate to discharge legitimate demands for accountability of corporations. Moreover, there are calls for greater accountability from corporations and managers. According to Messner (2009), existent management and financial practices embody a rather restricted type of accountability that is insufficient to fulfil the responsibilities as more than economic subjects. As a result, there have been discussions for improving organisational accountability. According to Cooper and Owen (2007), one way largely discussed to enhance organisational accountability is through disclosures. Cooper and Owen (2007) suggest that new organisational environmental and social disclosure initiatives will enhance stakeholder accountability through empowerment. Cooper and Owen (2007 p. 653) mention that, in a Foucaldian sense, ‘disclosure in itself can be instrumental in terms of enhancing

accountability in that it creates a new form of visibility, which may not only shape managerial subjectivities but also offer ammunition to influential outside parties, notably NGOs, seeking to bring influence to bear on the organization'. It is this visibility which is worth exploring.

Based on the previous discussions, it seems obvious that accountability is beneficial for society at large, but the question is whether more accountability is always desirable. Messner (2009) argues that in some cases more accountability is justifiable, but accountability can become problematic if its limits (as an ethical practice) are not considered. Such limits of accountability are inherent to the accountability process itself and, according to Messner (2009), recognising such limits is important if the objective is to understand the complete ethical dimension in the practice of giving accounts. Messner (2009) considers limits to accountability on the basis of the impossibility of the accountable self to give a full account and the benefits of keeping some information secret.[28] In some instances demands for accountability can be so great that they can create an ethical problem for the person or entity that is meant to give an account. Hence it can be preferable to have an 'imperfect' accountability instead of a 'perfect' one due to the fact that the accountable self cannot be made fully accountable (Messner, 2009).

In accounting, the annual report and the financial statements are the mechanisms for discharging accountability (Gray *et al.*, 1996). Currently there exist different reporting mechanisms meant to discharge accountability such as the GRI reporting or the Accountability Standard AA1000.[29] SWA is about water reporting and it can be considered as a new form of accounting or new disclosure initiative. (Another new kind of accounting involves, for example, the use of shadow accounts.) SWA means using financial accounting principles to account for and report on water. Corporate social reporting is one mechanism by which to discharge the accountability of corporations towards a wider range of stakeholders. In Australia, water management and administration remains in the hands of the public sector (Pigram, 2006).

[28] According to Messner (2009), such a burden is based on the fact that the accountable self is vulnerable to accountability to the degree that it is an opaque self (because it cannot account for everything that it has experienced), an exposed self (because being exposed to an accountee who will receive the account means being exposed to a demand that is existent even before an answer is provided) and a mediated self (which is based on a set of social norms that structure the whole scenario or regime of truth).

[29] 'For AA1000, a quality reporting process is quite simply governed by the principle of accountability, which is itself underpinned by the principle of inclusivity, i.e. accountability to all stakeholder groups' (Cooper and Owen 2007 p. 650).

In its simple form, accountability is a concept which is multi-faceted (Sinclair, 1995). However, concepts are considered as one of the levels of theorising (Llewelyn, 2003). Accountants have tended to spend more time talking about other theories rather than developing accountability as a concept (Spence *et al.*, 2010). As a theory, accountability can be considered as a Meso Theory (Gray, 2007). Accountability has been traditionally connected with the private sector, but significant research has been done on public sector accountability, which is critical to this study because water is primarily managed by the public sector. The next section discusses public sector accountability.

4.1.1. Public Sector Accountability

This section translates previous discussion on accountability into the public sector arena. But before looking at Public Sector Accountability, it is important to define what the public sector is. Broadbent and Guthrie (1992 p. 3) define the public sector as 'that part of a nation's economic activity which is traditionally owned and controlled by the government'. Public entities in charge of delivering utilities and services to the community comprise the public sector. Guthrie (1993) terms this myriad of public entities as Public Business Enterprises. Central government has been involved in either (or both) funding of and policy-making for the provision of public utilities and services (Broadbent and Guthrie, 1992). The provision of public utilities and services hence justify the existence of accountability in the public sector that is different from corporate accountability. Broadbent and Laughlin (2003) distinguish between managerial and political/public forms of accountability.[30] Political or public accountability applies to governments who were elected by their voters whereas the managerial kind applies to the managers of organisations who are accountable for the responsibilities entrusted to them by the principals (Broadbent and Laughlin, 2003). Governments make themselves accountable through political/public forms of accountability. The relationship between citizens and the government is a special element of public/political accountability; however, such relationship has not been explored in depth by researchers on Public Accountability. According to Smyth (2012), the existing literature on Public

[30] According to Stewart (1984), there are different levels or categories in accountability which he calls 'ladder of accountability'. These levels include: accountability for probity and legality, process accountability, performance accountability, programme accountability and policy accountability. These five levels in the ladder can be associated with political/public accountability and managerial.

Accountability has overlooked the relationship between the state and service users or civil society.

Overall, water management is considered as a natural monopoly because it involves an indispensable public service delivered by government agencies (Larrinaga-Gonzalez and Perez-Chamorro, 2008). In some countries, such as the United Kingdom, water services have been privatised (see Ogden, 1995). However, it seems that privatisation of water has not been the panacea because in some countries major corporate water players have been accused of price-gauging, fraud and anti-competitive behaviours in water supply (Douglas, 2011). At present more than 90% of water services around the globe are publicly owned (Douglas, 2011). In Australia, the administration of water resources and their management remains public (Pigram, 2006). But water administration, sanitation and delivery are not purely public because there are private investors involved (especially in the delivery of water). The introduction of New Public Management (hereafter NPM) reforms has also seen the introduction of Public-Private Partnerships (hereafter PPPs) operating in the water sector.

Seen as complementary to public management, 'Public Accountability is not just the hallmark of democratic governance, it is also a *sine qua non* for democratic governance' (Bovens, 2005 p. 192). Therefore, public sector accountability involves evaluating the democratic system in which the public sector operates because it is believed that democratic mechanisms will ensure that accountability is discharged. Traditionally, public sector accountability has been characterised by having two features: a descending accountability to citizens and an ascending accountability through public sector hierarchies to Parliament (Shaoul *et al.*, 2012). It seems that Public Accountability is a *must-happen* in any democratic system. The main functions of public accountability include: democratic control, the enhancement of the integrity of public governance, the improvement of performance and the maintenance and/or improvement of the legitimacy of public governance (Bovens, 2005). These functions can be seen as positive aspects of public accountability; however, there are some inherent problems that affect public accountability.[31]

Due to the neo-liberal public sector reforms that started in the 1980s (see Broadbent and Guthrie, 1992; Parker and Guthrie, 1993; Ogden, 1995; English, 2006; Broadbent and Guthrie, 2008; Egan, 2009), those democratic mechanisms were replaced by market and

[31] Defined as *too many eyes* and as *too many hands*, these problems involve the existence on many levels of hierarchy in the public sector which creates difficulties.

managerial-based accountabilities. Hence, there was a shift from the previous accountancy and auditing to one that is based on effectiveness, efficiency, streamlining and cost savings (Broadbent and Guthrie, 1992). Neo-liberal reforms are mainly characterized by a new institutional framework with strong private property rights, free trade and free market and the way neo-liberals perceive the democratic control of state organisations (Smyth, 2012). Under these neo-liberal reforms, public accountability becomes a contested field because of the interaction between civil society resistance and neo-liberal restructuring (Smyth, 2012). The change from the public to the private service represents a change in public accountability as follows: (1) a decrease in the intensity and scope of political accountability (because private or privatized entities are not subject to direct political accountability and have fewer responsibilities to report to the public on their performance) and (2) the reinvention and/or creation of accountability relations for these new private entities delivering public services (this private form of public accountability is based on shareholders' needs and not citizens' needs even if the lives of citizens are affected) (Bovens, 2005). Therefore, accountability in the public sector nowadays involves managerial conceptions which have replaced or augmented traditional norms of democratic accountability (Sinclair, 1995). A more detailed analysis of such reforms is discussed below.

4.1.2. Modernisation of the Public Sector, the Rise of Public Private Partnerships and Accountability

The public sector started to change in the early 1980s, with western countries taking the lead in those changes (see Broadbent and Guthrie, 1992; Parker and Guthrie, 1993; Broadbent and Guthrie, 2008). The UK was the most prominent example in terms of water privatisation (see Ogden, 1995; Ogden, 1997; Ogden and Clarke, 2005).[32] This change is based on the influences of neo-liberalism. 'Overall, the thrust of the changes favoured an emphasis on reducing the size of the public sector and therefore its cost, in the name of economic rationalism' (Broadbent and Guthrie, 1992 p. 3). Neo-liberal reforms present some characteristics which apply to New Public Management reform: growing moves towards privatisation, full pricing of products and services and a noticeable trend to adapt to market solutions wherever possible (Egan, 2009; Smyth, 2012).[33] It is argued that public sector

[32] The changing process of the public service in the UK is called New Public Management.

[33] Smyth (2012) noticed that these neo-liberal reforms have been analysed by different researchers in the last few years; however, there has not been a thorough analysis of the resistance that these reforms have generated. Such resistance could be reflected by the appearance of social movements across the globe.

reforms occurred because the public sector was seen as part of the economic problem and not as a solution to market failures (Egan, 2009). The new scenario focuses on outputs, efficiency, cost, and performance accountability (Broadbent and Guthrie, 1992). 'Public sector organizations were reclassified as commercial businesses or as a *remainder* category, and the public was redefined as customers' (Parker and Guthrie, 1993 p. 63). The *market discipline* was introduced under this reform, and, according to Guthrie and Parker (1993), the Australian Public Sector shifted from a philosophy of public administration to a philosophy of public sector management.

In the early 1980s the UK government changed the way it managed public sector enterprises. These changes are circumscribed under the major developments that happened in the UK which Broadbent and Laughlin (2003) classify in three historic phases. During the 1980s and early 1990s, several state industries were privatized in an unprecedented way (Broadbent and Laughlin, 2003). For example, British Telecom was privatised in 1984, British Gas in 1986, British Airways in 1987, British Steel in 1988 and Water Authorities in 1989 (Ogden, 1995). However, market features were introduced into public sector provision even before privatization took place. According to Ogden (1995), the privatization of Water Authorities was just a continuation of a process of change that affected the industry since the early 1980s (Ogden, 1995). There was a major reorganisation of the water industry in 1973 which involved the creation of ten Regional Water Authorities (Ogden, 1995). Such reorganisation was necessary to concentrate disperse functions. According to Ogden (1995), even after that reorganisation, in the early 1980s those Water Authorities were the subject of new financial controls and performance evaluation from the government. Thus, the privatization of Water Authorities was just one step in the chain of events.

In Australia, the impact of these modernisation reforms was noticeable by the changes in individual publicly owned entities. Before NPM reforms most commercial activities on behalf of governments were conducted by Public Business Enterprises. The NPM reforms drove these Public Business Enterprises either to commercialisation, to corporatisation and in some cases to privatisation.[34] According to Broadbent and Guthrie (1992), commercialisation refers to the introduction of commercial management principles, practices and accountability regimes whereas corporatisation involves using a corporate form for governance,

[34] According to Parker and Guthrie (1993), this process started with the election of the first Hawke Labor government in 1983. This had government administration reforms in its agenda.

management, legal and accounting and accountability purposes. These modernisation reforms still have an influence in the Australian public sector.[35] During this period, government reformed Statutory Authorities and Public Business Enterprises. These changes happened not only in the public service in general, but more specifically in Public Business Enterprises (Guthrie, 1993). Based on NPM reforms, these entities (previously called Public Business Enterprises) changed to a new form of entity that were called Government Business Enterprises. According to Funnel and Cooper (1998 p. 4), Government Business Enterprises provide goods and services that are mainly non-regulatory, market and non-financial in nature and fund their operations from their own activities (therefore they form part of the non-budget sector). Boards and managers appointed to operate a Government Business Enterprise are accountable ultimately to the minister in whose portfolio the agency is located. Egan (2009) argues that there is a philosophy regarding public sector modernisation in the Australian water sector that is evident by the establishment of the National Water Commission in 2007. Egan's (2009) research explores the impact of this modernisation process not only on water organisations, but also on water regulation.

English (2006 p. 251) identifies three directions taken by public entities due to NPM reforms: 'Infrastructure-based outsourcing, privatisation and Public Private Partnerships can be distinguished on the basis of asset ownership and the extent of the state's control over the quantity, quality and cost of services.' In an outsourcing arrangement the infrastructure is owned by the government whereas the private contractor is in charge of delivering the services that are paid for by the government (English, 2006). In this type, the ownership of the infrastructure asset is in the hands of the government.[36] Privatisation implies the sale of the asset to a private entity and hence the right to produce and sell services related to the business (English, 2006).[37] The state is limited in the level of influence on service quality and cost to customers. The UK water industry is an example in which full-privatisation was applied (Ogden, 1995). Finally, Public Private Partnerships (hereafter PPP) are reflective of a long-

[35] According to Broadbent and Guthrie (1992 p. 4), 'in Australia, the various levels of government have introduced market discipline and best commercial practices either through commercialisation (…) or through corporatisation (…) or finally through privatisation'. NOTE brackets not necessary unless quoted

[36] English (2006) states that there is less negative attention with outsourcing in comparison with privatisation or PPPs; however, its main problem is based on the use of public borrowings to fund infrastructure construction.

[37] In Australia the first entity to be privatised was the Commonwealth Bank in 1991.

term relationship between the private and the public. Such relationship is based on the 'construction, maintenance and operation of infrastructure assets and procurement of related services' (English, 2006 p. 251). Water privatisation has been adopted in a few cases: fully in England and Wales and partially in Chile, for example.[38] It can be seen that those neo-liberal reforms altered the nature of public sector accounting and accountability especially by the introduction of these new entities.

As mentioned in the previous paragraph, under these reforms there was a transition in the nature of public accountability and, as a result, a new type of hybrid organisation called a Public-Private Partnership was created. These hybrids are affected by the influence of private corporate governance and public sector accountability (Shaoul *et al.*, 2012). The creation of PPPs reveals a new stage in the NPM reform movement which reflected partnerships between private contractors and governments (English, 2006). In this new scenario, the infrastructure is owned by the private contactor during the length of the contract and it provides services which in turn are paid for directly by consumers or governments (English, 2006). Globally, PPPs can be found in the provision of hospital buildings and services, major infrastructure projects such as bridges, roads and tunnels, schools, prison accommodation and public housing (English and Baxter, 2010) whereas in Australia, examples of PPPs can be found in the delivery of utilities, large toll roads, prisons, hospitals, sporting facilities and schools (English, 2006). The role of PPPs has been important in the Australian public sector since the start of NPM reforms. During the period 1980-2005, there were 127 projects identified which represented AUD $35,669 million (English, 2006). In terms of water, during the period 1980-2005 there were 22 water projects across multiple jurisdictions representing one-sixth of the total number of projects and accounted for only 4% of the net present cost of all PPP projects (English, 2006). For example, the Sydney desalination plant project contract which was awarded in 2007 (see Black, 2009 p. 14). This new scenario reflects an intersection between public accountability regimes and corporate governance regimes.

The accountability of PPPs is complex due to their nature and structure, which are reflected in several political and service performance risks (Shaoul *et al*. 2012).[39] PPPs, known as Private Finance Initiatives in the UK, present a special accountability case 'because of the role of

[38] According to Budds and McGranahan (2003), privatised water companies in England operate under commercial rules with tight regulation.

[39] Shaoul *et al.* (2012) explain these risks by using the UK's Private Finance Initiative as an example.

private finance, the relationships between the multiple entities, and the payment mechanism, which relies on performance measurement systems controlled by the private sector' (Shaoul *et al*. 2012 p. 215). To sum up, accountability in the public sector under neo-liberal reforms follows three streams: an upward component, a downward component and a horizontal component. This horizontal component is between these newly-created entities and with both the private sector components and the public sector procurer (Shaoul *et al.*, 2012). The elements of governance in the public sector, previously discussed, overlap with the idea of corporate governance in the private sector. PPPs in the Australian water sector can be found mainly in infrastructure projects as governments are vested with the control of water.

This study adopts Gray *et al.*'s (1996) accountability model, but given the issues of public sector accountability discussed above, extend this model to include elements especially pertinent to the public sector (these elements are **Clarity of Relationship, Transparency** and **Power of Accountees**). The next section provides an overview of the model.

4.2. An Overview of Gray et al.'s *(1996) Accountability Model*

In this study, Gray *et al.*'s (1996) accountability model is adopted to evaluate accountability in the context of water accounting. The model starts by understanding accountability as connected with responsibility. According to Gray *et al.* (1996), accountability involves two responsibilities: the responsibility to undertake certain actions and the responsibility to provide an account of those actions. The main elements of this model arise from the **Relationship** between the accountor (agent) and the accountee (principal) which is defined by society and provides accountees with a right to **Information,** and the outcome from accountees to accountors is **Instructions about actions,** and **Reward and Power over resources** (Gray *et al.*, 1996). These elements are circumscribed in the social context. This model can be applied to all types of relationships and rights to information (Gray *et al.*, 1996).

The model specifies a simple two-way relationship between the accountor and the accountee. The terms of the flows between them will be a function of the relationship between the parties and this will reflect the social context of that relationship (Gray *et al.*, 1996). Roles between accountor and accountee are not fixed since each of them can interchange roles. The core of Gray *et al.*'s (1996) model is the relationship between parties and the role that society ascribes to the relationship. This relationship assigns responsibilities and grants rights to information thus determining accountability. The issue of determining the relationship is based on the

series of social contracts between members of society and can be legal and non-legal (Gray *et al.*, 1996). These contracts provide the basis for rights and responsibilities between the parties. The most evident rights and responsibilities are those established by law, but while law frequently identifies responsibilities for actions, it rarely identifies responsibility to account for those actions (Gray *et al.*, 1996). Therefore, the legal responsibility for action and the legal responsibility for accountability are not the same. According to Gray *et al.* (1996), non-legal rights and responsibilities are divided into quasi-legal rights (enshrined in codes of conduct or statements from authoritative bodies that the organisation subscribed to and other semi-binding agreements) and philosophical rights (which can be absolute or relative).

The social context is perceived as a social system that is determined by social relationships that bring changing rights, responsibilities and accountability. Major sources of information are the accounts prepared by organisations; however, those accounts are predominantly financial and directed to the most powerful group in society hence creating anti-democracy (Gray *et al.*, 1996). 'In the proactive rather than analytical sense accountability is essentially a mechanism, the development of which contributes to the normative position of a more justly organised and better informed democracy' (Gray *et al.*, 1996 p. 42).

In terms of applying the Gray *et al.* (1996) to the public sector, for the element of **Relationship**, I look at the critical component of **Clarity of Relationship**; for the element of **Information**, I look at the critical component of **Transparency**; for the critical component of **Instructions, Reward and Power**, I look at the critical component of **Power of Accountees.** Accountors and accountees must be clearly identified, and identification is the starting point of accountability. After identifying the actors, accountors should provide an account of their actions to accountees. Such account must be *transparent* in order to create visibility. Finally, after transparent information is provided to accountees, they may be said to be *empowered*. Such power is represented by the possibility of accountees to create change with the information provided. These components are developed in further detail in the following three papers.

To recap, the objective of this study is to investigate the role of SWA in enhancing the accountability of Australian water managers. Accountability is assessed by extending Gray *et al.*'s (1996) accountability model to include elements pertinent to the public sector. **Paper 1** explores the perceptions of practitioners regarding SWA and its possibility to enhance the accountability of water managers. Several limitations were identified during the case study-

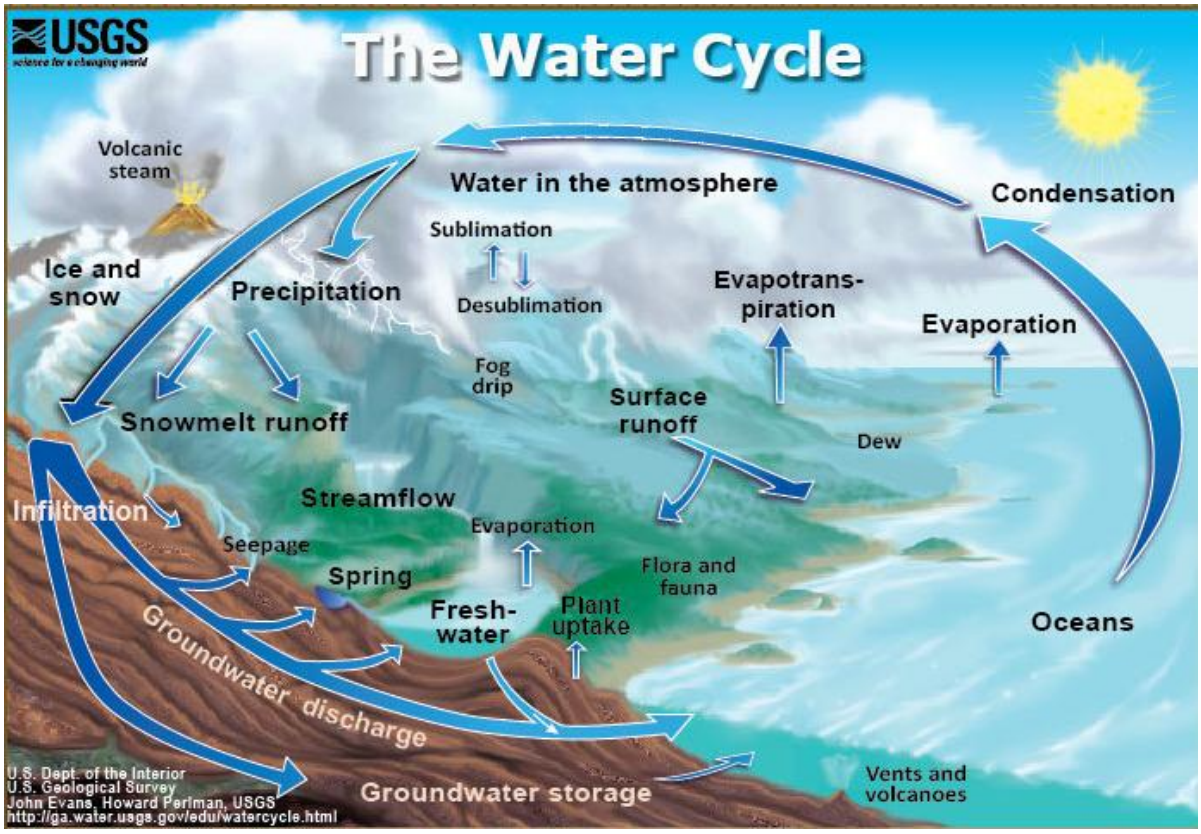
participant observation phase and most of them were corroborated during the interview phase and after analysing public submissions to the WASB. Due to these limitations, it was concluded that it is unlikely to be fully realised in the second iteration even though SWA has the potential to enhance the accountability of water managers. Overall, practitioners suggest the numerical components of SWA offer limited possibilities for accountability because a significant portion of these 'results' are out of the control of water managers.

Paper 2 explores the perceptions of potential users of SWA reports regarding the process itself and its possibility to enhance the accountability of water managers. Even though users agree the preparation of water reports under SWA is beneficial, they are unsure about the possibility of these reports in discharging the accountability of water managers. Finally, **Paper 3** explores groundwater accounting and reporting from the perspective of practitioners in the light of the development of SWA. It is concluded that it is unlikely to fully realise accountability under the second iteration of the standard due to the limitations identified after analysing data gathered.

Overall, it is concluded that it is unlikely to fully realise accountability under SWA (based on the second iteration of the standard) due to the limitations identified in the research papers. Finally, it is concluded that one explanation for SWA is auto-communication in the sense that the end-user of SWA reports could actually be the preparer of those reports.

5. Appendix

Figure 1.1. The Water Cycle



Source: U.S. Geological Survey

Table 1.1. Evolution of Standardised Water Accounting (SWA)

2004	The National Water Initiative (NWI) is signed. The NWI is an intergovernmental agreement reached by the Council of Australian Governments (CoAG)
2006	Sinclair Knight Merz (SKM) is commissioned by the Department of Agriculture, Forestry and Fisheries to undertake a stocktake and analysis of water accounting practice in Australia
2006	On November 24th, the National Water Accounting Development Project (NWADp) was endorsed by the Natural Resource Management Ministerial Council (NRMMC)
2007	The Water Accounting Development Committee (WADC) was established
2007	State pilot projects were established (until 2009)
2007	The Water Act 2007 is signed into law. The Bureau of Meteorology (BoM) was assigned the task of issuing National Water Information Standards
2008	WADC is assigned under BoM's responsibility
2009	The Water Accounting Standards Board (WASB) superseded the WADC in February

2009	The Water Accounting Conceptual Framework (WACF) and the Preliminary Australian Water Accounting Standard (PAWAS) are issued
2009	Water Reform Committee replaced CoAG Working Group on Climate Change: Water Subgroup
2010	The Exposure Draft of the Australian Water Accounting Standard 1 (ED AWAS 1) is issued by the WASB. Comments and feedback were received until June 2011
2012	In late 2012, the WASB released the Australian Water Accounting Standard 1 (AWAS 1) after incorporating feedback and comments from the ED AWAS 1

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THE EXTENT TO WHICH AUSTRALIAN STANDARDISED WATER ACCOUNTING CONTRIBUTES TO ACCOUNTABILITY – PRACTITIONER PERSPECTIVES

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THE EXTENT TO WHICH AUSTRALIAN STANDARDISED WATER ACCOUNTING CONTRIBUTES TO ACCOUNTABILITY – PRACTITIONER PERSPECTIVES

ABSTRACT

Purpose – This study examines the perspectives of water accounting practitioners regarding the extent to which Standardised Water Accounting (SWA) could improve the accountability of water managers. SWA is an innovative new approach to account for water recently adopted in Australia which utilises financial accounting methodology and format, but quantifies water in physical rather than monetary amounts. SWA is intended to improve water information and hence water management, a critical element of both the Australian and global sustainability agenda and previously characterised as meeting the public interest (Chalmers *et al.*, 2012).

Design/methodology/approach – Based on Gray *et al.*'s (1996) accountability model, a theoretical framework of accountability was developed, constituting the elements of clarity of relationship, transparency and power of accountees, and this framework formed the basis of data analysis. Data was obtained from three sources. First, a participant observation-case study was carried out and five pilot sites were each visited for a period of two to three days. Second, structured interviews were undertaken with seven senior staff members from five of the six pilot sites. Third, the nine public submissions from practitioners to the Water Accounting Standards Board (WASB) on the Exposure Draft of Australian Water Accounting Standard 1 (ED AWAS 1) were analysed.

Findings – Overall, water accounting practitioners suggest the numerical components of SWA offer limited possibilities for accountability as these 'results' are not within the control of water managers. The qualitative disclosure components may be a vehicle for accountability, particularly the Accountability Statement, but issues around reporting boundaries and recent modifications to the requirements of this Statement limit its current contribution. It seems that SWA might be for the public interest (see Chalmers *et al.*, 2012); however, it cannot be fully realised at this stage due to the limitations identified.

Research limitations/implications – Consistent with other case studies, the primary limitation of this research is generalisability. Particular Australian environmental and regulatory characteristics in relation to water suggest that the adoption of SWA in other contexts may yield different results.

Practical implications – The main implication from this study is that modification of SWA is required for this reporting mechanism to enhance water manager accountability. If SWA ultimately proves to be successful, it could be adopted not only in Australia, but also in other countries. Additionally, accounting for other environmental elements (such as carbon emissions) might adopt a similar approach.

Originality/value – Within the accounting literature there is emerging interest in corporate water reporting, but little prior research has been done in relation to national water accounting. This paper therefore contributes to this important area. In addition, by extending Gray *et al.*'s (1996) accountability model, this study seeks to make a contribution to our conceptual understanding of accountability.

Keywords – Sustainability, water accounting, Australia

1. Introduction

A water crisis is occurring worldwide (World Water Assessment Programme, 2009), driven by issues including population growth, pollution, water mismanagement and climate change. These issues affect the availability of water resources and could have greater impacts in Australia because this country has the highest per capita use of water in the world (Slattery, 2008) while water in Australia is scarcer than in any other continent except Antarctica (Vardon *et al.*, 2007). Water is a constant issue in Australia because 'apart from being one of the driest continents, Australia experiences a spatially and temporally highly variable climate that includes periodic drought, leading to a relatively unpredictable water supply' (Lenzen, 2004 p. 1). Furthermore, during the early 2000s, Australia suffered one of the worst water crises in its history mainly because of a protracted drought (Godfrey and Chalmers, 2012).

Against this backdrop of global and Australian water challenges, robust water information has emerged as an important strand of water management. Slattery (2008) argues that reliable water information is necessary to manage the resource appropriately. In light of calls for robust water information (see Council of Australian Governments, 2004; SKM, 2006), the idea of 'water accounting' has emerged. According to Chalmers *et al*. (2010 p. 8), 'given the critical nature of Australia's water shortage, combined with advanced thinking and practices for water management, it is no surprise that Australia is taking the lead regarding water policy and water accounting'. A key response to calls for improved water accounting is the introduction of what we term *Standardised Water Accounting* (hereafter SWA), that is, water accounting that mimics financial accounting in methodology and presentation and which is created in accordance with Water Accounting Standards. It should be noted that there is a clear contrast between a style of report that follows accounting procedures (known as SWA) and a table of water statistics as the latter do not link information on flows and volumes meaningfully and do not show where all water has come from or gone to (SKM, 2006). Although non-SWA accounts may be easier to prepare, extra information provided in SWA accounts could be worthy of the extra effort. This is the first time that natural resource accounts have been prepared utilising a format and methodology so closely modelled on financial accounting.

From the perspective of Social and Environmental Accounting (SEA) research, SWA represents an example of the 'new' forms of accounting called for by authors such as Bebbington and Gray (2001). While SWA may be innovative, an important question is whether applying accounting techniques to report on water will be useful in promoting

accountability. This study aims to explore this question from the perspective of practitioners who were involved in developing the first iteration of SWA in Australia and who have commented on the Exposure Draft of Australian Water Accounting Standard 1 (hereafter ED AWAS 1).

The main body of the paper is structured as follows. Section 2 provides a background to the development and current manifestation of Standardised Water Accounting. Section 3 presents the accountability framework and describes Gray *et al.*'s (1996) model adopted in this study. This extension comprises the key elements: clarity of relationship, transparency and power of accountees. Section 4 describes the research method used in this paper and data gathering techniques, namely, case studies, interviews and content analysis of submissions to ED AWAS 1. Section 5 discusses the findings of the study and finally Section 6 provides concluding remarks.

2. Standardised Water Accounting research

This section provides an overview of SWA and the emerging academic research in this area. The way SWA evolved is explained in detail next.

2.1. Evolution of Standardised Water Accounting

Water reporting has existed in Australia for decades (Vardon *et al.*, 2007; Vardon *et al.*, 2012), but it has been mainly used for internal management purposes with low external scrutiny and the lack of an enhanced format (Slattery *et al.*, 2012). Calls for improved water reporting began with the National Water Initiative (hereafter NWI) of 2004, which sought to modernise Australian water management by means of a number of reforms including water trading. Later, in 2006, SKM (2006) recommended the adoption of water accounting as a discipline.

SWA is considered as an effort to establish water accounting as a sub-discipline in accounting (see SKM, 2006; Godfrey and Chalmers, 2007; Slattery, 2008; Chalmers *et al.*, 2010).[40] Slattery (2008 p. 26) suggests that Australia has the unique opportunity to lead the world in the development of SWA, for a number of reasons: (1) The commitment by Australian

[40] Key drivers for the development of SWA as a discipline include: (1) The inability of external users of information to command water information from the organisations (except from the Australian Bureau of Statistics), (2) The fact that water information collected and reported has to be prepared under consistent standards and (3) The need for public confidence in water accounting information (SKM 2006 p. 100).

governments and territories to improve water information, (2) The existence of water information compiled by Australian hydrographers in decades of work as well as the existence on an existing measuring and monitoring system, (3) Separate rights to be assigned to water due to the separation of water and land in Australia, (4) The instruments of water reform which lead to accounting as well as the nature of water entitlements and allocations, (5) The nature of water access entitlements and allocations which lend themselves to an accounting type of approach and (6) Water scarcity in Australia which requires audit trails to provide transparency for the management and allocation of the resource.

SWA is defined by SKM (2006 p. 2) as 'the application of a consistent and structured approach to identifying, measuring, recording and reporting information about water'. This information about water includes the rights and other claims to that water and obligations to deliver water or rights to water (Godfrey, 2011). According to SKM (2006), a disciplinary approach of water accounting is the most appropriate way forward and the one that will achieve a nationally consistent result. Water accounting involves recording, reporting and interpreting data related to water transactions, transformations and events (Godfrey, 2008). Australia is pioneering SWA in that no other country has attempted to develop water accounting following financial accounting principles (Godfrey, 2011).

In terms of standards development, SKM (2006) recommended the adoption of a procedure similar to that used by Standards Australia. Key aspects of this process include: (1) Standards can be requested by individuals and other organizations, (2) Cost-benefit analysis that guarantees that the needs and demands of users of water accounting information will be weighted, (3) Potential participation of water experts in the standard-development committee, (4) Involvement of users groups as well as the general public in the process of developing standards, and (5) Suitability of the procedure for the development of technical standards (SKM 2006 p. 233). Broadly, as Table 2.1 shows, the development of water accounting standards has followed this process.

[Insert Table 2.1 here]

SKM (2006) recommended the development of both a conceptual framework and accounting standards for water accounting. SKM (2006 p. 232, 233) recommended that the proposed conceptual framework for water accounting should comprise components such as report scope, reporting entities (water entities and report preparers), objective, relevance, reliability, understandability, comparability, materiality, recognition criteria, key components of chart of

water accounts, measurement, reporting and compliance, and monitoring and enforcement. This recommendation was taken into consideration by the Water Accounting Standards when it finalised the Water Accounting Conceptual Framework (hereafter WACF) in 2009. Broadly, the SKM recommendations have been adopted for water accounting and, as of October 2012, the WACF and the Australia Water Accounting Standard 1 (AWAS 1) have been completed.

The first step in developing these standards was that, in February 2007, the Natural Resource Management Ministerial Council (hereafter NRMMC) established the Water Accounting Development Committee (hereafter WADC). Unlike many governmental organisations the WADC was an independent expert group composed of water and accounting experts from industry, academia, environmental groups and government rather than a body comprising representatives from jurisdictions (Bureau of Meteorology, 2012a).

In the period from late 2007 to early 2009, the WADC (with the support of the Jurisdictional Reference Panel and the Water Accounting Development Committee Office) undertook two major tasks. The first task was the development of the Water Accounting Conceptual Framework, which comprises eight Statements of Water Accounting Concepts. In order to do this task, the WADC engaged a team of academics to draft and refine these concepts. The second major task was to pilot SWA in multiple locations around Australia (Slattery, 2008). Six pilot sites were identified by the jurisdictions to engage with SWA and prepare prototype water accounts, with the objective of identifying (and where possible overcoming) the challenges of implementing SWA. These pilot sites included differing water conditions and management practices, and comprised surface water systems in South Australia, Queensland, New South Wales and Victoria and a river and groundwater system in Western Australia. A system managed by the former Murray-Darling Basin Commission formed the sixth pilot site. Participants at the pilot sites were mainly professionals from the water industry and while some pilot teams included financial accountants others did not. In November 2008, the responsibilities of the National Water Accounting Development project (hereafter NWADp) were transferred to the Bureau of Meteorology (hereafter BoM) and the WADC became the advisory body of the BoM (Chalmers *et al.*, 2012). In February 2009, the Water Accounting Standards Board (hereafter WASB) superseded the WADC in its role as an advisory body of the Bureau of Meteorology.

In 2009, the WASB released the Water Accounting Conceptual Framework which sets out the concepts that will underlie the preparation of future General Purpose Water Accounting Reports (Water Accounting Standards Board, 2009b). Later that year, the WASB released the Preliminary Australian Water Accounting Standard (hereafter PAWAS) which was the preliminary version of the Australian Water Accounting Standard. It was prepared to conduct the Methods Pilot for the National Water Account (Water Accounting Standards Board, 2009a). The Exposure Draft of Australian Water Accounting Standard 1 was released by the WASB. Comments and feedback on it were received until 30 June 2011 (Water Accounting Standards Board, 2010).

In October 2012, the WASB released the Australian Water Accounting Standard 1 (hereafter AWAS 1) based on the feedback received after the release of the ED AWAS 1. AWAS 1 is the third iteration of the standard, following ED AWAS 1 and PAWAS. AWAS 1 prescribes the preparation of GPWAR under SWA by setting the conditions for recognition, quantification, presentation and disclosure of the items in water reports (Water Accounting Standards Board, 2012b). The second iteration of the standard (ED AWAS 1) has been used by the Bureau of Meteorology for the preparation of the National Water Accounts 2010 and 2011. In order to support the release of AWAS 1, the Water Accounting Standards Board (2012a) also released the Effects Analysis which examines the costs and benefits of adoption of AWAS 1, drawing upon a series of reports and industry research. The Water Accounting Standards Board (2012a) concludes that the cost of implementing SWA would be justified if stakeholder decision-making is improved by establishing a SWA framework, although it remains uncertain how much it will cost to prepare water reports and to implement AWAS 1. While a range of benefits can be identified, it is difficult to quantify the cost of water information reporting; therefore, further analysis is required. The Effects Analysis is a summary of four reports which were prepared for the WASB ('Effects analysis of AWAS adoption' prepared by Deloitte Access Economics, 'Standardised Water Accounting: Effects Analysis' prepared by Macquarie University, 'General Purpose Water Accounting Report: Independent Assurance Cost Estimate' prepared by Ernst & Young and 'Gap Analysis of water reports compared against ED AWAS 1' prepared by the WASB) (Water Accounting Standards Board, 2012a).

Within SEA, research on water accounting has been mainly about corporate water disclosures (e.g. see Morikawa *et al.*, 2007; Morrison and Schulte, 2009; Prior, 2009; Barton and Morgan-Knott, 2010; Egan and Frost, 2010; Morrison and Schulte, 2010; The Association of

Chartered Certified Accountants, 2010; Carbon Disclosure Project, 2012). However, these studies were about corporate reporting and not about SWA which is about water reporting using financial accounting principles and methodologies.

Considered as an emerging discipline (see Godfrey and Chalmers, 2012), there has been growing research on SWA (e.g. see Godfrey and Chalmers, 2007; Lowe, 2008; Ahmad *et al.*, 2010; Sofocleous, 2010; Godfrey, 2011; Kirby, 2011; Chalmers *et al.*, 2012; Slattery *et al.*, 2012); however, these projects have not been as extensive as research about other forms of water accounting. For example, Chalmers *et al*. (2012) examine the development of SWA from the perspective of three regulatory theories (public interest, regulatory capture and private interest) which have been used to describe regulatory developments related to financial accounting. The same authors suggest that water industries may dominate the development of standards in the public interest and also that regulatory capture by water professionals will not clash with the public interest. They also argue that the multidisciplinary nature of the system is a strong reason that limits the dominance of any particular professional group.

Given the importance of water to the community, an important aspect to look at in terms of SWA is the impact on accountability for water resource management, an area not explicitly considered by any of the above studies. Thus, the research question driving this study is: from the perspective of the report preparers, to what extent does SWA enhance the accountability of water managers? Section 3 explores the accountability framework in the light of Gray *et al.*'s (1996) model extended to include elements pertinent to the public sector. Having explained the path followed in the development of SWA, the components of SWA are explained below.

2.2 Exploring Standardised Water Accounting

In line with financial accounting, the SWA model includes (among other things): a conceptual framework which underpins the standard-setting process and practical reports called General Purpose Water Accounting Reports (hereafter GPWAR) which comprise seven components in the second iteration of the standard (reduced to six in the third iteration). The National Water Account 2010 and 2011 has been prepared by the Bureau of Meteorology on the basis of the second iteration of the standard (known as ED AWAS 1). The Water Act 2007 assigned the Bureau of Meteorology the task of preparing Australian national water accounts from 2010.

SWA is fundamentally different from previous Australian and international water accounting initiatives in that it draws heavily from the principles and practices of financial accounting. These aspects can be broadly grouped under three themes: Water Accounting Conceptual Framework, Water Accounting Standards and water accounting reports.

2.2.1. Water Accounting Conceptual Framework

Among other things, the WACF defines and explains the concept of a water reporting entity for which General Purpose Water Accounting Reports shall be prepared, sets out the objective of water reports, and provides guidance regarding the quality of information presented in the reports as well as the nature and quantification of the elements of such reports (Water Accounting Standards Board, 2009b p. 8). Unlike the conceptual framework in accounting, the WACF includes eight Statements of Water Accounting Concepts (hereafter SWAC). These SWACs are as follows:

SWAC 1: Definition of the water reporting entity,

SWAC 2: Objective of general purpose water accounting reports,

SWAC 3: Qualitative characteristics of general purpose water accounting reports,

SWAC 4: Definition of elements of general purpose water accounting reports,

SWAC 5: Recognition of the elements of general purpose water accounting reports,

SWAC 6: Quantification of attributes of elements of general purpose water accounting reports,

SWAC 7: Compliance disclosures in general purpose water accounting reports, and

SWAC 8: Assurance of general purpose water accounting reports (Water Accounting Standards Board, 2009b).

It is worth emphasising that water accounting standards were developed once the Water Accounting Conceptual Framework was completed, unlike financial accounting where the standards were developed before the framework. By following this process in the water arena, it is contended that standard-setting in water can develop faster, more efficiently and more rigorously in comparison with financial accounting (Godfrey, 2011). It can be argued that by having the conceptual framework before the standards, the result would have more conceptually pure statements. In fact, according to Doupnik and Perera (2012), without a conceptual framework, accounting standards would be developed unsystematically. The water standard-setting process follows a principle-based system which is similar to the International

Accounting Standards Board (hereafter IASB) framework. In a principle-based system, a conceptual framework is necessary in order to drive the standards.

2.2.2. Water accounting standards

In financial accounting, accounting standards contain the principles governing accounting practices and determine the proper treatment of financial transactions. Similar to financial accounting, in water the idea is to have a set of water accounting standards that guide the preparation of water accounting reports.

GPWARs will be prepared following water accounting standards. Basically, data will be collected and reported according to these standards. Presently, organisations such as state water authorities and the BoM have databanks with most of the information that is likely to be reported under water accounting standards (Godfrey, 2008).

2.2.3. Water accounting reports

Traditionally, water information has been presented in tables of statistics instead of presenting it in an integrated manner (SKM, 2006). Under SWA, however, integrated water accounts would be prepared. General Purpose Water Accounting Reports under SWA will include the following:

- A Contextual Statement (information about the operations of the water entity over the reporting period),
- A Statement of Water Assets and Water Liabilities,
- A Statement of Changes in Water Assets and Water Liabilities,
- A Statement of Physical Water Flows,
- An Accountability Statement (a statement by the managers of the water entity that attests to the contents of the report)
- Note disclosures (Water Accounting Standards Board, 2012c para. 9)

While the broad components of these reports have been identified, more detailed requirements are set out in the AWAS 1 (the third iteration of the standard). The AWAS 1 prescribes the basis for the preparation and presentation of a general purpose water accounting report (Water Accounting Standards Board, 2012c). The ED AWAS 1 (known as the second version of the standard) is a document that informed the AWAS 1. GPWARs are analogous to general purpose financial reports both in concept and in structure because they are meant to satisfy the

information needs of users who are unable to command that information by themselves (Godfrey, 2011). The AWAS 1 released by the Water Accounting Standards Board includes six components and not seven as it was on ED AWAS 1. Even though the assurance statement is not included as an element any more, the Water Accounting Standards Board indicates that GPWAR must be assured by an independent body. Other changes include a suggestion to omit the Statement of Changes in case there are no accruals in the water entity and the reduction of the objectives of the Accountability Statement. Now preparers have to mention whether GPWARs have been prepared in accordance with the Australian water accounting standards. Before, it was required to report on compliance as well.

Under the Water Act 2007, in November 2008 the responsibility of the National Water Accounting Development was transferred to the BoM (Water Accounting Standards Board, 2012c). An important aspect of the Water Act 2007 is that the Bureau of Meteorology has been assigned responsibility for the provision of a National Water Account (to commence from 2010 after a pilot conducted during 2009) and delegated authority to issue National Water Information Standards (Water Accounting Standards Board, 2012c). The vision of the standards is that they would be picked up by various water report entities; however, the main purpose to date is to inform the National Water Account.

The BoM prepared and released the National Water Account for years 2010 and 2011 following a standards-based approach to water resource reporting (following the ED AWAS 1) (Bureau of Meteorology, 2012b). The national water account includes standard information about the management of water resources in Australia (Bureau of Meteorology, 2012b). More specifically, the National Water Account presents information on water stores and flows, water use and water rights (Bureau of Meteorology, 2012b). In 2010, the BoM prepared and disclosed the first national water account for eight water management regions (Adelaide, Canberra, Melbourne, Murray-Darling Basin, Ord, Perth, South East Queensland and Sydney) and covered the period 1 July 2009 to 30 June 2010. In 2011, water reports were produced for eight significant water management regions (Adelaide, Canberra, Melbourne, Murray-Darling Basin, Ord, Perth, South East Queensland and Sydney) for the year end in 30 June 2011. The contextual information, which is similar to the Contextual Statement, brings a lot of detail for all regions. Both surface and groundwater resources are described as part of the physical information. Information disclosed also includes administration, water rights, climate and water overview. Each of the regions presents the three statements: Statement of Water Assets

and Water Liabilities, Statement of Changes of Water Assets and Water Liabilities and Statement of Physical Water Flows.

3. Accountability Framework

3.1. Background

Gray (2007) groups theories in three levels: Meta-Theory, Meso (or Middle) Theory and Micro (or Narrow) Theory. Accountability is located within the Meso Theory and as such it 'tends to leave major assumptions about the world and society in the *taken-for-granted* category and concentrates on the broad area of intended enquiry' (Gray, 2007 p. 19). This framework creates a criteria or normative ideal about how things should work in order to assess practice.

Responsibility is connected with the idea of accountability (e.g. see Jones, 1977; Stewart, 1984; Gray *et al.*, 1996; Kamuf, 2007; Messner, 2009; McKernan, 2012). Gray et al. (1996) suggest that accountability involves two responsibilities: the responsibility to undertake actions on behalf of the principal and the responsibility to provide an account for those actions. Jones (1977) understands accountability as part of bigger concept: responsibility. Jones (1977) describes responsibility as a multi-faceted concept comprised of four elements: accountability, causation or authorisation, obligation and concern for consequences. Regarding accountability, Jones (1977 p. 3) states that '[it] is the liability to give an account to another of what one has done or not done'. In this context, 'responsibility as accountability implies a liability to explain to someone else, who has authority to assess the account, and allocate praise or censure'. When connecting accountability with a liability, Jones (1977) relates the concept to an obligation. Such obligation goes from the accountor or agent to the accountee or principal.

In addition to corporate accountability, public accountability is important because, as Pigram (2006) points out, water resources administration and management in Australia remain in the public sector with primary responsibilities resting on individual states and territories. According to Guthrie and Parker (1993), public sector accountability involves the analysis of the financial performance and the quality and nature of the services provided to the community. Such analysis involves assessing public entities that deliver utilities and services to the community.

This study implements Gray *et al.*'s (1996) accountability model to operationalise accountability. The model has three elements: *Relationship, Information* and *Instructions, Reward and Power* which are circumscribed in a social context. According to Gray *et al*. (1996), accountability is based on a relationship and that relationship promotes rights to information. Such information enables instructions, reward and power. Gray *et al*'s. (1996) model is operationalised by drawing on the literature (see Jones, 1977; Stewart, 1984; Roberts, 1991; Gray, 1992; Gray and Jenkins, 1993; Guthrie, 1993; Parker and Guthrie, 1993; Sinclair, 1995; Mitchell *et al.*, 1997; Broadbent and Laughlin, 2003; Llewelyn, 2003; Bovens, 2005; Barton, 2006; Cooper and Owen, 2007; Kamuf, 2007; Brennan and Solomon, 2008; Messner, 2009; Roberts, 2009; Spence *et al.*, 2010; Zyglidopoulos and Fleming, 2011; Gibbon, 2012; Joannides, 2012; Lowe *et al.*, 2012; McKernan and McPhail, 2012; Shaoul *et al.*, 2012; Smyth, 2012) and then by deriving three core components: *Clarity of Relationship, Transparency* and *Power of accountees*. This model is explained further.

3.2. An Overview of the Gray et al. (1996) Accountability Model

Gray *et al.*'s (1996) model starts by defining accountability as involving a responsibility to undertake certain actions and a responsibility to provide an account for those actions. Therefore, the main element arising from responsibility is relationship. Gray *et al*. (1996) argue that there is a **relationship** between the accountor (agent) and the accountee (principal) which is defined by society and that provides accountees with a right to **information**. The resulting outcome is **instructions about actions, reward or sanction and power over resources** from the accountees to the accountors. All elements are circumscribed in a social context (Gray *et al.*, 1996) (see Figure 2.1 for a depiction of Gray *et al.* (1996) model).

[Insert Figure 2.1 here]

Based on Gray *et al.*'s (1996) model and the wider accountability literature, three critical components are identified in order to operationalise the model, namely **Clarity of Relationship, Transparency** and **Power of Accountees**.

3.2.1. Relationship

Gray *et al*. (1996) place a lot importance on this element as they consider it as the essence of the model. Relationship establishes the roles between accountors and accountees and also assigns responsibility and permits rights to information. For Gray *et al*. (1996) the essential issue is to work out how the relationship is determined. They argue for the existence of social

contracts, which can be legal or non-legal. For Gray *et al*. (1996), relationships are based on social contracts that exist in society and such contracts can be legal or non-legal. They think of society as a series of relationships and each relationship as a social contract.

The traditional notion of relationship between the firm and the shareholder is extended by Gray *et al.* (1996) (see Figure 2.2 in the Appendix for a depiction of the traditional model, Gray *et al.'s* (1996) model, and my suggested modification of it).

[Insert Figure 2.2 here]

Traditionally, the private sector relationship has been considered a one-to-one relationship. Such relationship is based on a free-market perspective. This perspective will rule out stakeholders and society as principals due to the fact that its philosophical basis is within the theory of neo-classical economics (Cooper and Owen, 2007). A range of multiple stakeholders considered as accountees is considered by Gray *et al.* (1996) who extend the traditional notion of relationship. In this new scenario, corporate accountability, the accountability relationship may exist within the firm (employees and officers) and/or outside the firm (shareholders, creditors, government, labour unions, consumers or general public).

Other scholars also consider relationship important (e.g. see Ijiri, 1983; Giddens, 1984; Sinclair, 1995; Funnell and Cooper, 1998; Bovens, 2005; Joannides, 2012; Shaoul *et al.*, 2012). The meaning of the accountability relationship is that a person is expected to account for his/her activities and their consequences to a certain person (Shaoul *et al.*, 2012) whether he/she likes it or not (Ijiri, 1983). Bovens (2005) adds that the accountor-accountee relationship should consist of three elements: the accountor must inform about his/her conduct by providing information, the accountee receives the information and questions the accountor and, finally, a judgment emitted by the accountee in the form of reward and sanction, formally or informally.

While clarity of relationship is important in relation to accountability within the private sector, in the public sector this issue is even more acute as there are not only multiple accountees but also multiple accountors. In terms of the accountors, there are two problems with public accountability: too many eyes and too many hands (Bovens, 2005). In the case of the former, this is because accountability relations are based not only in one, but in five areas. In the case of the latter, the reason is the difficulty for accountees to pin down individual

responsibility about the actions taken.[41] Defining the relationship in public accountability is difficult as a series of principal-agent relations can be found in modern democracies OR democratic states/theory (Bovens, 2005). The critical component derived from the *Relationship* element in Gray *et al*.'s (1996) accountability model is **Clarity of Relationship** which is based on the idea that accountability entails a relationship between the accountor and the accountee and the necessity that this relationship must be clear. Understanding the accountability relationship means understanding its clarity because in any relationship there is a certain degree of principal and agent relationship which means there is a certain delegation, but such degree of delegation does not define the overall level of accountability. Applying this situation to the Australian water sector, there are multiple agents (accountors) and multiple principals (accountees). The agents include State Water Agencies, Federal Government (in the case of the Murray Darling Basin, for instance) and local service providers. Conversely, potential users of GPWARs include not only government agencies, but also water users, entitlement holders, water market investors traders and brokers, environmental organisations, auditors, local governments, academics, citizens and policy formulators (Water Accounting Standards Board, 2009b para. 19).

3.2.2. Information

The second element of the Gray *et al*. (1996) accountability model is information. Information is based on rights to information allowed by the relationship between the accountor and the accountee. According to Gray *et al*. (1996), accountors can discharge their accountability through the provision of information about their actions. Nonetheless, those authors do not explore further this element; instead they focus on relationship as they consider it the core of the model. Then, Gray *et al*. (1996) go on to discuss Corporate Social Responsibility (hereafter CSR) reporting as a mandatory ideal instead of a voluntary one. Gray *et al*. (1996 p. 41) mention that 'CSR…can be used to develop democratic functioning of information flows relating to responsibilities established in law, in quasi-law plus those we must constantly debate: the philosophical (natural/moral) responsibilities'. Legal and non-

[41] New Public Management brought a shift from solely public to more private spheres (though in different degrees). Bovens (2005) suggests that the shift from the public service to the private service represents a change in public accountability as follows: (1) A decrease in the intensity and scope of political accountability (because private or privatized entities are not subject to direct political accountability and have fewer responsibilities to report to the public on their performance) and (2) The reinvention and/or creation of accountability relations for these new private entities delivering public services (this private form of public accountability is based on shareholders' needs and not citizens' needs even if the lives of citizens are affected).

legal responsibilities are connected to information disclosures (Gray *et al.*, 1996). Gray *et al.* (1996) provide a general description about information, but they do not provide a framework to assess the usefulness of information that is provided. Nonetheless, they provide examples of the different types of information.

Information is considered important by other scholars as well (e.g. see Stewart, 1984; Hazelton, 2010). Hazelton (2010) connects the provision of information with information rights. Furthermore, Hazelton (2010) states that information is a human right and is necessary for other rights to be achieved. Information is seen by Stewart (1984) as the raw material in preparing an account. Information is useful as the basis for judgement to the one who accounts (Stewart, 1984).

Other scholars have discussed the transparency of information (e.g. see Gray, 1992; Barton, 2006; Kamuf, 2007; Roberts, 2009; Zyglidopoulos and Fleming, 2011; Lowe *et al.*, 2012; McKernan and McPhail, 2012). Roberts (2009) defines transparency as involving two ideas: it promises visibility and it promises a thorough examination. In terms of visibility and transparency in an organisational context, Zyglidopoulos and Fleming (2011) argue that companies have become less accountable to their stakeholders due to the conditions of late modernity which are reflected in less transparency. Transparency can be improved by different mechanisms. For instance, Lowe *et al.* (2012) state that one of the reasons for trialling the digitisation of annual report information by way of interactive data by the US Securities and Exchange Commission was to improve transparency. The objective was to benefit principally retail investors. Regarding social and environmental accounting, Gray (1992) mentions the possibility of creating a greater environmental responsibility through transparency. Furthermore, transparency can be seen as a tool for reducing corruption due to the fact that it prevents representatives and office-holders from deviating from their responsibilities (Kamuf, 2007). According to Barton (2006), in public sector accountability, transparency is important as it enables citizens to make informed judgements about the performance of government.

Some scholars (e.g. O'Neill, 2006; Roberts, 2009; McKernan, 2012) have questioned the suitability of transparency to accountability, however. While Roberts (2009) acknowledges the potential of transparency to create visibility he discusses the problem that occurs when transparency is merged with accountability, as transparency is not synonymous with morals and fairness. Hence, accountability is reduced to compliance with ethical guidelines. Even

though Roberts (2009) acknowledges the potential of transparency to create visibility, he finds some limitations. Roberts (2009) suggests that amalgamating accountability with transparency creates a problem as transparency is not a synonym for fairness and morals. Roberts (2009 p. 958) states that 'if we rely only on transparency as a form of accountability then these positive effects are often countered by serious distortions to communication which, paradoxically, serve to weaken the effectiveness of accountability'. In line with Roberts (2009), McKernan (2012) suggests that transparency has a complicated relationship with accountability for two reasons: 1) it has been thought that transparency produces accountability and 2) transparency produces a kind of tyranny and can have dysfunctional effects. O'Neill (2006) finds that in reality transparency has not made UK institutions more trustworthy. However, O'Neill (2006 p. 76) acknowledges that 'government, corporations, and their critics seemingly converge in seeing transparency as indispensable for accountability and good governance, for preventing corruption and improving performance, for increasing trustworthiness and trust'. O'Neill (2006) concludes that transparency is not well-correlated with trust and trustworthiness.

The above discussion demonstrates the importance of transparency. The critical component derived from the *Information* element in Gray *et al.'s* (1996) accountability model is **Transparency** which is based on the idea that information provided has to be transparent. Should information be transparent, visibility will be created. Reporting is considered as a subset of transparency. There are different types of reporting including annual reports and raw data on websites. Reporting was selected as a proxy for transparency due to the role that accounting plays in the preparation and publication of accounts. Reporting is not the only mechanism by which transparency can be reflected. Other examples are media publications and media pronouncements. For instance, a government institution such as the Bureau of Meteorology has different types of reporting including annual reports, advice on water levels, and so on.

3.2.3. Instructions, Reward and Power

The final element of Gray *et al.*'s (1996) model is instructions, reward and power. Gray *et al*. (1996) provide the following description of the three ways accountees influence accountors after the information is provided: Instructions about actions, Reward, and Power over resources. Gray et al. (1996) also note that some researchers suggest that accountability has major problems regarding power. They conclude that enforcement is not necessary for accountability to be due.

A general definition of power is not provided by Gray *et al.'s* (1996); however, Wickramansinghe (2006) states that power can be defined as influence or control despite resistance. In life, some people are more powerful than others and such power can be reflected by their influence of others' behaviours (Wickramansinghe, 2006). Even though power might be difficult to define, Mitchell *et al.* (1997) argue that it is not difficult to recognise as it can be seen in the ability of some people to get the outcome they look for. Furthermore, Mitchell *et al.* (1997) mention that power is transitory because it can be lost in the same way it was acquired.

It is argued that this power is reflected in the **Power of Accountees** to create change and influence the decision-making process. This power is characterised by the extent to which accountees are empowered to influence the accountor through the provision of information. In corporate accountability, power goes beyond the mere consideration of the shareholders by including the stakeholders, as the power of stakeholders is important due to the ability of stakeholders to create change. For instance, stakeholder power can be seen when stakeholders exercise pressure on a company. In the case of Nike in the 1990s and the sweatshops, stakeholders accomplished their goal of creating change in the way the company was operating (Locke and Siteman, 2002).

Power is also considered important by other scholars (e.g. see Roberts and Scapens, 1985; Wickramansinghe, 2006). There has been previous accounting research on power from the perspective of accounting itself and from the perspective of other organisational mechanisms which creates a dichotomy of 'power over accounting' and 'power of accounting' (Wickramansinghe, 2006). The meaning of 'power of accounting' is that accounting is considered as a holder of power so the task is to explore whether accounting is a source of power. On the other hand, the meaning of 'power over accounting' is about the possibility of accounting failures because of the power of non-accounting factors such as power of other organisational professionals or organisational cultures (Wickramansinghe, 2006). Roberts and Scapens (1985) consider that power rests on the accountee (principal) who is able to enforce his/her social values to the accountor (agent).

Dryzek (2009b; 2009a) suggests a binomial model of power (reflected in the power of accountors and the power of accountees). In his research about polities, Dryzek (2009b; 2009a) relates accountability, public space and empowered space. Power is connected to deliberative democracy and in such a democracy information is a necessary, but not a

sufficient condition for political participation. According to Dryzek (2009a), deliberation is an important component of democracy and this deliberation includes five elements: public space, empowered space, transmission, accountability and decisiveness. The outcomes are generated in the empowered space, but the public space influences the empowered space via transmission. Because of these outcomes, accountability involves that the empowered space should respond for its actions. However, the public space can influence the empowered space depending on the information provided. According to Dryzek (2009b; 2009a), in the short term the empowered space has more power and in the long term the balance of power between the public space and the empowered space will depend on the mechanisms of transmission.

The category of **Instructions, Reward and Power** needs to be expanded for two reasons. First, the accountees will be empowered if information which enables the evaluation of the performance of accountors is provided. In the private sector, that task is accomplished via financial statements, but in the public sector it becomes more difficult. There should be a mechanism to assess performance, but power is not only based on performance evaluation. According to Broadbent and Guthrie (1992), in the public sector, accountancy and auditing are related with compliance, control and rectitude. As an example, imagine a government agency is assessed for whether it performed well. Accountees can check different types of reports. There is no single way to assess performance in a government agency and the same applies to water as, according to Pigram (2006), water resources development and management in Australia are administered by the public sector with individual states having prime responsibility. This situation can also be seen in the public sector after the introduction of neo-liberal reforms in the 1980s. In this new scenario accountability has moved from a procedural-type accountability to a performance-type accountability (Shaoul *et al.*, 2012). Diverse stakeholders can be recognised in public sector accountability. However, traditionally, public sector accountability has had two features: a descending accountability to citizens and an ascending accountability through public sector hierarchies to Parliament (Shaoul *et al.*, 2012).

Second, it is difficult to assess performance in the public sector as there are multiple relationships (e.g. media, citizens with voting power, NGOs and their capacity to influence protests and so on). Who is the primary accountee? Citizens can be considered as primary because citizens fund the government via taxes. According to Broadbent and Laughlin (2003), such power is not short-term, but a medium-to-long term power.

4. Research Method

This study adopted a qualitative approach. Qualitative data has a number of strengths: including a focus on naturally occurring, ordinary events in natural settings, data collection in close proximity to the specific situation, data collection over a sustained period which makes data powerful to study, and data that is rich and holistic due to providing insightful descriptions of events (Miles and Huberman, 1994).

Data was captured in two stages. The first stage comprised a participant observation case study of six sites piloting SWA and subsequent in-depth semi-structured interviews. This stage considered the issues of implementing SWA before the release of ED AWAS 1. The pilot sites prepared prototype water accounts without following specific water accounting standards. The extended case study in stage one involved interviewing senior staff members from the pilot sites to explore some specific issues in depth, their perceptions on the PAWAS and on accountability. The second stage comprised the analysis of public submissions on the ED AWAS 1 released by the WASB in 2010.

Case studies offer the possibility of applying different methods in order to gather data. Consistently with the principles of data collection suggested by Yin (2003), data was gathered by using multiple sources of evidence to create a case study database. These principles are intended to make the process as explicit as possible so that validity and reliability of the case study evidence is constructed (Yin, 2003).

The main idea of participant-observation is that the researcher is not merely a passive observer. This fact means that the researcher can assume different roles and may participate in the events within the case study (Yin, 2003 p. 94). A positive aspect of participant-observation case studies is that the researcher-observer participates actively in the situations under study for an extended period of time (Singleton and Straits, 2010 p. 365). According to Saunders *et al.* (2007 p. 286, 287), there are four levels or roles of involvement that the researcher can adopt in participant-observation which include complete participant, complete observer, observer as participant and participant as observer. In this case, the researcher adopted the role of participant-as-observer because he became fully part of the group while working on the water project and also experienced directly what the subjects faced. Furthermore, the subjects were aware of the research activity.

Because the intention is to extract meaningful interpretations of the social world, observation in case studies should be planned and be methodically carried out (Singleton and Straits, 2010 p. 362). Meetings were not recorded because it was considered that audiotaping the meetings would be highly obtrusive. Instead, notes were taken in every meeting, mindful of the principles that notes should be concrete. By concrete is meant that the researchers have to be aware of specific behavioural details and also should avoid attaching their own abstract labels to things (Singleton and Straits, 2010 p. 383). Unlike other strategies, the possibility in case study research of using different sources of evidence is a strength of case studies (Yin, 2003).

In the present study, sources of evidence included documentation and participant observation. Written approval was received from both the pilot participants and from the Water Accounting Development Committee Office to acknowledge and utilise material from that site. Information about each pilot site was received before the actual visit.[42] Following the agenda prepared by the Water Accounting Development Committee Office, a series of activities was undertaken when visiting each pilot site. The initial phase was obtaining an understanding of the physical and management characteristics of the pilot sites, followed by a discussion regarding the implementation of water accounting. This aspect considered the actual progress made by the pilot site to date, including a review of the transactions, chart of accounts, journals, accounting reports and to notes to the accounts (as available). In addition, draft sections of the current iteration of the conceptual framework were provided to pilot participants and their feedback was obtained. Discussions took place at the offices of the pilot participants and lasted for two or three days. Notes were taken based on the discussion points derived from the agenda proposed. While audio recordings of these discussions were considered impractical and overly intrusive, extensive notes were taken during the discussions. At the end of each session, findings were discussed with members of the WADC Office team. The pilot sessions ended with a 'conclusions' session where issues arising from the previous discussions were raised. Issues were also logged by the Water Accounting Development Committee Office on an 'issues register'. These issues were subsequently sent to the sites by the WADC Office as a more formal reflection of the meeting outcomes. In addition, some issues were elevated for further discussion at the meetings of the WADC and/or the Jurisdictional Reference Panel. Further input into these discussions was provided

[42] Such information mainly consisted of: 1) Background information about the sites and their role in the SWA development process, 2) Internal reports, 3) Information about how they adapted their existing practices OR to the use of to use SWA and 4) Prototype water accounts prepared by them (under SWA).

by the preparation of discussion papers, both by the researchers and by other participants from the pilot sites and from the Water Accounting Development Committee Office.

The national implementation of SWA was facilitated by the WADC.[43] This entity was established in February 2007 (later superseded by the WASB under the Bureau of Meteorology). The WADC was in charge of overseeing the National Water Accounting Development project (Bureau of Meteorology, 2012a). In order to fulfil its tasks, the Water Accounting Development Committee worked along with six pilot sites (or water management areas) whose managers volunteered to prepare water accounts. These six pilot sites offered voluntarily to prepare prototype water accounts following accounting procedures. These pilot sites were: (1) a valley catchment in Queensland, (2) a river system in New South Wales, (3) a catchment area in Victoria, (4) a river system within the Murray Darling basin, (5) a river system located in South Australia, and (6) a river system along with a groundwater system in Western Australia. One of my supervisors and I were engaged by WADC to participate, along with members of the former Water Accounting Development Committee Office, in reviewing the progress of each of the pilot sites and identifying and overcoming issues in implementing Standardised Water Accounting. Due to delays in getting the final contract, only five of the six pilot sites were visited, but all available information regarding the first pilot site was provided.

The second phase (of stage one) involved collecting data from five semi-structured interviews of seven members of the staff of the entities controlling the pilot sites. This phase is considered as an extension of the case study and it was carried out after the WASB released the PAWAS. The interview guide was prepared based on the components of the PAWAS and the things we learned in the pilot-project phase. After finalising the case study, it was decided to conduct semi-structured interviews with the senior staff members of the pilot sites.[44] Semi-structured interviews are non-standardised (Saunders *et al.*, 2007). At the beginning there was

[43] Members of the WADC included water and accounting experts from industry, academia, environmental groups and government who were expected to bring their expertise in the different fields related to the development of SWA.

[44] Face to face interviews with the managers of the pilot sites were necessary because the intention was to 'get inside their heads', [this is slang, and probably needs expanding] to really understand how they think and why they act as they do. The researcher prepared an interview guide comprising 13, mostly open, questions. Four of the five interviews were conducted face-to-face while one interview was conducted over the phone. In two interviews, the senior staff members were accompanied by one staff member from the pilot site. Only the views of the senior staff members were considered in the findings.

a set of interview themes and questions, but the order in which the questions were asked varied and also new questions were asked according to the context of each interview. The type of questions that were asked during the interviews was open questions. According to Saunders *et al*. (2007 p. 329, 330), open questions allow interviewees to respond to the questions in the own way whereas closed questions provide a limited number of alternatives in each question for the interviewee to choose. The semi-structured interviews were recorded after permission from the interviewees was granted. One of the benefits for the interviewer of recording interviews is the possibility of concentrating fully on what is being said and the expressions and non-verbal cues that the interviewees are giving (Saunders *et al.*, 2007). As mentioned above, the pilot sites were public water management areas in six different catchment areas across Australia so the interviewees were all public servants. The interviews were carried out between January and May 2011 and five senior staff members from the pilot sites agreed to be interviewed. In one of the interviews, the Deputy Chief Executive of that pilot site agreed to be interviewed along with the senior staff member whereas, in another interview, the project manager was accompanied by a water accountant. Interviews of approximately fifty-minute duration were held with the managers. The senior staff members who were interviewed were from New South Wales, Victoria, South Australia, the Murray-Darling Basin Authority and Queensland. The intention was to support the data-results obtained in the case study.

The post-interview data analysis followed the approach of O'Dwyer (2004). Three different but overlapping phases were conducted. These phases were data reduction, data display and data interpretation. O'Dwyer (2004) provides a detailed description of the process of post-interview analysis in his handling of the twenty-nine interviews conducted in his research. He acknowledges that there is not going to be a unique 'true' story with qualitative data; therefore, he tries to present a process in an attempt at being both reflective and systematic.

Nvivo software was used for transcribing and analysing the interviews. Each interview was listened to and each transcript was analysed and coded under the main themes. Identifying key or primary themes is an important step when coding (O'Dwyer, 2004). Similar to Sinclair's (1995) study, content analysis was used by scanning the interviews transcripts for direct or indirect references to accountability and similar concepts (like responsibility) and also by analysing the context in which the interviewees referred to accountability[45].

[45] In total 191 pages of transcripts were analysed.

The second stage of data collection involved analysing nine public submissions on the Exposure Draft of Australian Water Accounting Standard 1 (ED AWAS 1) made by potential report preparers. The ED AWAS 1 was released in 2010 and the public was invited to comment on its content until June 2011. After the WASB released all submissions on its website,[46] each submission was revised to check the identity of the respondent and only submissions from potential report preparers were separated from the total number of submissions. In total, nine of the twenty-three submissions were from potential report preparers comprising 125 pages in total. The remaining fourteen submissions were sent by potential users of reports. The submissions were coded in Nvivo and were analysed four times: 1) To get a general understanding of each submission, 2) To code each question according to the responses, 3) To review each question in depth so as to identify patterns that were related to the elements of the model and 4) To review each node and proceed with a second level of coding.

In the next section, the implications of preparing water accounts under SWA are explored as well as the perceptions of practitioners on the ED AWAS 1. This is to pursue this research paper's desire to explore whether SWA enhances accountability.

5. Findings

5.1. Stage one / Phase one: The participant-observation case study

After visiting the pilot sites, a number of technical challenges to the implementation of SWA were observed. In particular, there were extensive discussions around the issues of the reporting entity, users' information needs, the accountability statement, quantification, and the use of accrual accounting and double-entry bookkeeping. These issues are discussed below. (A table summarising all accounting issues identified during the pilot visits is presented in Table 2.2 of the Appendix.)

[Insert Table 2.2 here]

In summary, the issue of the reporting entity is about identifying the water entity and the water report entity because practitioners are not sure about what the water report entity is. One of the main problems was a boundary issue because not all entities in charge of managing the resource would be in charge of preparing the water reports. For instance, there are

[46] Submission can be found at www.bom.gov.au/water/standards/wasb/awasfeedback.shtml. ml

multiple water entities within the Murray-Darling Basin, but not all of them are managed by the same entity. In this scenario, the Murray Darling Basin Authority prepares a basin-wide report even though they do not manage all water entities within the Basin. Therefore, it becomes a boundary issue because of the identity between the report preparer and the water reporting entity. This confusion about the identity of the report preparer and the water report entity is reflected in the consolidation of water reports. The Water Accounting Standards Board is not specific about the identity of the water report entity and the water entity. In the latest iteration of the standard, the Water Accounting Standards Board (2012c) considers the water entity as WHAT and not WHO. In terms of users' information needs, practitioners were asked to prepare prototype water accounts by considering the information that users would consider more useful. Claims were made by practitioners at the pilot sites for more studies to explore the information needs of potential users of GPWARs. Regarding the Accountability Statement, there was considerable discussion around this issue. Care must be taken because water managers have much less control over water than managers in the business world have over income. One suggestion during the pilot-site visits was to consider disclosure of compliance with water management plans as part of the accountability statement. In terms of quantification, there were considerable discussions around this issue since water data is not always precise. Finally, the use of accrual accounting implied a limitation, but practitioners learned what it means, as they did with the double-entry accounting system, because practitioners had to learn accounting so as to be able to record water transactions.

5.1.1. The reporting entity

In financial accounting, a reporting entity is required to prepare general purpose financial reports following prescribed standards. The reporting entity is an entity in which it is reasonable to expect the existence of users who depend on general purpose financial reports for information to enable them to allocate resources (Australian Accounting Research Foundation, 1990). In parallel with financial accounting, the concept of the water entity and water reporting entity are put into practice in water accounting. Both concepts are now defined in the WACF. However, when the pilot sites were visited, the Water Accounting Standards Board was in the final stages of drafting the WACF. The definition of water entity has changed slightly from that point to the recently released AWAS 1 (third iteration of the standard).[47] The definition of the water entity is broad and encompasses any entity that

[47] The Water Accounting Standards Board (2009b para. 10) defines the water entity as 'a physical entity, an organisation or individual, which holds or transfers water, or has rights or other direct or indirect claims to

interacts with water whereas a water reporting entity is a water entity that has users dependent on the preparation of General Purpose Water Accounting Reports for decision-making.[48]

The starting point for the pilot water accounts were physical water entities such as catchments. The pilot sites generally adopted a particular management area as the appropriate reporting entity. The use of management areas has a number of advantages, such as the fact that information was often already being collected at this level of analysis and also that management plans had been developed which might be used as a basis for manager accountability. However, this approach may also present difficulties at a more aggregated level, particularly as ground and surface management areas may operate independently. The level of user interest in such aggregated reporting will determine the significance of this issue. For example, the ABS national water accounts have been criticized by expert hydrologists who suggest they do not contain the level of detail required for the purposes of the water accounts such as planning, design, and management (Cordery *et al*., 2007). Similarly, it is possible to imagine users desiring information at a more detailed level than that of a management region, akin to the demand for segment reporting in financial accounting.

In New South Wales there were discussions about whether surface water areas and groundwater areas should be considered separately. Additionally, the 'water entity' and 'the water reporting entity' definitions created concerns due to its scope. In Victoria there were lengthy discussions about the definition of the water entity. In some cases, it might not be similar to the report preparer. In Western Australia the identity of the report preparer created concerns and also the distinction between a water body and a reporting organisation (from the definition of the water entity). There were also lengthy discussions about the definition of the water entity and the water reporting entity in South Australia. Their prototype water accounts were about geographical areas. Finally, in the Murray Darling Basin Commission (later superseded by the Murray Darling Basin Authority) there were discussions about their role in preparing basin-wide consolidated accounts and also on the identity of the water entity (and

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water, or has inflows and/or outflows of water, or has responsibilities relating to the management of water' whereas the water reporting entity is 'a water entity in respect of which it is reasonable to expect the existence of users who depend on General Purpose Water Accounting Reports for information about water, or rights or other claims to water' (Water Accounting Standards Board, 2009b para. 11).

[48] In the WACF, the Water Accounting Standards Board (2009b) uses the term *water reporting entity*, but in the third iteration of the standard (known as AWAS 1), the Water Accounting Standards Board (2012c) uses the term *water report entity.*

hence the water reporting entity). The definition involves a WHO and a WHAT. In terms of what is included in the water report entity, there were lengthy discussions in terms of the boundaries of the water entities and water report entities. It is difficult to demarcate the boundaries of water report entities as they do not have similar physical characteristics.

In terms of the discussion about boundaries, a possibility left open by the proposed water accounting framework is that distinct but overlapping reports could be provided to meet the needs of different users. For example, the Murray Darling Basin Authority might prepare a Basin-wide report, but State agencies might also include applicable elements of the Basin in their own water reports. Other water 'reporting entities' such as bulk water providers or companies might also report information forming part of other reports. While reconciliation of such overlapping reports may be difficult, provided the information they contain is relevant and reliable and met user needs, they might still facilitate improved decision-making.

A further interesting issue is the distinction between the report subject and the report preparer. The report preparer is the entity responsible for the preparation of the GPWARs. A particular physical water system might form the basis of a report prepared by different levels of government (federal, state or local) or by another organization (for example, the Murray-Darling Basin Authority). In some cases the report preparer would be similar to the water reporting entity, but not in all cases. While the identity of the report preparer may not change the content of the report, it does have implications for the ability of the report to discharge accountability obligations. For example, within the Murray-Darling Basin there are different physical water entities which are managed by different entities. A wide-basin report would include consolidated information of all those areas even though the Murray Darling Basin Authority does not manage all physical water entities within the Basin. The discussions regarding this issue led to it being specifically identified in the WACF and it will be an important point for further consideration in the potential implementation of water accounting.

5.1.2. Users' needs

In financial accounting, financial statements are meant to satisfy the information needs of users. The main users of financial statements are the shareholders. However, identifying users of GPWARs is a complex process because of the large number and potentially divergent interests of interested parties. Therefore, meeting the information needs of these potential users could be problematic due to the specific types and detailed levels of information they would look for. A variety of potential users of GPWARs have been identified, but this

diversity could be a strength and a weakness. It is a strength because a report would be more useful if it serves the broad community whereas it is a weakness if a report does not make any significant contribution to any particular group. As noted above, potential users of GPWARs include not only government agencies, but also water users, entitlement holders, water market investors traders and brokers, environmental organisations, auditors, local governments, academics, citizens and policy formulators (Water Accounting Standards Board, 2009b para. 19). The decisions of these users are expected to be not only about water, but may also include economic, environmental and social decisions. In order to determine which water-related information would be beneficial for potential stakeholders, a user information requirements study was carried out by the former WADC (Chalmers *et al.*, 2012; Slattery *et al.*, 2012). More specifically, this study discussed the characteristics of water reports based on users' expectations (Godfrey, 2011). However, as far as it is known, no specific study has been made about the identity of potential users of water accounting reports and their information needs. Since GPWARs are designed to meet the information needs of users; it is necessary to identify users' information needs with precision.

The issue regarding the precise user needs that would be met through the provision of water accounts was often raised. The Water Accounting Development Committee Office considered it difficult (if not impossible) to ask user groups to describe their needs in detail without the benefit of prototype accounts. Therefore, the pilot sites were asked to create accounts that they considered appropriate with the intention that these accounts would be used as a template for the creation of the initial batch of water accounting standards and iteratively improved.

5.1.3. Quantification

A third issue concerns water quantification and related disclosures of quantification accuracy. Water information will be used in the preparation of water reports so the need for relevant and reliable water information is paramount. Discussion on quantification accuracy has been ongoing, even before the introduction of SWA (i.e. see Gleick, 1998). 'If water planning and management are to be democratic and effective, data on all aspects of the water cycle must be collected and made available in an unrestricted manner' (Gleick, 1998 p. 577). According to Lowe *et al*. (2006), water information needs to be reliable in order to be useful for decision-making. Yet almost all water measurements are inferential because 'what is really being measured is a level, a number of rotations of a meter, the change in frequency of an electromagnetic wave etc.' (SKM, 2006 p. 149). Not only is accounting for all water flows difficult, but there are significant sources of uncertainty that limit the usefulness of any

system for reporting water resources. For water accounting to accurately reflect water-related events, the system must have an acceptably low estimation error. Many aspects of data in the regional and national water supply and use are not collected and when they are, they are not widely available (Gleick, 1998).

In the preparation of prototype water accounts, practitioners of the pilot sites struggled to reduce the error term in their accounts. The error term is defined as the unaccounted-for difference in the total amounts of the different statements. Therefore, the key accuracy issue was about measurement error. In many of the pilots extensive use is made of sophisticated models for both surface water and/or groundwater estimation. Estimating the confidence interval of such models is difficult and model reliability may be better reflected by disclosing other information such as the length of time that the model has been in operation, calibration policies, and so on. In New South Wales they use different techniques to quantify water. There must be clarity as to which measurement technique is used. In Victoria, the reliability of measurements was often discussed and in Western Australia there were extensive discussions on their models to quantify water in aquifers. In South Australia there were also discussions on water measurement and the quality of such data. Data gathering was discussed in the Murray Darling Basin Commission pilot because basic data is gathered by the states. Such data is then used to prepare models in order to make estimates.

Various initiatives under the National Water Initiative are now underway in an effort to mitigate the limitations of data reliability. For example, 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. Data reliability, however, is likely to remain an important issue for the foreseeable future, and was a persistent theme of pilot discussions. A suggestion put forward by one of the pilot groups (and subsequently supported by other groups) was the use of a scale as used in the preparation of previous water accounts. For example, data in the Australian Water Resources 2005 Level 2 Assessment report was presented in seven categories: A (+/- 10%), B (+/- 25%), C (+/- 50%), D (+/- 100%), E (no data), F (no data currently available) or Not applicable (National Water Commission, 2007). In addition, a composite reliability index (based on the proportion of data in each category) and a water balance error (the proportion of total unaccounted for flows to total flows) were also provided. While this might be a useful approach for disclosure purposes, as the data quality deteriorates the accounts obviously

become less useful.

5.1.4. Accounting processes

Another challenge concerns the application of other financial accounting processes to water. The two processes discussed here are the double-entry system and accrual accounting. The double-entry system proved to be a steep learning curve for water experts at the pilot sites, but the challenge was generally met. The initial challenge was to explain water experts the meaning of the double-entry system, but once they grasped the concept, it was easy to start recording transactions using the system. One advantage of adopting this approach is the ability to use off-the-shelf accounting software (adopted by many of the pilots). Further, a national accounting system could be implemented which would greatly enhance the ease of constructing highly aggregated accounts. However, investment in accounting training would be necessary if this approach is adopted.

The accrual accounting principle was adopted by the pilot sites when preparing prototype water accounts. The Statement of Physical Water Flows will report the flows that have actually occurred over the reporting period while the 'accrual' reports (Statement of Water Assets and Liabilities and the Statement of Changes in Water Assets and Water Liabilities) adjust for future outflows or inflows currently attributable to the entity. In general, pilot participants were comfortable with this approach, but whether certain items (such as dead storage in dams) constituted 'assets' or 'liabilities' attracted considerable discussion. However, given the correspondence in the pilot sites between the reporting year and the water allocation year there were few liabilities booked in the reports. Only in management areas which allowed unused water allocations to be carried forward to subsequent years, or where there were longer-term transactions with other water entities, did the issue of accrual accounting arise.

These two challenges required that practitioners learn accounting techniques because the majority of practitioners were not accountants. Even though they did not have full knowledge of accounting procedures, they used accrual accounting and double-entry anyway. For this reason, the level of development of prototype water accounts was different in each of the pilot sites as accounts were well-developed in some, but very basic in others. Hence this level of development is associated with the accuracy of the pilot water accounts.

5.1.5. The Accountability Statement

The final challenge in implementing SWA concerns the accountability statement. Recall from Section 3 that (according to Gray *et al*. (1996)) accountability involves two responsibilities or duties: the responsibility to undertake certain actions and the responsibility to provide an account of those actions. In financial accounting, according to the Statement of Financial Concepts (para. 14), financial reports are a necessary tool to evaluate the accountability of management for the resources entrusted to them (Australian Accounting Standards Board, 2004). Therefore, the accountability of management is evaluated through general purpose financial reports which reflect management's actions regarding the operations of companies. Given that the purpose of corporations is profit maximization, it can be assumed that in financial accounting the Profit and Loss statement would be an important mechanism for the discharge of management accountability. *Ceteris paribus* a simple translation of this approach to water accounting would imply that reporting the change in net water assets would be useful to discharge the accountability of water managers. However, the change in net water assets is fundamentally different to the financial accounting profit figure for a number of reasons. First, water inflow is largely dependent on natural systems, such as rain or upstream inflows (though exceptions may occur when water managers have the ability to purchase water from outside the system) and therefore may be subject to wide variation. Second, outflows are often dependent on inflows and determined on the basis of water user demand (both human and environmental). Therefore, the change in net water assets, while partly within the control of the water manager (via allocation decisions) is a very poor proxy for the 'performance' of the manager. While this information may be useful to users seeking to understand the characteristics of the water system, they achieve little in the way of discharging water management accountability.

The issue of discharging accountability was discussed during the pilot site visits and one proposed solution was the disclosure of compliance with water management plans within water accounts. (It has to be mentioned that by the time of visiting the pilots, the WACF was being finalised.) As noted above, a promising approach for water accounts is to report at the level at which management plans are developed, and such management plans typically contain targets such as allocation limits, town water supply requirements and minimum flow rates. Consequently, water managers could disclose whether they complied with the provisions and provide supporting explanations if they did not. Further, while this approach may be relatively straightforward in cases where the report preparer is the water manager, in

other cases care would have to be taken in establishing the accountability relationship. For instance, if a national body is publishing aggregated results an important question is the degree to which it is itself asserting compliance with management plans (or for that matter, any other information) versus relying on assertions by the underlying water managers and jurisdictions.

There were quite different opinions about the accountability statement as at that point in time the standard had not been released. The need for an accountability statement was not doubted during the pilot site visits, but the main discussions were about signing-off such statement as there are multiple entities involved. For example, the Murray-Darling Basin comprises sub-entities in each state. If the Murray-Darling Basin Authority is to prepare a basin-wide report, then by signing-off such report, it accepts responsibility in the management of water of each entity within the basin. It has to be acknowledged that water managers have much less control over their resource (water) than business managers have over theirs (capital, labour, equipment, and so on).

5.2. Stage one / Phase two: Extended case study / Interviews

Having identified the accountability statement as one of the issues faced by practitioners when preparing prototype water accounts, it was deemed convenient to carry out interviews with senior staff members of the pilot sites so as to explore, among other things, the accountability idea, in depth. Interviews were semi-structured and were recorded after consent was granted by the interviewees.

Findings are discussed as follows: Firstly, their views regarding SWA (and reflected in the PAWAS) are discussed and then their views on accountability and the accountability statement are set out. Five senior staff members, a Deputy Chief Executive and a water accountant were interviewed during the first semester of 2011 in five different locations. Interviewees were from five of the six pilot sites that took part in the water project carried out by the former WADC. In order to have consistent results, only the views of the senior staff (including the Deputy Chief Executive) are considered.

Interviewees generally agreed with the idea of having national standards that govern the way water reports are prepared. Having national standards is a characteristic of water reports prepared under SWA. Preparing standardised reports is seen as an advantage rather than a disadvantage mainly because potential reports will be consistent and comparable.

> *A short answer would be yes and why because I think it makes them consistent, it makes it repeatable so you can compare but it also needs to make sure that it is accessible. So consistent, repeatable, comparable and accessible are good reasons to have national standards (Interviewee 6 – Deputy Chief Executive).*

The majority of interviewees agree with the application of financial accounting principles into water; however, their justifications are not the same. Financial principles are mainly seen as a system that adds external rigour to water reporting; however, it is still too early to make a final judgement on it:

> *I must admit I was a little bit sceptical when we first started but I think it seems as though it is providing a picture. I think it is still a little bit early to tell whether it is going to be accepted generally (Interviewee 1 – Director of Water Accounting Group).*

In terms of the aspects of the financial accounting process that they found more challenging, reactions were mixed mainly because of their professional backgrounds. For interviewees who were accountants, understanding and applying the concepts was not difficult whereas managers without accounting background struggled a bit more.

It is important to educate water professionals about SWA. Interviewees perceive that understanding water reports would not be an easy task. Reading water reports prepared under SWA is not similar to reading reports in financial accounting.

Interviewees agree that water reports do not reflect sustainability. According to them, water reports portray only a one-year picture; however, assessing sustainability involves looking beyond only one year. In this context, a certain period of time and not only one year has to be assessed. Some senior staff members suggest that water plans should be evaluated instead of water reports if sustainability is to be pursued.

> *(...) if you are looking at sustainability in terms of, is there going to be enough in 10 years or 20 years, I do not think you are going to be able - well, you cannot tell that from a set of accounts I would not have thought, because they are not prospective, I guess (Interviewee 2 – State Water Accountant).*

Three interviewees link the concept of responsibility with accountability. This linkage between accountability and responsibility has been explored by different scholars (e.g. see Jones, 1977; Stewart, 1984; Kamuf, 2007; Messner, 2009; McKernan, 2012). Jones (1977) argues that accountability is a liability to explain what has been done. Thus, in that context, responsibility as accountability implies a liability. An interviewee seemed unclear about the connection between accountability and responsibility though.

> *We are talking about our resource not how we are performing as managers. So it discharges the responsibility in terms of saying, yes we have operated in accordance with the plans to our best ability (Interviewee 3 – Water Accounting Development Coordinator)*

There are mandatory and voluntary reporting mechanisms in place in every jurisdiction. Managers described their current mandatory and voluntary reporting regimes. Whether or not these reports discharge the accountability of water managers was another question explored. Even though there are some issues that make accountability difficult in different water reporting entities, it does not mean that managers believe that accountability is not achieved; for example, one issue is consolidation. An organisation like the Murray Darling Basin Authority has to prepare accounts for nineteen regions across the region, which makes accountability difficult. Interviewees agree that existing reports discharge the accountability of water managers, but only to a certain extent. However, one interviewee was emphatic that the current reporting mechanisms do not discharge accountability.

> *A hindsight review of what happened for the year. So it is reporting everything that happened, It is not specifically saying that any particular person did not do their job or did not do it properly and everything else. It is just saying this is what actually happened … The is reported in there but that does not discharge anyone's responsibility for the fact that this was stuffed up or if we have reported something was stuffed up in there … it does not discharge responsibility of the person who may have made the mistake (Interviewee 3 – Water Accounting Development Coordinator)*

It seems unclear how accountability is perceived by interviewees. One interviewee in particular seemed to separate accountability from performance.

> *This becomes a real issue depending upon what you are trying to report on. Because our reports reflect different things the starting point is what is it that you're actually reporting on? Then until you define that you cannot actually even ascertain whether you are assessing accountability or performance. (Interviewee 4 – Pilot Project Manager for Water Accounting Development)*

However, water in any water entity is managed according to water management plans (or bulk entitlements, depending on each jurisdiction) so if GPWAR are about performance, then there should be compliance after all because through reports, it can be checked whether or not managers complied with the plans. It is believed that one of the reasons for the separation between accountability and performance is that managers are circumscribing themselves to the description provided in the first iteration of the standard (known as PAWAS). In this description, the accountability statement is based on either the preparation and presentation of accounts or the management of resources, or both of them at the same time. This separation is

clear. The entity in charge of the Murray Darling Basin has to prepare a basin report even though they do not manage the resource directly in all regions. Therefore, the problem becomes a boundary issue. On the Murray-Darling Basin Authority:

> *So this is this whole question of we are not actually producing an account that is about the performance. We are producing an account that is about the consolidated view of what has happened in the Basin. It is not really about individual managers' performance, it is about the consolidated perspective on the net impact of all of those different managers and what has that resulted in. (Interviewee 4 – Pilot Project Manager for Water Accounting Development)*

If we accept the idea that the main objective of all statements under PAWAS (and then under ED AWAS 1) is to improve water information, then the question is to identify the objective of the accountability statement. Under PAWAS, the Water Accounting Standards Board (2009a para. 41) states that the accountability statement should provide information to users on whether externally-imposed requirements have been complied with and whether best practices for managing water assets and water liabilities have been utilised. These two objectives are a reflection of performance of water managers. Therefore, it can be said that performance of water managers is assessed through General Purpose Water Accounting Reports and the accountability statement is a tool for doing it. Therefore, it is assumed that General Purpose Water Accounting Reports under SWA (and consequently under ED AWAS 1) have a dual role: to improve water information and to assess performance. However, assessing performance (in other words accountability) becomes blurred because of the different anomalies that may exist in water reporting entities. Then it is argued that through the accountability statement, accountees will be empowered to create changes by influencing the decision-making process.

Accountability in the water context is not clear-cut. For example, accountability becomes problematic due to the existence of different layers of accountability. There are different types of institutions going from the top to the bottom of the ladder in terms of aggregation. The pilot sites are entities which have to produce reports at an aggregated level (the top part of the ladder). Even though they control and manage the resource within each state, there are local providers who manage the resource at a local level. The main problem would be with the Murray-Darling Basin as there are five states involved. State entities will form a supra-entity such as the Murray-Darling Basin Authority.

> *At a Basin scale account or even at a regional account you are actually building in quite a number of different layers of accountability. Therefore it becomes a little bit unclear*

> *about whether you are actually managing or reporting on and the relevance of accountability in that context (Interviewee 4 – Pilot Project Manager for Water Accounting Development).*

One way to get clarity on accountability is by having no misunderstandings about the identity of the report preparer and the reporting entity. Recall from Section 5.1.1 that the identity of the report preparer was an operational issue identified during the case study. One point of discussion about the accountability statement is about signing off such a statement. Due to the existence of different layers of accountability, report preparers in the top level of the chain might feel unsure about signing it off. Having these layers of accountability might be reflected in delays in the release of water reports.

> *If you are trying to get each manager to sign off, you would never get the accounts out. You would have to go to five different people to get them to sign and then it has got to go up to the commissioner who comes back to these people and says, well you said this, this and this and I have got to sign off on it on top of you guys (Interviewee 3 - Water Accounting Development Coordinator).*

Based on this discussion, it seems that the most logical path would be signing off in terms of compliance with water management plans.

Regarding the question of whether SWA will enhance the accountability of water managers, it seems SWA might enhance the accountability of water managers; however, interviewees consider SWA as an information tool and not a mechanism to evaluate water managers' accountability. By analysing accountability by its three components (accountability relationship, transparency and power), it seems evident that transparency would be fulfilled with the reports; however, the accountability relationship is still not clear and power cannot be assessed at this stage. If we assume that the accountability of water managers is related only to compliance with water management plans, for example, then SWA does not bring anything new because water reporting entities already report on compliance (in their current reporting mechanisms). Therefore, there are reporting mechanisms (either voluntary or mandatory) in place that discharge the accountability of water managers regarding compliance with water management plans. The accountability statement offers uniformity because any user can find all information regarding externally-imposed requirements. At this stage, it seems that the introduction of SWA might enhance the accountability of managers because it will bring uniformity, but there are still issues to consider which limit the scope of SWA reports. Since some information contained in the accountability statement seems to exist in other reports already, a reasonable option would be to refer to those reports. From the

perspective of practitioners, it seems that SWA might enhance the accountability of water managers, but it is not clear-cut because of the limitations it presents.

No references about power were found during the interviews, but it was suggested in Section 3.2.3 that for accountees to be empowered first requires information which enables the evaluation of the performance of accountors. In the context of SWA, it has been found that the Accountability Statement can fulfil that role as it informs whether externally-imposed requirements relevant to the water reporting entity have been complied with.

5.3. Stage two / Analysis of submissions to the WASB on ED AWAS 1

In order to complement the findings of the case study and the semi-structured interviews, the researchers considered it convenient to carry out one more analysis. This analysis involved the evaluation of submissions to the Water Accounting Standards Board on the Exposure Draft of Australian Water Accounting Standard 1 (ED AWAS 1). Since SWA is reflected on the ED AWAS 1, it was considered necessary to assess the perceptions of potential report preparers about ED AWAS 1. Therefore, the purpose was to explore whether the issues identified during the case study and the semi-structured interviews were still found concerning by report preparers after the ED AWAS 1 was released. This investigation was carried out by analysing public submissions on ED AWAS 1 by report preparers.

The WASB released the ED AWAS 1 on October 2010. After its launch, it received comments and feedback on the Exposure Draft until June 2011.[49] The WASB asked 54 questions to the public on the ED AWAS 1. Even though the submissions should follow that structure, it is up to the respondents what to cover in their submissions. Out of the 23 submissions, nine were from potential report preparers. Therefore, to be consistent with the paper, it was considered necessary to analyse their opinions in the light of the ED AWAS 1. The case study-participant observation reflects a situation ex-ante the release of the ED AWAS 1. The interviews were carried out after the release of the Exposure Draft, but explore in depth the findings of the case study. The analysis of submissions is an ex-post situation after the release of the ED AWAS 1. The analysis of the submissions under the elements of Gray *et al.*'s (1996) accountability model is presented next.

[49] The submissions can be found on the WASB website: http://www.bom.gov.au/water/standards/wasb/awasfeedback.shtml

5.3.1. Clarity of Relationship

Each submission was analysed in order to draw references on clarity of relationship. However, three questions captured more attention as they related specifically to relationship. These questions were about the water entities and about users. In terms of the water entity, respondents ask for clarification on the definition and also the inclusion of the report preparer in the picture. It seems that the 'who' and the 'what' in terms of the water entity are confusing. One respondent expressed that, in its jurisdiction, physical areas were used as a proxy for the water entity.

> *'Using the current definition it is possible that a Water Report Entity may be wholly contained within another Report Entity or may overlap with another' (submission 8 – State Water Authority)*
>
> *'... currently applies the term "water entity" to a water resource plan area (geographical area) for its state water accounts' (submission 10 – State Water Authority)*
>
> *'The definition of water report entity appears to be very wide. This definition may require any individual or organisation that has anything to do with water to prepare GPWARs if there is any external party who says that they want this information' (submission 11 – State Water Authority)*
>
> *'There needs to be a separation between the "what" that is being reported on and the "who" (report preparer) that is doing the reporting, and both need to be defined in the standard' (submission 12 – State Water Authority)*

In terms of users of water reports or accountees, one respondent stated that it is still unclear who the users are. The WASB identified broad categories of users, but it seems it requires more clarity. However, the main point of discrepancy is about users' needs. Their information needs are still a matter of discussion because they are diverse.

> *'The concept of users should include a definition of "the environment" as a user. Even from a solely human-centric viewpoint, responsible custody of environmental assets may have implications for humans which cannot yet be measured (...) The "information needs of users" are described as needs to make and evaluate decisions about allocation of water resources, and needs to evaluate the accountability of managers. However, information needs may go beyond this – there may be requirements which are not related to allocation of water or to its management' (submission 8 – State Water Authority)*
>
> *'It was difficult to identify the potential users of a water account for the reporting entity. Each user of water accounts will have different requirements for specific information about how water is managed. There is a risk that general purpose water accounts will not meet their needs' (submission 14 – State Water Authority)*
>
> *'However what the "user" needs is still unclear at this stage of water accounting across Australia' (submission 10 – State Water Authority)*

> *'The reports need to reflect the level of information required of users of the reports, and these are not necessarily representative of the same needs of the users of financial reports' (submission 13 – Water Corporation)*

> *'Currently it is not at all clear to … who the actual users of the current form of this product will be, which should drive the objective of the GPWARs' (submission 20 – State Water Authority)*

5.3.2. Transparency

Each submission was analysed in order to draw references on transparency. However, out of the 54 questions asked by the WASB to the general public on the ED AWAS 1, it was found that 22 questions related specifically to the notion of transparency discussed in this study. These questions were based on six of the seven components of GPWAR. It has to be mentioned though that no questions were asked about the Assurance Statement because at that time no sample of such statement was provided by the WASB. However, each submission was analysed carefully to see if there was any reference to the Assurance Statement.

The majority agree with the concept and the objectives of GPWAR. It seems that there is a general understanding and acknowledgement on what a GPWAR will convey. However, one particularly interesting comment concerned the perception of stakeholders about the standard. That perception would be worth exploring in order to know their expectations.

> *'The Objective of the AWAS is acknowledged and appreciated, as the standards set in place a framework which allows further development of water accounting practice and possible regulation. However, in the wider stakeholder community the purpose of the standards is frequently misunderstood. In particular, stakeholders often feel that the standards will prescribe and define calculation methods in order to standardise measurement nationally' (submission 9 – State Water Authority)*

In terms of the contextual statement, the majority of respondents agree on its importance; however, three respondents noted that its content might be too lengthy and that some for some information users might just be referred to the websites or to other reports. In terms of the Statement of Water Assets and Water Liabilities, the Statement of Changes of Water Assets and Water Liabilities and the Statement of Physical Water Flows, all of the respondents agree with their inclusion; however, they provided some advice for improvements (for example, either to standardise the terms or to rename the components of the statements so as to avoid confusion). In terms of notes, there is no disagreement about their inclusion, just some advice to improve their content. Similar to what was found during the interviews (see Section 5.2), one of the statements that creates controversy is the Accountability Statement. Report

preparers do not disagree with its preparation; however, they disagree that the Accountability Statement reports on compliance.

> *'Consideration should be given to simplifying the requirements of the standard. This also includes the Context Statement and Accountability Statement that appear to be unnecessarily complex and excessive' (submission 18 – Private Irrigation Company)*

> *'... disagrees with the proposal to include a statement on whether externally imposed requirements relevant to managing the water assets and water liabilities have been complied with' (submission 11 – State Water Authority)*

5.3.3. Power of Accountees

No question was identified that could be related to the idea of power. Therefore, power was analysed by reviewing each submission in detail and locating any reference to power in them and by reviewing comments on the Accountability Statement. In Section 3.2.3 it was discussed the need of having a tool to assess water managers' performance and the Accountability Statement might fulfil that role in the case of SWA.

In analysing the submissions, special attention was placed on any reference to the empowerment of accountees in influencing the decision-making process. Power was not referred to in any of the respondents' submissions. What was found is a linkage between water reports under SWA and providing information although with no specific reference to power.

> *'... believes there should be an additional objective as this definition excludes probably the most common use of the product, which is to simply know the information' (submission 20 - State Water Authority)*

> *'The "information needs of users" are described as needs to make and evaluate decisions about allocation of water resources, and needs to evaluate the accountability of managers. However, information needs may go beyond this' (submission 8 – State Water Authority)*

Practitioners expressed doubts about the Accountability Statement. Only four respondents manifested a positive or negative support: three of those respondents supported the statement partially and the remaining respondent was completely against it. Their concern is about disclosing compliance with externally imposed requirements.

> *'The requirement for an Accountability Statement may result in disclosure of minor breaches of statutory obligations. This could lead to adverse publicity or prosecution. This risk may be significant for some entities especially if they have conflicting requirements in regard to: water trading, environmental compliance, health and safety and interactions with other water users' (submission 14 – State Water Authority)*

'Assessing compliance is overstepping the water accounting discipline and the ability to get such a product signed off would be extremely limited given that much compliance in water, unlike financial accounting, is subjective [this entity] would not be able to apply the perceived intent of this definition of the accountability statement and does not think it should be part of the standard' (submission 20 - State Water Authority)

6. Conclusions

The need for consistent water information is based on the critical state of freshwater resources worldwide. Many solutions have been suggested to tackle this problem, one of them being the implementation of effective water management. Through an effective water management system, water will be used rationally and equitably; therefore, water information is important in order to implement an effective water management system. SWA was developed in Australia as a mechanism to meet the aims of the NWI. Collectively, the implementation of SWA is an effort to establish water accounting as a discipline (Sinclair Knight Merz, 2006; Godfrey and Chalmers, 2007; Slattery, 2008; Chalmers *et al*., 2010).

SWA could be considered as an example of the 'new accountings' described by Bebbington and Gray (2001). In fact, the development of Standardised Water Accounting (reflected in the PAWAS, then in the ED AWAS 1 and, most recently, in the AWAS 1) can be considered as a new and developing reporting system (Chalmers *et al.*, 2012). Bebbington and Gray (2001) state that in pursuing Sustainable Development, accounting and accountants might be able to support water accounting goals, but it is problematic to know how. Since SWA is based on financial accounting principles and methodologies, it can be argued that SWA is an example of those 'new accountings'.

The research question ('To what extent does SWA enhance the accountability of water managers?') leads us to explore the issues faced by the pilot sites (or practitioners) in preparing water accounts under SWA (by means of the participant observation-case study along with structured interviews with pilot project senior staff members) and the perceptions of practitioners towards the second iteration of the standard (known as ED AWAS 1) presented in public submissions.

In terms of clarity of relationship, one of the key findings was the confusion created by the definition of the water entity and the water reporting entity provided in the Water Accounting Conceptual Framework. In line with this issue, there were problems to identify the identity of the report preparer, the water reporting entity and the manager of a particular water entity.

This issue is about the identification of accountors and is considered as a boundary issue. It is difficult to establish the limits of water entities in water accounting unlike financial accounting. The identity of users of reports (or accountees) also created concern as identifying users is necessary in order to know what their information needs are and whether they will be satisfied with the reports. According to the ED AWAS 1, General Purpose Water Accounting Reports are prepared to satisfy the common information needs of users of reports hence it is paramount to identify first who the users are. These issues have been constant in all sources of evidence.

In terms of transparency, key findings were problems related to measurement as quantifying water is not as precise as finance; thus, this issue affects the quality of reporting. During the case study-participant observation, it was found that practitioners reported material error terms in their prototype accounts. There were lengthy discussions about the error term during the case study and how to deal with it. The accounting processes identified as the use of the double-entry system and the application of accrual accounting were identified as challenges by the practitioners during the case study; however, they eventually overcame those challenges. While practitioners broadly agree with the components of the ED AWAS 1 reporting package, fundamentally practitioners remain unclear as to the information needs of users. User needs are therefore a critical area to investigate further as General Purpose Water Accounting Reports are meant to satisfy users' information needs.

In terms of power of accountees, a key finding was that the Accountability Statement can be used as a mechanism to assess performance. It is argued that for the context of SWA, the Accountability Statement could fulfil that role. The Accountability Statement is a recurrent theme in all sources of evidence. It was identified as one of the issues faced by practitioners during the participant-observation case study and was constantly mentioned during the semi-structured interviews and in the public submissions. ED AWAS 1 introduces an accountability statement. The accountability statement should assist users to evaluate whether: '(a) the general purpose water accounting report has been prepared and presented in accordance with Australian Water Accounting Standards, (b) externally-imposed requirements relevant to managing water assets and water liabilities of the water report entity have been complied with, and (c) best practices for managing water assets and water liabilities have been applied' (Water Accounting Standards Board, 2010 para. 10). At the time of writing, it was found that practitioners had serious doubts about signing-off the accountability statement, especially when there are consolidated reports. For example, there are many layers

of accountability in a report prepared for the Murray-Darling Basin area. The question in this case is who, ultimately, is responsible for the actions undertaken in the water reporting entity. Therefore, consolidated reports create a problem. However, the standard states that a party may be accountable for preparing the report and/or managing the resource (Water Accounting Standards Board, 2010) which may apply when there are supra-entities such as the Murray Darling Basin Authority. The Accountability Statement however created conflicts among practitioners not only for signing it off, but also for including disclosure with compliance.

To date SWA has been considered in a positive light in the literature (e.g. see Sofocleous, 2010; Kirby, 2011; Chalmers *et al.*, 2012; Mungatana and Hassan, 2012), but some improvements still need to be made. The development of SWA is considered by Chalmers *et al.* (2012) as beneficial for the public interest and as an alternative accounting system to account for water (Godfrey and Chalmers, 2012). However, there are still some issues that need to be faced in the preparation of General Purpose Water Accounting Reports as discussed previously. Moreover, these issues become more relevant if it is assessed whether these reports discharge the accountability of water managers.

The National Water Account prepared by the Bureau of Meteorology uses the standards to prepare GPWARs. In terms of measurement and transparency, after analysing the National Water Account 2011, a large unaccounted-for difference figure can be seen. This figure represents unexplained changes in water assets and water liabilities. Care must be taken because the higher the value the more unreliable the figures could be.

In terms of power and the Accountability Statement, in the National Water Account 2011, it is acknowledged that there is not enough information to assist users to understand and evaluate the accountability of water managers. Furthermore, in the AWAS 1, the Water Accounting Standards Board (2012c) reduced the scope of the accountability statement as stated in the ED AWAS 1. One of the problems with the National Water Account 2010 and 2011 is that there is no Accountability Statement and the main reason for this absence is the problem of signing-off such statement. During the interviews with senior staff members from the pilot sites, one interviewee reflected on this fact by mentioning the difficulties of having multiple actors involved because if the intention is to get each manager to sign off, then it is unlikely that accounts will be released either at all, or in a timely fashion.

In October 2012, the WASB released the Australian Water Accounting Standard 1 (AWAS 1), which is the latest step in the evolution of water accounting standards. The AWAS 1 takes

on board feedback from the public regarding ED AWAS 1. Assurance is recognised as an important part of GPWAR, although it is no longer considered as a component of GPWAR. Additionally, it is suggested that there is no need to present a Statement of Changes in Water Assets and Water Liabilities if there are no accruals in the water report entity. Finally, in terms of accountability, it is mentioned that its purpose is to establish whether GPWARs have been prepared according to the standards (Water Accounting Standards Board, 2012c para. 62) removing the previous requirements on disclosures in compliance with externally-imposed requirements and whether best practices were applied in the management of water (Water Accounting Standards Board, 2010 para. 50).

Possibly the most important challenge going forward is to make the case for water accounting at the various levels of government that must agree to its adoption. While a detailed discussion of the political aspect of SWA is beyond the scope of this study, the initiative will ultimately succeed based on the ability of the WASB to present a proposal of value to Australia's senior water professionals and politicians. The Water Accounting Standards Board (2012a) mentions that the cost of implanting SWA might be offset by its benefits, although there is significant uncertainty about the cost of implementing it.

The implication of these findings for the accounting literature, and in particular the work on water accounting by researchers such as Chalmers *et al*. (2012) and Sofocleous (2010), is that while there may be potential long-term benefits from implementing SWA there are major issues that create concerns about SWA as currently constituted. In line with Sofocleous' (2010) findings, it was found that measurement in water accounting will be one of the key challenges ahead. More importantly, however, are the lack of clarity around user requirements and the limitations of the Accountability Statement in discharging accountability.

The limitation of the study is that the case study was carried out before the release of the Water Accounting Conceptual Framework and the standards. Therefore, there was no chance of evaluating how practitioners cope with the preparation of water accounts when applying the standards.

Future research might explore the perceptions of practitioners towards the third iteration of the standard (known as AWAS 1). As mentioned previously, there have been some amendments in some of the standards so the perceptions of practitioners in light of those changes would be motivating to explore. Future research might also explore the perceptions

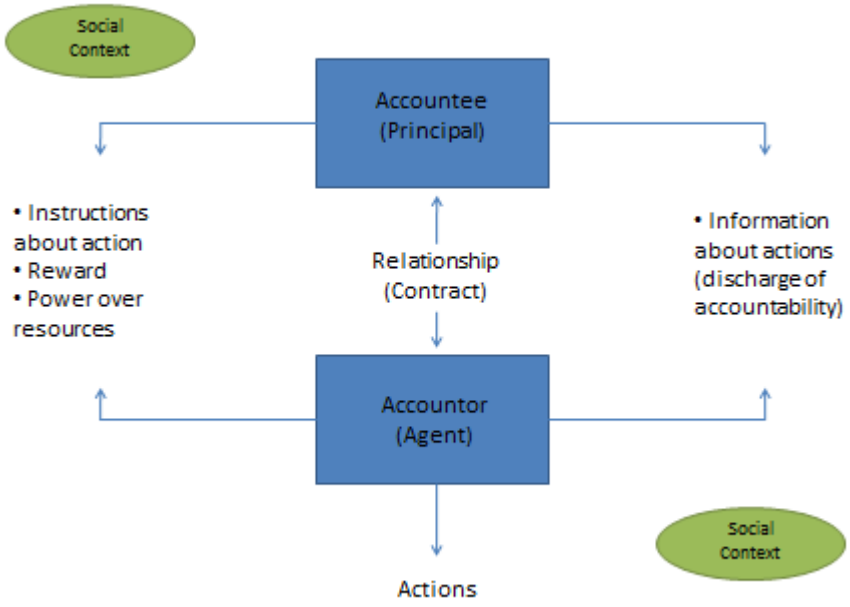
of practitioners towards groundwater reporting under SWA since the use of groundwater is of critical importance is different parts of Australia.

7. Appendix

Table 2.1. Evolution of Standardised Water Accounting (SWA)

2004	The National Water Initiative (NWI) is signed. The NWI is an intergovernmental agreement reached by the Council of Australian Governments (CoAG)
2006	Sinclair Knight Merz (SKM) is commissioned by the Department of Agriculture, Forestry and Fisheries to undertake a stocktake and analysis of the water accounting practice in Australia
2006	On November 24th, the National Water Accounting Development Project (NWADp) was endorsed by the Natural Resource Management Ministerial Council (NRMMC)
2007	The Water Accounting Development Committee (WADC) was established
2007	State pilot projects were established (to last until 2009)
2007	The Water Act 2007 is signed. The Bureau of Meteorology (BoM) was assigned the task of issuing National Water Information Standards
2008	WADC is assigned under BoM's responsibility
2009	The Water Accounting Standards Board (WASB) superseded the WADC in February
2009	The Water Accounting Conceptual Framework (WACF) and the Preliminary Australian Water Accounting Standard (PAWAS) are issued
2009	Water Reform Committee replaced CoAG Working Group on Climate Change: Water Subgroup
2010	The Exposure Draft of the Australian Water Accounting Standard 1 (ED AWAS 1) is issued by the WASB. Comments and feedback were received until June 2011
2012	In late 2012, the WASB released the Australian Water Accounting Standard 1 (AWAS 1) after incorporating feedback and comments from the ED AWAS 1

Figure 2.1. Gray et al. (1996) Accountability Model



Source: Gray *et al.*, 1996 p. 39

Figure 2.2. Traditional Model, Gray et al. (1996) model and Modified

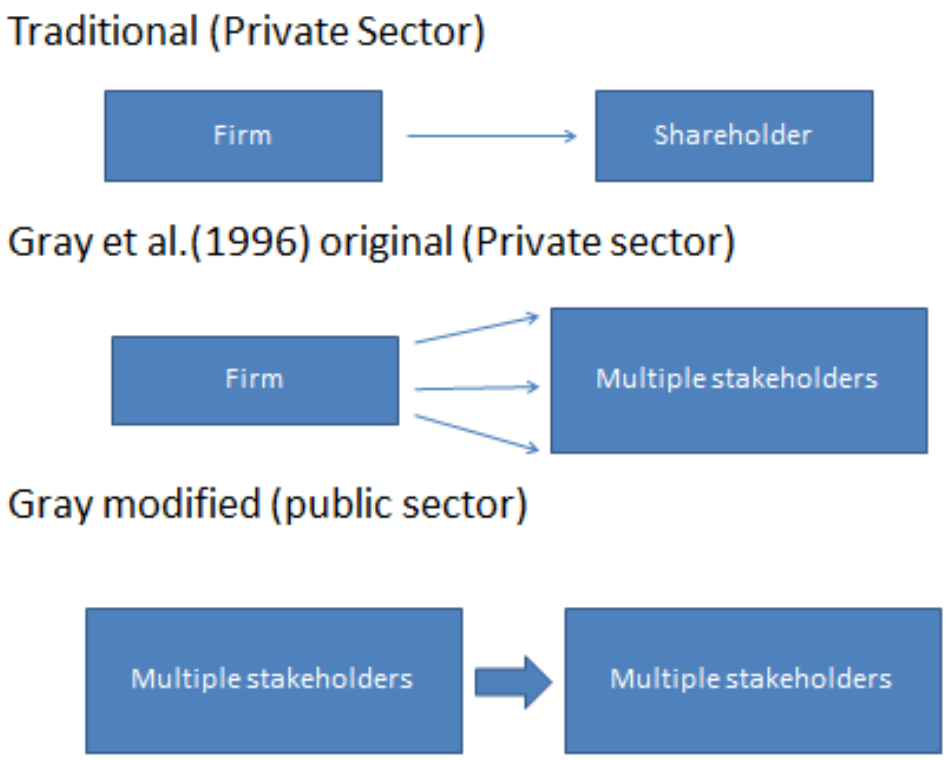


Table 2.2. Summary of the accounting issues identified during the pilot visits (case study project facilitated by the former WADC)

	NSW	VIC	WA	SA	MDBC (*)
Common language by applying accounting terms into water	Different terms were applied by NSW when preparing prototype water accounts. For example, there were discussions on how to apply 'reserves' to water. Another discussion was about profit. NSW consider that the idea of profit does not make sense in water	*No discussion*	WA considered that some terms in the chart of accounts were misleading	The use of the accounting model implies that *standard terminology* should consider hydrological terms. This process might be complex	Different accounting terms were applied when preparing water accounts; it was a learning curve. The question of how to account for some events was always present e.g. perpetual commitments
Level of detail of information disclosed in prototype water accounts	*No discussion*	Graphs and other additional information were suggested to be included in the face statements by VIC ? face statements	Discussions on the required level of detail in water reports. Moreover, discussion on the level of detail in an aggregated way e.g. top level (town, mining, so on)	*No discussion*	Discussions on what kind of information should be disclosed in water reports and the level of detail. 'Notes' are powerful in water accounting statements according to MDBC
Identification of users' information needs	Identifying users' needs is important even more in the current scenario because public will demand more information due to climate change	Discussion on the lack of a proper users' requirements study. First target of water reports should be satisfying the needs of citizens who live in each jurisdiction	Discussion on the existence of different users' needs. WA suggested that 'tailored reports' should be prepared (depending on users' requests)	Users' requirements should be in line with the purpose of the accounts. Water accounts are of national interest hence study on users' needs should be more concrete	Discussion on how to satisfy the needs of all users. MDBC wondered if water accounts would be good enough for different user groups e.g. environmentalists
Accountability statement	Discussions on how to assess accountability. NSW believed that the accounts should be 'best practice' accounts. NSW believes that the purpose of reports is to discharge the accountability of managers	The usefulness of water reports was discussed. VIC considered that reports are going to be useful for water management and hence for accountability	Discussion on the appropriate signatures needed in the accountability statement	Discussion regarding the accountability statement was mainly on the person who will sign such report. A related issue was that SA believed that if reports are going to be prepared on OR at an aggregated level, probably some people may not want to sign	There were diverse discussions regarding accountability e.g. Performance in water. MDBC believed that water managers have much less control than managers in the business world
Water quantification	There are different techniques to quantify water (e.g. models, etc), NSW suggested that it should be clear	The question of the validity of the numbers was often raised by VIC	There are different models to quantify water in aquifers (e.g. the PRAMS model and the Carnarvon model)	Discussions on water quantification were about measurement and the quality of data measured	Measurement was an issue raised by MDBC. Basic data used by MDBC is gathered by the states. Additionally, models were used

	which measurement technique was used				in MDBC. Discussions on the accuracy of such models were present (e.g. models do not adapt for climate change)
Time frame of reports	*No discussion*	*No discussion*	For WA, timeliness is relevant. Calendar year is different from seasonal year (for WA it is not 30th June)	Water year in South Australia is from the 1st of July to the 30th of June (e.g. River Murray) so there is no problem; however, the 'flow in the system' should be taken into account (e.g. high in summer)	*No discussion*
Amount of time allowed for the preparation of reports	There were discussions on the time-frame allowed to prepare water reports after the year end (whether 3, 5 or 6 months)	Discussion on time was related to the costs. According to VIC, less time means more expensive. Time and cost are also related with the assurance component	WA did not agree with a 3-month period after the year end to prepare water reports	*No discussion*	*No discussion*
The appropriate water reporting entity	There were discussions on whether or not surface water entities and groundwater entities should be considered separately. NSW wondered if the current definition of the 'water reporting entity' covers everything	It is clear for VIC that the water reporting entity is not always similar to the report preparer. There were lengthy discussions on both of them	For WA, there were concerns on the identity of the report preparer. There is a separation between a water body & a reporting organisation	There was confusion regarding the identity of the water reporting entity, this issue was explored in depth. A water entity is different from a water reporting entity. It involves looking at physical and administrative areas. SA considered it relevant to report on 'prescribed areas'. At that stage, SA considered only geographical areas as water reporting entities	MDBC had different ideas on the identity of the water reporting entity in their case (e.g. Who or what is the reporting entity?). Discussions on the role of MDBC (now Murray Darling Basin Authority) in preparing water reports (for example consolidation)
Assurance process	NSW believed that there should be an independent assurance institution. NSW believed that hydrologists should be part of the assurance process in order to measure and test validity	There were discussions about the identity of the body in charge of the assurance process. VIC suggested someone independent from the report preparer	Discussions on the required level of accreditation of potential auditors of water reports (e.g. skills, training certificates)	*No discussion*	The audit process of water accounts was a concern for MDBC. Discussions were mainly on how to check the veracity of water accounts

Manual to prepare reports	*No discussion*	A manual is necessary to see how the standards can be applied. Members of the Victorian pilot site wanted more guidance	A manual is required to prepare water accounts. WA had problems with consolidation	A *water accounting manual* to prepare water accounting reports should be made. Among other things, such manual should include the methods used to get the numbers	*No discussion*
Level of qualification	So far water accounts are prepared by hydrologists and engineers. Moving to 'water accounting' means re-educating water professionals (those who do not have accounting backgrounds)	*No discussion*	*No discussion*	*No discussion*	*No discussion*
Comparability of reports	Reports should be useful to compare the same reporting entity in different years; however, NSW believed that all comparison should be put into context (e.g. drought)	Comparability of reports cannot be straightforward because conditions change every year. Numbers in a report are not easy to understand	*No discussion*	It is difficult to compare data in reports because the 'quality' of such numbers is not the same across reports. SA believed that there should be some degree of consistency between the numbers	MDBC believed that comparability across different entities is necessary. MDBC wondered if ratios can be applied into water like in financial accounting
Prior period adjustments	NSW recommended changing numbers later (water report should be prepared first)	*No discussion*	*No discussion*	*No discussion*	MDBC wondered how to account for post-balance water accounting events
Application of financial accounting processes	There were discussions on accrual accounting mainly because of carryover (there is no physical happening with accounts in accrual)	The existence of accruals due to carryovers was discussed. VIC believed that carryover will create some sorts of difficulties for the water accounting process. A discussion involved separating what you owe (future outflows) but not what you would receive because there is no control (future inflows)	WA prepared prototype water accounts, but at a very basic level. There were discussions on how WA prepared their water accounts	There were discussions on how to record water transactions and also on the existence of accruals in the South Australian pilot site	MDBC wondered if accrual accounting adds any value. Physical accounts do not show obligations. There were a lot of accruals in the MDBC
Groundwater (*)	NSW discussed how the quality of groundwater is measured. It is hard to know the total amount of water available	Groundwater areas in VIC were identified but interactions were not established. Analysing interactions	There were concerns about how to report when there are multiple aquifers. WA wondered whether to	Discussions on the amount that should be reported for groundwater (whether the extracted amount or the estimated	*No discussion*

	for consumptive use of an aquifer	proved to be difficult	disclose net or gross volumes and the boundaries of aquifers	100% amount). This discussion is related to the 'quality' of the data. SA also raised concerns on the sustainable yield and interactions between surface and groundwater areas	

(*) The former Murray-Darling Basin Commission is now the Murray-Darling Basin Authority.

(**) Groundwater is a whole different arena. It was considered as an issue because there were discussions on groundwater during the pilot visits. However, as an issue per se, it overlaps with others. For example, issues like accountability or the water reporting entity are relevant with groundwater as well

Notes to Table 2.2:

1. Common language by applying accounting terms in water-related terms – This expression means applying accounting terminology in the water arena and is based on the need for having and using common terms to identify the different elements of water accounts. Professionals at the pilot sites had to follow accounting terminology to name the different elements of the water field. Some examples: How to consider sustainable yield or dead storage? Whether the perpetual commitment to SA is a liability? How to consider environmental water? How to account for the water used to recharge aquifers (may take up to 30 years – Western Australia)?

2. Level of detail of information disclosed in prototype water accounts – Since the Water Accounting Standards were not completed by the time the pilot sites prepared prototype water accounts, they included what they considered was relevant. A lot of information was included in the Notes. The question 'what to include in the reports' was always present when the pilot sites prepared prototype water reports. General Purpose Water Accounting Reports will contain standard information and additional information will be included in the notes to the disclosures. For example, including graphs or additional explanations about how climate change affects water inflows.

3. Identification of users' information needs – Since prototype water accounts were prepared under the discretion of the pilot sites with minimal influence from the former Water Accounting Development Committee, this issue was critical for the pilot sites. It is necessary to identify the needs of potential users of water accounting reports. In financial accounting, the main users of reports are investors. Their information needs are covered in the financial reports.

4. Accountability statement – One of the main issues identified when visiting the pilot sites concerned the content of the accountability statement, in particular the discharge of accountability by water managers. In relation to the accountability statement, the question was about signing-off the statement. There are different layers of responsibilities within each water reporting entity; therefore, signing-off a statement creates concerns.

5. Water quantification – This is a complex issue, but it is associated with to the issue of 'how' water is measured. The accuracy and reliability of water numbers were discussed. For example, how accurate is the number that represents the amount of existing water in an aquifer and how reliable is that number (or estimate which is based on models)? Different methods are used in water measurement (some methods include models whereas others are direct measurement). Water quantification is also connected with the disclosure of error terms and how to report on them.

6. Time frame of reports – Another operational issue identified was about the time-frame of the reports. The water year is different from the financial year because water cycles run differently depending on the season. It was decided to follow the same time-frame as financial accounting in Australia (June to July).

7. Amount of time allowed for the preparation of reports – This issue is about the amount of time that report preparers should take to prepare water accounting reports once the financial is over. Discussions during the pilot visits were diverse and time-frames were different from three months after the year end to six months or even more.

8. The appropriate water reporting entity – Identifying the water reporting entity and the report preparer was an issue that created some confusion between the pilot sites. It should be clear the scope of these concepts in preparing water reports. unclear Identifying the right report preparer in relation to the water reporting entity has an accountability component as well as the level of detail that will be expected to be disclosed in the reports.

9. Assurance process – Even though pilot sites did not get so far as to include the assurance component in the preparation of water reports, the issue was constantly discussed during the pilot visits. One of the discussions was about the entity in charge of auditing future General Purpose Water Accounting Reports. The latter is connected to the accreditation of auditors (for example, necessary skills).

10. Manual to prepare water reports – Pilot sites complained of the fact of not having a model to follow in order to prepare water reports. Having a water conceptual framework and water accounting standards was not enough because the need for an accounting manual as well was discussed. Such manual should include a sample containing all (or the majority of) potential water-related events happening in water reporting entities.

11. Level of qualification – The issue is whether professionals at the pilot sites were qualified sufficiently to undertake the task of preparing water reports and about the level of (accounting) qualification required to prepare them. In relation to the latter, the need to educate the professional staff was discussed.

12. Comparability of reports – One of the qualitative characteristics of financial accounting reports is comparability. During the pilot visits, the issue of comparability of water accounting reports was discussed. Comparability is related to the possibility of comparing reports from different water years and also the possibility of comparing reports from different water reporting entities. The water year will influence the comparability of reports because water seasons are different across Australia.

13. Prior period adjustments – The issue discussed here was about how to report changes or adjustments that happen after the year end.

14. Application of financial accounting processes – The application of accrual accounting and the double-entry system are labelled as 'financial accounting processes' because both are important pieces in the preparation of water accounts. Understanding these concepts proved to be a complex task for water experts, but not impossible.

15. Groundwater – Groundwater was an issue in some of the pilots, but its nature is different from the other issues. Due to its importance, it was decided to explore groundwater in depth in a new research paper instead of pursuing it in this research paper. Discussions on groundwater included the main issues previously discussed (such as the reporting entity, measurement and so on).

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PERCEPTIONS OF POTENTIAL USERS OF STANDARDISED WATER ACCOUNTING REPORTS: AN ACCOUNTABILITY APPROACH

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PERCEPTIONS OF POTENTIAL USERS OF STANDARDISED WATER ACCOUNTING REPORTS: AN ACCOUNTABILITY APPROACH

ABSTRACT

Purpose – This paper explores the perceptions of potential users about water accounting reports prepared under Standardised Water Accounting (SWA), and reflected in the second iteration of the Australian water accounting standard named *Exposure Draft of Australian Water Accounting Standard 1* (ED AWAS 1). Previous research (see Paper 1) found that practitioners felt that the perceptions of potential users of water accounting reports were not completely addressed in developing SWA. This research paper attempts to explore the perceptions of potential users of water accounting reports under SWA. Efficient and effective water management is an important element in alleviating water crises caused by the misuse of water resources.

Design/methodology/approach – The accountability framework is adopted by using Gray *et al.*'s (1996) accountability model extended to included elements pertinent to the public sector. This concept is explored in depth across three main ideas: clarity of relationship, transparency and power. A mixed method approach was utilised in which a questionnaire was administered to users with water-related interests in five different water-related seminars. The results yield to 36 usable responses. The qualitative phase comprised the analysis of 14 public submissions to the Water Accounting Standards Board (WASB) on ED AWAS 1 by potential report users. The submissions were coded in Nvivo and analysed according to the components of the integrated accountability model.

Findings – Results from the questionnaire indicate that approximately 83% of the respondents perceive that it is useful to adopt a standard system to prepare water accounting reports. Conversely, the majority of potential users of water accounting reports are unsure about the effectiveness of such reports in discharging the accountability of water managers (approximately 53% of respondents on all statements except the accountability statement and approximately 58% of respondents on just the accountability statement). After analysing public submissions to the WASB based on the elements of the integrated accountability model, it was found that there is resistance regarding the use of the Accountability Statement. Overall, it was found that accountability is unlikely to be fully realised with this iteration of the Standard (reflected in ED AWAS 1).

Research limitations/implications – The main limitation is the relatively low data volume. Whilst the questionnaire was administered at key water-related seminars, the response rate was low at approximately 21%. However, understanding the perceptions of attendees at those events is important because respondents are potential users of water accounting reports with a water-related interest. It was expected that public submissions would represent a comprehensive view from users on ED AWAS 1; however, the number of submissions was not significant. Of the 23 public submissions comprising the final sample, only 14 were used for the analysis because the other nine represent the views of potential report preparers. Due to low data volume, future research might usefully corroborate these findings.

Practical implications – The ambivalence about the Accountability Statement indicates this area needs to be addressed in a future iteration of the Standard. It might also be necessary to educate more potential users of SWA reports.

Originality/value – SWA is currently ongoing in Australia. ED AWAS 1 was issued in mid-2010 and the Australian Water Accounting Standard 1 in late 2012. The study has sought to overcome the limited research undertaken to date to explore the perceptions of potential users of water accounting reports under SWA.

Keywords – Water, water accounting, users, social and environmental accounting, Australia

1. Introduction

There is a worldwide water crisis due not only to declining water availability, but also to sub-optimal water management (World Water Council, 2000 p. xix-xxi; World Water Assessment Programme, 2003 p. 4; World Water Assessment Programme, 2006 p. 1; Global Markets Institute, 2008 p. 5; World Water Assessment Programme, 2009 p. xix). As a country with both significant water issues and relative wealth, Australia has been at the vanguard of innovative water management techniques (Slattery, 2008), also with water information, and more specifically with water accounting. We call Standardised Water Accounting (hereafter SWA) the effort to account for water using financial accounting methodologies and guidelines. The development of national water accounting techniques has been ongoing since the commencement of the National Water Initiative (NWC, 2012). The latest milestone has been the publication of the National Water Account in 2011. With respect to accounting frameworks and accounting standards, the Water Accounting Conceptual Framework was released in 2009 and the Australian Water Accounting Standard 1 (hereafter AWAS 1) in October 2012. SWA is a novel approach in that it applies many of the techniques of financial accounting in a physical accounting context using water flows represented as mega litres (Slattery *et al.*, 2012) and represents an example of the 'new accountings' mentioned by Bebbington and Gray (2001).

This study examines the perception of potential users of water accounting reports to the Exposure Draft of Australian Water Accounting Standard 1 (hereafter ED AWAS 1). At the time of gathering data for this paper, AWAS 1 had not been released. ED AWAS 1 is the second iteration of the standard development process. One of the findings of Paper 1 was that the majority of practitioners were unsure of the perceptions of users about SWA and also unsure of precise user needs that might be met through the provision of water accounts and therefore were unsure whether the benefits would exceed the costs. Further, while the adoption of financial accounting techniques was considered helpful in some aspects, report preparers differed as to the extent to which they believed SWA reports would facilitate the discharge of water managers' accountability. Therefore, this study explores these issues and other minor ones by delivering a questionnaire to potential users of water accounting reports at five water-related events between late 2010 and early 2011. Additionally, public submissions to the Water Accounting Standards Board (hereafter WASB) on the ED AWAS 1 were analysed.

This study extends previous accounting research on users of financial accounting reports and users of Social and Environmental Accounting and Reporting (hereafter SEAR). Studies on users of financial reports are not new in accounting research (e.g. see Cooper and Sherer, 1984; Ansari and Euske, 1987; Weetman *et al.*, 1996; Harding and Mckinnon, 1997; Mellemvik, 1997; Stanton, 1997; Yap, 1997; Mirshekary and Saudagaran, 2005; Durocher *et al.*, 2007) and certainly not new in SEAR (e.g. see Dierkes and Antal, 1985; Freedman and Stagliano, 1991; Tilt, 1994; Deegan and Rankin, 1997; Deegan and Rankin, 1999; Al-Khater and Naser, 2003; O'Dwyer *et al.*, 2005; Tilt, 2007). This research extends those studies by exploring the perceptions of users about water accountings standards and reports. As SWA is an innovative approach to account for and report on water using financial accounting principles and methodologies, knowing the perceptions of potential users of General Purpose Water Accounting Reports (hereafter GPWAR) is compelling.[50]

This paper explores SWA from an accountability point of view from the perspective of potential users (or stakeholders) of water accounting reports. The research paper is structured as follows: Section 2 explains briefly Standardised Water Accounting while Section 3 presents a review of the literature on users of accounting reports and stakeholders. The accountability framework is presented in Section 4 while Section 5 describes the research method applied. Section 6 discusses the results of the study and Section 7 presents the implications and conclusions of the study.

2. Standardised Water Accounting

This study deals with the introduction of SWA in Australia and the perspectives of potential users of water accounting reports prepared under SWA. SWA is not similar to what is commonly known as water accounting. In fact, SWA is considered as part of water accounting. The term *General Water Accounting* is applied to reflect all previous water accounting efforts that are not *Standardised Water Accounting*.[51]

[50] In this study, 'SWA reports' are reports prepared under SWA. In the ED AWAS 1 (and also in the recent AWAS 1), such reports are termed 'General Purpose Water Accounting Reports' (GPWAR). I use either 'SWA reports' and/or GPWAR to refer to reports prepared under SWA.

[51] For the purposes of this study, '*General Water Accounting'* is a term used to consider all efforts to prepare water accounts which do not follow financial accounting principles and methodologies. '*Standardised Water Accounting'* is a term that implies the application of financial accounting principles to account for water.

An innovation in Australian water accounting is the trial of SWA, which is water accounting that mimics financial accounting in methodology and presentation and is created in accordance with water accounting standards. According to SKM (2006), there is a clear contrast between a style of report that follows accounting procedures (called *Standardised Water Accounting*) and a table of statistics (part of what is called *General Water Accounting*). For SKM (2006 p. 127), SWA is advantageous because

‘separate tables of river flows and extraction volumes do not link information together meaningfully, and do not show where all the water has come from or gone to, and do not demonstrate the same accountability for the management of the resource’.

Godfrey (2008) suggests that SWA, as discussed here and currently under development in Australia, has the potential to fundamentally transform water policy.

To understand SWA, it is important to know the context under which SWA emerged. The beginning of national water reform in Australia is reflected in the agreement reached by the Council of Australian Governments (hereafter CoAG) in 1994 (Slattery *et al.*, 2012). Such agreement was reinforced by the Intergovernmental Agreement to the National Water Initiative (hereafter NWI) which was signed by the Commonwealth and State and Territories between 2004 and 2006 (NWC, 2012). According to Chalmers *et al.* (2012), one of the drivers for signing the NWI was the severe drought that affected Australia in the early 2000s. Eight areas of reform are outlined in the NWI which include the need for a consistent water resource accounting in order to have standard information that can be compared, aggregated and reconciled (Bureau of Meteorology, 2012d).According to Slattery *et al.* (2012), this process would allow achieving the objective of a nationally managed system of groundwater and surface resources for rural and urban use that maximises social, economic and environmental results.

In 2006 the National Water Accounting Development Project was endorsed by the Natural Resource Management Ministerial Council (hereafter NRMMC). The Project was funded under the Raising National Water Standards program (part of the Australian Government Water Fund) and managed by the National Water Commission which provided for $5 million of Commonwealth funding matched by $5 million of in-kind support from the States over a three year period. In February 2007, the NRMMC established the Water Accounting Development Committee (hereafter WADC) (Slattery, 2008). WADC was an independent expert group composed of water and accounting experts from industry, environmental groups,

academia and government rather than a body comprising representatives from jurisdictions (Bureau of Meteorology, 2012a). Then, in 2009 the WADC was superseded by a new body, the Water Accounting Standards Board which became the advisory board of the Bureau of Meteorology relative to water (hereafter BoM) (Godfrey, 2011). The main task of WASB is issuing standards in relation to water accounting called Australian Water Accounting Standards (Bureau of Meteorology, 2012a).

In the period from late 2007 to early 2009, the WADC undertook two major tasks: development of the Water Accounting Conceptual Framework (hereafter WACF), which comprises eight Statements of Water Accounting Concepts and was released in 2009, and piloting SWA in multiple locations around Australia. In this pilot study, the former WADC expected to identify, and if possible overcame, the challenges of implementing SWA. Six pilot sites were identified by the jurisdictions to engage with SWA and to prepare prototype water accounts. The WADC engaged James Hazelton and Edward Tello in early 2008 to assist with this pilot process and consequently visited five pilot sites. The WACF sets out the concepts that will underlie the preparation of future General Purpose Water Accounting Reports (Water Accounting Standards Board, 2009b). In late 2009, the WASB released the Preliminary Australian Water Accounting Standard (hereafter PAWAS), which was the preliminary version of the Australian Water Accounting Standard (first iteration of the standard).In 2010 the ED AWAS 1 was released by the WASB and received comments and feedback on it until June 2011 (Bureau of Meteorology, 2012b). In October 2012, the WASB released the AWAS 1 based on the feedback received from the ED AWAS 1. This Standard prescribes the preparation of GPWAR under SWA by setting the conditions for recognition, quantification, presentation and disclosure of the items in water reports (Water Accounting Standards Board, 2012a). Figure 3.1 provides a timeline of the development of water accounting.

[Insert Figure 3.1 here]

According to the Water Act 2007, one of the roles of the Bureau of Meteorology involves delivering comprehensive water information across Australia (Bureau of Meteorology, 2012d). Existing water information was either unavailable to users in a standard format or was problematic to access. The Bureau of Meteorology prepared and released the national water account for the years 2010 and 2011 following a standards-based approach to water resource reporting (following the ED AWAS 1) (Bureau of Meteorology, 2012c). The

national water account includes standard information about the management of water resources in Australia. In 2010 and 2011, water reports were produced for eight significant water management regions (Adelaide, Canberra, Melbourne, Murray-Darling Basin, Ord, Perth, South East Queensland and Sydney). The next section reviews the literature regarding stakeholders generally, and in particular users of accounting reports and users of SWA water reports.

3. Literature review

3.1. Stakeholders

In financial accounting, financial accounting reports are prepared for a wide range of stakeholders. Thus, it is convenient to analyse who the stakeholders of water report entities might be as these entities are in charge of managing water. Water Report Entities (hereafter WRE) that are meant to prepare GPWARs can be both public sector and private sector oriented. The majority in Australia belong to the public sector because, in Australia, the administration of water resources and their management remains public (Pigram, 2006).[52] Budhwar and Boyne (2004) state that most research regarding the public and the private sector differentiates on the basis of ownership. Shareholders own private-sector companies whereas members of political communities at different levels of government own, fund and control public agencies (Budhwar and Boyne, 2004). The public sector and the private sector differ inherently in terms of funding, ownership and control; however, it appears that both sectors function similarly in terms of management (Lawry *et al.*, 2007).[53] The private sector comprises small, medium and large-scale organisations, whereas the public sector in Australia comprises 'local government authorities and all government departments and agencies created

[52] A water report entity is defined by the Water Accounting Standards Board (2012 p. 31) as 'a water entity in respect of which it is reasonable to expect the existence of users who depend on general purpose water accounting reports for information about water, or rights or other claims to water' whereas the water entity is 'an entity that: a) holds or transfers water, or b) holds or transfers rights or other direct or indirect claims to water, or c) has inflows and/or outflows of water'. The WASB defined the water entity in a broad way so as to be as inclusive as possible.

[53] Lawry *et al.* (2007) mention that management has to establish organisational objectives, make plans and control performance regardless of the fact that it is public or private.

by, or reporting to, the Commonwealth, or state/territory parliaments' (Australian Bureau of Statistics, 2012a).

One of the reasons why public sector entities are different from private sector entities is the range of stakeholders associated with each sector. The organisational stakeholder concept has been explored in depth in accounting and management research. Traditionally, corporate success has been measured by the degree of satisfaction of one stakeholder, that being the shareholder (Clarkson, 1995). However, Clarkson (1988) argues that satisfying only the shareholder is self-defeating. Clarkson (1995) states that *fairness* and *balance* are necessary for the stakeholder system to work. The stakeholder framework proposed by Clarkson (1995) views the corporation as a system of primary stakeholder groups that need to fulfil their economic and social purpose in order to survive. It is clear from Clarkson's (1995) study that *stakeholder* and *shareholder* are not synonymous terms. Stakeholder is a broader and more inclusive term to the shareholder term. If water report entities belong to the public sector then the owner is the government, but since citizens fund the government via taxes, then the ultimate primary stakeholder would be the citizens (given the water report entities are public).

This study examines potential users of GPWARs, who are the stakeholders in relation to water accounting. Research in relation to stakeholders dates from 1932, when Harvard Law Professor Merrick Dodd quoted the views of General Electric executives who identified four major stakeholder groups (shareholders, employees, customers and the general public) (Preston and Sapienza, 1990). Preston (1990 p. 361, 362) traces the origin of the stakeholder concept by giving an account of how the concept has evolved since 1932. Freeman's (1984) seminal work laid the foundation on which stakeholder models and theories have been built. Freeman (1984) traces the stakeholder term back to 1963 in which an internal memorandum at the Stanford Research Institute introduced the term. In the 1963 memo, the term referred to stakeholders as the only group to whom management needs to be responsive.[54] Dill's (1958) research is considered a benchmark because it formally introduces the *stakeholder concept* into the management literature. Dill (1958) considers stakeholders as environmental factors that restrict the structure of corporations and the behaviour of organisational members. These

[54] Freeman (1984) states that stakeholder was originally defined as those groups whose support is important for the organisation's operations while Clarkson (1995 p. 106) defines stakeholders as 'persons or groups that have, or claim, ownership, rights, or interests in a corporation and its activities, past, present, or future'. Both definitions are inclusive and do not differentiate between primary or secondary stakeholders.

elements of the environment, known as stakeholders, are customers, suppliers, competitors and regulatory groups (Dill, 1958).

The difference between primary and secondary stakeholders is established by the extent to which their actions affect the operations of the organisation. Clarkson (1995) defines primary stakeholders as groups whose participation is important for the corporation to survive as a going concern, whereas secondary stakeholder groups are those who affect and are affected by the corporation, but are not engaged in transactions with companies and are not indispensable for a company's survival. It is important to mention that even though secondary stakeholders are not important for company survival, they have the power to mobilise public opinion against, or in favour of, corporations. In an organisational context, primary stakeholders typically comprise shareholders and investors, customers, employees, suppliers, governments and communities, whereas secondary stakeholders include the media and a wide range of special interest groups (Clarkson, 1995). The level of interaction between the corporation and its primary stakeholder grouping is high. The wide range of stakeholders is recognised, but it seems there is a hierarchy within the different groups regarding how they affect and are affected by corporations. In spite of its wide acceptance, Preston and Sapienza (1990) criticise the stakeholder concept and defend the proposition that corporations should look for the benefit of their shareholders only. The stakeholder concept is useful for enriching the understanding of the strategic tasks managers have to face.

The idea of the primary stakeholder can be connected to the idea of the 'absolute other'. According to Joannides (2012), accounts are owed to others and, in particular, to an 'absolute other' who acts as a principal and higher principal. This higher principal holds utmost authority over the organisation itself and its members (Joannides, 2012). The higher principal can have different faces depending on the type of organisation; for example, for listed companies, the higher principal is the shareholders; for public sector organisations, the higher principal is the taxpaying citizens and for not-for-profit organisations (such as charities), the higher principal is the donors. Little research has been carried out on corporate social disclosures regarding the perspectives of non-managerial stakeholders (O'Dwyer *et al.*, 2005). In fact, more studies have been undertaken on primary and economically powerful stakeholders than studies on secondary stakeholders.

Research in the higher principal is connected with the work of Joannides (2012). For public sector organisations, the higher principal is the taxpaying citizens (Joannides, 2012). Smith

(1995) argues that measures of performance in the public sector should be indicators of the outcomes for society of public sector activities. According to Smith (1995, p. 15), 'the closest analogy to the endorsement offered by a willingness to pay is – at best the vote wielded by the electorate, and more general political action', but such analogy does not reflect a benchmark for public satisfaction. In the case of SWA, the activities of water report entities are seen by the way they manage water. Smith (1995) suggests looking at the preferences and perceptions of those who have a legitimate interest in the public sector. In general terms, this group includes taxpayers, staff, employers, the general public and government, but these stakeholders are difficult to identify and might not recognise themselves as such (Smith, 1995).

The question to answer is who the primary users of SWA reports are. Users of GPWAR can be considered as stakeholders of water report entities. There is no specific description about the identity of users of GPWAR and their needs. The Water Accounting Standards Board (2009b para. 19) identifies a broad range of categories of users of GPWARs which include water users (environmental, urban, agricultural, commercial and industrial), investors in water dependent enterprises, government representatives, water industry regulators, water managers, water industry consultants, academics, groups and associations with a water-related interest and interested citizens. Water users are part of the list, but not the only item on it. It can be argued that water users have a big stake in knowing how the resource was managed. If that is the case, they might be primary users of reports. According to the ABS (2012b p. 19), in Australia the major water user during the period 2009/2010 was the agriculture sector (irrigators and farmers), using 6,987,334 mega litres (ML) in total, whereas households came third with 1,867,621 ML. But assuming that water users would be the primary users of reports would leave out citizens or government representatives, for example. Care must be taken in evaluating who the primary users of SWA reports would be.

3.2. Users of Water Accounting Reports

Accounting research on users of reports is not new. There have been studies on users of financial reports (e.g. see Cooper and Sherer, 1984; Ansari and Euske, 1987; Weetman *et al.*, 1996; Harding and Mckinnon, 1997; Mellemvik, 1997; Stanton, 1997; Yap, 1997; Mirshekary and Saudagaran, 2005; Durocher *et al.*, 2007) as well as studies on users of SEAR (e.g. see Dierkes and Antal, 1985; Freedman and Stagliano, 1991; Tilt, 1994; Deegan and Rankin, 1997; Deegan and Rankin, 1999; Al-Khater and Naser, 2003; O'Dwyer *et al.*, 2005; Tilt,

2007). O'Dwyer *et al.* (2005) present a detailed review of user studies of sustainability reports. Prior survey research on users' perspectives on sustainability reporting has focused on the views of economic stakeholders in relation to specific corporations (O'Dwyer *et al.*, 2005). Whilst it appears that stakeholder concerns around issues of sustainability and corporate accountability are evident, secondary stakeholders seem to be more interested in sustainability reporting than primary stakeholders (Tilt, 2007)[55].

Studies on users of financial accounting reports are diverse. For example, by examining the ways in which accounting is applied in dialogues on the subject of finance between Norwegian local government and its financial supporters, Mellemvik (1997) investigates the concept of accounting not only as an organised painting, but also as a collage. Mellemvik (1997) concludes that an accounting report comes to represent a collage as reports are read by different individuals and each user group has in mind different ways of understanding the information. Since each user group understands information differently, it may be that reports should be tailored to each user group. Cooper and Sherer (1984) discuss private versus public value approaches of reports by outlining an alternative framework for accounting research, namely, the Political Economy of Accounting. Cooper and Sherer (1984) mention that there have been studies that evaluated the use of published accounting reports by external users without including the shareholders.[56] There are conflicting objectives between user groups which result in differences in the content and form of reports. The solution could be to publish a report tailored to each user group, but it would be costly. Hence, Cooper and Sherer (1984) mention that it would be necessary for general purpose accounting reports to be prepared in those cases. According to Cooper and Sherer (1984), the recognition of multiple users is insufficient for assessing the wide-economy value of accounting reports.

There has been a growing interest in investigating users of SEA reports over the last few decades. Deegan and Rankin (1999) explore whether the demand/supply imbalance of corporate environmental reporting is due to different perceptions between users and preparers of reports about environmental performance information. Views of users and preparers regarding issues related to corporate environmental performance reporting were found to differ (Deegan and Rankin, 1999). The different views between users and preparers of reports

[55] Clarkson (1995) defines secondary stakeholders as those who influence/affect or are influenced/affected by companies, but are not necessarily engaged in transactions with them.

[56] These external users included tax authorities, government, employees and researchers.

were also explored by Weetman *et al.* (1996) who reviewed submissions about the UK Operating Financial Review. Weetman *et al.* (1996) find imbalances between preparers and users in the submissions. Additionally, Weetman *et al.* (1996) note that in the submissions there was an absence of responses from users of financial statements.

The perceptions of users in the accounting-standard setting process are explored by Harding and McKinnon (1997) and Durocher *et al.* (2007). Harding and McKinnon (1997) explore whether accountants and users of financial reports hold congruent or incongruent opinions regarding the usefulness of accounting information, whereas Durocher *et al.* (2007) develop an explanatory theory to describe the participation of users of financial statements in the standard-setting process. Yap (1997) explores whether the claim by professional accounting bodies for more cash flow information is reflected in the perception of investors and creditors to publish cash flow data. Results support the need for cash flow information as they have become important sources of information for users. Through a survey, Al-Khater and Naser (2003) explore the perceptions of four user groups about corporate social responsibility information in Qatar. User groups agreed on the necessity of having corporate social responsibility disclosures. By surveying seven different user groups, Mirshekary and Saudagaran (2005) explore the perceptions of users of financial statements in Iran. The annual report was found to be a significant tool for making investment decisions.

Little research has been carried out regarding potential users of SWA reports (see National Water Commission, 2006; SKM, 2006; Water Accounting Standards Board, 2009a). The National Water Commission prepared a baseline assessment of Australian water resources, known as *Australian Water Resources 2005*, which sought to provide a picture of a series of water management and resource issues. This report addressed issues of water availability, river and wetland quality, and water use (National Water Commission, 2006). One of the studies within *Australian Water Resources 2005* encompasses the requirements of the potential users of a proposed Australian Water Resources Information System (hereafter AWRIS). The AWRIS is defined as an ongoing water resource information asset that includes a set of interoperable tools that accesses water data published through a distributed water data infrastructure (National Water Commission, 2006). Whilst the study was not on potential water-accounting-report users (under SWA), this study is a comprehensive study of potential users of AWRIS. Sinclair Knight Merz (2006) includes a section on user requirements in their Stocktake of Australia's Water Accounting Practice. Users of water accounting reports are the receivers of water accounting information and are located at the end of the process (SKM,

2006). Similar to financial accounting, the purpose of SWA is to meet the information needs of users. One of the findings of Sinclair Knight Merz (2006) was that the needs of potential users of water information were not completely addressed. Sinclair Knight Merz (2006) state that detailed requirements of water information users were necessary in order to inform the scope and development of water accounting.

In order to determine which water related information would be beneficial for potential stakeholders, a user information requirements study was carried out by the former WADC (Chalmers *et al.*, 2012; Slattery *et al.*, 2012). Approved by WADC in October 2007, this User Information Requirements Study was conducted by Associate Professor Brad Potter and funded by the National Water Commission (at the request of the former WADC) (Water Accounting Standards Board, 2009a). Some of the findings regarding the information requirements of potential water information users were the need for: consistent water reporting according to accepted standards, a disciplined approach to recording, reporting and decision making, better information for accountability and performance, and better education and greater awareness of stakeholders (Water Accounting Standards Board, 2009a p. 6-22). In summary, the main finding of the study was that financial accounting can contribute to the development of the new water accounting system (Water Accounting Standards Board, 2009a). The Sinclair Knight Merz study described in the previous paragraph was not as comprehensive as the study funded by the National Water Commission in terms of exploring the information needs of potential users of water accounting reports. The question arises as to why a comprehensive study was not conducted on potential users of water accounting reports under SWA as there is significant scope for identifying the needs of users. This question is connected to one of the findings of Paper 1 which is about practitioners' calls for more studies on users' needs.

Consequently, the research question driving this paper is: to what extent do users perceive Standardised Water Accounting (SWA) reports, under the Exposure Draft of Australian Water Accounting Standard 1 (ED AWAS 1), as being useful for discharging the accountability of water managers? Gray *et al.*'s (1996) accountability model is discussed next.

4. Accountability Framework

In line with Paper 1, the accountability framework, which is prescriptive in nature, drives this study. Accountability is linked with the idea of being held to account, but Roberts (2009 p.

959) goes further by describing accountability as the 'condition of becoming a subject who might be able to give an account'. Roberts' (2009) description emphasizes that accountability means more than just giving an account. A general definition on accountability is provided by Gray *et al.* (1996 p. 38) who define accountability as the 'duty to provide an account (by no means necessarily a financial account) or reckoning of those actions for which one is held responsible'. It can be deduced then that accountability implicates the provision of information from the accountor (agent) to the accountee (principal).

This study adopts Gray *et al.*'s (1996) accountability model to evaluate accountability in this particular context of water accounting. Gray *et al*.'s (1996) model is a simple and flexible. I engage in other literature on accountability (see Jones, 1977; Stewart, 1984; Roberts, 1991; Gray, 1992; Gray and Jenkins, 1993; Guthrie, 1993; Parker and Guthrie, 1993; Sinclair, 1995; Broadbent and Laughlin, 2003; Llewelyn, 2003; Bovens, 2005; Barton, 2006; Cooper and Owen, 2007; Kamuf, 2007; Brennan and Solomon, 2008; Messner, 2009; Roberts, 2009; Spence *et al.*, 2010; Zyglidopoulos and Fleming, 2011; Gibbon, 2012; Joannides, 2012; Lowe *et al.*, 2012; McKernan and McPhail, 2012; Shaoul *et al.*, 2012; Smyth, 2012) to extend Gray *et al.*'s (1996) model to include elements pertinent to the public sector. Their model is composed of three elements (Relationship, Information and Instructions, Reward and Power) and for each element I identify a critical component to operationalise the model. These three critical components are **Clarity of Relationship, Transparency** and **Power of Accountees**. Even though this model is similar to the one discussed in previous research (see Paper 1), it has been expanded based on the findings on that research.

4.2. Gray et al.'s (1996) *Accountability Model*

Gray *et al.*'s (1996) accountability model is based on a neo-pluralist conception of society and on participative democracy. The neo-pluralist conception of society assumes that power is distributed unevenly in society and that there are different sources of power and influence. Gray *et al*.'s (1996) model involves the responsibility to undertake certain actions and the responsibility to provide an account about those actions. The main elements of this model come from the ***relationship*** between the agent (known as the accountor) and the principal (known as the accountee). Society ascribes a role to such relationship (Gray *et al.*, 1996p. 39) which provides accountees with a right to ***information***. Accountees have a connection with accountors in the form of ***instructions about actions, reward and power over resources***. (See Figure 3.2 in the Appendix for a depiction of Gray *et al.'s* (1996) model.)

[Insert Figure 3.2 here]

A critical component for each element of Gray *et al.*'s (1996) model is identified. These three critical components are **Clarity of Relationship, Transparency** and **Power of Accountees**. The first element is *clarity of relationship* and is based on the accountability relationship. Once the relationship accountor-accountee has been properly identified, then the information is analysed. The second element is *transparency*. The information provided has to be transparent enough so as to create visibility. The last element is *power of accountees*. Once information has been clearly transmitted, the effect is that accountees will be empowered with such information. Such empowerment will be reflected in the ability to make changes and influence the decision-making process. All these elements are analysed next.

4.2.1. Relationship

The essence of Gray *et al.*'s (1996) accountability model is relationship. According to Gray *et al.* (1996 p. 39), 'it is this relationship that ascribes responsibility and permits rights to information, and thereby determines the accountability'. Gray *et al.* (1996) provide an extensive description about relationship and related it to the social contract. They mention that contracts can be legal or non-legal in nature.

Gray *et al.* (1996) extend the traditional notion of relationship of the firm and the shareholder by including multiple stakeholders. In its traditional sense, the relationship in the private sector has been considered as a one-to-one relationship between the firm and the shareholder. In this sense, Cooper and Owen (2007) mention that a free market perspective will rule out stakeholders and society as principals as its philosophical basis is within neo-classical economic theory. Gray *et al.* (1996) include a range of multiple stakeholders as accountees extending the traditional perception of relationship. Cooper and Owen (2007) suggest that if accountability is to be accomplished, stakeholders need to be empowered so they can hold to account the agents. In terms of corporate accountability in this new scenario, the accountability relationship may exist within the firm (employees and officers) and/or outside the firm (shareholders, creditors, government, labour unions, consumers or general public).

Other scholars also consider relationship important (e.g. see Ijiri, 1983; Giddens, 1984; Sinclair, 1995; Funnell and Cooper, 1998; Bovens, 2005; Joannides, 2012; Shaoul *et al.*, 2012). Accounts are owed to others and, in particular, to an 'absolute other' who behaves as a principal and higher principal (Joannides, 2012). Maximum authority over the entity is held

by the higher principal who has different faces according to the type of entity under consideration (Joannides, 2012).[57] Nonetheless, as discussed in section 3.1, there exist not only primary, but also secondary stakeholders who affect and are affected by organisations. Shaoul *et al.* (2012) argue that the accountability relationship means that a person is expected to account for his/her activities and their consequences to a certain person. Bovens (2005) adds that the accountor-accountee relationship consists of three elements: the accountor must feel obliged to inform about his/her conduct by providing information, this information can be used by the accountee to question the accountor and, finally, the accountee may emit a judgment and impose a sanction, formally or informally.

From this perspective, other scholars have identified the clarity of relationship as being important, but they refer mainly to the private sector. In the public sector, however, there are multiple accountors (Bovens, 2005) who demand accountees to speak multiple languages (Messner, 2009). The problem of having multiple accountors in the public sector is due to there being multiple public officials in the chain of hierarchy. Bovens (2005) states that defining the relationship in public accountability is not an easy task because a series of principal-agent relations can be identified in modern representative democracy. Such delegation chain is as follows: Citizens (who are the main actors in a democracy) transfer their powers, through election, to political representatives (Bovens, 2005) [58]. According to Messner (2009), if different conflicting demands are raised by multiple stakeholders, then the accountable self should be able to speak in multiple languages so as to satisfy those demands. It would be unethical if such individual fails to meet all demands; however, it is also ethically questionable to expect that such individual should meet all demands. Therefore, the critical component derived from the R*elationship* element in Gray *et al.*'s (1996) accountability model is ***Clarity of Relationship*** which is based on the idea that accountability entails a relationship between the accountor and the accountee and such relationship has to be clear.

[57] For listed companies, that 'absolute other' is the shareholders, whereas for not-for-profit organisations, they are the donors. In terms of public sector organisations, they are taxpaying citizens.

[58] New Public Management brought a shift from only public to more private spheres (although in different degrees). Bovens (2005) suggests that the shift from the public service to the private service represents a change in public accountability as follows: (1) A decrease in the intensity and scope of political accountability (because private or privatized entities are not subject to direct political accountability and have fewer responsibilities to report to the public on their performance) and (2) The reinvention and/or creation of accountability relations for these new private entities delivering public services (this private form of public accountability is based on shareholders' needs and not citizens' needs even if the lives of citizens are affected).

The assessment of relationship is on the clarity of the relationship. In any relationship there is a certain degree of principal and agent relationship so there is a certain delegation of relationship, but such degree of delegation does not define the overall level of accountability. Therefore, for a *relationship* to be an *accountability relationship* the actors must be clearly identified as in some instances there are several accountabilities that exert influence on organisations.

In the case of the Australian water sector, there would be multiple agencies (accountors) and multiple principals (accountees). For example, multiple agencies include State Water Agencies, Federal Government (in the case of the Murray Darling Basin for instance) and local service providers. Under the Water Act 2007, the Bureau of Meteorology is in charge of issuing the National Water Account and not the state agencies. On the other hand, multiple accountees include, for example, irrigators, farmers, town-water users, academics, and so on. The Water Accounting Standards Board (2009) provides a wide range of categories of users of GPWAR which is all-inclusive.

4.2.2. Information

Gray *et al.* (1996) discuss information about actions and the way that accountability could be discharged through the provision of information. It is the relationship that permits rights to information and consequently the provision of information. Accountors provide information to accountees.

Hazelton (2010) and Stewart (1984) highlight the importance of information. Hazelton (2010) relates the provision of information with information rights. Information constitutes a human right and without information is difficult (or impossible) for other rights to be realised. Stewart (1984) considers information as the raw material in the preparation of an account and such information is used as a basis for judgement and action by the one who accounts (Stewart, 1984). Information is a source of power and this power is given by organisations through the provision of information (Stewart, 1984).

Gray *et al.* (1996) do not give an explanation of the quality of information, but give examples of different types of information provided. They state that this information might be useful; however, they do not give a framework with which to assess the usefulness of the information.

From this perspective other scholars have discussed the transparency of information (e.g. see Gray, 1992; Barton, 2006; Kamuf, 2007; Roberts, 2009; Zyglidopoulos and Fleming, 2011; Lowe *et al.*, 2012; McKernan and McPhail, 2012) and also the qualitative characteristics of financial reports (e.g. see Australian Accounting Standards Board, 2004). Roberts (2009) states that in its literal, physical sense, transparency is connected with the idea of light passing through something so that objects behind can be seen. Thus, transparency involves two ideas: it promises visibility and it promises a complete examination. According to Roberts (2009), such potential of transparency is reflected in the preparation of new forms of financial and non-financial disclosures by corporations to their broad range of stakeholders.[59] Improving transparency is discussed by Lowe *et al.* (2012) as being one of the reasons why the US Securities and Exchange Commission trialled the digitisation of annual report information through 'interactive data'. Such transparency was meant to benefit mainly retail investors. In terms of social and environmental accounting, Gray (1992) notes the potential of transparency to create a greater environmental responsibility, whereas Kamuf (2007) relates calculative accountability with transparency as calculative accountability involves making responsibilities and performances visible. One important feature that links transparency with calculative accountability is that calculative accountability has little room for the secret (McKernan and McPhail, 2012). Transparency in public sector accountability is important because by being well-informed of government activities, citizens can make judgements and informed decisions on the performance of governments (Barton, 2006).

The quality of reporting is important because not all information reported is of quality. For example, one way of determining the quality of information reported is by classifying the information provided as either positive or negative disclosures. Within social and environmental accounting disclosures, Deegan and Rankin (1996) evaluated the voluntary disclosure of environmental information in annual reports of 20 prosecuted companies. Deegan and Rankin (1996) classified the disclosures as either positive or negative.[60] Not all information disclosed can be considered as quality information. One way of seeing whether or

[59] Regarding organisational transparency, Roberts (2009) points out that accounting is seen as the technology that allows seeing behind or within a business entity as accounting is considered as a tool that produces a true and fair view of organisational activities.

[60] Positive disclosures are defined as information that portrays the company in accord with the environment whereas negative disclosures are disclosures that present the corporation as operating in detriment of the environment.

not reports are of quality is for reports to be prepared following certain qualitative characteristics. For example, the Australian Accounting Standards Board (2004 para. 24) states that 'qualitative characteristics are the attributes that make the information provided in financial statements useful to users'. The four principal characteristics of financial statements are understandability, relevance, reliability and comparability.

The critical component derived from the *Information* element in Gray *et al.*'s (1996) Accountability Model is ***transparency*** which is based on the idea that information provided has to be transparent so as to create visibility. (See Figure 3.3 in the Appendix for a depiction of transparency.)

[Insert Figure 3.3 here]

I consider that reporting is a subset of transparency and such reporting has to be of quality. In terms of reporting, there are different forms of reporting such as raw data on webpages and the annual report. Using reporting as a proxy to assess transparency is based on the role that accounting plays which involves the preparation and publication of accounts. Even though it is argued that the main instrument that reflects transparency is reporting, there are other forms by which transparency can be reflected (e.g. an entity's response to questions, media publications, corporations' pronouncements, etc.). For example, a government agency such as the Bureau of Meteorology has various types of reporting (annual report, water levels, etc.) and each of them will have different qualities.

4.2.3. Instructions, Reward and Power

Gray *et al.* (1996) consider Instructions, Reward and Power as their last element of the model. This element goes from the accountee to the accountor. As discussed in previous research (see Paper 1), Gray *et al.* (1996) do not provide much discussion on this element, but they acknowledge that one of the problems with accountability has to do with power. This situation is described by Gray *et al.* (1996) as ex gratia disclosure. Finally, Gray *et al.* (1996) conclude that accountability can be due even if it cannot be enforced because a natural right to information flows from established responsibility.

Gray *et al.* (1996) do not provide a general definition of power, but Wickramansinghe (2006) mentions that power can be defined as control or influence in spite of resistance. According to Wickramansinghe (2006), in life, some people are more powerful than others so that these

powerful people can influence the behaviour of others. Furthermore, Mitchell *et al*. (1997) state that power might be complicated to define, but not difficult to recognise as it can be seen by the ability of those who possess power to get the outcome they look for.[61]

It is assumed that power in terms of accountability consists of the ***Power of the accountees*** to create change. Such change is reflected in their power to influence the decision-making process. Stakeholder power is important due to the ability of stakeholders to create change. For instance, one way to see stakeholder power is when stakeholders exercise pressure on a company. Locke and Siteman (2002) discussed the case of Nike in the 1990s which is an example of how stakeholders can create changes in the way a company operates.

Gray *et al.*'s (1996) final element (Instructions, Reward and Power) needs to be expanded for two reasons. Firstly, for accountees to be empowered first requires information which enables the evaluation of an accountor's performance. In other words, there must be a mechanism to assess performance, but performance evaluation is only one element and not all about power. Accountancy and auditing of the public sector are connected with compliance, rectitude and control (Broadbent and Guthrie, 1992). For example, in order to assess whether a government agency (such as the Bureau of Meteorology) performed well, accountees can look at reports or check whether they saved money. There are different ways to assess performance in a government agency and the same applies to water. This situation can also be seen in the public sector after the introduction of neo-liberal reforms in the 1980s. Shaoul *et al.* (2012) posit that under that scenario accountability has shifted from a procedural-type accountability to a performance-type accountability. Public sector accountability underlies accounting and the operations of democratic governments (Barton, 2006); therefore, multiple stakeholders can be recognised in public sector accountability. Shaoul *et al.* (2012) state that public sector accountability has traditionally been characterised by having two features: a descending accountability to citizens (to whom the public sector is owed) and an ascending accountability through public sector hierarchies to Parliament.

Secondly, in the private sector it is easy to assess performance mainly through profit evaluation, but in the public sector this is difficult because there are multiple relationships (e.g. citizens with voting power, NGOs and their capacity to influence protests, so on). Citizens' power is reflected in the power of voting. It is not a short-term power, but a

[61] Moreover, Mitchell *et al.* (1997) state that power is transitory because it can be acquired and also it can be lost.

medium-to-long term power (Broadbent and Laughlin, 2003). The existence of multiple relationships is mentioned by Barton (2006 p. 260) when he states that 'where all the information, including cost information, is provided to parliament and the public, then parliamentary committees, opposition parties and the media can highlight areas of bad management and inefficiency and place pressure on the government to take appropriate remedial action'. Therefore, to evaluate accountability in the public sector a mechanism is needed by which performance can be assessed.

Power of Accountees could be exercised through a tool that permits its implementation. It is argued that this mechanism will enable the evaluation of accountors' performance. One of the findings from previous research (see Paper 1) was that, in terms of SWA, the Accountability Statement could be considered as a mechanism to assess performance. According to the Water Accounting Standards Board (2010 para. 50), the Accountability Statement is meant to assist users in assessing whether: (1) a GPWAR has been presented in accordance with Australian Water Accounting Standards, (2) externally imposed requirements have been complied with, and (3) best practices for managing water assets and liabilities have been used. The fact that the accountability statement includes disclosure of compliance with externally-imposed requirements could reflect a situation in which accountees will be informed and empowered to take action. Even though the Water Accounting Standards Board considered disclosure of compliance with externally-imposed requirements as part of the Accountability Statement in the second iteration of the standard, the Water Accounting Standards Board did not include it in its third iteration of the standard (known as AWAS 1). In terms of AWAS 1, the Water Accounting Standards Board (2012b para. 62) states that the Accountability Statement should only provide information that assist users to understand whether GPWARs have been prepared according to the standards.

Gray *et al.*'s (1996) model is operationalised through *Clarity of Relationship, Transparency* and *Power of Accountees* and these elements allow evaluating accountability. In this study, data is gathered by using a mixed method approach which will be explained next.

5. Research Method

This research paper adopts a mixed method research approach. Termed 'third methodology' (see Hall and Howard, 2008) or 'third paradigm' (see Denscombe, 2008), mixed method research has a long history in the social sciences, including management (Grafton *et al.*,

2011). However, little mixed method research has been undertaken in the accounting field (particularly management accounting) (Grafton *et al.*, 2011). Mixed method research seeks to link methods from different paradigms, its significance determined by the way the methods are combined. According to Creswell and Clark (2007), the mixed method involves collecting qualitative and quantitative data in one single study either sequentially or concurrently.

There are four basic designs in mixed methods: Triangulation, Embedded, Explanatory and Exploratory (Creswell and Clark, 2007). This paper follows the explanatory design, characterised by an initial quantitative phase followed by a qualitative phase. This design is characterised as sequential because it involves collecting data in an iterative manner (Creswell and Clark, 2007). Data collected in the first phase contributed to data collected in the second phase because it informed and set the scenario so as to understand the general perceptions of stakeholders towards SWA. Qualitative results serve to explore in depth the general findings identified in the quantitative phase. The first phase involved delivering a questionnaire (survey) to potential users of water reports. The whole population of potential users of water accounting reports was narrowed by delivering the questionnaire only to attendees of five key water-related events. Attendees of those events represent users with an interest in water issues. Therefore, the whole population of potential water users was substantially narrowed to include those who are interested in water accounting. The questionnaire was exploratory and investigated the perception of potential users of water reports towards water accounting.

The results of the survey allowed the researcher to develop an understanding of the perceptions of potential users of water reports towards Standardised Water Accounting. The second (qualitative) phase involved the analysis of secondary data in the form of submissions to the Water Accounting Standards Board (WASB) so as to explore in depth SWA as it is reflected in the Exposure Draft of Australian Water Accounting Standard 1. In October 2010, the WASB published ED AWAS 1 and asked the public to provide comments by June 2011. By the end of 2011, the WASB had published 28 submissions on its website, but, after checking the identity of each respondent, all submissions were grouped by respondent. Hence, 23 submissions comprised the final sample. However, for the purposes of this study 14 submissions were evaluated because they were prepared by users of SWA reports and not practitioners.

5.1. Quantitative Phase

A questionnaire or survey technique was the method chosen for the initial phase. The questionnaire was carefully designed so the final list of questions was unambiguous, clear and easy to understand (Grix, 2010). An advantage of doing surveys instead of face-to-face interviews is that there will not be *interviewer effects* on the answers. *Interviewer effects* are the personal characteristics of the interviewer that might affect respondent answers (Grix, 2010).

A questionnaire or survey asks respondents about their opinions, beliefs, characteristics and past or present behaviour (Neuman, 2000).[62] In this particular case, respondents are stakeholders or potential users of water accounting reports prepared under SWA. Self-administered questionnaires were delivered to participants at those events. The population is all potential users of water accounting reports, but the sample included only those users with a real water-related interest. Participants who attended those five water-related events have an interest in water and water accounting in particular.

There are advantages and disadvantages in choosing to gather data with self-administered questionnaires. According to Neuman (2000), some advantages of self-administered questionnaires include: (1) direct contact with respondents, (2) they are inexpensive and (3) they can be conducted by a single researcher. Conversely, some disadvantages include: (1) the possibility of having a low response rate, (2) the researcher's inability to control the conditions under which the questionnaire is completed, (3) incomplete questionnaires and (4) the researcher's inability to observe visually the respondents' reactions to questions, their physical characteristics or the setting (Neuman, 2000p. 272). The major advantage of delivering self-administered questionnaires at these events was the possibility of surveying a large population of potential respondents; however, the response rate was not high.[63]

5.1.1. Questionnaire Design

Each question in the questionnaire follows a logical order and all the questions were set out in a user-friendly manner (Grix, 2010). The results of a previous research study which evaluated

[62] The questionnaire was constructed by following the principles of good question writing outlined by Neuman (2000 p. 251-255).

[63] Approximately 21% of attendees answered the questionnaire.

the perspectives of practitioners towards SWA (see Paper 1) provided the basis for the design of the questionnaire. The initial questionnaire comprised twelve questions (8 close ended and 4 open ended questions). After the first event, it was decided to make a slight change to the questionnaire because one question was not considered relevant. Such change included: (1) the addition of one closed ended question and (2) the removal of one open ended question. However, in order to keep consistency in the analysis of results, only similar questions from the old and the new questionnaire were considered. Most questions were closed ended with possible responses from either a five-point Likert scale or Yes/No/Undecided type of question. The questionnaire was delivered to potential users of water accounting reports in five different water-related seminars in Sydney and Melbourne from late 2010 to mid-2011.[64]

5.2. Qualitative Phase

After analysing the results of the survey, it was necessary to explore in depth the perceptions of potential users regarding SWA following the exploratory design of the mixed method. Thus, the qualitative phase involved the analysis of secondary data in the form of the submissions made to the WASB. Public submissions were on the Exposure Draft of Australian Water Accounting Standard 1 that the WASB released in 2010. This qualitative phase is characterised by the use of available (or secondary) data. By utilizing available data, bias can occur because the information cannot be relevant for the study and/or because available data will seldom be ideally suited to the purposes the researcher has in mind (Singleton and Straits, 2005). This research is on the SWA (reflected on the ED AWAS 1); therefore, data represented by the submissions is relevant.

The Water Accounting Standards Board published the Exposure Draft of the Australian Water Accounting Standard 1 (ED AWAS 1) in October 2010. The WASB received public submissions on issues regarding the ED AWAS 1 until June 2011 and published those submissions on its website in late 2011.[65] The submissions followed a structure based on 54 questions asked by the WASB on ED AWAS 1. Additionally, the respondents were free to

[64] These seminars were as follows: 'Sustainability in the Key Professions: Accountancy' Summit held in Sydney (September 2010), Water Accounting Seminar Melbourne held by the WASB (November 2010), Water Accounting Seminar Sydney held by the WASB (November 2010), 'Australia's Urban Water Challenge: A Drought of Ideas' public discussion forum held by the Centre for Independent Studies in Sydney (April 2011) and The RMIT Accounting for Sustainability Conference in Melbourne (May 2011).

[65] See www.bom.gov.au/water/standards/wasb/awasfeedback.shtml

add additional *general comments*. In total, 28 submissions were downloaded from the WASB website and coded in Nvivo. However, the WASB posted some submissions from the same respondent (which is considered as repetition in terms of the identity of the respondent). Therefore, after the identity of each respondent was double-checked, the total number of respondents who sent a submission was 23. All those 23 submissions were reviewed four times to: (1) obtain a general understanding, (2) code by question, (3) review each question in depth so as to identify patterns related to the integrated accountability model and (4) code the question and general comments according to elements of the model. Finally, of the 23 submissions, only 14 were analysed in depth according to the critical components described in section 4 by which to operationalise Gray *et al.*'s (1996) accountability model because the other nine submissions were from respondents who are practitioners (State Water Authorities and private water providers) and therefore form part of the analysis of practitioners considered in Paper 1. The 14 submissions were from individuals/citizens, government entities and private independent bodies who are best characterised as report users.

6. Findings

6.1. Quantitative Phase

In total, 36 questionnaires were completed which represented approximately 21% of the total number of attendees of those events. Demographics of those 36 responses indicated that 18 (50%) were from qualified accountants, all respondents completed tertiary education and there were 26 males and 10 females.

The results of the questionnaire indicate that 83% of respondents agree with the idea of having national standards that govern the way water reports are prepared. One of the characteristics of SWA is the preparation of standard water reports that will facilitate comparability. Approximately 56% of respondents perceive the benefits of preparing water accounting reports under SWA will outweigh the costs.[66] Finally, the majority of respondents are undecided on the contents of the reports as useful tools to discharge the accountability of water managers (approximately 53% approved all statements except the accountability statement and approximately 58% approved only the accountability statement).

[66] This result includes those who consider that the benefits will exceed or strongly exceed the costs.

The first question evaluated the perceived value of adopting national standards to prepare water accounting reports. 83% of the respondents agreed with the introduction of SWA. In supporting their choice, some respondents mentioned that they agree with the idea of having standardisation in the reporting process so as to enhance comparability. One respondent mentioned that reports are necessary to enable accountability of reporters whereas another respondent was not sure about the benefits of the standards for urban people.

> *'To allow comparability of info between reports, to enable audit of reports, accountability of reporters, support confidence of accounts' users' (Respondent 22: Master's degree, Non-qualified accountant).*

> *'To provide consistent interpretation, to provide consistent forms of data provision, to streamline all water accounting processes' (Respondent 20: Master's degree, Non-qualified accountant).*

Most respondents agree with the idea of having national standards that govern the way water reports are prepared.[67] (See Table 3.1, question 1 in the Appendix for summary of results and statistical analysis.)

[Insert Table 3.1 here]

The second question explored the perception of respondents as to which stakeholder group would find water accounting reports under ED AWAS 1 useful (See Figure 3.4 in the Appendix for a summary of the results).[68]

[Insert Figure 3.4 here]

Results were analysed using proportions and such results are associated with the discussion of water accounting report users and primary and secondary stakeholders in Section 3. Responses show that approximately 72% of respondents believe that reports would be more useful to water industry regulators; hence they should be considered as primary stakeholders, in their opinion. This result is surprising because it is expected that water users would be

[67] A Chi-square goodness of fit test was carried out to analyse whether people are likely to choose any of the alternatives provided (Categories were: 'Yes', 'No' or 'Undecided'). The Minitab16 software program was used. The Null hypothesis was of 'Equal proportions'. This means that it is believed that people are equally likely to choose 'yes', 'no' and 'undecided' (each one at 33.3%). If the expected value is greater than 5, an analysis of the 'p-value' can be carried out. The 'p-value' has to be less than 0.05 so as to have statistically significant results. The 'p-value' was lower than 0.05.

[68] The users described in the question were taken from the broad range of categories of users according to the Water Accounting Conceptual Framework (Water Accounting Standards Board, 2009 para. 19).

primary stakeholders of water accounting reports. Results show that most respondents believe that water industry regulators, government water managers and finally government representatives and their advisors would find water accounting reports 'very useful'. Conversely, the majority of the respondents perceive that town-water users will be indifferent.

In terms of the components of the ED AWAS 1, the majority of respondents do not perceive that members of the community will find it useful (See Figure 3.5 in the Appendix for a summary of the results). [69][70] The majority find the Statement of Physical Water Flows, the Statement of Water Assets and Water Liabilities and the Statement of Changes in Water Assets and Water Liabilities as 'most useful' for the community (50%, 47% and 34% respectively)[71]. Previous research (See Paper 1) finds that the accountability statement could be considered as a power enabling tool. The results show that 56% consider the accountability statement as 'somewhat useful'.

[Insert Figure 3.5 here]

The third question explored respondent perceptions regarding the benefits and costs of preparing water accounting reports (see Figure 3.6 in the Appendix for a summary of the results). Approximately 56% believe that benefits will exceed costs. This result can be considered as supporting the implementation of SWA.

[Insert Figure 3.6 here]

As to whether or not the material contained in the General Purpose Water Accounting Reports excluding the Accountability Statement is perceived to be a useful tool to discharge the accountability of water managers, approximately 53% of the respondents were undecided (see Table 1, question 2 in the Appendix for a summary of the results and statistical analysis). The

[69] According to the second iteration of the standard, components of GPWAR according to the ED AWAS 1 include: Contextual Statement, Accountability Statement, Statement of Water Assets and Liabilities, Statement of Water Assets and Water Liabilities, Statement of Physical Water Flows, Note Disclosures and Assurance Statement.

[70] A test by evaluating proportions was carried out.

[71] According to the Water Accounting Standards Board (2010), the Statement of Physical Water Flows contain information about the nature and volumes of physical water flows in the entity during the reporting period whereas the Statement of Water Assets and Water Liabilities contain information about the nature and volumes of the water assets and water liabilities of the water report entity. Finally, the Statement of Changes in Water Assets and Water Liabilities contain information about the changes in the nature and volumes of the water report entity's net water assets.

fact that more than half of the respondents were undecided could (based on some of the responses in the questionnaires) be due to the lack of information about the nature of the accountability statement.[72] In fact, the reasons stated by some were that they were not informed enough to make a judgement.

[Insert Table 3.1 here]

The perception of potential users regarding the accountability statement only as a useful tool in discharging the accountability of water managers is similar to the previous question because approximately 58% of respondents were undecided (see Table 3.1, question 3 in the Appendix for a summary of results and statistical analysis). The reason given as to why the majority of potential users feel undecided about the components required to discharge the accountability of water managers was the lack of both information and accounting knowledge. Recall that demographics include 18 respondents who were qualified accountants. Results of this question are also statistically significant.

[Insert Table 3.1 here]

The use of the double-entry system and accrual accounting to record physical water transactions can be considered part of the element of transparency because both will facilitate the preparation of accounts. Since both aspects were identified as issues in Paper 1, it was considered necessary to include two questions enquiring about them. The majority of respondents were in favour of their use (approximately 53% in favour of the double-entry system and approximately 56% in favour of accrual accounting) (see Table 1, question 4 and 5 in the Appendix for a summary of the results and statistical analysis).

The final question of the questionnaire was open-ended and enquired about which additional information they would like to see in addition to what is prescribed in the ED AWAS 1. Twelve respondents answered this question. Two respondents stated that they did not have enough knowledge to make any suggestion whereas the rest of respondents made suggestions about specific information they want to see in the accounts. These suggestions include: The expected implications of accounts (e.g. construction of new dams), information on optimisation of usage level, comparison on state-allocation practices and evapotranspiration, water recycling, monetary amount, water quality and comparison of water use with industry

[72] A Chi-square goodness of fit test was carried out and the 'p-value' was found significant at 0.05.

standards, more information on efficiency, total water resource which includes the flows of water not held in storage, water efficiency and self-reliance, and water accounting reports should focus more on accountability and sustainability. It has to be mentioned that the Australian Bureau of Statistics prepares water accounts including monetary values following the UN's System of Environmental and Economic Accounting for Water.[73]

6.2. Qualitative Phase

Out of the final sample comprising 23 submissions in total, nine submissions were sent by practitioners (seven State Water Authorities and two private water providers). Therefore, fourteen submissions, representing the views of potential users of water accounting reports were analysed in depth. The WASB requested the general public to make comments on the ED AWAS 1 which was publicly released in October 2010. The WASB asked feedback on different parts of the standard by asking the public to comment on 54 questions. Each response was analysed in depth and then they were categorised according to the three elements of Gray *et al.*'s (1996) extended model as explained in Section 4. Additionally, some respondents included general comments on the ED AWAS 1 and such comments were also analysed and classified according to the elements of the model.

6.2.1. Clarity of Relationship

Submissions were analysed to identify comments related to Clarity of Relationship. Recall that the accountability relationship includes an accountor and an accountee. In terms of the accountor, it means analysing the identity of the water report preparer. One issue mentioned by the respondents is their struggle to differentiate between the water entity and the water report entity as sometimes they are not the same. The WASB (2010 p. 33) defines the 'water entity' in the ED AWAS 1 as 'a physical entity, an organisation or individual, that: a) holds or transfers *water*; b) holds or transfers rights or other direct or indirect claims to *water*; c) has inflows and/or outflows of *water*; or d) has responsibilities relating to the management of *water'* whereas the water report entity is the water entity under which it is expected the existence of users of water accounting reports who depend on GPWAR for information on water. The physical part of the water entity involves water and rights to water (WHAT) whereas the other part involves the organisations that are responsible for managing water

[73] For more information on the Australian Bureau of Statistics' water account: http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4610.02010-11?OpenDocument.

and/or preparing water accounts (WHO). In some cases, they overlap, but in others they do not. For example, even though the Murray Darling Basin Authority is in charge of managing the Murray Darling Basin and consequently prepare whole-basin reports, there may be other entities with water management responsibilities such as bulk water suppliers. These organisations have environmental and social obligations, but they are not the designated water managers because the Murray Darling Basin Authority is. According to the definition provided by the WASB, a water report entity is about the WHAT and the WHO; however, the report preparer is only about the WHO. Confusion is initially generated by the way the water report entity is defined.

> *'the fundamental difficulty is the confusion in the definition of a water report entity between: (1) Water and rights to water (the WHAT) and (2) Organisations that are responsible for managing water and/or preparing water accounts (the WHO)' (submission 4 – Individual/citizen)*
>
> *'A water report entity should correspond to existing management units eg catchments or aquifer extents because models and monitoring etc are carried out specific to these boundaries' (submission 5 – Individual/citizen)*
>
> *'The definition fills a need, but the name is not intuitive. The water entity makes sense. The report that a water entity lodges also makes sense. Should not the report be called the water entity report? I think there is no need for water report entity as a term. It should be more simply referred to as water entity. And yes, the water entity can have reports written about it' (submission 28 – Individual/citizen)*

The majority of respondents agree with the definition of water report entity proposed, but with reservations and suggestions as to improvement given the confusion between the WHO and the WHAT. Controversy surrounds the entity concept in accounting and this controversy seems to be even more significant in water accounting due to the complexities of the water entity concept. Meyer (1973) examines the entity concept controversy by exploring eight conceptions of the accounting entity. Five of the eight conceptions can be viewed as a continuum from the most restrictive to the most open idea of 'ownership interest', whereas the 'remaining three conceptions refrain from setting up priorities among interests' (Meyer, 1973 p. 125). In his research, Meyer (1973 p. 126) concludes that 'different conceptions of the entity inevitably give rise to different solutions of accounting and reporting problems'. As it is seen, controversy and confusion about the entity concept exist in financial accounting and water accounting is not the exception. The difficulty in water accounting is about the delimitation of what a water entity (and hence a water report entity) includes.

Approximately 83% of respondents in the submissions stated that users' needs will be satisfied by the content of water accounting reports. Users of reports are the accountees in the accountability relationship. The results of this node (coding) should be linked with the results of the quantitative phase which explored which users would find water accounting reports more useful (recall Figure 3 in Section 6.a). As mentioned in the quantitative phase, approximately 72% of respondents perceive that water industry regulators would be more interested in water accounting reports; however, it is not easy to determine who the main users of GPWAR would be. Analysis emerging from the data suggests that it is difficult to state who the potential users are (accountees) and to describe their precise information needs. The majority of respondents agree with the idea that the information needs of users should drive the preparation of GPWARs. This fact confirms the importance of identifying users in the development of SWA. Respondents also mention that users' needs are not known because of the different user types. Cooper and Sherer (1984) mention that each user group in accounting has different information needs; hence the preparation of general purpose accounting reports is recommended in order to have a general report that suits the majority of information needs of users. The WASB assumes that ED AWAS 1 will satisfy the common information needs of users of water accounting reports (Water Accounting Standards Board, 2010). Another issue raised by respondents was about the role of the Bureau of Meteorology in the whole process of water accounting and reporting. The Bureau of Meteorology is in charge of collecting, holding, managing and disseminating Australia's information on water (Cwlth, 2012). Part of the confusion expressed by the respondents strives in the role of the Bureau of Meteorology in light of the set of relationships between accountor and accountees within a water-accounting-report context.

> *'Each water entity within the NSW water planning areas, has existing licences to take water and is obliged under those licences to order water and the take is to be measured and recorded by State Water or NSW Office of Water. That is well understood. It seems that the draft standard moves away from that set of relationships and seeks to interpose BOM between the licencing and operating body and its customers' (submission 7 – Individual/citizen).*

6.2.2. Transparency

As mentioned in section 4, the quality of reporting is considered as a subset of transparency. Since all submissions were based on the ED AWAS 1, the majority of the comments are related to the seven components of ED AWAS 1. In line with the findings of the quantitative phase (see Section 6.1), some respondents suggested that extra information should be added

in order to enhance the content of the reports. For example, adding extra information such as information about the inclusion of water market participants in GPWARs.

> *'Yes. The objectives are quite specific, for good reason. However in the interests of wider uptake of GPWA, it might be useful to add a softer objective of "Provide general information about water resources in the entity" ' (submission 26 – Individual/citizen)*

There is not much disagreement on the purpose of the contextual statement. The majority of respondents agree on its importance, but some give suggestions for improvement.

> *'[we agree with the content of the Contextual Statement], but should be simpler and use illustrated examples where possible' (submission 1 – Government entity)*

> *'Agree that reports need to be put in some sort of context. However it is unreasonable to expect a small, or even a large irrigation entity – a syndicate, co-operative, irrigation trust, irrigation company etc. – to provide this in the detail indicated in the Associated Model Reports. Contextual information is available at a broader level via State Departments, water resource plans etc. and it is reasonable for irrigation entities to just refer to those sources' (submission 15 – Industry association)*

> *'(some additional information that could be included is the) other objectives of the entity. E.g. does it have a profit motive? Is it a public good? What is its reason for being?' (submission 28 – Individual/citizen)*

With respect to the Statement of Water Assets and Liabilities, the Statement of Changes in Water Assets and Water Liabilities and the Statement of Physical Water Flows, all respondents agree in terms of their importance; however, a couple consider that instead of three statements there should be only two because of the low number (or even inexistence) of accruals (water carryover and/or inter valley owed between river basins). Water carried over to the next period is considered as an accrual; however, in reality the amount of water carried over is not significant. Additionally, two respondents were hesitant about the use of the term and meaning of 'water assets' and 'water liabilities'.

> *'There will obviously be some need for clarity about who owns what water or rights. I did not notice that having been well enough explained in the Draft. That would be especially so where a licence has multiple holders, partners, or where a licence is a collection of separate rights, not truly a licenced right, but where the two sets are used as matching pairs' (submission 7 – Individual/citizen)*

> *'[The Statement of Physical Water Flows] can readily be combined with a statement of flows including accruals. It would contain the whole of the statement of physical water flows, with the accrual items added at the end' (submission 15 – Industry association)*

> *'Assets and Liabilities only present the current status of the entity. It may be useful to include a Statement of Water Rights that presents the entitlements to water in the entity as well. Obviously it could be argued that this could also become part of the notes. In*

some ways, this can be just as important in defining the status of a resource' (submission 26 – Individual/citizen)

'While the concept of an "inflows and outflows" statement that includes accruals (i.e. rights to water as well as physical water) is supported, we do not agree with either the title or the way [the Statement of Changes in Water Assets and Water Liabilities] this report is prepared in the examples given' (submission 15 – Industry association)

One respondent was completely opposed to the use of the terms water assets, water liabilities and net water assets taken from financial accounting because the physical accounting of water cannot be mirrored perfectly by financial accounting as they are two different worlds:

'These terms and the way in which they are treated in the associated model reports imply strongly that they have much the same meaning as assets and liabilities in financial accounting. That is not the case' (submission 15 – Industry association).

Two statements that create controversy are the Accountability Statement and the Assurance Statement. One statement that creates confusion between potential users is the Accountability Statement because of its potential link with compliance (as stated in the ED AWAS 1). Four respondents out of fourteen indicated their support for the information disclosed in the accountability statement whilst one respondent was non-supportive, finding the statement 'too burdensome to prepare'. While there were voices suggesting that the Assurance Statement should not be included as a component of water accounting reports (because it will be done by independent assurers), other voices suggest it should not be included because it will be very costly to prepare. In the recently released Australian Water Accounting Standards 1 (AWAS 1), the assurance statement is not anymore considered as a component of the General Purpose Water Accounting Reports.

6.2.3. Power of Accountees

Previous research (see Paper 1) recommended the Accountability Statement as a tool that will enable power because through this statement, users of water accounting reports will have the possibility of assessing the performance of managers in terms of compliance with water management plans (based on the second iteration of the standard known as ED AWAS 1). In terms of power, even though there were no specific comments reflecting the notion of power of accountees, some comments were found connected with the notion of power. (All submissions were analysed carefully so as to identify references to power.) Maybe it is too early to assess whether GPWAR will empower accountees.

One response was easily identifiable as an example of empowerment. In this response, power is linked with a reward or sanction, which in terms of public sector accountability is connected to upward accountability:

> *'The purpose of the reports is to provide information to users of that report…and so enters the real reason for the Commonwealth interest in all this data – that is to have another externally imposed accountability and punishment regime for individuals and managers and collective directorial and management bodies, at great expense to those bodies' (submission 7 – Individual/citizen)*

Two submissions mentioned the power of accountees (about GPWAR prepared under ED AWAS 1) and related it to the power to make decisions, but it is not clear whether those decisions are about creating any change and influence the decision-making process. It is assumed users and decision makers are synonyms.

> *'Overall, we support the development of standards aimed at improving the consistency and comparability of information about water resources provided by water report entities. This should assist decision makers at all levels in both the public and private sectors' (submission 2 – Statutory agency of government)*

Five respondents out of fourteen stated that they agree with the information included in the accountability statement and one disagreed with the components of the Accountability Statement. The other respondents did not comment on it. One respondent gave suggestions for improvement.

> *'Paragraph 50(c) requires the water report entity to provide information to assess whether "best practices for managing water assets and liabilities have been applied". Based on the guidance and explanation provided on this requirement, it appears there is no current best practice in managing water assets and water liabilities. For users of the general purpose water accounting reports the absence of "best practice" in this area may not be clear' (submission 16 – Professional body).*

By agreeing with the contents of the Accountability Statement, then respondents accept indirectly the idea that water managers are accountable for their performance. This finding goes against to the perception of report preparers about the Accountability Statement who considered it difficult. The respondent who disagreed about the Accountability Statement stated that it was seen as burdensome:

> *'We do not understand the rationale behind these proposals. They appear very onerous and do not seem to have any parallel in financial accounting. We believe that: - It is reasonable to expect an irrigation entity to confirm that the numbers in its accounts are the best available and prepared in good faith, but it has little control over some of those numbers … - It is not reasonable to expect a statement about compliance with all sorts of legislation. There are plenty of Government agencies (water departments, environmental*

agencies, occupational health and safety agencies, vehicle registration agencies etc.) that monitor compliance within their area of legislation - It is even less reasonable to expect a statement that the managers of an irrigation entity are using "best practice" in all their activities. How is "best practice" defined? There may be good cost reasons for not adopting the very latest technical solution in every case' (submission 15 – Industry association)

The results of the qualitative analysis of the submissions reinforced the results obtained during the quantitative phase. The majority of the comments were related with transparency as they focused mainly on the statements.

7. Summary and Conclusions

As a result of previous research (see Paper 1), it was considered necessary to explore the perceptions of potential users about SWA and in particular about the accountability of water management. A review of the literature about stakeholders discloses the possibility of having a wide range of multiple users of SWA reports similar to corporate accounting. Research about users of accounting reports is significant and even though it is not as significant as research about users of accounting reports, research on users of SEA reports has been growing in the last decades. However, there is little research on users of SWA reports. The research question driving this study is: To what extent do users perceive Standardised Water Accounting (SWA) reports, under the Exposure Draft of Australian Water Accounting Standard 1 (ED AWAS 1), as being useful for discharging the accountability of water managers? The accountability framework drives this study by adopting Gray *et al.*'s (1996) accountability model and extending it to include elements pertinent to the public sector. Gray *et al.*'s (1996) model was selected to evaluate accountability and transparency was the critical component selected to operationalise information. Such transparency can be reflected through the quality of reporting. It was suggested that one way to assess the quality of reporting was that reports meet certain qualitative characteristics such as financial accounting reports do. The Australian Accounting Standards Board (2004) discusses the qualitative characteristics of financial statements. In the context of water accounting, conversely, SWA includes a Conceptual Framework called the Water Accounting Conceptual Framework. In SWAC 3 (Qualitative Characteristics of General Purpose Accounting Reports), the Water Accounting Standards Board (2009b SWAC 3 para. 16, 17) describes the qualitative characteristics of GPWAR. Hence, they represent a way to assess the usefulness of information. A mixed method approach is used and in order to gather data a sequential approach was designed. Grafton *et al.* (2011) note that the use of the mixed method has been increasing in

management and accounting research. In the quantitative phase, a questionnaire was delivered to attendees at five major water-related events and their responses were analysed. In the qualitative phase, secondary data in the form of public submissions to the WASB on ED AWAS 1 were analysed.

General findings of the survey suggest that respondents perceive as useful the introduction of SWA. Approximately 56% of respondents consider that the benefits of preparing water accounting reports under SWA will exceed the costs. In general terms, it was found after the analysis of public submissions that respondents are open to the introduction of SWA (reflected on the ED AWAS 1); nonetheless, they recommend revising specific parts of it.

In terms of clarity of relationship, one question from the survey was about who the respondents perceive to be the main users of SWA reports. Approximately 72% of respondents believe that reports would be more useful to water industry regulators followed by government water managers and finally government representatives and their advisors, while the majority of respondents perceive that town-water users will be indifferent. Findings from the analysis of submissions show that there is no full clarity yet in terms of the identities of the accountees (or users of reports). Determining the identity of users is important in order to identify their information needs which are the driver behind the preparation of water accounting reports. In terms of the accountors, some level of controversy regarding the water entity concept was identified during the analysis of submissions, more specifically about the potential dual nature of water report entities as WHO and WHAT which often overlap, but not always. The main difficulty in water accounting is about the delimitation of the water report entity. The level of controversy about the entity concept is not unique to water accounting because, in relation to accounting research, Meyer (1973) investigates the entity concept controversy by analysing eight conceptions of the accounting entity and by analysing the tensions between them.

In terms of transparency, two questions from the survey which are connected with the idea of quality of reporting concern the double-entry system and accrual accounting. The majority of respondents were in favour of using both of them (53% in favour of the double-entry system and 56% in favour of accrual accounting). In the analysis of submissions it is found that there is agreement on the importance of the water accounting statements; however, not all statements seem to be needed. In particular, there were voices against the Accountability Statement and the Assurance Statement. Furthermore, some respondents recommended

merging the Statement of Water Assets and Water Liabilities with the Statement of Changes of Water Assets and Water Liabilities into one as there are not many accruals actually happening. Identifying the information needs of users is important for the preparation of General Purpose Water Accounting Reports. Research on users of accounting reports has been ongoing, but one of the key aspects to remember is that each user group has different information needs whether in financial accounting or water accounting (see Cooper and Sherer, 1984).

In terms of power, a question from the survey is about the Accountability Statement and the discharge of accountability. Respondents were undecided about its usefulness in discharging the accountability of water managers (58% of respondents perceive the Accountability Statement as 'not useful' or they are 'indifferent' about it). In the analysis of submissions, five out of fourteen respondents showed their agreement with the information included in the Accountability Statement whereas one respondent disagreed with information disclosed in the Accountability Statement. The other respondents did not comment on the statements and suggested improvements. The majority of those who responded in favour of the contents of the Accountability Statement asked some modifications. However, there was less agreement in terms of the requirements to sign-off the statement.

The results of this study have implications for policy makers during the inception phase of SWA. This is because knowing what potential users think of SWA is necessary to enable a more informed assessment as to whether information needs are satisfied and, if not, what changes are necessary. The results of this study reflect the importance of users' perceptions in line with other accounting studies on users (e.g. see Yap, 1997; Al-Khater and Naser, 2003).

The result of these comments and suggestions is reflected somewhat in the recently released third iteration of the Standard (known as AWAS 1). This updated standard removes the assurance statement as part of the original seven components, reduces the objectives of the accountability statement to report solely on whether water accounting reports are prepared according to standards, simplifies the requirements to report when there are no accruals, and reduces the water entity to the WHAT and no longer to the WHO. The publication of AWAS 1 is relevant in a context in which there have been calls for more involvement of users in the standard-setting process (Harding and Mckinnon, 1997). The influence of users in standard-setting is investigated by Hardin and McKinnon (1997) by analysing one user group (accountants and investment analysts) through a survey. Even though, this study does not

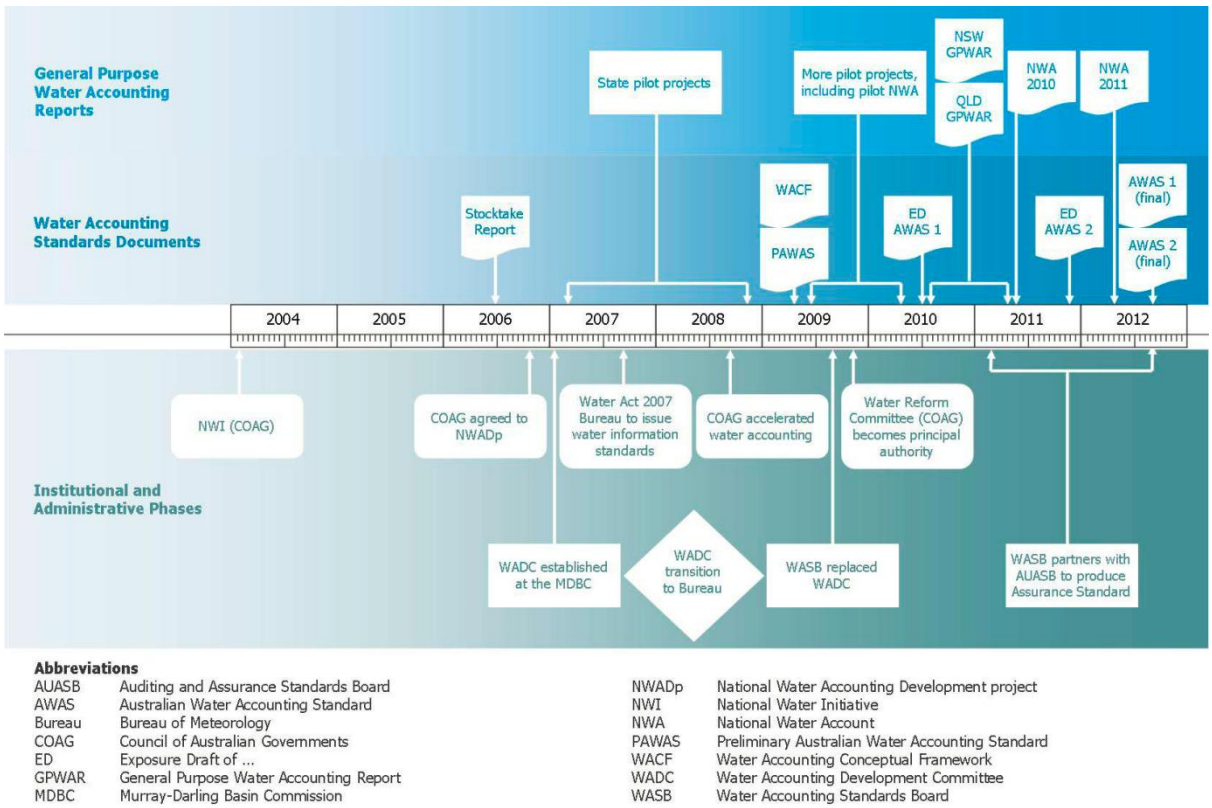
explore the perceptions of a particular user groups, it explores the perceptions of potential users who have water-related interests.

Overall, based on the results of the survey and the analysis of submissions, it was found that at this stage users do not believe that SWA, reflected in ED AWAS 1, and by implication AWAS 1, will discharge the accountability of water managers. Based on the perception of users, the study suggests that accountability of water managers in unlikely to be fully realised.

The main limitation of the study is the relatively low data volume of the survey, with a response rate of approximately 21%. Future research might target this limitation by delivering the questionnaire to specific user groups at different events.

8. Appendix

Figure 3.1. Timeline of Water Accounting Development

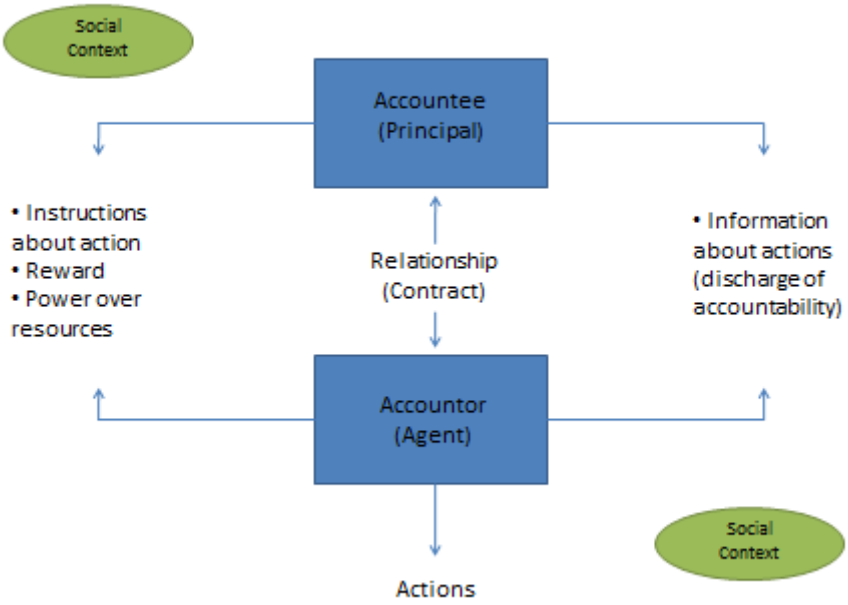


Abbreviations

AUASB	Auditing and Assurance Standards Board
AWAS	Australian Water Accounting Standard
Bureau	Bureau of Meteorology
COAG	Council of Australian Governments
ED	Exposure Draft of ...
GPWAR	General Purpose Water Accounting Report
MDBC	Murray-Darling Basin Commission
NWADp	National Water Accounting Development project
NWI	National Water Initiative
NWA	National Water Account
PAWAS	Preliminary Australian Water Accounting Standard
WACF	Water Accounting Conceptual Framework
WADC	Water Accounting Development Committee
WASB	Water Accounting Standards Board

Source: Bureau of Meteorology, 2012 (www.bom.gov.au/water/standards/wasb/waterAccStory.shtml)

Figure 3.2. Gray et al. (1996) Accountability Model



Source: Gray *et al.*, 1996 p. 39

Figure 3.3. Transparency and the Quality of Reporting

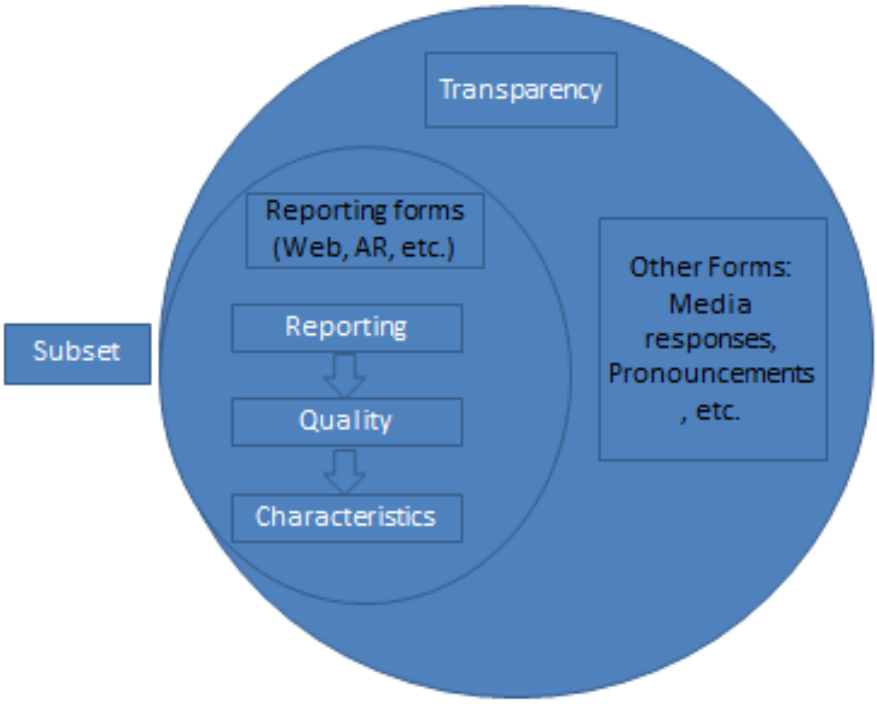


Table 3.1. Summary of Results and Statistical Analysis

Number	Question	Yes	No	Undecided
1	National standards governing the preparation of reports	30	1	5
	Chi-Square 41.1667			
	P-value 0			
2	GPWARs excluding Account. Statement & the discharge of Accountability	11	6	19
	Chi-Square 7.16667			
	P-value 0.028			
3	The accountability Statement and the discharge of Accountability	12	3	21
	Chi-Square 13.5			
	P-value 0.001			
4	Double-entry system for recording physical water transactions (ml)	19	6	10
	Chi-Square 7.6			
	P-value 0.022			
5	The use of accrual accounting into the preparation of reports	20	5	11
	Chi-Square 9.5			
	P-value 0.009			

Figure 3.4. Stakeholders' Perceptions Towards Water Reports

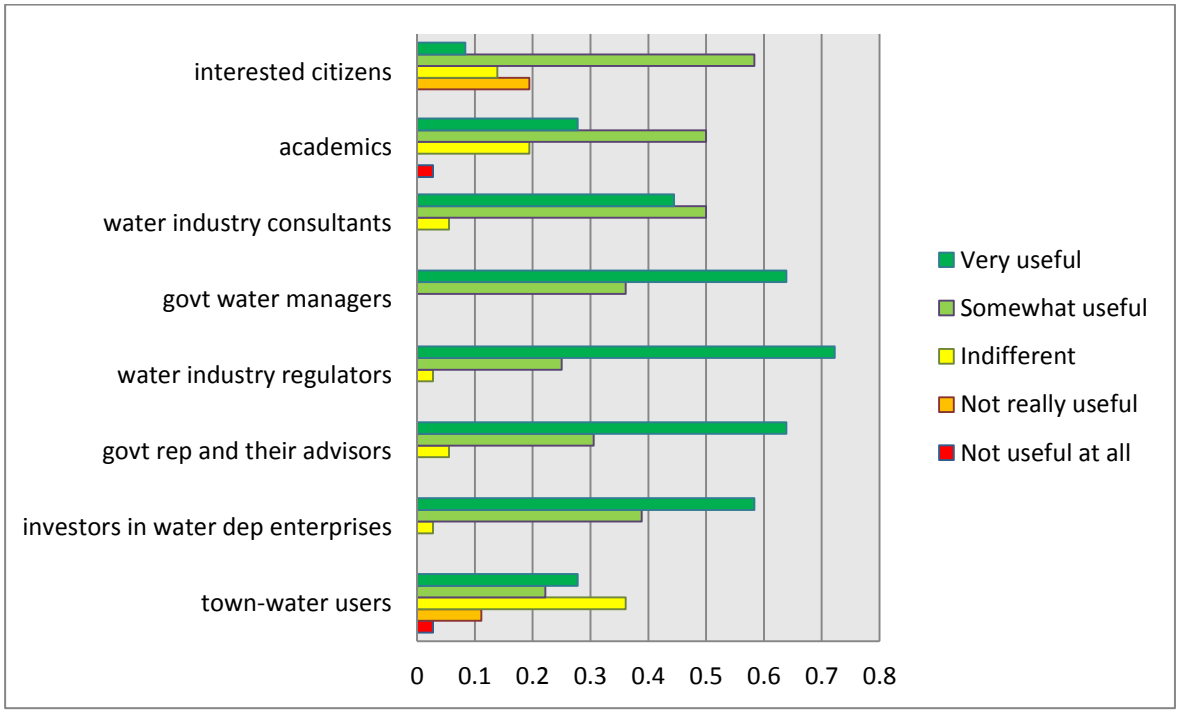


Figure 3.5. Perceptions towards components of water accounting reports under SWA

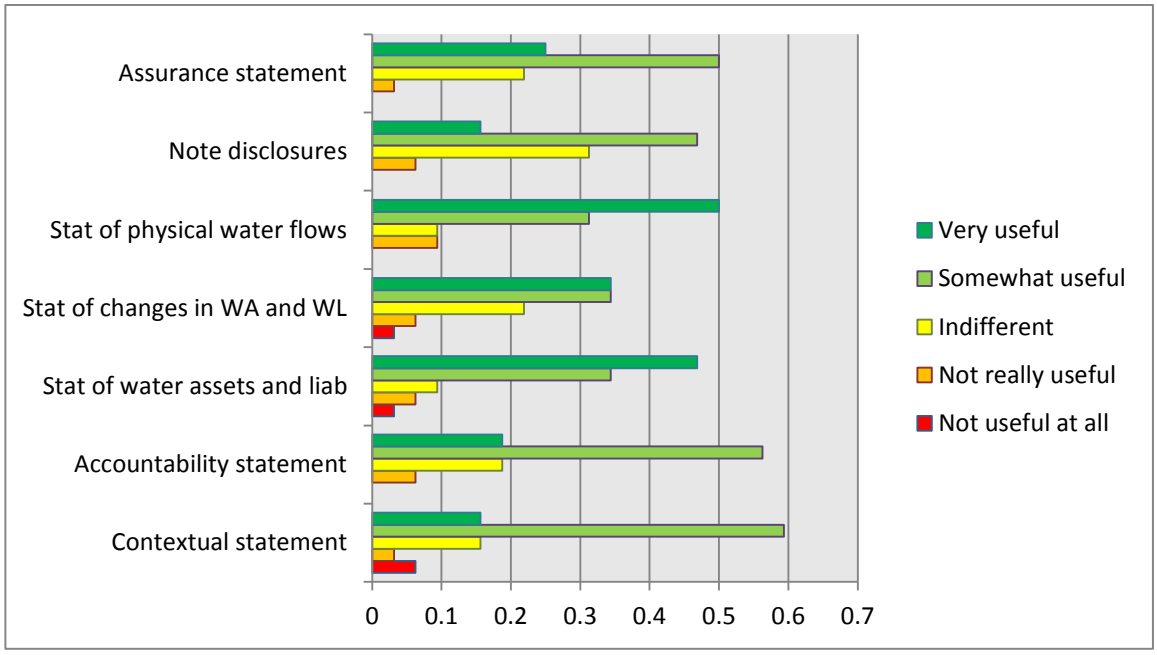
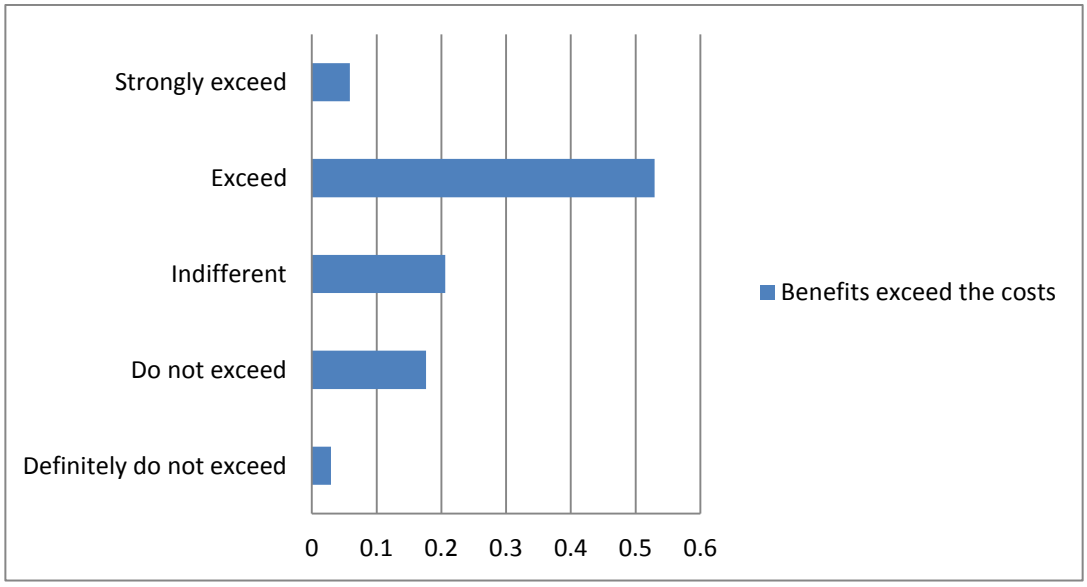


Figure 3.6. Benefits versus costs of preparing water accounting reports



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ACCOUNTABILITY AND SUSTAINABLE MANAGEMENT OF WATER RESOURCES: THE CASE OF GROUNDWATER IN AUSTRALIA

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ACCOUNTABILITY AND SUSTAINABLE MANAGEMENT OF WATER RESOURCES: THE CASE OF GROUNDWATER IN AUSTRALIA

ABSTRACT

Purpose – This paper explores the potential impact of Standardised Water Accounting (SWA) on the accountability of Australian groundwater management. Effective, efficient and sustainable water management is essential to alleviate the misuse and wastage of water resources, yet groundwater management poses many unique challenges. Further, a number of issues specific to groundwater accounting and reporting were identified during the pilot phase of SWA development.

Design/methodology/approach – This paper deploys a theoretical framework of accountability using Gray *et al.*'s (1996) model extended to include elements pertinent to the public sector. This framework is used to analyse groundwater accounting and accountability at two Australian government departments with responsibility for groundwater, namely, the Department of Environment, Water and Natural Resources of South Australia and the New South Wales Office of Water. Data comprised structured interviews with eight staff members with responsibilities connected to groundwater management and/or reporting as well as a review of private and public documents from the two Departments. In addition, nine public submissions to the Water Accounting Standards Board on the Exposure Draft of Australian Water Accounting Standard 1 were analysed for any references to groundwater.

Findings – In groundwater, the recharge rate is managed and not the amount of water in stock. Surface and groundwater connectivity poses challenges in terms of reporting as practitioners have divided opinions as to report them combined or separated. Groundwater accounting and reporting poses more challenges in comparison to surface water reporting. These findings suggest SWA is unlikely to have a significant impact on the accountability of Australian groundwater managers.

Research limitations –One of the limitations of case studies is generalizability. In this research most findings relate to characteristics common to all groundwater areas in Australia, so future research might explore the extent to which these findings apply to other locations in which groundwater is important (such as Western Australia and Queensland).

Practical implications –This study addresses the paucity of accounting research on groundwater accounting and has practical implications for future iterations of Australian water accounting standards.

Originality/value – Water is an emerging area in Social and Environmental Accounting, but groundwater has yet to be specifically addressed. This study seeks to begin research on groundwater accounting and reporting in relation to SWA, and will inform future iterations of Australian Water Accounting Standards.

Keywords – Water, groundwater, water accounting, social and environmental accounting, Australia

1. Introduction

Groundwater is an important part of the water cycle and represents a proportionally large part of the cycle's land-component (National Water Commission, 2012). In fact, groundwater represents approximately 97% of all freshwater available on earth (Pigram, 2006). The total amount of groundwater increases due to the interaction of groundwater and surface water resources (such as rivers and lakes). Different to surface water (which has been developed intensively over an extended time), groundwater remained a sparse resource until approximately a century ago (World Water Assessment Programme, 2012). However, today it represents an important source of water for human consumption because it supplies almost half of the world's drinking water, and roughly 43% of all water used in irrigation (World Water Assessment Programme, 2012). Moreover, approximately half of all countries use groundwater as the main water supply resource (Pigram, 2006).[74] According to Burke *et al.* (1999), nowadays groundwater is a significant part of economic activity and social welfare through extraction and the environmental services it provides. Therefore, understanding groundwater is paramount to avoid its irreversible degradation (National Water Commission, 2012). According to Burke *et al.* (1999), the development of groundwater technologies for exploration and exploitation as well as the development of techniques for understanding flow dynamics in aquifer systems are ongoing; however, there is still need for an understanding of groundwater's economic, social, political and institutional dimensions.

Groundwater is a critical source of freshwater because of its relevance and socio-economic impact. Its relevance is reflected in its ability to serve as a buffer of large quantities of water stored in aquifers that can be withdrawn when there are periods of little to no rainfall (World Water Assessment Programme, 2012).[75] The livelihoods and food security of populations across different parts of the world are affected by groundwater.[76] Approximately 40% of global population uses groundwater and 50% of the food produced depends on agriculture

[74] Groundwater is defined by the AWA (2007 p. 6) as 'water stored underground in rock fractures and pores'.

[75] The National Water Commission (2012 p. 44) defines aquifers as 'rock or sediment in a formation, group of formations, or part of a formation which is saturated and sufficiently permeable to transmit quantities of water to wells and springs', whereas Pigram (2006) states that aquifers are formations or strata that carry water that can be used for economic and practical purposes.

[76] For example, groundwater supplies water to more or less 1.5 billion rural households in poorer regions of Asia and Africa and other regions of the world (UNESCO, 2012).

irrigated by groundwater resources (Seiler and Gat, 2007). Finally, according to Pigram (2006 p. 25), groundwater has certain advantages over surface water: (1) a small investment is required for its development, (2) it is generally free of pathogens, (3) evapotranspiration losses are insignificant, and (4) groundwater is better protected against contaminants in comparison to surface water. However, more energy is required for its use and the resource is also affected by differences in standing water levels.

At present, groundwater reserves are being depleted faster than they can be replenished due to over-exploitation in many areas of Asia and North America (Wickham, 2012). Even though 80% of global aquifers are being used sustainably, this trend is offset by over-exploitation in other important areas. Even more concerning is the fact that these aquifers are critical to the agricultural sector (Wickham, 2012) and, hence require better management.[77]

Australia, as an arid country (see Habermehl, 1985; Seiler and Gat, 2007; Wahlquist, 2008), has widespread, but unevenly distributed groundwater resources. Significant sedimentary basins extend under approximately 60% of the country (Pigram, 2006). Human settlements in Australia are located in areas where there exist water resources either at the surface or under the ground, or both. Approximately 17% of existing accessible water resources in Australia come from groundwater which also represents approximately 30% of water consumption in some regions (National Water Commission, 2012). Historically, the existence of groundwater in Australia has assisted in the establishment of inland settlements and even today groundwater is the most important resource in the arid interior (Pigram, 2006). However, according to Habermehl (1985 p. 31), groundwater in the arid and semi-arid interior of the country is frequently of poor quality and limited in quantity. Nevertheless, especially in arid and semi-arid areas, groundwater is the only reliable source of water (National Water Commission, 2012).

In total, there are approximately 538 groundwater management units in Australia and these water systems may interact and overlay with each other (AWA, 2007). According to the National Water Commission (2012), the majority of groundwater systems in Australia are connected to surface water systems. Therefore, understanding their connectivity is an

[77] Groundwater management is important in countries like Australia which has varied precipitation. Effective groundwater management can avoid problems associated with overuse such as depleted water tables and aquifers. Examples include the Nubian Sandstone Aquifer System in the Sahara, from which Libya has extracted large amounts of water through its Great Man-made River Project (GMMR) (Wickham, 2012).

important variable in groundwater management. Confined aquifers are more important to Australia because their relative shallowness makes them easily accessible (National Water Commission, 2012).[78] More than 10% of total groundwater comes from the Great Artisan Basin which is largest source of groundwater in the country[79].

In Australia, groundwater use in states and territories has increased recently mainly because frequent periods of drought have depleted surface water supplies (National Water Commission, 2012). Groundwater that can be extracted sustainably amounts to approximately 25,780 GL each year (AWA, 2007). Such water is suitable both for potable use and agricultural irrigation. However, approximately 38% of those 538 groundwater management units are either close to or actually overused in comparison with their sustainable yield (AWA, 2007). According to the National Water Commission (2012), however, groundwater is neither understood nor managed in a sustainable way. Therefore, an important tool for groundwater management is groundwater information.

Previous research (see Paper 1) discussed several operational issues in the preparation of prototype water accounts (under SWA) that are faced by report preparers. The five problem areas identified in Paper 1 are as follows: identification of the reporting entity is problematic, user needs are unclear, the accuracy of water measurements is an unresolved issue, the accountability statement and problems in the application of accrual accounting and the double-entry system. Among these issues, it was found that groundwater accounting and reporting faces significant challenges in Australia as all issues mentioned in Paper 1 overlap with groundwater. Such research was based on the 'Water Accounting Project'.[80]

Given the importance of groundwater, currently unsustainable groundwater management and the importance of information for effective management, this paper aims at exploring the potential of Standardised Water Accounting (hereafter SWA) for improving accountability for

[78] According to the National Water Commission (2012 p. 8), 'confined aquifers are permeable rock units deep under the ground and overlain by less permeable layers'.

[79] The Great Artisan Basin is an example of a confined aquifer and extends across 1.7 million km2 (under parts of New South Wales, Queensland, South Australia and the Northern territory) and stores approximately 8,700,000 GL (AWA, 2007).

[80] The 'Water Accounting Project' was carried out by the former Water Accounting Development Committee and one of its main objectives was to assess the progress of pilot site (or practitioners) in preparing prototype water accounts under SWA. I was engaged along with one of my supervisors by the WADC to participate in the project.

groundwater resources in Australia. SWA can be considered an example of the 'new accountings' which, according to Bebbington and Gray (2001 p. 562), represents an attempt 'to develop a praxis in which the accounting is turned upon itself'. More specifically, this paper explores groundwater accounting and accountability by examining the perception of potential preparers of water accounting reports under ED AWAS 1 (in relation to groundwater). This study seeks to extend the limited number of studies on groundwater accounting and reporting (i.e. Subba Rao *et al.*, 1998; Molden and Sakthivadivel, 1999; Peranginangin *et al.*, 2004; Zhu *et al.*, 2004; Dassi *et al.*, 2005; Foster and Perry, 2010), which are either related to modelling or to statistical groundwater reporting as opposed to SWA. This study adopts a qualitative approach in which data was obtained from two case study organisations and by exploring the perceptions of practitioners regarding SWA via public submissions to the WASB.

The research paper is structured as follows: Section 2 presents a discussion on groundwater management, accounting and related research. The accountability framework is explored in Section 3 and Section 4 presents the research method. Section 5 discusses the findings and Section 6 presents the main conclusions of the study.

2. Groundwater Management and Accounting in Australia

Burke *et al.* (1999) argue that the main obstacles to sustainable management of worldwide groundwater resources are social, institutional and political factors. They evaluate technical aspects of groundwater management against its socio-economic aspects. Groundwater use is important for socio-economic development; however, its use also has negative impacts on the resource base as most uses are 'consumptive or involve a degradation of water quality when returned to the system of shallow groundwater circulation' (Burke *et al.*, 1999 p. 305).[81] Groundwater is distinct from surface water. Groundwater management presents separate and more difficult challenges mainly as control and regulation are easier to apply to surface water than to groundwater (Burke *et al.*, 1999). In terms of groundwater, it is important to separate renewable (flux) and non-renewable (stock) supplies since exploitation of non-renewable groundwater systems is important in arid and humid areas (Burke *et al.*, 1999).

[81] According to Pigram (2006 p. 25), surficial aquifers (also called shallow aquifers) occur 'in unconsolidated materials such as alluvium, colluvium and sands, as well as calcrete and other carbonate deposits [and] are highly productive'.

Examination of groundwater stock (its non-renewable component) can be connected with the extractive industries including petroleum and mining industries. Considerable research has been undertaken regarding accounting for extractive industries (e.g. see Cortese *et al.*, 2009; Cortese and Irvine, 2010; Cortese *et al.*, 2010), specifically regarding the International Financial Reporting Standard (hereafter IFRS) 6 *Exploration for and Evaluation of Mineral Resources*. However, IFRS is about methods for accounting for pre-production activities in the extractive industries. Cortese *et al.* (2009) suggest that the IFRS6 allows choosing between costing methods (such choice favours the economic consequences argument). Nonetheless, the main problem with groundwater is that almost all types of groundwater found in Australia are regenerative as all can be recharged through different processes (see Geoscience Australia, 2012).[82] For those very deep aquifers (which are not interconnected and without any possibility of recharge), the non-regenerative principle can be applied. However, this case is hardly observable in the Australian context. For this reason, IFRS6 could not be applied as its application is to non-regenerative resources.

Habermehl (1985) states that although several problems affect the availability of groundwater resources, it is possible to increase the development of groundwater use for towns, agriculture and industry. In order to do so, it is a requirement to have not only improved hydrogeological techniques, but also adequate assessment and management. In Australia, each state and territory has its own arrangements regarding groundwater management (National Water Commission, 2012).[83] All levels of government in Australia are working together to understand the resource and manage it effectively (National Water Commission, 2012). Groundwater is not an infinite resource because its replenishment depends on the rate of recharge; therefore, surface water and groundwater should be managed sustainably in order to

[82] Except, perhaps, for 'palaeovalleys' which are alluvial deposits formed by ancient rivers that are no longer active (Geoscience Australia, 2012), but their use is not very significant in comparison to the others and mainly in comparison with alluvial aquifers.

[83] In New South Wales there is the NSW Office of Water, in Victoria the Department of Sustainability and Environment, in Queensland the Department of Environment and Resource Management, in Western Australia the Department of Water, in South Australia the Department of Environment, Water and Natural Resources (former Department of Water), in Tasmania the Department of Primary Industries, Parks, Water and Environment, in the Australian Capital Territory the Department of Environment, Climate Change, Energy and Water and in the Northern Territory there is the Department of Natural Resources, Environment, the Arts and Sport (National Water Commission, 2012).

avoid over-allocation and over-use (National Water Commission, 2012).[84] Poor groundwater management has been reflected in the failure to meter groundwater use, the provision of groundwater under a lower or a no-price structure, and the failure of management plans to recognise the interconnection between groundwater and surface water (National Water Commission, 2012).

In order to facilitate groundwater management and protection strategies, it is important to know the rates of groundwater recharge as well as the geometry, structure and hydraulic properties of aquifer systems (Vrba and Verhagen, 2011).[85] Recharge can take place naturally or artificially (National Water Commission, 2012).[86] Groundwater recharge determination is dependent on both scale and time; therefore, independent methods of investigation should be applied simultaneously (Vrba and Verhagen, 2011). Such methods, however, cannot be applied in all climate zones.

Managing groundwater recharge is similar to the concepts of capital and income. Fisher (1896) formalised the concepts by suggesting that both concepts are different in reference to time. Fisher (1896) relates stock with capital and flow with income. According to Fisher (1896 p. 514), 'stock relates to a point of time, flow to a stretch of time'. In other words, managing groundwater recharge is similar to managing flows, whereas the amount of water existing in the aquifer which cannot be recharged is considered as stock.

However, according to Pigram (2006 p. 26), there is still much to be learned in groundwater management. There is a lack of data and that affects management greatly.[87] Problems in groundwater management are also reflected in the lack of attention to artificial or induced recharge to replenish overdrawn aquifers.[88] Artificial recharge (known as Managed Aquifer

[84] According to the National Water Commission (2012 p. 45), groundwater recharge is 'replenishment of groundwater by natural infiltration of surface water (precipitation, runoff), or artificially via infiltration lakes or injection'.

[85] There are six broad approaches used to determine groundwater recharge; however, according to Seiler and Gat (2007), the precision needed to determine groundwater recharge is based on: (1) the conceptual model used, (2) the time duration of groundwater recharge, and (3) the precision in determining the source and loss functions.

[86] Artificial recharge is known as Managed Aquifer Recharge.

[87] According to Pigram (2006), an example of this lack of data is the Namoi valley.

[88] Some artificial recharge programs are currently in operation in the Pilbarra region of Western Australia and in Queensland (Pigram 2006).

Recharge) exists in Australia although it is not comparable to the use of artificial recharge in other regions such as North America.[89]

One area that should be considered in groundwater management is groundwater-surface water connectivity. Many dams, lakes and rivers are connected either directly or indirectly with groundwater (National Water Commission, 2012). Australia has a history of managing both separately which has resulted in an over-allocation of resources in certain areas (National Water Commission, 2012). Groundwater managers have also to evaluate ecosystems which are groundwater-dependent because they change due to competing human use and other land management factors, so water regimes and water quality are both affected (National Water Commission, 2012).

From the discussion above it is evident that managing groundwater resources has more levels of complexity compared to surface water management. In Australia, there exist water management plans that balance water availability with population water use and the needs of the environment. Such plans are generally prepared in areas with well-used groundwater resources unlike other areas which do not have the economic and environmental incentive to develop them (National Water Commission, 2012). States and territories 'apply environmental, resource and water management policies to manage groundwater' (National Water Commission, 2012 p. 35).[90] Another challenging area within groundwater management concerns the treatment and disposal of extracted groundwater. Such poor quality water can be extracted from aquifers to prevent salinity reaching river systems or to depressurise an aquifer (National Water Commission, 2012). Therefore, groundwater management goes beyond understanding the physical characteristics of the resource.

Data on groundwater is already captured and reported in Australia, but in an old-fashioned way since the information is produced in an inconsistent way without a framework that guides its collection and preparation in a standard way. Such data is captured by monitoring boreholes, but these boreholes are not equally distributed across all Australian aquifers (National Water Commission, 2012). There tends to be more monitoring boreholes in aquifers where there is the highest number of entitlements and usage. Groundwater data can be found

[89] This technique is being applied in different countries and entails using lands in upstream areas of major rivers to store water from floods in natural aquifers so farmers can pump it out during dry times.

[90] For example, the Gnangara Sustainability Strategy aims at developing a groundwater management plan for the Gnangara mound groundwater area.

in public documents provided by the different Departments of Water across all jurisdictions in Australia.

The Australian Bureau of Statistics (hereafter ABS) is the entity in charge of preparing Australian water accounts which follow the guidelines from the United Nations. These accounts are considered part of what I call *General Water Accounting*. In the water accounts prepared for the period 2010-2011 (see Australian Bureau of Statistics, 2012), the groundwater component can be found in the accounts concerning the origin of distributed water across Australia, the volume of water discharged to various water bodies and the origin of water used in agriculture. However, according to SKM (2006), these statistics do not link the information meaningfully like water reports prepared under Standardised Water Accounting. SWA is considered as an emerging discipline (see Bureau of Meteorology, 2012b) which applies financial accounting principles and methodologies to report on water.

National water reform in Australia began with an agreement at the Council of Australian Governments (hereafter CoAG) in 1994 (Slattery *et al.*, 2012). Such agreement was reinforced by the Intergovernmental Agreement to the National Water Initiative (hereafter NWI) which was signed by the Commonwealth and State and Territories between 2004 and 2006 (Slattery *et al.*, 2012) which was 'a significant milestone that provided the impetus for the current Australian systems of water management and water accounting' (Chalmers *et al.*, 2012 p. 1004). One of the drivers for the NWI was the severe drought that affected Australia in the early 2000s (Chalmers *et al.*, 2012). SWA deals with the application of accounting principles, the objective of which is to improve and report on water information. The objective is to develop a system of water accounting as an accounting sub-discipline, analogous to financial accounting, to guide intra-national and national decision making (Chalmers *et al.*, 2010).

Because of NWI reforms, it was necessary to improve the water accounting system; therefore, General Purpose Water Accounting Reports were created to fill in this gap. In 2006, the National Water Accounting Development Project (NWADp) was formed to progress the development of water accounting (or SWA) as a discipline. The Water Accounting Development Committee (hereafter WADC), an independent standard-setting body, was established to oversee all activities related to the development of Australian water accounting standards (Slattery *et al.*, 2012). One of the tasks of the WASB (formerly WADC) was the development of a Water Accounting Conceptual Framework (hereafter WACF) (similar to the

Accounting Conceptual Framework) to underpin the development of the Preliminary Australian Water Accounting Standard (hereafter PAWAS) which became the Exposure Draft of Australian Water Accounting Standard 1 (ED AWAS 1). The third iteration of the standard is known as the Australian Water Accounting Standard 1 (hereafter AWAS 1), and was released by the WASB in late 2012.

There have been some developments in Australian legislation in terms of groundwater. The National Water Initiative signed by all Australian governments between 2004 and 2006, calls among other things, for a 'whole water cycle approach' to the management of water, including improving groundwater management (National Water Commission, 2012). The Australian government later established an $82 million National Groundwater Action Plan that aims at improving groundwater knowledge and also the planning and management of groundwater resources in the country (National Water Commission, 2012).

Unlike the ABS, the Bureau of Meteorology (hereafter BoM) was assigned, under the Water Act 2007, responsibility for the provision of a National Water Account (commencing in 2010 after a pilot program in 2009) and was also delegated authority to issue National Water Information Standards (Bureau of Meteorology, 2012b). In November 2011, the BoM released the first national water account for the period 1 July 2009 to 30 June 2010. The national water account follows ED AWAS 1 (Bureau of Meteorology, 2011) and provides information on water rights, water stores and flows and water use (Bureau of Meteorology, 2012a). Water accounting reports were prepared for eight significant water management regions and groundwater is mentioned in all regions. The National Water Account follows the second iteration of the standard (known as ED AWAS 1) which states that the components of General Purpose Water Accounting Reports (hereafter GPWAR) are: the Contextual Statement, the Accountability Statement, the Statement of Water Assets and Water Liabilities, the Statement of Changes of Water Assets and Water Liabilities, the Statement of Physical Water Flows, the Assurance Statement and Note disclosures (Water Accounting Standards Board, 2010 p. 2). The Assurance Statement was not provided at this stage because the first draft is yet to be completed. The Accountability Statement is very broad and mentions the role of BoM in gathering the necessary information to prepare the reports. Contextual Statements are detailed and include information on groundwater resources. The Statement of Water Assets and Liabilities, the Statement of Changes of Water Assets and Water Liabilities and the Statement of Physical Water Flows are presented but not all include groundwater information.

2.1. Water Accounting and Groundwater Accounting Research

Within the area of Social and Environmental Accounting (hereafter SEA), research on water disclosures have focused mainly on corporate-water related disclosures (e.g. see Morikawa *et al.*, 2007; Morrison and Schulte, 2009; Prior, 2009; Barton and Morgan-Knott, 2010; Egan and Frost, 2010; Morrison and Schulte, 2010; The Association of Chartered Certified Accountants, 2010; Carbon Disclosure Project, 2012). For example, Egan and Frost (2010) evaluate current external water reporting practices of a group of major Australian water consuming organisations and find a growing trend in water disclosures. These studies however are not about water reporting under SWA which is currently under development in Australia.

Despite SWA, research literature on groundwater accounting is limited (i.e. see Subba Rao *et al.*, 1998; Molden and Sakthivadivel, 1999; Peranginangin *et al.*, 2004; Zhu *et al.*, 2004; Dassi *et al.*, 2005; Foster and Perry, 2010). Peranginangin *et al.* (2004) apply a water accounting procedure to analyse water usage patterns and trade-offs between water users of the Singkarak-Ombilin river basin in Indonesia. They treat groundwater and surface water separately, despite being interconnected. Peranginangin *et al.* (2004) argue that considering surface water and groundwater components separately will allow a more realistic estimate of water availability. Dassi *et al.* (2005) assessed the suitability of isotopic methods to study groundwater recharge sources in the Merguellil river basin. Even though their study is not necessarily on groundwater accounting, they study sources, times of recharge and mixing processes when infiltration reaches the water table, points that relate to groundwater. Molden and Sakthivadivel (1999) discuss a water accounting methodology to account for the use and productivity of surface water and groundwater. This methodology is based on a water balance approach. Foster and Perry (2010) analysed the relationship between groundwater recharge and irrigation groundwater management on permeable soils. They conclude that investments to improve irrigation technology are not the approach to reduce net groundwater extraction and preserve water. Groundwater accounting (as reflected in recharge-discharge balances) provides important information in evaluating the sustainability of groundwater resources and the effectiveness of groundwater management (Foster and Perry). Finally, Zhu *et al.* (2004) explore general water (and groundwater) accounting in the Yellow River Basin (China). They found that the main difference between water accounting methodologies in the Yellow River and those applied in other regions is on supply accounting, and in particular on groundwater

accounting. Zhu *et al.* (2004) show a declining trend in rainfall and runoff and an increase in industrial and domestic use which affects water planning.

This paper addresses the gap in the limited research about groundwater accounting and reporting, the more so because it is about an innovative approach to account for and report on water. Groundwater accounting in Australia is explored from an accountability viewpoint and the research question underlying this study is: To what extent does SWA (as reflected in ED AWAS 1) contribute to groundwater accounting and accountability? SWA is reflected in the ED AWAS 1, which was released by the Water Accounting Standards Board in 2010. This paper uses Gray *et al.*'s (1996) accountability model to evaluate accountability. Each dimension of the Gray *et al.* (1996) model is extended for the purposes of SWA. The accountability framework and Gray *et al.* (1996) model are explained next.

3. Accountability framework

3.1. Background

Accountability is the prescriptive theoretical framework that drives this study. However, Spence *et al.* (2010) argue that accountability itself is not a theory so much as an underspecified idea. In fact, Archel *et al.* (2011) conclude that accountability is a fine ideal, but impossible to implement given the dominance of certain interest groups in the political process. In its simple form, accountability is a concept and concepts are considered by Llewelyn (2003) as one of the levels of theorisation available to qualitative empirical researchers. However, Gray (2007) considers accountability as a theory and, more specifically, as a Meso Theory. According to Gray (2007 p. 19), Meso Theory 'tends to leave major assumptions about the world and society in the "taken-for-granted" category and concentrates on the broad area of intended enquiry'. This accountability framework establishes criteria for how things should work so current practice can be evaluated.

In line with previous research (see Paper 1), this study adopts Gray *et al.*'s (1996) accountability model. It includes the elements of Relationship, Information and Instructions about actions, Reward and Power. The study also engages other literature on accountability (see Jones, 1977; Stewart, 1984; Roberts, 1991; Gray, 1992; Gray and Jenkins, 1993; Guthrie, 1993; Parker and Guthrie, 1993; Sinclair, 1995; Broadbent and Laughlin, 2003; Llewelyn, 2003; Bovens, 2005; Barton, 2006; Cooper and Owen, 2007; Kamuf, 2007; Brennan and

Solomon, 2008; Messner, 2009; Roberts, 2009; Spence *et al.*, 2010; Zyglidopoulos and Fleming, 2011; Gibbon, 2012; Joannides, 2012; Lowe *et al.*, 2012; McKernan and McPhail, 2012; Shaoul *et al.*, 2012; Smyth, 2012). As discussed in previous research (see Paper 1), the three critical components to operationalise the accountability model are: *clarity of relationship, transparency* and *power of accountees.* The discussion on these elements is expanded by taking into account the findings of previous research (see Paper 1 and Paper 2).

3.2. An Overview of the Gray et al.*'s (1996) Accountability Model*

Defined as the 'duty to provide an account (by no means necessarily a financial account) or reckoning of those actions for which one is held responsible' by Gray *et al.* (1996), accountability is the theoretical framework applied in this study and, in particular, accountability is evaluated through Gray *et al.*'s (1996) model. Gray *et al.*'s (1996) model is extremely simplified and places relationship at its core. The elements of the model commence from the **relationship** between the accountor (agent) and the accountee (principal) which is defined by society and provides accountees with a right to **information**. Accountees provide to accountors **instructions about actions, reward and power over resources** (Gray et al., 1996). (See Figure 4.1 for a depiction of Gray et al. (1996) model.)

[Insert Figure 4.1 here]

Gray *et al.'s* (1996) model is extended to include elements pertinent to the public sector namely **clarity of relationship, transparency** and **power of accountees**.

3.2.1. Relationship

The first element of the Gray *et al.* (1996) model is relationship. Gray *et al.* (1996) place utmost importance on this element as it drives the accountability concept. Relationship is its core because it ascribes responsibility and in turn permits information rights. Gray *et al.* (1996) argue that relationship is determined by social contracts between members of society and society itself and that the nature of these contracts can be either legal or non-legal. Following their discussion of legal and non-legal contracts, Gray *et al.* (1996) conclude that social and environmental reporting should be mandatory if it is meant to be meaningful.

In their model, Gray *et al.* (1996) extend the traditional notion of relationship which connects the firm and the shareholder. This extension involves the inclusion of multiple stakeholders. The traditional notion of relationship in the private sector considers a one-to-one relationship

between the shareholder and the firm. The traditional model is based on a free market perspective which is meant to rule out society and stakeholders as principals as it is based on neo-classical economic theory tenets (Cooper and Owen, 2007). By extending this traditional model, Gray *et al.* (1996) include a range of multiple stakeholders as accountees. Cooper and Owen (2007) support the introduction of stakeholders and state that stakeholders need to be empowered to hold agents to account. .

The role of relationship in accountability has also been considered by other scholars (i.e. see Ijiri, 1983; Giddens, 1984; Sinclair, 1995; Funnell and Cooper, 1998; Bovens, 2005; Joannides, 2012; Shaoul *et al.*, 2012). The meaning of the accountability relationship is that an individual is expected to account for his/her actions and their consequences to another individual (Shaoul *et al.*, 2012). The person who accounts is required to do so whether he/she likes it or not (Ijiri, 1983), as being accountable implies that there is an obligation to answer for one's decisions and actions (Sinclair, 1995). These decisions and actions arise when authority to act on behalf of an individual or body (the principal) is given to another party (the agent) (Funnell and Cooper, 1998).[91] The relationship between accountor and accountee comprises three elements: 1) the feeling to account for his/her actions (the accountor feels compelled to do so), 2) the opportunity for the accountee to question the accountor, and 3) the result which is the judgement emitted by the accountee possibly in the form of a sanction (formal or informal).

The public sector poses a different scenario in which there are multiple accountees and multiple accountors. In this context, Bovens (2005) argues that there are two problems with public accountability: too many eyes and too many hands. The existence of accountability relations with public officials is based on five different areas which create a situation of *too many eyes*. Conversely, it is difficult for accountees to pin down responsibilities regarding the actions taken which creates a situation of *too many hands*. Needless to say that New Public Management affected the public sector as well which was reflected in a change from only public to more private spheres (in varying degrees).[92] According to Bovens (2005), such

[91] Funnell and Cooper (1998) connect accountability with responsibility and state that the accountability concept is based on a responsibility concept because agents are made responsible by principals. If responsibility is taken into account, accountability involves two responsibilities or duties: (1) the responsibility to undertake certain actions and (2) the responsibility to provide an account of those actions.

[92] New Public Management is characterised by the introduction of neo-liberal reforms in the public sector. Such process started in the early 1980s.

change was reflected in changes in public accountability: a decrease in the scope and intensity of political accountability and the creation or reinvention of new relationships for those new entities delivering public services. Thus, **Clarity of Relationship** is derived as the critical component from the *Relationship* element of Gray *et al.*'s (1996) model. Clarity of Relationship means that accountability involves the relationship between accountor and accountee and such relationship must be clearly determined. Any relationship is characterised by a certain degree of principal-agent delegation, but such delegation does not determine accountability. Instead, it is determined by the clear identification of the actors involved. This critical component tries to explain that in order for accountability to happen, one important part – relationship – must be clear. Such relationship is not represented by the degree of responsibility delegated to the agent. Instead, it is the degree of clarity by which the relationship exists. In other words, it is about the level of clarity about whom the responsibility has been delegated to.

As an example, there are multiple agencies (accountors) and multiple principals (accountees) in the Australian Water Sector. In the case of the Murray Darling basin, for instance, the accountor consists of State water agencies, the federal government and local service providers involved. The same applies with the existence of principals (accountees) which might include irrigators, town-water users, government representatives, and so forth. A list of potential users of GPWARs is provided by the Water Accounting Standards Board (2009).

For a relationship to be an accountability relationship, the actors must be clearly identified. Such relationship is not represented by the degree of responsibility delegated to the agent. Instead, the relationship exists because of the degree of clarity in the relationship.

3.2.2. Information

The second element of Gray *et al.*'s (1996) accountability model is information. Gray *et al.* (1996) provide some discussion on information and circumscribe it as part of the rights ascribed by relationship. The nature of the social contract (legal or non-legal) will influence the outcome (information).

Other scholars also emphasise the importance of information (i.e. see Jones, 1977; Stewart, 1984; Hazelton, 2010). The provision of information is connected with information rights (Hazelton, 2010). These information rights are only one of the myriad of human rights and are fundamental for other rights to be realised (Hazelton, 2010). According to Hazelton (2010),

the intersection of accounting and human rights comes from two perspectives: the first is that corporations are accountable for their actions regarding human rights and the second that certain information might be a human right (or at least constituting a necessary condition for the realisation of human rights). In governmental terms, Jones (1977) considers accountability as a liability and as such implies giving an account of what has or has not been done. Information is necessary as a basis for judgement and to question and debate, and accounts have to be provided in a form that can be understood (Stewart, 1984). Ultimately, this information is a source of power which is given by entities via the provision of information (Stewart, 1984).

However Gray *et al.* (1996) do not provide an explanation of the quality of information. They refer to different types of information that can be provided. Gray *et al*. (1996) state that accountability will be discharged through the provision of information about actions. Gray *et al.* (1996) suggest that information is useful; however, they do not provide a framework to assess its usefulness.

From this perspective there have been discussions on transparency of information by different scholars (i.e. see Gray, 1992; Barton, 2006; Kamuf, 2007; Roberts, 2009; Zyglidopoulos and Fleming, 2011; Lowe *et al.*, 2012; McKernan and McPhail, 2012) and also discussions about the qualitative characteristics of financial reports (i.e. see Australian Accounting Standards Board, 2004). The adequacy of transparency in terms of accountability, however, has been questioned by some scholars (i.e. O'Neill, 2006; Roberts, 2009; McKernan, 2012). Roberts (2009) suggests that amalgamating accountability with transparency creates a problem as transparency is not a synonym for fairness, morals and justness. Due to the fact that transparency distorts those ideas, accountability is reduced to compliance with ethical guidelines. For this reason, Roberts (2009) states that there is an ambivalent embrace of transparency as a form of accountability. According to McKernan (2012), there is a complicated relationship between accountability and transparency as transparency has the potential of creating some sort of tyranny and can have dysfunctional effects. Additionally, O'Neill (2006) states in the UK many institutions and office-holders on whom transparency requirements have been imposed since the early 1990s now seem less trusted and less trustworthy than before even though 'government, corporations, and their critics seemingly converge in seeing transparency as indispensable for accountability and good governance, for preventing corruption and improving performance, for increasing trustworthiness and trust'

(O'Neill, 2006 p. 76). O'Neill (2006) states that transparency, trustworthiness and trust are not better correlated.

The importance of the quality of reporting stems from the fact that not all information that is reported is of quality and ultimately it is this feature is necessary to make informed judgements. In financial accounting, the quality of reporting is supported by the fact that financial reports are prepared following certain qualitative characteristics. In this sense, the Australian Accounting Standards Board (2004 para. 24) mentions that 'qualitative characteristics are the attributes that make the information provided in financial statements useful to users'. In financial statements, the four principal characteristics are understandability, relevance, reliability and comparability. On the other hand, in SWA, the Water Accounting Conceptual Framework was prepared by the Water Accounting Standards Board and describes the qualitative characteristics of SWA reports. The Water Accounting Standards Board (2009 para. 16, 17) states that the qualitative characteristics of GPWARs are relevance, faithful representation, comparability, verifiability, timeliness and understandability.

The critical component regarding *Information* from Gray *et al.*'s (1996) model is **Transparency** which is based on the idea that information provided by accountors has to be transparent in order to create visibility. I consider the quality of reporting as a subset of transparency. There are other ways by which transparency can be reflected including media pronouncements or an entity's responses to questions, and so on. Organisations have different ways of reporting information including the annual report or raw data on web pages. Suggesting reporting as a subset of transparency is based on the fact that accounting plays an important role in the preparation and publication of accounts.

Information is understood by the degree of transparency of the information provided. Transparency will make organisations visible to accountees and will also allow a full examination of the entity. The quality of reporting is considered as a subset of transparency, as previously discussed.

3.2.3. Instructions about Actions, Reward and Power

This element is the final part of Gray *et al.*'s (1996) accountability model. Unlike the previous two, Gray *et al.* (1996) do not provide a comprehensive discussion on this element. This element can be seen as a result after information is provided. Since accountees have the power

over resources, they provide instructions about actions and provide rewards or sanctions depending on performance. Gray *et al.* (1996) concur with Roberts and Scapens (1985) by stating that power rests in the hands of the principals.

A definition of power is not provided by Gray *et al.* (1996); however, Wickramansinghe (2006) states that power can be defined as control or influence in spite of resistance. Wickramansinghe (2006) bases this deduction on the fact that, in life, there are people who can influence others and this level of influence represents power. Nonetheless, Mitchell *et al*. (1997) mention that it is difficult to define power, but not difficult to recognise it as the ability of some people to obtain the outcome they want. However, Mitchell *et al.* (1997) state that power is transitory because it can be lost at any point in time.

The level of power is reflected by the **Power of Accountees** to create change and influence the decision-making process. Stakeholder power is important as scholars have pointed out its ability to make change. For example, the case of Nike in the 1990s demonstrates the way stakeholders could influence companies by exerting pressure on them. Locke and Siteman (2002) discuss that case in terms of good corporate citizenship. At some point, consumer and labour groups organised boycotts of Nike goods in their attempts to see a change in the way the company operated (Locke and Siteman, 2002).

Instructions, Reward and Power needs to be expanded for two reasons. First, in order to be empowered, accountees need information that enables them to evaluate the performance of accountors. There should be a mechanism for performance assessment, but this element is only one factor, and not the only one, that relates to power. Performance evaluation in the private sector is different from performance evaluation in the public sector. According to Broadbent and Guthrie (1992), compliance, rectitude and control are related to accountancy and auditing in the public sector. Shaoul *et al.* (2012) states that public sector accountability has traditionally been characterised as having two features: a descending accountability to citizens (to whom the public sector is owed) and an ascending accountability through public sector hierarchies to Parliament. Performance assessment in the public sector became more complex after the introduction of neo-liberal reforms in the 1980s by shifting from a procedural-type accountability to a performance-type accountability (Shaoul *et al.*, 2012).

The second reason to expand this element is that assessment of performance in the private sector is straightforward as it mainly looks at profit evaluation; however, performance assessment in the public sector is more complex as there are multiple relationships (with

citizens, with the ministries and so on). According to Broadbent and Laughlin (2003), the power of citizens for instance is ultimately reflected in their power of voting which is a medium-to-long-term power. Barton (2006 p. 260) highlights the existence of multiple relationships by stating that 'where all the information, including cost information, is provided to parliament and the public, then parliamentary committees, opposition parties and the media can highlight areas of bad management and inefficiency and place pressure on the government to take appropriate remedial action'.

Previous research (see Paper 1) has identified the Accountability Statement as one mechanism by which to assess performance in SWA, but there might be others. In the second iteration of the standard (known as ED AWAS 1), the Water Accounting Standards Board (2010) states that the Accountability Statement allows an assessment of whether water managers have complied with externally-imposed requirements. However, in the third iteration of the standard (known as AWAS 1), the Water Accounting Standards Board (2012) specifies that the Accountability Statement should not include information on compliance with externally-imposed requirements. AWAS 1 is the final version of the Australian water accounting standard.

After circumscribing the elements of the model, the question is what this model looks like now. For example, let us say that a student wants to do a grade appeal after receiving a grade on a unit. Going through the elements of the model, the first part is to look at the relationship that exists between the accountor and the accountee (clarity of relationship). This part entails knowing who to appeal to or who is responsible for the information the student wants. The second part involves looking at transparency. This part entails knowing what information the student is entitled to get; for example, looking at the exam script so as to determine how the final grade was determined. Analysing these two components does not allow changing the grade; there must be another component so the grade can be changed. It is then that power comes into play, because there must be a process by which the student can use that information. It is not enough merely to have such information. Power is reflected because there is a process by which the student can appeal to the dean of students and get his/her grades changed. The three interconnected elements of the model are important because, in this example, you must have the information in order to exercise that power. In the case of accounting, just because stakeholders are given information on corporate activities is not enough because there must be a mechanism by which the stakeholder can use such information to change an activity. Power is necessary in the accountability model because

unless stakeholders can do something to change 'business as usual', there is no accountability. This reason explains why the three dimensions of the model are necessary. They are necessary because, in the case of stakeholder accountability, stakeholders might need to know first who the manager is (clarity of relationship), then stakeholders need to know if they are given the information they need (transparency). The final part is about what stakeholders can do about it (power). It is time to look at the three components of the integrated model working together in the Australian public sector (because water resources administration and management remain public). This analysis involves, for example, knowing who is responsible for making water allocation decisions in a particular water management area (the boundary question). The second part involves analysing whether they are providing the necessary information to evaluate their performance. The third part entails change which in this example means if water allocation decisions can be changed from the way they are actually made.

The Power of Accountees is represented by the ability of accountees to create changes and influence the decision-making process, but for accountees to be empowered they require a mechanism by which they can evaluate the accountors' performance. I argue that the Accountability Statement might fulfil that role in the context of SWA.

4. Research Method

This study adopted a qualitative approach. The use of qualitative data in accounting research is widespread. According to Miles and Huberman (1994), qualitative data has the following strengths: (1) they focus on naturally occurring, ordinary events in natural settings, (2) data is collected in close proximity to the specific situation, (3) data is collected over a sustained period which makes data powerful to study and (4) data is rich and holistic because they provide insightful descriptions of events. All these strengths were relevant to the qualitative study the researcher is carrying out. The first stage of data gathering involved a case study. In this case study, data was gathered from two host organisations. Data gathering techniques involved analysis of secondary data (or documentation), semi-structured interviews and informal conversations conducted with personnel from both locations. The second stage of data gathering is an addendum to the case study. In this part, public submissions to the WASB on ED AWAS 1 were analysed so as to assess relevant comments and feedback regarding groundwater accounting. These phases are discussed in further detail below.

4.1. Case Study

4.1.1. Site selection

The two case study organisations chosen are the Department of Environment, Water and Natural Resources (the former Department of Water) in South Australia and the NSW Office of Water (in New South Wales). The use of groundwater in South Australia is significant as it provides approximately 65% of all irrigation water for viticulture, agriculture and horticulture (The Government of South Australia, 2011). Water from aquifers is used for drinking in different areas across the state such as the Eyre Peninsula, the South East part of the state and in remote communities (The Government of South Australia, 2011). In the city of Adelaide, groundwater from springs is used for irrigation and for soft drink and beer production. Ensuring the good quality of groundwater is 'a must' in South Australia because of low rainfalls and the limited number of water storage facilities (The Government of South Australia, 2011). In the case of New South Wales, groundwater is important as a source of drinking water in many rural towns and for mining (NSW Department of Primary Industries, 2012b). Since groundwater availability is more stable unlike surface water, gorundwater in NSW is also used to support domestic and stock requirements of farms and distant communities. According to the NSW Department of Primary Industries (2012b), 11% of all water used in NSW is sourced from groundwater. The majority of groundwater areas in NSW are covered by water sharing plans (NSW Department of Primary Industries, 2012b). The 'Water Accounting Project' allow me to have access to collect data on groundwater from both locations.

a. New South Wales

Approximately 17% (51,997 ML) of groundwater consumption in Australia occurred in New South Wales during the period 2009-2010 (Australian Bureau of Statistics, 2012).[93] All water in New South Wales (hereafter NSW) is managed by the NSW Office of Water, which reports to the Department of Primary Industries (NSW Department of Primary Industries, 2012a). The Office of Water is responsible for the strategic management of surface water and groundwater resources of the state (NSW Department of Primary Industries, 2012d). According to the NSW Office of Water (2012a), they report to the NSW Government for the

[93] Moreover, during the same period, agriculture OR agricultural industries consumed 35.3% of water from groundwater sources.

administration of relevant water management legislation (including the *Water Management Act 2000*, *Water Act 1912*, and the *Hawkesbury-Nepean River Act 2009)* and for water policy.

In terms of the way water is administered in NSW, there are other entities besides the NSW Office of Water. The State Water Corporation, which is a stand-alone State Owned Corporation in charge of bulk water delivery in rural NSW, operates the main rural dams across New South Wales (NSW Department of Primary Industries, 2012d). The supply of water to households is the responsibility of local water utilities across most of regional NSW and state-owned corporations in the main urban centres (NSW Department of Primary Industries, 2012d).

For the period 2009-2010, the NSW Office of Water prepared water reports under ED AWAS 1 for four catchment areas in NSW (Lachlan catchment, Macquarie-Bogan catchment, Murrumbidgee catchment and Namoi catchment). For the period 2010-2011, the NSW Office of Water envisages preparing General Purpose Water Accounting Reports, under ED AWAS 1, for all Murray-Darling Basin regulated river catchments and uploading them to the Office of Water webpage (NSW Department of Primary Industries, 2012c). Additionally, in light of ED AWAS 1, a document specifying the methodologies used in groundwater was prepared by the NSW Office of Water. By April 2012, the NSW Office of Water had released six water reports (under ED AWAS 1) for the period 2010-2011. Unlike surface water, information disclosed about groundwater is not complete; however, progress can be noticed from the 2009-2010 edition to the 2010-2011 edition. There were attempts to present the groundwater component separately from the surface water component, although this was not done for all reports. Additionally, they do not present information on groundwater liabilities at this stage, only information on groundwater assets.

b. South Australia

Water in South Australia (hereafter SA) is managed by the South Australian Department of Environment, Water and Natural Resources (hereafter DEWNR).[94] In terms of water, the DEWNR has to safeguard the availability and sustainability of water resources in the state by advising the Government and the community about the quantity, quality, availability and use of water (The Department of Environment Water and Natural Resources, 2012a). The work of

[94] The DWNER was created on 1 July 2012, but before its inception the Department of Water was in operation from 1 July 2010 to 30 June 2012.

the DEWNR is guided by the State's strategic plan *Water for Good* (South Australia's plan to guarantee the availability of water resources to 2050), the State Natural Resources Management Plan, legislation, the National Water Reform Agenda and the National Water Initiative (The Department of Environment Water and Natural Resources, 2012a).

South Australia's water resources are divided into surface water and groundwater. Both systems are interconnected and feed each other (The Department of Environment Water and Natural Resources, 2012d). South Australia places overreliance on the River Murray for most of its water so the objective is to find alternate sources of water. These are set out in the plan *Water for Good* and include the use of desalination plants and the recycling of stormwater and wastewater (The Department of Environment Water and Natural Resources, 2012c). According to the Australian Bureau of Statistics (2012), in 2009-2010 groundwater in South Australia represented approximately 5% (15,545 ML) of total distributed water used in Australia. However, groundwater has a huge potential in South Australia. In fact, groundwater there represented 60% of water consumed in Agriculture during the period 2009-2010 (Australian Bureau of Statistics, 2012).

In terms of water, South Australia is divided into eight natural resource management (hereafter NRM) regions, which are aligned with administrative boundaries. Each of these regions is environmentally diverse and consequently uses water resources in different ways (The Department of Environment Water and Natural Resources, 2012b)[95]

4.1.2. Data Collection and Analysis

Access was gained to both SA and NSW locations due to the networking done during the water accounting project during 2008 and 2009. The water accounting project, in which the researcher was involved along with one of his supervisors (see Paper 1), allowed him to meet relevant staff from the Departments of Water of five jurisdictions and also staff from the Murray-Darling Basin Authority (the former Murray-Darling Basin Commission). In early 2011 an informal interview was conducted during a water-related event with the Water Accounting Development Coordinator. The NSW Office of Water in Parramatta (Sydney) was visited over a period of seven business days. During those days, several discussions with

[95] These regions are as follows: (1) Adelaide & Mount Lofty Ranges, (2) Eyre Peninsula (which predominantly relies on groundwater due to scarce surface water resources), (3) Northern & Yorke, (4) South Australian Arid Lands, (5) Alinytjara Wilurara, (6) Kangaroo Island, (7) SA Murray-Darling Basin and (8) South East.

relevant staff members (formal and informal) were undertaken and both internal and public documents were revised.[96] During the visit, six staff members were interviewed in total: five staff members were interviewed once while one staff member was interviewed twice (to follow up on outstanding issues).

The intention of the interviews was to discover what was in the minds of the interviewees regarding groundwater accounting and accountability. Interviews were semi-structured and lasted between 30 to 45 minutes (except for one 15-minute interview and one 85-minute interview). Unlike structured and unstructured interviews, semi-structured interviews are considered as non-standardised since the researcher prepares a list of questions and themes that will be covered during the interview which might vary from one interview to the other (Saunders *et al.*, 2007). The degree of variation is related to either the order of the questions, or the addition of new questions or the omision of one or some questions. A questionnaire consisting of 22 questions was prepared and the types of questions in the questionnaire were: open questions, probing questions and specific and closed questions (following Saunders *et al.*, 2007). The interviews were recorded after the interviewees granted permission to do so. Recording information is recommended as a way to control bias and also to generate reliable data for analysis (Saunders *et al.*, 2007).

In terms of South Australia, the DEWANR (the former Department of Water) was visited in July 2011 and the same day an informal interview was carried out with a relevant staff member for 45 minutes. Additionally, several emails were exchanged with two staff members and also public documents reviewed.[97] A group interview with three personnel from the Department was also carried out. This was a telephone interview which lasted for 46 minutes and was recorded (after permission was granted by the interviewees). The interview was semi-structured and the same questionnaire that was used in NSW was used in SA. Not all questions were answered during the telephone interview; therefore, a follow-up was carried out. In this follow-up, two key personnel answered the remaining questions in written form and emailed those responses.

[96] The main source of public information was their website (see www.water.nsw.gov.au).

[97] All these documents are publicly available on the websites (see www.nrm.sa.gov.au, www.environment.sa.gov.au, www.waterconnect.sa.gov.au, www.bom.gov.au/water/nwa/2010 and www.waterforgood.sa.gov.au).

The post-interview analysis follows O'Dwyer's (2004) process of analysis in which data is reduced, displayed and interpreted. This view is consistent with Miles and Huberman's (1994) method in which analysis is defined as the concurrent flows of data reduction, data display and conclusion drawing and verification. Nvivo software was used to categorise the data. Each interview was analysed and coded twice. Data coded was revised two more times in order to interpret all information coded.

4.2. Extension to the case study: Analysis of secondary data

Further data was collected by analysing public submissions to the WASB on SWA (reflected in the ED AWAS 1). The WASB released the Exposure Draft of Australian Water Accounting Standard 1 (ED AWAS 1) in 2010. After its release, the WASB asked the public to make comments via submissions on the content of the Exposure Draft. Twenty-eight submissions were received until June 2011 and were publicly released later in 2011.[98] The final sample comprised 23 submissions because some respondents sent comments more than once. Thus, in order to avoid repetition in relation to the source of each submission, submissions were grouped according to the source.

In the ED AWAS 1, the WASB directed 54 questions to the public. Therefore, the submissions should have followed that structure, although it was up to the respondents to answer all or some of the questions. Out of the final sample of 23 submissions, nine of them were from potential report preparers. Therefore, in order to keep consistency with the case-study part of the project, these nine submissions were analysed in depth and coded in Nvivo, but the coding was only about specific comments related to groundwater and groundwater accounting.

Singleton and Straits (2005) discuss that one bias in the use of secondary data is that sometimes information may not be relevant to the study. However, in this situation secondary data is completely relevant for the purposes of this study because all data represent opinions regarding ED AWAS 1. The findings are discussed next.

[98] These submissions on ED AWAS 1 are publicly available from the Bureau of Meteorology's website (http://www.bom.gov.au/water/standards/wasb/awasfeedback.shtml).

5. Findings

Following an evaluation of data gathered from the case-study sites and from the public submissions on ED AWAS 1, the findings are discussed in order to answer the research question that drives this study. The findings are grouped in three sub-sections: first, findings regarding current groundwater reporting without following SWA guidelines are discussed; second, general findings about groundwater and about groundwater management are discussed and, finally, findings in relation to the extended elements of Gray *et al.*'s (1996) accountability model are discussed.

5.1. Current groundwater reporting without SWA

Under the National Water Initiative (see Council of Australian Governments, 2004), every constituency is required to prepare a groundwater account. Current groundwater reporting mechanisms in NSW are both mandatory and voluntary, but these reporting mechanisms are not well-developed because they are still at an early stage.

The NSW Office of Water presents groundwater information voluntarily in the form of online registers whereas mandatory groundwater reports can be seen via the 5-year review water reports. (The NSW Office of Water also produces status reports.) These reports include elements of water use, changing water quality, changing water levels and changes in water volumes. Status reports started being voluntary, but are becoming mandatory especially in those areas with heavy groundwater usage. In NSW, there are 150 groundwater plan areas so preparing status reports for each would be resource intensive. For these reasons, report cards are prepared in areas in which groundwater is not heavily used. Report cards are those reports that are small in terms of length. Furthermore, the NSW Office of Water provides groundwater data to BoM for the preparation of the national water accounts and has used groundwater data to prepare General Purpose Water Accounting Reports (under SWA). On current groundwater reports:

> *'Review reports are for water sharing plans. Plans are for 10 years, but rules and performance (compliance) are evaluated every 5 years. By law, they have to prepare those review reports every 5 years…it is assessed whether they are complying with the rules that are in place (or not)' (Interviewee 1, round 2 – Senior Water Accounting and Reporting Officer)*

> *'We report on – we assess the groundwater condition and we report to various areas. We report to the State of Environment…we report to the National Water Commission, we*

report to the Murray-Darling Basin Authority… They are done every 2 years. Sometimes we fall behind and we do them every 5 years… So reporting is becoming more mandatory but it started off as being voluntary' (Interviewee 4 – Director of Water Management Implementation)

In SA, the DEWNR prepares reports either mandatorily or voluntarily.[99] Water reports including groundwater are currently being prepared in SA and NSW, but they are prepared in an old-fashioned way because different types of reports are prepared which satisfy the needs of managers and direct customers. However, there is no a framework that guides all water report entities in the preparation of reports in a consistent way.

5.2. Groundwater and Groundwater Management

Even though groundwater and surface water are the same resource (water), there are differences between both systems. Both differ due to timescale. In surface water, the timeline is shorter. For this reason, adaptation is easier with groundwater than surface water because water travels slowly. Conversely, it might take a couple of years for the water to reach the aquifer so it is a much slower process. Surface water is more dependent on rainfall and flooding.

'I think it is a different product that you get by running this process in groundwater than you get in surface water because in surface water...the timeline is much shorter...so groundwater travels very slow, has very big…underground storages. You have time to adapt. So if you run this process and you get it wrong, the groundwater system is very forgiving' (Interviewee 4 – Director of Water Management Implementation)

'[in terms of groundwater] it only happens on a large timescale and essentially because of the large timescale, it makes research and investigation very difficult' (Interviewee 6 – Report Services Officer, water accounting)

Surface and groundwater are managed in different ways. In the surface component, water stored in dams lasts for three years; therefore, it is managed based on that time-frame. Even though groundwater has a bigger storage capacity than surface water, not all water stored in aquifers is managed. Instead, recharge is managed. The average recharge is used to set the annual extraction limit, but this number is estimated. Groundwater is managed based on the

[99] These reports include: (1) Report to BoM under Water Act 2008 regulations (mandatory), (2) Groundwater Status Reports (DEWNR corporate plan), (3) Demand and supply reports (Water for Plan), (4) Contribution to National Water Account (funding agreement with BoM), (5) Website of groundwater information (DEWNR public reporting requirements), (6) DEWNR technical publications (DEWNR public reporting requirements), (7) Water trading reports (DEWNR public reporting requirements) and (8) Water licensing details (DEWNR public reporting requirements)

timeline of recharge and discharge. More specifically, groundwater management involves managing by estimating the amount of water that can be taken out of an aquifer in the long-term.

> *'We manage to recharge. It is very difficult to measure recharge accurately so we work on average figures… We set that as our extraction limit…we do not set all the recharges on extraction. We determine how much of the recharge should be allowed to be allocated…with groundwater you can be adaptive in your management, you can look at trends and adapt the way you are managing' (Interviewee 4- Director of Water Management Implementation)*

> *'We do not manage by defining a volume. We manage by defining a level we do not want to fall below or not even a level. We manage by saying how much water, in the long-term, can we take out of that aquifer? …we do a long-term model to say: what is going in, and we say: that is the maximum we can take out' (Interviewee 5- Water Accounting Development Coordinator)*

In terms of reporting in either independent or combined reports (surface water and groundwater), only three interviewees supported the idea of having separate reports. In fact, the vision of NSW Office of Water is to produce surface water reports independent of groundwater reports. However, they also point out that such reports should show the interactions between surface water and groundwater and that numbers should match in case of interacting water entities.

> *'I would say they should be separate… Because there is a whole different response time, there is a whole different accuracy in measurements. Then the groundwater numbers will dwarf any surface water numbers and they will have a certain degree of uncertainty than a surface water number. You'd find a greater difference in quality than the surface water. The important thing is that where they do interact, that the same numbers are used, like the surface water base load – that is contribution for groundwater – should be the same number as groundwater discharge to rivers, sort of thing' (Interviewee 8 – Principal Hydrogeologist)*

> *'No, I would prefer to have them separate… I think the community has not got its head around the connection between surface and groundwater and I think we need to deliver a product that is understandable [to] the community groups. To do that, the easiest way…is to run separate accounts acknowledging the connection between the two. We might get there in 10 years or 20 years of getting the community understanding that hydraulic connection between the two and the exchange of volumes of water between the two, but I do not think we are there now' (Interviewee 4 – Director of Water Management Implementation)*

Those who favour combined reports support this idea because water organisations are usually responsible for managing a range of water resources which often interact. For this reason, it is preferable to prepare combined reports so as to give the community an improved resource picture.

'I believe they should be combined because the actual managing of the resource – a lot of the national kind of guidance of NWI, everything suggests that the water resources should be managed together, there should be no separation between our water as for like the final figure' (Interviewee 6 – Report Services Officer, water accounting)

'In my opinion it's to have them combined …and also because it is surface water and groundwater. Difficult as they are to measure, I think it is valuable to have them in the same area' (Interviewee 7 – Project Manager, water accounting project)

In NSW, they suggest preparing water (and groundwater) reports based on water sharing plans because if reports are prepared based on catchments, information might not match.

'Because when you are doing your accounting and working out what the end balances of all these irrigators accounts should be, generally they are reliant on what the rules are set out in the water sharing plan' (Interviewee 1, round 2 – Senior Water Accounting and Reporting Officer)

5.3. Issues in groundwater reporting under SWA based on Gray et al.'s (1996) accountability model

Before analysing the issues identified in future groundwater reporting under SWA, it will be worth analysing the perception of report preparers on SWA. Interviewees were asked whether they believe reporting mechanisms under SWA will discharge the accountability of managers of groundwater resources. For the majority of interviewees, those reports are useful only because they provide information. They do not see GPWARs as a mechanism of accountability.

The elements by which the Gray *et al.* (1996) model are operationalised (discussed in Section 4), *Clarity of Relationship, Transparency* and *Power of Accountees*, will be analysed next.

5.3.1. Clarity of Relationship

In terms of relationship, it was stated in Section 4 that having a clear relationship is a necessary condition for accountability to occur. Accountability entails in the first place determining clearly the relationship between the accountor and the accountee and this relationship was considered as ex-ante. Thus, clarity of relationship can be evaluated from two sides: the accountor side and the accountee side.

The area to report on and the boundaries of aquifers are important in considering the water report entity. Surface water areas do not necessarily match with groundwater areas because of the boundaries. Sometimes there are many aquifers underground aligned with a surface water

area, but again some of these areas are not aligned. In New South Wales, they solve this problem by following water-sharing plans as water is managed within the area of each plan.

> *'…what we do is _ so here is the river. Here [are] different aquifers. These might be highly productive aquifers on alluvial flats associated with the river. But then we might also have aquifers down here…So we might have other aquifers and this might be, let's say, a thousand metres. So we would label this as a water-sharing plan and we've had accounts – so people have got bores down in here' (Interviewee 4 – Director of Water Management Implementation)*

In terms of the accountor-side, an important difficulty stems from separating clearly between the report preparers and the water reporting entity (according to the second iteration of the standard). In most cases, they do not overlap. Additionally, it has to be assessed whether or not there are many layers of accountability within the reporting entity. Determining who is responsible for managing water is important, but the report preparer would not always be the ultimate manager of the resource.

> *'One of the things that is difficult to determine is exactly who is responsible for managing various different resources. Within South Australia there [are] complex interactions between the members of this Department, the Department for Water and the Natural Resources Management Board' (Interviewee 7 – Project Manager, water accounting project)*

The DFW (later superseded by the DWENR) attempted to determine who is responsible for the management of water resources and who should report on them. According to the DWNER, stakeholders in the management of water include the Department of Water, Natural Resource Management Boards, the Minister for Water and the river Murray, SA Water Corporation and local councils.

> *'DFW is clearly responsible for some aspects of water management; however, it is unclear whether or not DFW has complete responsibility for managing any particular water resource' (Interviewee 6 and Interviewee 7 combined – Report Services Officer, water accounting / Project Manager, water accounting project)*

The second difficulty on the accountor-side about groundwater reporting is the identification of the water reporting entity. There are two cases worth exploring regarding the boundaries of water reporting entities. Firstly, there is some doubt about whether to combine or separate groundwater and surface water in water reports. As mentioned before, New South Wales favours separate reports (even though one interviewee was against it) whereas two staff members in South Australia favour combined reports over independent reports.

Secondly, the doubt is how to report on different aquifers that are in the same area. There are cases in which there is more than one aquifer in a particular area; for example, there might be more aquifers underneath a particular surficial aquifer. The majority agrees in having a consolidated report that groups all of them. The main justification for having all of them in one report is because of the interactions.

> *'They are not independent systems unless they are an independent aquifer and they have no interactions whatsoever, but as long as there are interactions, as long as the management rules that apply to them are under the same plan, it makes sense to me to have them together' (Interviewee 1, round 2 – Senior Water Accounting and Reporting Officer)*

> *'[whether aquifers are confined or unconfined]…this is a difficult one because unconfined fresh rock aquifers should all be combined because they are essentially in one…geographic area because of the high degree of interconnection and they are all recharged from rainfall and they all have the same discharge process as with streams… So that is…straightforward… The difficulties come when you have layered certain entry aquifers one on top of the other. That is where in some ways treating them crudely as one might be more convenient at the scale of the reporting units' (Interviewee 8 – Principal Hydrogeologist)*

When looking at the accountee side, attention must be paid to the potential users of water accounting reports. The wide range of users includes primary and secondary stakeholders. A possibility to ease the identification process might be that primary stakeholders are chosen as main users. A proxy to determine primary stakeholders could be identifying major groundwater users. In this case, major groundwater users are irrigators and farmers. However, they would not the sole users of potential water accounting reports because regulators and government entities would also be primary users of SWA water accounting reports.

The interviewees revealed that proper identification of potential users of GPWARs is still an unresolved issue. Respondents indicated the need for more studies on the identity of water report users and their information needs. Not having clarity in terms of who the final user of water reports would be complicates any accountee-accountor relationship. For the majority of interviewees it is hard to identify who the users of GPWARs will be.

> *'I do not know to be frank with you. I just do not know who is going to use it, but I think once it kicks off and a lot of people understand what it is, I think, yeah, a lot of people will use it. But for the time being, I do not know… I know that we put our reports in the internet for everyone to access… It could be anyone. It could be government departments' (Interviewee 3 – Hydrogeologist)*

> *'I still am struggling to find the users of some of these reports to start with. I still have not convinced myself that there is a major market out there for these reports…good for*

the people who are quickly coming in to have a look at what happened in that year as an annual review… Outside of that, I struggle to get my head around who would use it. It is not a tool that can be used for analysis, long-term analysis. It has not got the appropriate data in for that. You cannot compare year-to-year very easily for most of the stuff… Outside of that, I cannot see too many users of it' (Interviewee 5 – Water Accounting Development Coordinator)

'The majority of the water – say 85% – is taken for irrigation purposes. The other balance is town water supply and stocking domestic people. So I would think that the irrigation community who use groundwater would be interested – the most interested to know what is happening to the groundwater resource' (Interviewee 4 – Director of Water Management Implementation)

5.3.2. Transparency

I describe the quality of reporting as a subset of transparency. In terms of SWA, the Water Accounting Standards Board (2009) states that the qualitative characteristics of SWA reports are relevance, faithful representation, comparability, verifiability, timeliness and understandability. Currently, all jurisdictions are working together to determine water assets and water liabilities for groundwater, with the Department of Water in Western Australia providing a lead role because the Water Accounting Standards Board (2010) does not provide specific guidance. Instead, it provides just a general description on what to consider a water asset.

Potential issues in preparing groundwater reports under SWA will now be explored. All interviewees agreed with the idea of preparing water (and groundwater) reports using financial accounting principles.

'I think it is very useful, yeah… So in this way, you know how much water is going out, how much liability on your groundwater resources, how much assets you have and all these things' (Interviewee 3 – Hydrogeologist)

'I think it is very thorough… I think it treats it pretty much the same as surface water and there is a terrible lot of detail' (Interviewee 1, round 2 – Senior Water Accounting and Reporting Officer)

The standard ED AWAS 1 poses challenges regarding groundwater reporting. Such challenges are different in comparison with surface water reporting.

'…but our issue with groundwater data is that we do not see that the current standard or the proposed standard ED AWAS 1 works as well as it does for surface water…in terms of presenting the information to our users in the best possible way where they can interpret the figures and get the information they need out of that account… I am not sure that ED AWAS 1 does the best job for that, specifically…in terms of defining the asset and what it is' (Interviewee 1, round 2 – Senior Water Accounting and Reporting Officer)

NSW appears to be the most pre-eminent of all the Australian states and territories in the preparation of water (and hence groundwater) reports following ED AWAS 1. For the period 2009-2010, the NSW Office of Water produced reports for four valleys[100] whereas for the period 2010-2011, it produced reports for all Murray-Darling Basin regulated river catchments.[101] Finally, by the end of 2012, they published a report for the Border Rivers Catchment for the period 2011-2012 (see NSW Department of Primary Industries, 2012b). The groundwater component is included in some of these reports. Groundwater estimates follow a range of methods which are described by the New South Wales Office of Water along with the reports.[102]

For example, by analysing the Lachlan catchment report for the period 2009-2010 (which includes a groundwater component) (see Burrell *et al.*, 2012), it was found that:

- no groundwater liabilities were considered at that stage due to resource constraints,
- in the sub-section 'Changes in Groundwater Storage' of the Statement of Changes in Water Assets and Water Liabilities, the unaccounted volume is quite high (this amount was reported to offset increases),
- of the three methods described, method C is the least reliable for the purposes of annual water budgets only, and
- the estimated amount shown as 'opening groundwater storage' is unrealistic (they used the Long Term Extractable Limit as a proxy of the 'extractable portion' defined in the ED AWAS 1).

South Australia is yet to prepare groundwater reports under SWA. The closest reports to those prepared under SWA are the Groundwater Status Reports prepared by the DWNER.[103] These reports include information on regional hydrogeology, on groundwater dependent ecosystems,

[100] Lachlan catchment, Macquarie-Bogan catchment, Murrumbidgee catchment and Namoi catchment.

[101] Border Rivers catchment, Gwydir catchment, Lachlan catchment, Lower Darling catchment, Macquarie catchment, Murrumbidgee catchment and Namoi catchment.

[102] There are three methods to estimate water movement, but these methods are connected to the number of monitoring boreholes in the area. Method A is called Groundwater Models, Method B is called Water Table Fluctuation and Method C is used for areas where there is no sufficient bore data available. See: www.water.nsw.gov.au/Water-management/Water-availability/Water-accounting/default.aspx.

[103] See www.waterconnect.sa.gov.au/GSR/Pages/default.aspx.

on groundwater monitoring sites and an assessment of the status of the groundwater resource at current use levels. However, these reports do not follow SWA.

Transparency also involves examining the seven water accounting statements prepared under SWA (under the second iteration of the standard or ED AWAS 1) and whether or not report preparers would encounter any problems in preparing them.[104] There was resistance to the Assurance Statement and the Accountability Statement. With respect to the former, preparers felt there was no need to assure information that is already public. Moreover, assurance will be an expensive process.

> *'In a government organization where everything is already out there in the public arena…or most of the data is already out there, available in other sources, I am not so sure that a government agency is going to pay some accounting firm $100,000 to come and assure their accounts in terms of their water… The standards are also seeming to be pushing down the line of accountability, and accountability is another issue that we see as a problem. The standards were [mainly in the line] of compliance as well, and I do not think that compliance is something that should be in the accounting standards…if something does not meet our water sharing plans and falls outside or anything like that, we will document it in our general purpose water accounts as an issue, and we do not see why we need to re-state that again in an accountability statement… We will not be able to get our commissioners and directors and everything else to sign off on our accountability in that way. Accountability has got to be a more generic statement' (Interviewee 5 – Water Accounting Development Coordinator)*

An important point related to transparency and reporting is to assess whether or not reports reflect a complete picture of the groundwater resource and its management. The majority of interviewees mentioned that groundwater information in SWA reports is comprehensive and all items in the statements are relevant. However, the quality of such information is questioned because in groundwater, unlike surface water, there are many unknowns.

> *'There are some things we feel do not work, in terms of the financial accounting structure…when you move it across to water, and I think that is just the nature of financial accounting compared to water accounting. Things that people want to see do not appear, if you go the Australian standard line…when you have got your physical flow statement, your statement of changes, and your statement of assets and liabilities, typically in your statement, people would expect to see a usage statement in there' (Interviewee 5 – Water Accounting Development Coordinator)*

In terms of groundwater reports under SWA reflecting a more complete picture of the entity, the NSW Office of Water makes three suggestions: combining the Statement of Changes of

[104] These statements are: Contextual Statement, Accountability Statement, Statement of Water and Water Liabilities, Statement of Changes in Water Assets and Water Liabilities, Statement of Physical Water Flows, Note disclosures and Assurance Statement.

Water Assets and Water Liabilities with the Statement of Physical Water Flows, finding a way of showing the amount of internal trade (as it will be cancelled) and including a physical flow diagram into the combined statement.

a. Problems in Producing Groundwater Reports under SWA

After a thorough evaluation of the documents provided at both locations, informal discussions with personnel and the responses provided in structured interviews, it was found that if report preparers are to prepare groundwater reports under SWA (and following ED AWAS 1), they will encounter two core problems, those being (for the purpose of this study) *Pre-existing data limitations* and *Translating financial accounting into water*. Both core problems are relevant on their own account. Their degree of relevance would be primarily based on the physical area covered by the report. For example, if groundwater reports are prepared for the whole state, then the first problem (Pre-existing data limitations) is significant. If it is accepted that water reports will be prepared only in areas in which there is already a significant amount of data, then the second problem (Translating financial accounting into water) is more significant. Both core problems pose limitations in future preparation of groundwater reports under SWA as can be seen from the following quotes:

> *'Yes (problems) accumulate on top of each other… So, because you have not got the appropriate amount of data, you have trouble implementing the standards in some areas and the standards have an out on that' (Interviewee 5 – Water Accounting Development Coordinator)*

> *'Accounting gives the underpinning method of doing that but we still need good science, we need good field data – very much timely field data' (Interviewee 4 – Director of Water Management Implementation)*

The problem of *Pre-existing data limitations* involves an existing problem related to groundwater data capturing and reporting and that is groundwater data gathering. Currently water entities face a lot of problems in gathering groundwater data. If SWA is implemented, this problem may manifest if reports for all groundwater entities are going to be prepared. It seems unavoidable to have groundwater data limitations because groundwater occurs below the surface so it cannot be seen and hence cannot be measured easily. Thus, there are higher degrees of inaccuracy with groundwater data. For a complete picture, it is necessary to have a comprehensive network of monitoring bores to measure water levels, and to have metres on all pumping bores to determine extraction limits and also the geological formation of each aquifer. Since it is almost impossible to have up-to-date groundwater information, some data is estimated by using models. Models are a good approximation, but still it is not the real

value. The challenge here is to ensure the reliability of those groundwater models because data gathered is the basic ingredient for the preparation of groundwater accounting reports. Interviewees consider data as an important requirement in the preparation of reports. The more reliable the data captured on different water systems, the more accurate the report will be. Having more consistent data is necessary in having reliable and relevant reports as information is a key element in water management. Lowe *et al.* (2016) examine the uncertainties related with the preparation of water accounts identifying six sources of uncertainty. Regarding the inaccuracy of groundwater data, Lowe *et al.* (2006) discuss about 'incertitude' which is connected with people's limited understanding. In some cases, subjective judgement might be used whereas in others it might not be. An example of this source of uncertainty based on the findings of the case study is the lack of information on water inputs into aquifers.

Groundwater is measured on a long-term average basis. The amount of water that can be pumped is based on an estimate of how much water is going into the aquifer. It is not possible to estimate how much water goes in and the monitoring bores measure water levels. If reports under SWA are going to be prepared, the two basic ingredients that need to be measured are recharge and pumping.

> *'…because in groundwater situations we have a network of monitoring bores and we measure the water levels in those bores… For example, if it rains a lot, the water levels rise. But you have to relate that rising water level to an actual volume, and to do that you have to estimate the actual parameters' (Interviewee 2 – Hydrogeologist/Team leader)*

The majority of interviewees in NSW and SA mentioned that significant groundwater data and flow models exist, but mainly in areas of high water usage. On the other hand, there is a lack of groundwater data in areas where groundwater quality is not good and where usage is not high. (These areas outnumber the former.) But some of the interviewees also acknowledge that overall groundwater data is incomplete.

> *'[there is a limitation on] the actual measurement of [what is] used. When usage is not in a prescribed area – and even sometimes within prescribed areas – the measurement of usage is…poor' (Interviewee 7- Project Manager, water accounting project)*

The above quote highlights the problems associated with groundwater measurement. There are many uncertainties surrounding groundwater and many estimates and models are

undertaken. There is a limited number of monitoring bores in aquifers as well as infrequent readings of monitoring bores.[105]

> *'The data is sketchy. Even where there is groundwater bores and they monitor it, it is not continuous…so it might be monitored twice [or] three times a year. To interpret this data, you need continuous data' (Interviewee 3 – Hydrogeologist)*

> *'There is always data limitations…you cannot measure it as easily as you can surface water. You have to have a whole network of bores to measure water levels, you need to have metres on all your pumping bores to determine your extraction limits, you need to know the geological framework of the aquifer that you are interested in. So in doing the accounting side of things, there is all these related things that you need to understand in order to make the accounting side useful' (Interviewee 4 – Director of Water Management Implementation)*

> *'For groundwater, yes, there are significant areas [where] we do not have much groundwater data. We do not have long historical records in a number of areas as well so that is a problem,…you can't accurately account for what is happening in groundwater if you have not got enough monitoring… I think we have a significant shortfall in our monitoring network' (Interviewee 5 – Water Accounting Development Coordinator)*

When talking about measurement, it is important to know how much water goes in and how much goes out of each aquifer (known as groundwater balance). To determine how much water goes out, there are monitoring bores that measure water levels; however, the frequency of those readings is not constant. In terms of determining how much water goes in, the recharge figure is important. Identifying the recharge is important if the aquifer is to be managed sustainably (recall Section 3). It is in determining this figure that groundwater models are used because recharge is difficult to measure. It is this context that should SWA goes ahead; standards for recharge estimation must be stated.

> *'So if you are saying …we are going to manage this sustainably, then you need to know what recharge is occurring. Recharge is difficult to measure, so we develop groundwater models which are complicated models …they help but they are not perfect and …they are never right in their answer' (Interviewee 4- Director of Water Management Implementation)*

Not all groundwater and surface water measurement problems are similar. Some specific problems related to measurement identified in SA involve:

[105] For example, in some bores readings are done twice a year which makes it difficult to see a trend because of limited data input.

- the availability and usage of data (difficulty in collecting usage of groundwater data, lags in availability, unlicensed groundwater in certain areas, make it difficult to monitor),
- the requirement to estimate (some usage, flow and other quantities must be estimated when metering and modelling is not available),
- measurement of flows (flow in and out of aquifers is difficult to assess),
- absence of long term studies to accurately measure groundwater,
- water use practices impact measurement (groundwater may mix with other water sources making it difficult to measure), and
- modelled results (models are expensive to run and calibrate and models from different geographical regions cannot be applied to all regions).

Measurement is also related to the reliability of the data. Even in situations in which data is gathered, there is no guarantee that such data represents correctly the groundwater scenario of a particular aquifer. In fact, in some areas the quality of data is not good overall. If there are not enough readings, then reliability of data is reduced.

One of the reasons why measurement of groundwater data is problematic is related to funding. The reason for this problem is because water reporting entities are government entities, and funding is always limited.

> *'We cannot afford to [start] monitoring the wells every metre or so, which you would need almost, to get a real true representation of groundwater in some systems. So there is a lot of interpolations of results and that is where the estimates come in…So even though we would like to investigate a lot of quite important processes, we just do not have the funds and the resources to do it. An example of that is…groundwater interactions' (Interviewee 1, round 1 – Senior Water Accounting and Reporting Officer)*

Also connected to measurement is modelling. Measured data is used in groundwater models. Modelled results are expensive to run and calibrate. Moreover, applying models from a different region may not be suitable. Funding is also a constraint with groundwater modelling. The majority of interviewees agree with the idea of rating such models in terms of their ability to accurately explain reality.

> *'So to have a rating for the amount of water… I think…any model should be able to do that with reasonable accuracy, provided it is well-calibrated within the guideline boundaries. But often models are not designed specifically to do this' (Interviewee 8 – Principal Hydrogeologist)*

> *'We have not actually put like a category of different models. There are various models all across South Australia. Some of these would not involve using groundwater monitoring at all. They might use…isotopes in the water itself because you actually work out the groundwater age. Other methods might use airborne geophysics' (Interviewee 6 – Report Services Officer, water accounting)*

The second core problem in preparing groundwater reports under SWA, Translating financial accounting into water – involves the application of financial accounting principles to the physical measurement of water through ED AWAS 1, which commences with the application of accounting concepts. ED AWAS 1 becomes a problem when defining water concepts in accounting terms. This terminology problem, among others, involves for example defining the extractable portion of aquifers, defining the boundaries of the water reporting entity and explaining the amount of net water assets in any statement.

> *'Difficulties in definition may result in reports which are not comparable between jurisdictions. Even if items are included in the notes, the desired rigour of the water accounting statements will then be lost… Groundwater resources in particular do not fit well into the standard definitions and maybe misrepresented in the reports because of this…' (Interviewee 6 and Interviewee 7 combined – Report Services Officer, water accounting / Project Manager, water accounting project)*

> *'I think what we need is a glossary to convert the accounting terms into everyday groundwater terms… So often…accounting terminology and…groundwater terminology do not mix very well and have an additional purpose…' (Interviewee 8 – Principal Hydrogeologist)*

The main example of the second problem is a current issue being addressed by report preparers in all jurisdictions which is the determination of the extractable portion (groundwater assets). ED AWAS 1 does not provide specific guidance on what should be considered an asset; the WASB (2010) states that a water asset is the *extractable portion* of an aquifer. The *non-extractable portion* is considered as a contingent asset. The rationale is that not all water in an aquifer should be considered a water asset because not all water is available for use. Jurisdictions are still discussing what the *extractable portion* is and different methods have been proposed without a resolution. This task is even more complex if it is intended to determine assets and liabilities of confined and unconfined aquifers.[106] Quantifying groundwater assets is not as straightforward as quantifying surface water assets since groundwater storages are not visible and groundwater is difficult to measure. Jurisdictions suggested using the annual draw extraction limit of a groundwater resource as a proxy to

[106] According to the National Water Commission (2012 p. 46), unconfined aquifers are 'aquifers in which there are no confining beds between the saturated zone and the ground surface, so the watertable can fluctuate'.

estimate groundwater assets, but it has several shortcomings. Additionally, the different jurisdictions have suggested approaches for major systems and for systems with limited data. Furthermore, applying financial concepts into water is not straightforward as surface water and groundwater have their own unique characteristics which are not the same. For example, water in a dam can be considered as water in stock. On the other hand, in groundwater the 'stock' concept cannot be applied in the same way because the 'sustainable yield' is not affected by outflows, recharge and yearly extractions.

5.3.3. Power of Accountees

As explained in section 3.2.3, accountability entails power as it is argued that through information, accountees will be empowered and will be able to influence the decision-making process. Such power will be reflected in the actions that accountees will carry out after the information is given. Power could not be fully assessed at this stage of standard application directly. Therefore, any comment on power is somewhat speculative. Report preparers were asked about whether accountees will be empowered through the provision of groundwater information under SWA. Therefore, the analysis of power represents the perceptions of report preparers a priori as the standard was not completed at the time of the interviews (recall that the third iteration was released in October 2012). Interviewees' responses are mixed, but a slight majority of interviewees do not see GPWARs as tools that will empower accountees.

> *'No. It is nothing you can really empower with it […] But from our perspective, when you are doing a summary of a full catchment, it is not really an individual thing anyway. So, someone cannot come in and say, I am interested in buying a property in this value. It might be used for it, but I doubt it… Not empowered, no. It is informed, but not empowered' (Interviewee 5 – Water Accounting Development Coordinator)*

> *'I think that both parties will be empowered and will benefit because the reports include detailed context statements, knowledge of further information sources, knowledge of the extent to which resources are being used and in particular, reliable, audited reports which are considered to be authoritative [which] will ease the process of community consultation when preparing Water Allocation Plans and making decisions about the future allocation of resources' (Interviewee 6 and 7 combined – Report Services Officer, water accounting / Project Manager, water accounting project)*

In a previous study (see Paper 1), it was suggested that the Accountability Statement be used as a mechanism that will enable accountees to assess performance because accountability of water management cannot be assessed just by the numbers disclosed in the statements like it can in financial accounting (e.g. water managers do not have control of the amount of water flowing into a water entity). However, in terms of the Accountability Statement, more

resistance was found from potential report preparers. They do not agree to report on compliance with externally-imposed requirements in the statement.

> *'We have a separate process for compliance and that is a completely separate process where…we are complying with our water sharing plans… Yes, we will put a summary in…and refer off to another report if that is the case. We are not going to go down the process of listing every non-compliant issue and everything in an Accountability Statement and try and get our director to sign off' (Interviewee 5 – Water Accounting Development Coordinator)*

Even though the Accountability Statement is considered as an important tool to assess performance and therefore a mechanism that would empower accountees, the majority of interviewees do not perceive the Accountability Statement as a tool to discharge accountability and are a little uneasy about it.

> *'It is not accountability. I think it is more like understanding how the groundwater is being used and (how to) better manage groundwater, to understand groundwater. How much water is extracted from the ground each year and how much water goes into the ground each year? What is the balance if the groundwater is over-exploited? So I think it is more like understanding the groundwater situation more than just holding anybody accountable' (Interviewee 3 – Hydrogeologist)*

> *'It is mainly to give information…also it's just the information on how much is being used, but also information on how well the groundwater system is coping with that level of usage. It is not about how well we accounted for the water' (Interviewee 2 – Hydrogeologist/Team leader)*

5.4. Extension to the Case Study: Analysis of Secondary Data

The perceptions of report preparers or practitioners regarding groundwater reporting in the ED AWAS 1 were analysed via public submissions to the WASB in order to keep consistency with the findings of the case-study part of the project, because the case study sites represent the views of report preparers. In total, nine submissions out of twenty-three were explored in depth as they represented the views of potential report preparers towards ED AWAS 1, and on groundwater in particular.

Comments on groundwater are on the applicability of accounting terms to the issue of groundwater. The majority of comments are on the definition (and recognition) of water assets for groundwater. The standard suggests considering as water assets only that which is the extractable portion of aquifers. There are also doubts about water liabilities.

> *'non-extractable groundwater is an example of something which may not be regarded as an asset because it is non-extractable. This may be a misleading example because non-extractable groundwater could be regarded as an environmental asset, or could act as*

dead storage – such as a saline lens forcing better quality water to be nearer the surface' (Submission 8 – Government entity, State Water Authority)

'It is difficult to establish the volumes for groundwater. It can be difficult to define the asset based on the quality of the water, as what is unsuitable for one user may be satisfactory for another water user' (Submission 11 – Government entity, State Water Authority)

The practical applicability of the standard ED AWAS 1 into groundwater (presented in the Implementation Guidance) is limited in comparison to surface water.

'but the guidance paragraphs are geared to surface water situations. It would be good to have a guidance paragraph on groundwater' (Submission 12 – Government entity, State Water Authority)

A clear example on transparency (and the quality of reporting) comes with the suggestion of one respondent to combine the three main statements (Statement of Water Assets and Water Liabilities, Statement of Changes in Water Assets and Water Liabilities and Statement of Physical Water Flows) into one in cases of groundwater.

'I would interpret the standard to imply that the three statements would be compulsory but am wondering if it was considered during the process that there may be situations as above that may benefit significantly from a simplified "lite" version of the standard… Or perhaps one statement which combines the three somehow' (Submission 22 – Government entity, State Water Authority)

It seems that applying financial accounting principles to report on groundwater is even more complicated than surface water because there are many unknowns.

'In our opinion, the standard simply does not work well for groundwater reporting and it needs to be addressed by the WASB' (Submission 20 – Government entity, State Water Authority)

6. Conclusions

This study extends the limited research on water reporting within SEA (e.g. see Morikawa *et al.*, 2007; Morrison and Schulte, 2009; Prior, 2009; Barton and Morgan-Knott, 2010; Egan and Frost, 2010; Morrison and Schulte, 2010; The Association of Chartered Certified Accountants, 2010; Carbon Disclosure Project, 2012), which has focused mainly in corporate water-related disclosures without following SWA, and also extends the limited research in particular on groundwater accounting (i.e. see Subba Rao *et al.*, 1998; Molden and Sakthivadivel, 1999; Peranginangin *et al.*, 2004; Zhu *et al.*, 2004; Dassi *et al.*, 2005; Foster and Perry, 2010) by exploring the application of a new water reporting framework, SWA, to

groundwater. Gray *et al.*'s (1996) accountability model is adopted and extended to include elements pertinent to the public sector (namely, *clarity of relationship*, *transparency* and *power of accountees*). In order to gather data, two case study organisations were chosen. These findings were supported by the analysis of secondary data in the form of submissions to the WASB regarding ED AWAS 1.

In relation to **clarity of relationship**, a key issue is whether regions with significant surface / ground water interaction should prepare separate or consolidated accounts. It is important to plan and manage groundwater and surface water systems as one interconnected element; however, in terms of reporting, interviewees have mixed opinions. Some water management plans include surface and groundwater areas that consider them as one entity. In terms of water accounting reports under SWA, there were voices in favour of having combined reports for surface and groundwater and also there were voices for not having them combined. Since it is important to understand surface water and groundwater as an interconnected entity for management purposes; then, it is recommended that combined water accounting reports be prepared for interconnected surface water and groundwater systems.

In terms of the accountors, the proper identification of the water report entity poses another challenge because of boundaries. Groundwater area(s) and surface water areas do not match perfectly in terms of the physical area. Hence, it is suggested integrating into the water accounting standard the idea of IFRS 8: Operating Segments so that multiple aquifers in an area can be considered as operating segments of an entity. IFRS 8 requires entities to report financial and descriptive information about their reportable segments (Deloitte, 2012a).

In terms of the accountees, interviewees discussed the need to clearly identify potential users of water accounting reports and to have more studies on users and their needs. The majority of interviewees showed concerns about their difficulty to identify the users of SWA reports. This finding is in line with one of the findings of Paper 1.

In relation to **transparency**, even though future groundwater reports under SWA appear comprehensive, there are still some missing elements in the second iteration of the standard (ED AWAS 1). This study argues that if groundwater reports under SWA are to be prepared, there will be two limitations. The first is a data gathering problem (for example, infrequent readings or insufficient monitoring bores) which I call *pre-existing data limitations*. When discussing on the sources of uncertainties of water accounts, Lowe *et al.* (2016) mention 'incertitude' as one of the main sources of uncertainty in terms of groundwater. However, all

sources of uncertainty (measurement error, systematic error, model uncertainty, incertitude, subjective judgement and linguistic uncertainty) apply to different degrees. I call the second problem *translating financial accounting into water* which is, basically, the application of financial accounting terminology to water. The main issue of controversy regarding this problem concerns the determination of water assets. The Water Accounting Standards Board (2010) states that groundwater assets should only consider the extractable portion of aquifers although no guidance is provided to estimate it. In its third iteration, the standard (AWAS 1) provides the same description regarding the recognition of groundwater assets (see Water Accounting Standards Board, 2012). The jurisdictions are working together to determine how groundwater assets and groundwater liabilities could be handled consistently, but it is not an easy task. Groundwater accounting and reporting pose more challenges than surface water.

A further issue is whether the disclosure of groundwater assets should also include the sustainable yield as well as the total amount of water available, as the Water Accounting Standards Board (2010) recommends booking the total extractable portion of aquifers as groundwater assets. Groundwater use involves the use of non-renewable (or stock) and renewable (or flux) resources (Burke *et al.*, 1999). This distinction can be linked to Fisher's (1896) analysis of income and capital in which 'stock' is connected with 'capital' whereas 'flux' is connected with 'income'. Since stock is defined as non-renewable, its analysis could be connected and compared with accounting for extractive industries, IFRS 6 (Cortese *et al.*, 2009; Cortese and Irvine, 2010; Cortese *et al.*, 2010) in cases where groundwater extractions exceed recharge. However, in Australia, groundwater recharge is used for groundwater management.

The submissions to the WASB reflected concerns from respondents mainly in relation to transparency. The main area of concern was about the application of financial accounting terminology into water (itself connected with one of the problems identified in section 5.3.2). In this regard, the majority of comments were about the recognition of groundwater assets.

In relation to **power of accountees**, it was hard to assess power of accountees at this stage. Practitioners did not agree with the accountability statement because they would have to disclose compliance with externally-imposed requirements (however, that requirement was removed in the third iteration of the standard). There was consensus among interviewees that future water reports under SWA (containing information on groundwater) cannot be considered as tools to discharge the accountability of water managers. Instead they see them

as tools to communicate groundwater information. The main reason for this difference is that groundwater managers are wary about disclosing compliance with externally-imposed requirements in such a statement.

Overall, report preparers from both New South Wales and South Australia believed that groundwater reports prepared under SWA will not empower accountees because they see them only as information tools.

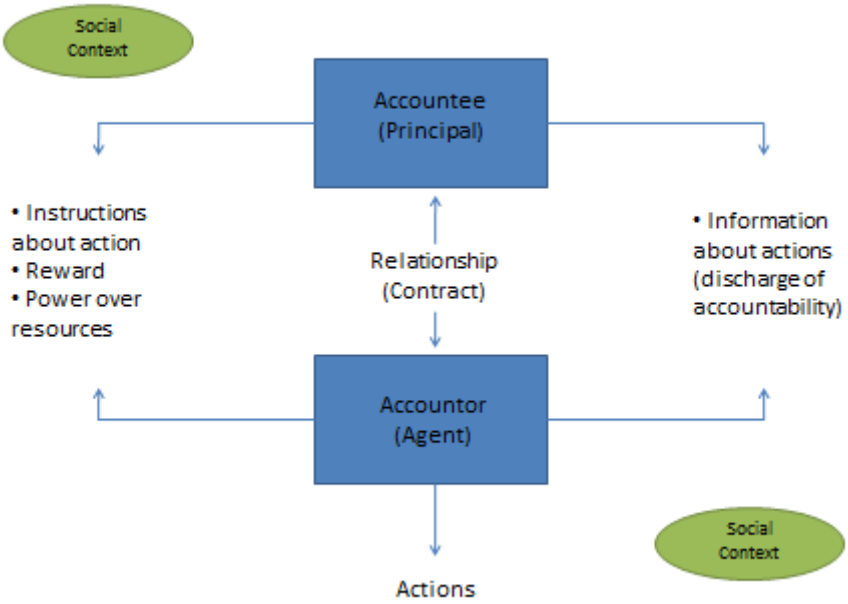
One recommendation from the interviews and the case study is to consider the physical areas according to water management plans (as is currently done in New South Wales). The idea of reporting groundwater and surface water areas within the same area is related to two Standards: Consolidated Financial Statements (IFRS 10) and Operating Segments (IFRS 8) (see Deloitte, 2012b; Deloitte, 2012a). International Financial Reporting Standard (hereafter IFRS) 10 is on Consolidated Financial Statements and presents the requirements for preparing and presenting consolidated financial statements and require entities to consolidate the entities that they control (Deloitte, 2012b). In this case, the parent entity is required to present consolidated financial statements of those entities controlled by it. This case might be an example of a manager-entity that manages surface and groundwater areas in a determined catchment area. Under this scenario, the preparer (who is the manager) would be required to prepare a report of those entities controlled by it. IFRS 8 for Operating Segments might also apply for groundwater and surface water areas (or in the case when there are many groundwater areas underneath). IFRS 8 applies to reportable segments that are operating segments and which meet specific criteria. If consolidation does not apply, then reporting as operating segments might apply.

Overall, it seems that the application of ED AWAS 1 to prepare groundwater reports poses challenges and concerns to potential report preparers (even more concerns than in surface water reporting). This paper suggests that accountability for groundwater management is unlikely to be fully realised under the second iteration of the standard (known as ED AWAS 1) and these issues remain pertinent to the current version of the Standard (known as AWAS 1). For example, while paragraph 68 of the standard can be compared to the IFRS 8: *Operating segments* (which states than when an area covers more than one groundwater management area it may be appropriate to report disaggregated information for each groundwater management area), it remains silent on the issue of ground/surface water

interaction. Future research might explore the costs of benefits of reporting surface water and groundwater combined or separated.

7. Appendix:

Figure 4.1. Gray et al. (1996) Accountability Model



Source: Gray *et al.*, 1996 p. 39

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CONCLUSION

1. Overview

Water usage is critical worldwide and in Australia, and poor water decision-making can be fatal. According to Mee and Adeel (2012 p. 10), mankind is facing a state of 'water bankruptcy' in different regions around the world which affects the supply of food and energy, the level of adaption to variations in climate, which in turn challenges human security and economic growth. According to Mee and Adeel (2012), water management is a crucial issue that requires government engagement and should be reflected in good regulation and integrated management of resources. Without any change, mankind is at risk of suffering hunger, disease and poverty because of water scarcity, pollution or flooding (Mee and Adeel, 2012). Therefore, it is necessary to manage the resource responsibly and in a sustainable manner. The accountability of water resource management has become important and poses unique challenges.[107]

This study makes three major contributions. Firstly, it examines the potential for Standardised Water Accounting (SWA) to enhance accountability from the perspectives of potential preparers and potential users of SWA reports. Secondly, it explores the specific issue of groundwater, which is an under-researched area within water and has not been previously considered within Social and Environmental Accounting (SEA). Finally, it operationalises and extends the Gray *et al.* (1996) accountability model to the public sector in light of contemporary work on accountability.

Three interconnected research papers that assess the potential of SWA in enhancing the accountability of water managers were developed. Paper 1, *The Extent to Which Australian Standardised Water Accounting Contributes to Accountability – Practitioner Perspectives*, explores the viewpoints of potential report preparers towards SWA and its link with accountability. SWA is potentially a useful mechanism to improve water information as per

[107] One of these challenges, for example, is that a profit figure in financial accounting is not similar to the 'profit' figure in the water world as exogenous factors such as rain affect water inflows. Bases on which the accountability of water management may be understood therefore include comparisons against targets and plans that are either internal or external (such as operational plans, water sharing plans and jurisdictional legislation).

Godfrey and Chalmers (2012).[108] The paper analyses SWA from the perspective of Gray *et al.'s* (1996) accountability model. The research question is: 'From the perspective of the report preparers, to what extent does SWA enhance the accountability of water managers?' Data collection was from three sources: Firstly (and predominately) data was collected from the case study-participant observations (based on the 'water accounting project') that allowed me to collect data in the field. From June 2008 to approximately April 2009, I had the opportunity to participate in the 'water accounting research project' along with one of my supervisors. The project was conducted by the former Water Accounting Development Committee (later superseded by the Water Accounting Standards Board). That 'water accounting project' is the driving force of the entire study.[109] Secondly, data was collected from formal structured interviews with senior staff members from different water report entities (practitioners from the pilot sites). Thirdly, data was collected by analysing secondary data in the form of public submissions on ED AWAS 1 to the WASB.

Paper 2, *Perceptions of Potential Users of Standardised Water Accounting Reports: An Accountability Approach*, explores how potential users perceive SWA and whether they believe GPWARs will enhance the accountability of water managers. One of the findings of Paper 1 was the claim from practitioners that more studies were needed about users of GWPAR reports (i.e. their identities and their information needs). Therefore, the research question for Paper 2 was: 'To what extent do users perceive Standardised Water Accounting (SWA) reports, under the Exposure Draft of Australian Water Accounting Standard 1 (ED AWAS 1), as useful for discharging the accountability of water managers?' Data were gathered by a mixed method approach. In the quantitative phase, a survey was delivered to participants at five water-related events. Results from this quantitative phase informed a qualitative phase which involved the analysis of public submissions (by report users only) to

[108] I argue that by having better water information, water management would be enhanced and therefore one of the drivers of the current water crisis would be confronted.

[109] The project involved visiting pilot sites for a period of 2-3 days to understand and comment on the limitations experienced at those sites in preparing water accounting reports under SWA. There were six pilot sites in total, but we only visited five due to delays in the final contract; however, all information about that site was provided later for reference. Additionally, some pilot sites were revisited after some time for further assessment. From May 2008 to mid-2009, we also attended formal and informal meetings with jurisdictional members and with staff from the Water Accounting Development Committee Office. Additionally, during the course of the project we had informal interviews with members of the WADC Office and with staff from the pilot sites. Meetings, interviews and pilot visits were not recorded as it was considered intrusive, but extensive notes were taken during the course of the project and on each visit.

the Water Accounting Standards Board on the ED AWAS 1. Paper 3, *Accountability and Sustainable Management of Groundwater Resources: The Case of Groundwater in Australia*, explores groundwater accounting and reporting in Australia in two locations (South Australia and New South Wales). Another significant finding of Paper 1 was that groundwater accounting and reporting is still an undeveloped area and, even though it involves water (such as surface water), groundwater has unique features and challenges in light of SWA reporting. Therefore, groundwater accounting and reporting and the discharge of accountability in the light of SWA were explored (from the perspective of practitioners). The research question here is: 'To what extent does SWA (as reflected in ED AWAS 1) contribute to groundwater accounting and accountability?' Data were gathered from two case study organisations: The New South Wales Office of Water and the Department of Environment, Water and Natural Resources of South Australia. Additionally, public submissions to the WASB on ED AWAS 1 (and specifically on groundwater) were coded and analysed in Nvivo.

This chapter brings together the contributions of each of these papers and is structured as follows. Section 2 reviews SWA as an example of the 'new accountings' described by Bebbington and Gray (2001). Section 3 reviews and reflects upon the theoretical framework utilised throughout the study, namely, an extension of Gray *et al.*'s (1996) accountability model. Findings and recommendations of each paper are drawn together in Section 4 and overall conclusions from the study are provided. Considered collectively, the findings suggest an alternate explanation for SWA – auto-communication – which is described in Section 4.8. Finally, Section 5 outlines four areas for future research regarding SWA.

2. Standardised Water Accounting: An Innovative Approach to Account and Report on Water

Bebbington and Gray (2001) describe four camps in which the accounting literature can be located in pursuing sustainable development. In the fourth camp it is recognised that accountants and accounting may support the pursuit of Sustainable Development. Bebbington and Gray's (2001) project involves forcing the concept of sustainability into the lens of accounting. SWA can be considered as a new form of accounting and accountability that is based on financial accounting mechanisms. Lowe *et al.* (2012 p. 198) call for new forms of accountability that have 'the potential to change the ways we think about what we should capture and how to transmit this data'. It is believed that SWA has the potential to offer those qualities mentioned by Lowe *et al.* (2012).

Chalmers *et al.* (2012) argue that SWA (which they refer to as General Purpose Water Accounting) is a necessary element for obtaining more relevant and reliable information which in turn will improve water management. Contrary to other forms of water accounting (described in the Introduction), SWA represents a new strand of reporting about water in which financial accounting principles and methodologies are applied in the preparation of water accounting reports. Section 2 explores SWA in depth and analyses the components of water accounting reports. In addition, this section describes the rationales behind each of the papers and addresses the research question driving the study.

I propose that one of the reasons for the development of SWA is to generate change in society, change which will bring improvements and amendments to current forms of reporting (Slattery, 2008; Chalmers *et al.*, 2012). Hopwood *et al*. (2005) presents a classification and mapping of various trends of thought about Sustainable Development and means of change. I adopt the reasoning that the development of SWA is in line with Hopwood *et al.*'s (2005) *reform* position in which they argue that fundamental reform of society's economic and political structures and human-environment relationships is necessary to achieve sustainable development, but without a change of existing arrangements. Since water management is an important factor in achieving sustainable development, SWA aims to bring a change in current practices.

SWA involves the preparation of water accounting reports following financial accounting principles and methodologies, an approach so far unique to Australia. The possibility for SWA to transcend the Australian setting is real because sustainable water management is a current global concern. Additionally, Chalmers *et al.* (2012) suggest that in line with financial accounting, there is also a possibility for SWA to become international in form. The development of SWA has been a long process which has been described in detail in the Introduction and also in each of the papers. The process started with the signature of the Australian National Water Initiative (NWI) between 2004 and 2006. Under the Water Act 2007 (see Cwlth, 2012), among other things, the Bureau of Meteorology is put in charge of collecting, managing, interpreting and disseminating Australia's water information and issuing National Water Information Standards.[110] The SWA development process thus far includes the completion of the Water Accounting Conceptual Framework, the release of the Preliminary Australian Water Accounting Standard (the first iteration of the standard), the

[110] The Water Accounting Standards Board is placed under OR subordinate to the Bureau of Meteorology.

release of the Exposure Draft of Australian Water Accounting Standard 1 (the second iteration of the standard) and the recent release of the Australian Water Accounting Standard 1 (the third iteration of the standard).

During the course of this study, the Water Accounting Conceptual Framework (WACF), the Preliminary Australian Water Accounting Standard (PAWAS – the first iteration of the standard), and the Exposure Draft of Australian Water Accounting Standard 1 (ED AWAS 1 – the second iteration of the standard) – were used and revised. However, towards the end of the study, the Water Accounting Standards Board (2012) released the Australian Water Accounting Standard 1 (AWAS 1 – the third iteration and first final version of the standard). The contents of the AWAS 1 in comparison with the ED AWAS 1 are analysed next.

In the second iteration of the standard (ED AWAS 1), the Water Accounting Standards Board (2010 para. 7) states that GPWARs are to comprise seven elements: a Contextual Statement, an Accountability Statement, a Statement of Water Assets and Water Liabilities, a Statement of Changes in Water Assets and Water Liabilities, a Statement of Physical Water Flows, note disclosures and an Assurance Statement. The Contextual Statement provides information about the physical and administrative aspects of the water report entity and information that affected the management of the entity (WASB, 2010 para. 48). The Accountability Statement provides information about: 1) whether GPWARs were prepared according to the standards, 2) whether the water report entity complied with externally-imposed requirements, and 3) whether best practices have been applied (WASB, 2010 para. 50). The Statement of Water Assets and Water Liabilities provides information on the nature and volumes of water assets and water liabilities of the water report entity at a given point in time, similar to the balance sheet in financial accounting (WASB, 2010 para. 58). The Statement of Changes in Water Assets and Water Liabilities provides information on the volumes and nature of the water report entity's net water assets during the reporting period, similar to the profit and loss statement in financial accounting (WASB, 2010 para. 101). The Statement of Physical Water Flows provides information on the nature and volumes of physical water flows during the reporting period (similar to the statement of cash flows in financial accounting) (WASB, 2010 para. 109). Similar to financial accounting, too, are the inclusion of notes to the accounts, which are meant to provide information that assists users to understand the information in the GPWARs (WASB, 2010 para. 124). Finally, the Assurance Statement is an attestation that the GPWARs have been prepared in accordance with the requirements of the standard (WASB, 2010 para. 168). It appears that some information contained in the Accountability Statement

might be similar to the information contained in the Assurance Statement, but the main difference is that the Assurance Statement should be prepared by a qualified and independent assurance provider (WASB, 2010 para. 169).

However, in the third iteration of the standard (AWAS 1) released in October 2012, some major changes were made and are noticed here (in comparison with the second iteration ED AWAS 1). The Contextual Statement now incorporates more information in comparison to the previous iteration of the standard. However, in this case, the report preparers have to name the externally imposed requirements that affect the entity. For this reason, the Accountability Statement is now reduced to reporting only whether or not GPWARs have been prepared only in accordance with the standards. As discussed in section [insert section #] below, the Water Accounting Standards Board (2012) removed the disclosure of compliance with externally-imposed requirements and disclosure of best practice. Additionally, the Water Accounting Standards Board (2012) modified the previous definition of the water report entity to consider it as the WHAT and not the WHO. Finally, in the AWAS 1 the Assurance Statement is deemed to be an addition to the components of the GPWAR reporting package and not a component as set out in the second iteration of the standard (ED AWAS 1). Nonetheless the preparation of the assurance statement remains 'a must' according to the latest iteration of the standard.

There has been significant research within SEA about water disclosures, however these studies have focused mainly on corporate water disclosures (e.g. see Morikawa *et al.*, 2007; Morrison and Schulte, 2009; Prior, 2009; Barton and Morgan-Knott, 2010; Egan and Frost, 2010; Morrison and Schulte, 2010; The Association of Chartered Certified Accountants, 2010; Carbon Disclosure Project, 2012). Even though this study is about water accounting and reporting, it focuses on water reporting under SWA which applies financial accounting principles and methodologies to report on water.

Although it is considered as an emerging discipline (see Bureau of Meteorology, 2012d), different scholars have investigated SWA (e.g. see Godfrey and Chalmers, 2007; Lowe, 2008; Ahmad *et al.*, 2010; Sofocleous, 2010; Godfrey, 2011; Kirby, 2011; Chalmers *et al.*, 2012; Slattery *et al.*, 2012), but not as much as *General Water Accounting*[111] (e.g. see Lange, 1997; Lange, 1998; Lenzen, 2004; Peranginangin *et al.*, 2004; Zhu *et al.*, 2004; Lowe *et al.*, 2006;

[111] I call *General Water Accounting* to all efforts to prepare water accounts which do not follow financial accounting principles and methodology.

Arntzen and Setlhogile, 2007; Cordery *et al.*, 2007; Hambira, 2007; Hazelton, 2007; Lange *et al.*, 2007; Vardon *et al.*, 2007; Ahmad *et al.*, 2010; Vardon *et al.*, 2012). After a thorough review of the literature, there is a need to fulfil the gap of limited research on accountability for water resource management in the light of SWA. Thus, having accountability in mind, the research question of this study proposed is: Overall, does Standardised Water Accounting enhance the accountability of water managers?

While analysis of the political development of SWA is beyond the scope of this paper, Chalmers *et al.* (2012) note that political influence is observed also in the financial accounting standard setting. Whether SWA will be mandatory or voluntary is one such political factor. However, under the Water Act 2007 the Bureau of Meteorology has to prepare an Australian National Water Account. Apart from that, GPWAR remains voluntary. There are legal and non-legal forces connected to the provision of an account, but Gray *et al.* (1996) argue that leaving accountability only to legal forces and voluntary initiatives would result in the demands of accountability being rarely satisfied. For this reason, Gray *et al.* (1996) favour mandatory Corporate Social Reporting if it is meant to be meaningful and the same principle could be applied to water accounting and SWA. The next section presents some reflections regarding the accountability framework.

3. Summary of and Reflections on the Gray *et al.* (1996) Accountability Framework

In applying the accountability framework, I adopt Gray *et al.*'s (1996) accountability model in all three papers to evaluate accountability by means of its three components: *Relationship, Information* and *Instructions, Reward and Power*. Additionally, a review of other literature on accountability identified three critical components by which to operationalise Gray *et al.*'s (1996) model: *Clarity of Relationship*, *Transparency* and *Power of Accountees.* Accountability requires firstly an accountability relationship that is clearly identified, and secondly that the information transmitted from the accountor to the accountee must be transparent (that is, it must enable the creation of visibility). Finally, power is represented by the extent to which accountees are empowered to influence the accountor through the provision of information. Such empowerment is reflected in accountees' ability to create change in the decision-making process. *Clarity of Relationship* is an *ex-ante* element as identifying the relationship is the first major step to accountability. *Transparency* informs the

whole process after the relationship has been clearly identified and *Power* is an *ex-post* element as it will be reflected after the information was provided to accountees.

Relationship is the first element of Gray *et al.*'s (1996) accountability model and is the one they place at the core of the model. The relationship between parties in society is the one that assigns responsibility and consequently permits rights to information. According to Gray *et al*. (1996), relationship is based on social contracts which can be legal and non-legal in nature. The major part of their discussion about the model is about relationship. On the one hand, Gray *et al.* (1996) consider that the root of the accountability relationship is the social contract between members of society and society as a whole. On the other hand, Stewart (1984) argues that the accountability relationship exists only if there is a bond of accountability.[112] Both analyses are connected as it can be argued that in all social contracts there is a bond of accountability. Furthermore, the idea of *link of account* defined by Stewart (1984) can be connected with the idea of *ex gratia disclosure* discussed by Gray *et al*. (1996) which is a situation in which accountability has been voluntary and the principal is unable to enforce the necessary disclosure.

In terms of relationship, I look specifically at the component of C*larity of Relationship.* I agree with Gray *et al.* (1996) about the importance of the accountability relationship, but it is not just the existence of the relationship but that relationship has to be clearly established. *Clarity of Relationship* is important because for accountability to be discharged the relationship of accountor-accountee has to be clear. This situation is more acute in the public sector where accountor-accountee relationships are blurred; thus, clarity is a key issue. Bovens (2005) describes the situation as a problem of *too many hands* and *too many eyes*. In any relationship there is a certain degree of principal and agent relationship so there is a certain delegation, but the degree of delegation does not define the overall level of accountability. In this relationship a person is expected to account for his/her activities and the consequences of his/her actions (Shaoul *et al.*, 2012).

Information is the second element of Gray *et al.*'s (1996) accountability model. Unlike relationship, they do not provide a comprehensive discussion on information. They consider that information happens as a natural progression after the accountability relationship has

[112] Such bond of accountability is a relationship of power between the accountor and the accountee and only the person or institution to whom the account is given has the power to hold to account the person or institution who gives the account (Stewart, 1984).

been identified. Information is connected with rights to information, which is granted by the accountability relationship. Gray *et al.* (1996) mention that there are legal and non-legal forces in the provision of an account.

In terms of information, I look specifically at the component of *Transparency*.[113] Information is generally seen as enabling transparency because information has the power to make things visible. There are different mechanisms by which transparency can be reflected (e.g. annual reporting or raw data on webpages). Reporting is considered as a subset of transparency, but such reporting has to be of quality. The information provided through reporting has to have a certain degree of quality if it is to be meaningful. Recall that the quality of reporting was used as a proxy to assess transparency. The quality of accounting reporting, for instance, can be connected with the qualitative characteristics of financial accounting reports. In financial accounting, it is assumed that financial reports are prepared by taking into account the qualitative characteristics of financial statements (e.g. see Australian Accounting Standards Board, 2004 para. 24). In terms of SWA, the Water Accounting Standards Board (2009 p. 31-34) describes the qualitative characteristics of GPWARs: relevance, faithful representation, comparability, verifiability, timeliness and understandability. On the other hand the WASB admits that there are constraints on GPWARs, namely, materiality and cost (Water Accounting Standards Board, 2009 p. 34, 35).

Instructions, Reward and Power is the final element of the Gray *et al.* (1996) accountability model. There is not much discussion about Instructions, Reward and Power in their article. Rather, it is presented as a consequence after the provision of information. These three characteristics move from the accountee to the accountor. Nonetheless, Gray *et al.* (1996) acknowledge that for some commentators accountability has some problems, especially regarding power. They argue that accountability is due even when it cannot be enforced. However, Stewart (1984) argues that no accountability is due if the principal cannot enforce accountability. Gray *et al.* (1996) do not provide more discussion on this final element. This element is a reflection of the power of accountees over accountors, but what about the power of accountors? An obvious doubt would be whether or not there is accountability without power. I argue that power is part of accountability and is reflected in the fact that accountees

[113] Accounting is perceived as a tool that enables seeing behind or within a business entity and therefore allows transparency (Roberts, 2009). Accounting involves the preparation of financial information for communication to stakeholders and SWA involves the application of the accounting technology to account and report on water.

will be empowered by the information that is provided to them. Such empowerment is reflected in their ability to create change and influence the decision-making process. However, a discussion on power could also be about whether principals have the power to enforce accountability (see Stewart, 1984). Gray *et al.* (1996) argue that sometimes accountability cannot be enforced and happens only as a result of a moral right to information. But (as mentioned) a political discussion about power is beyond the scope of my analysis. I extend Gray *et al.*'s (1996) idea of *Instructions, Reward and Power* by stressing the fact that accountability will empower accountees through the information provided.

In terms of *Instructions, Reward and Power*, I look specifically at the component of *Power of Accountees* which includes the three aspects in Gray *et al.*'s (1996) model. Accountees will be empowered by the information provided and such empowerment is reflected in their ability to create change and influence the decision-making process. Gray *et al.* (1996) do not provide a general definition about power, although Wickramansinghe (2006) does, defining it as control or influence in spite of resistance. In my analysis of Power, I compare Gray *et al.'s* (1996) element of the model with Dryzek's (2009b; 2009a) perspective. In his investigation of polities he relates accountability with public space and empowered space. Dryzek (2009a) argues that power is related to deliberative democracy and that the deliberative system comprises five elements: public space, empowered space, accountability, transmission and decisiveness. According to Dryzek (2009a), authoritative collective outcomes are generated in the empowered space, but they are influenced by the public space through transmission. From Dryzek's (2009b; 2009a) analysis, it can be deduced that both the empowered space and the public space have power, but this study focuses on the empowerment of the public space.

3.1. Reflections on the Theoretical Model

Overall, the theoretical model adopted proved very useful in evaluating the potential of SWA for enhanced water management accountability. Various findings emerged (discussed in more detail in the following section).

Clarity of Relationship (identified as Relationship in Gray *et al.*'s (1996) model) did not prove difficult to assess and provided a useful frame to engage in discussions related to multiple accountees and accountors. In terms of the accountors, the fact that Australian water management and administration is under government control led to an exploration of the public sector. Unlike in financial accounting, exploring the entity concept in water proved to be a complex task. It was not an easy matter to identify the identity of the accountors. In terms

of the accountees, it was difficult to identify their identities under SWA because there are several potential accountees each with different information needs.

Similarly, Transparency (identified as Information in Gray *et al.*'s (1996) model) did not prove difficult to assess because the nature of SWA is embodied in the reports. The quality of reporting was reflected in each of the components of the SWA package and since SWA is under development in Australia, it was easier to evaluate all of them.

Assessing Power of Accountees (identified as Instructions, Reward and Power in the Gray *et al.* (1996) model) was more difficult than the other elements of the model. An important issue was that the Power of accountees can only be assessed in periods after they receive information, but as little information had been provided at the time of study, this dimension was difficult to assess. However, as noted above, a pre-requisite for the exercise of power is the evaluation of performance, and this dimension of power was able to be readily incorporated into the study.

4. Conclusions and Recommendations

In this section I present the main findings and recommendations in relation to each element of the extended Gray *et al*. (1996) accountability model for each research paper. But first I discuss the general findings of each paper. Finally, in section 4.5 I present the general conclusions and final thoughts in the light of the findings.

4.1. General Findings

In terms of Paper 1, after evaluating the findings of the case study-participant observation, I argued that if the pilot sites had any significant issues in preparing prototype water accounts under SWA, then it was going to be difficult for SWA to enhance the accountability of water managers. In total, I identified fifteen issues during the case study-participant observation phase (see Paper 1), but of all of them I considered the most significant five issues: the reporting entity, users' needs, quantification, accounting processes and the accountability statement.

In terms of Paper 2, I found that the results of the quantitative phase show that 83% of the respondents perceive the introduction of SWA to be useful. However, they are undecided about its usefulness in discharging the accountability of water managers (53% were undecided about all statements except the Accountability Statement and 58% were undecided about the

Accountability Statement itself). It is possible that respondents do not see SWA as a tool to discharge the accountability of water managers, but rather as a way to convey water information. I suggest that stakeholders need to be better informed about the benefits and the contents of the SWA reporting package – the majority of respondents stated that they are not fully aware of its components. Furthermore, 56% of respondents believe that the costs of preparing SWA reports do *not* outweigh the benefits. They are less certain about the capacity of the Accountability Statement to discharge the accountability of water managers (58% of respondents). Overall, lessons from the quantitative phase are that the introduction of SWA is perceived as useful and that doubts remain about whether the components of the SWA reporting package are sufficient tools to discharge the accountability of water managers. These results show that people perceive that accounting can bring benefits to the current water accounting reporting mechanisms, but that it might be necessary to better educate potential users of GPWAR about the components of SWA.

In terms of Paper 3, I found that some challenges exist for groundwater reporting under SWA. There is a consensus among all interviewees that applying financial accounting principles to report on water, and specifically on groundwater, is beneficial. It is even more relevant for groundwater because groundwater accounting and reporting is considered to still be in its infancy. This fact is reflected in the National Water Account for 2010 and for 2011 prepared by the Bureau of Meteorology. In the National Water Account 2011, even though the groundwater component is present in seven of the eight management areas, the values are not significant except those from Perth (because of its heavy reliance on groundwater). This shows there is a limitation in putting into practice the standard for groundwater, and that is about data gathering. Groundwater accounting and reporting poses more challenges than surface water mainly because of the attempt to match accounting terminology with groundwater terminology. The literature on hydrology suggests that it is advisable to manage groundwater and surface water systems together, although in terms of reporting interviewees have mixed opinions, some favouring combined reports while others prefer independent reports.

4.2. Clarity of Relationship

4.2.1. Findings

In terms of clarity of relationship, the pilot studies revealed key issues in relation to the confusion created by the concepts of water entity and water report entity (because the water entity could be considered as both a WHAT and a WHO), by the identity of the report preparer and by the need for more studies on users so as to know the identity and needs of the end users of reports. Results from the interviews corroborated these findings and in the analysis of submissions it was found that the identity of the water report entity creates the greatest concern. During the case study-participant observation, I found that practitioners were confused about the water entity concept and what it really involves. The Water Accounting Standards Board (2009 p. 13) defines the water entity as a WHAT (something with physical attributes) and a WHO (an organisation with responsibilities on management) which was one of the causes of the confusion. However, in the AWAS 1 the Water Accounting Standards Board (2012) modified the previous definition of the water report entity to consider it only as a WHAT and no longer the WHO.

In terms of Paper 2, respondents expressed concerns about the accountability relationship because of the identity of the water report entity and consequently report preparers, but mainly to the identity of users of GPWARs. Concerns about the water report entity and its identity are mainly about boundaries in terms of delimiting the entities. Concerns about users relate to their information needs, but in order to identify their information needs, there must be clarity in terms of identifying those users. Approximately 72% of respondents of the questionnaire identified water industry regulators as the parties most interested in GPWARs, but those results cannot be generalised as there might be multiple parties interested in the content of GPWARs. For users to understand GPWARs, they would need some background knowledge. This situation will create a difficulty in identifying who real users of GPWARs are.

Similarly to Paper 1 and Paper 2, in Paper 3 the identity of potential users of GPWARs and their information needs created the greatest concerns. However, the identification of the water report entity poses a bigger concern in groundwater because of boundaries. Aquifers cannot be mapped with precision in comparison with surface water areas. Aquifers differ in shape and size and sometimes multiple aquifers are interconnected in one area. The standard *IFRS*

8: Operating Segments is a standard that could be revised in the case of multiple aquifers aligned with surface water in a particular area. There was no agreement among practitioners about reporting surface water independently from groundwater: almost half of them recommended reporting them combined whereas the others recommended reporting them separately.

It is evident from the analysis of the three papers that it is not clear who the primary users of GPWARs are. If there are different categories of users, then their information needs might be different. It is a challenge to determine who the principal users of GPWARs would be: is it going to be determined by water usage? Or is it going to be determined by ownership? Not having clarity in terms of the identity of users of reports makes it difficult to assess the accountability relationship. Since clarity of relationship is the first element of the accountability model and is seen as an *ex-ante* element, having difficulties in identifying clearly the identity of accountors and accountees creates concerns about the potential for accountability of SWA.

4.2.2. Recommendations

In terms of the accountor, there is the need to provide more specific details as to the identity of the water report entity (and hence the identity of the accountor). A way of delineating the water report entity might follow what is currently being done in New South Wales, which is corresponding to water sharing plans. Moreover, delimitating water report entities with water sharing plans will allow clarity in terms of the identity of the report preparer as well. This suggestion is in line with Sofocleous (2010). She suggests making distinctions between the water reporting entity and the report preparer so as to avoid confusion. In New South Wales, water sharing plans establish the rules for balancing water between (a) water users and (b) the environmental needs of the rivers or aquifers (NSW Department of Primary Industries, 2012). Water Sharing plans are progressively being developed for surface and groundwater areas across New South Wales following the Water Management Act 2000 (NSW Department of Primary Industries, 2012). New South Wales' solution could ease the problem of dealing with boundary issues between surface and groundwater areas and the identity of report preparers. Conversely, the water report entities might be chosen in terms of water usage in a particular physical area. For example, if a lot of water is withdrawn from an aquifer, perhaps that aquifer could be selected as a water report entity. Finally, it is recommended to report on surface and groundwater areas combined by linking them with water management plans.

In terms of the accountee, there is a need to carry out more studies about users. In this particular case, the reason for carrying out more studies is to identify them generally, to determine who the primary users would be, and to identify their information needs and whether those needs are satisfied by GPWARs. The Water Accounting Standards Board (2009) states that GPWAR will satisfy the information needs common to all users. However, potential users might demand additional information as was found to be the case during the quantitative phase of Paper 2.

4.3. Transparency

4.3.1. Findings

Paper 1 found that the most significant issues in terms of transparency and the quality of reporting relate to two topics in contention: quantification and measurement accuracy. I also found that practitioners were concerned regarding the application of the accrual accounting concept and the double-entry system (i.e. mechanical problems). Results from the interviews corroborated the findings of the case study-participant observation. More detailed comments regarding the seven components of GPWAR (under the second iteration of the standard) were provided in the submissions. The Accountability Statement and the Notes created more contention between practitioners. In terms of the Assurance Statement, there were concerns about its costs and implementation. I argue that identifying the information needs of users is part of transparency and that GPWAR should satisfy those needs. However, it is unclear who the users are and consequently it is unclear what their needs are. This fact is connected to the calls made by practitioners for more studies on users.

An additional issue found in Paper 1 was about water quality. Unlike money (which is the same in all circumstances), water varies in quality. For example, potable/drinkable water does not have the same quality as water used for environmental purposes.[114] Therefore, it was essential to examine how the Water Accounting Standards Board incorporated water quality into the standards and in GPWAR. In the Exposure Draft of Australian Water Accounting Standard 1 (ED AWAS 1), the Water Accounting Standards Board (2010 para. 69) incorporated water quality in the definition of water assets by stating that water to be reported is water that is fit-for-purpose. In other words, it refers to the water that can provide future

[114] The quality of water varies if it is used for human consumption or for agricultural use or used for environmental purposes.

benefits to the entity. Additionally, the Water Accounting Standards Board (2010 para. 4) states that the scope of GPWAR is water that is fit-for-purpose. Therefore, water report entities should assess whether water to be reported is of quality. The issue of water quality is one in which the second iteration of the water accounting standard (ED AWAS 1) falls short.

Paper 2 found that even though all components of GPWAR are considered important by respondents, not all components seem to be fully understood or needed by them. Respondents from the questionnaire/survey identify the three main statements (Statement of Water Assets and Water Liabilities, Statement of Changes of Water Assets and Water Liabilities and Statement of Physical Water Flows) as very useful. The Assurance Statement and the Accountability Statement created contention while the Contextual Statement was found very useful in providing a clear picture of the water report entity. Additionally, 83% of respondents from the submissions stated that they believe the information needs of users will be satisfied with GPWARs. (However, see section 4.2.1 for the lack of clarity over the identity and information needs of users.)

Paper 3 revealed even greater doubts in terms of the information needs of users because groundwater areas are managed differently from surface water areas. There are two core problems regarding groundwater: *Pre-existing data limitations* and *Translating financial accounting into water*. The first problem reflects limitations that already exist and are mainly related to groundwater data capturing (for example, infrequent readings or not enough monitoring bores). The second problem involves bringing financial accounting into the water arena. I found that in terms of groundwater the process has even more complications than with surface water when it comes to applying financial accounting concepts, with the main issue of controversy being the determination of water assets. The Water Accounting Standards Board (2010) recommends that groundwater assets should take into account the extractable portion of aquifers, but does not give any more details on how to calculate that portion. Ultimately water users have to understand that not all groundwater can be used despite the plentiful reserves in Australia (especially in the Great Artesian Basin), so a lot of education is needed in terms of the information provided on SWA groundwater reports as well.

In the theoretical framework I argued that the quality of reporting can be considered as a subset of transparency. Similar to financial accounting, SWA also includes a conceptual framework called the Water Accounting Conceptual Framework. In SWAC 3 (known as

Qualitative Characteristics of General Purpose Accounting Reports), the Water Accounting Standards Board (2009 SWAC 3 para. 16, 17) describes the qualitative characteristics of GPWAR as relevance, faithful representation, comparability, verifiability, timeliness and understandability. Hence, it can be argued that the quality of GPWAR would be enhanced by following these characteristics, as discussed in turn below.

In terms of relevance, the Water Accounting Standards Board (2009 SWAC 3 para. 18) states that information is relevant if it can influence users' decisions about the allocation of resources. Additionally, information is considered useful if users can understand and evaluate past, present or future events. The main problem here is to know what 'allocation of resources' means as the Water Accounting Standards Board (2009 p. 10) provides a broad range of categories of users. Additionally, it is hard to evaluate past, present and future events since water accounting, unlike financial accounting, is based on climatic events. For instance, there might be a drought lasting for several years with the result that water accounting reports prepared during that period will be different to reports made under normal weather patterns. Care must be taken to assess information in GPWAR.

In terms of faithful representation, the Water Accounting Standards Board (2009 SWAC 3 para. 23) states that information is considered to be a faithful representation when it is neutral, complete and free from material error. It can be assumed that the information on GPWAR is neutral and free from material error (because there exist multiple acceptable approaches to quantify different elements), but in terms of completeness, it is not clear yet because one ongoing difficulty with water is data capturing.

In terms of comparability, the Water Accounting Standards Board (2009 SWAC 3 para. 28) states that information should be useful because it can be compared with other water reporting entities. However, the difficulty here stems from the fact that not all water reporting entities are the same and, even more, that no specific guidance has been provided by the Water Accounting Standards Board about the identity of water report entities. For example, care must be taken if information about an aquifer is compared with information about a river system.

In terms of verifiability, the Water Accounting Standards Board (2009 SWAC 3 para. 33) states that verifiability entails that independent observers must be able to certify that the information provided is free from material error or bias. This characteristic is then connected to the fact of having an Assurance Statement. Hence care must be taken as findings from the

research papers show that practitioners are concerned about the costs and benefits of the Assurance Statement. Since practitioners were public entities, funding was always a concern.

In terms of timeliness, the Water Accounting Standards Board (2009 SWAC 3 para. 35) states that information should be timely. There are no major concerns about this characteristic since GPWARs are going to be prepared on a yearly basis and at a reasonable time after the year-end. However, not even this is a precise time. The BoM released the National Water Account for 2010 and for 2011 at different times after the year-end.

Finally, in terms of understandability, the Water Accounting Standards Board (2009 SWAC 3 para. 36) states that users should have a reasonable knowledge of how water may be sourced, shared, managed and used. The main difficulty here is to have water accounting reports following financial accounting methodologies because not all users will have enough knowledge to understand such reports.

There is no doubt that users would have knowledge about water systems, but the fact of having water reports following accounting methodologies make things more difficult. From the case study-participant observation, it was found that practitioners had to learn accounting in order to prepare water accounts under SWA. It was a significant learning curve. It is assumed that the same process will happen with users of reports. Finally, the Water Accounting Standards Board (2009) acknowledges the existence of two constraints on GPWAR: materiality and cost. Cost is an issue since report preparers are government-funded and funding is limited. Such concern was manifested by practitioners during the course of the study. The second constraint is materiality which is a real issue that affects GPWAR. This issue was also identified during the case study-participant observation (Paper 1). The Bureau of Meteorology prepared the National Water Account for 2010 and for 2011 following the standard ED AWAS 1. In both accounts, the error term is quite significant which clearly represents a materiality issue (See Appendix). Therefore, after assessing SWA in the light of the qualitative characteristics of GPWAR discussed by the Water Accounting Standards Board, I conclude that there are pending issues that limit the ability of GPWAR of to meet those characteristics.

4.3.2. Recommendations

I acknowledge that matching financial accounting terminology with water terminology is not an easy task, but it is believed that improvements can be made to the content of the reports in

order to increase the quality of reporting. In terms of the information provided in the statements, one of the main opportunities is to indicate clearly what is considered as the extractable portion for aquifers (water assets in the case of groundwater) as practitioners are struggling to report on it and also to disclose the sustainable yield.[115] Additionally, the incorporation of flow chart diagrams with the three main statements (Statement of Water Assets and Water Liabilities, Statement of Changes in Water Assets and Water Liabilities and Statement of Physical Water Flows) to understand where water comes from and where it goes would be beneficial. Moreover, since the number of accruals is not significant, it might be a good idea to merge the Statement of Changes in Water Assets and Water Liabilities with the Statement of Physical Water Flows. I also suggest improving data collection which involves the frequency of readings and the number of measurement devices available, especially in groundwater. Finally, I suggest considering water quality as an important aspect to disclose in water reports under SWA. As discussed before, the Water Accounting Standards Board provides a general consideration of water quality in the reports.

4.4. Power of Accountees

4.4.1. Findings

Paper 1 discussed the need for a report element that enables the evaluation of accountors' performance in the context of water accounting so that accountees might know how to use their power. Unlike financial accounting, the change in Net Water Assets does not provide such a mechanism because water managers are not responsible for water inflows, and in any event a 'surplus' at the end of the period does not necessarily indicate good water management. Instead, the Accountability Statement might fulfil that performance evaluation role as it includes disclosure of compliance with water management plans (only in the second iteration of the standard as this requirement was removed from the third iteration of the standard). During the case study-participant observation, practitioners did not have major disagreements about the Accountability Statement; however, in the interviews practitioners were hesitant, stating that signing-off the Accountability Statement would be problematic. It has to be mentioned though that the case study-participant observation was carried out before

[115] The standard AWAS 1 indicates that water assets in the case of groundwater should consider the extractable portion of aquifers, but does not give more details about how to get that number.

the Water Accounting Standards Board released the first iteration of the standard (known as PAWAS); therefore, practitioners did not know in detail the contents of such statement.

Paper 2 found similar ambivalence regarding the Accountability Statement. In the relevant survey question, 58% of respondents stated that they were undecided about the Accountability Statement as a useful tool to discharge the accountability of water managers. Yet, five respondents to the ED AWAS 1 out of 14 stated that they agree with the information included in the accountability statement, one disagreed and the others did not make comments about it.

Paper 3 found that groundwater managers do not see SWA groundwater reports as granting any powers. Rather, they view them as information tools. In terms of the Accountability Statement, similar to Paper 1, practitioners were hesitant about the disclosure-of-compliance component of the Accountability Statement as they mentioned that they do their best provided that there are exogenous factors affecting the availability of water.

4.4.2. Recommendations

Since power is difficult to assess at this stage, the findings of Paper 1 led to my recommendation that the Accountability Statement be reinstated as a pre-requisite for performance assessment. I believe that the Accountability Statement should include disclosure of compliance with externally imposed requirements (such as water sharing plans existing in New South Wales) even though it was removed in the third iteration of the standard (known as AWAS 1). This recommendation is consistent with Sofocleous (2010) who recommends mandatory disclosure of compliance with water management plans. There is also opportunity for further research to explore the reasons why the contents of the Accountability Statement were reduced from the second to the third iteration of the standard.

4.5. Overall Conclusions

In Paper 1, from the perspective of practitioners, I concluded that the application of financial accounting principles and methodologies to account for and report on water might be beneficial and also that SWA might enhance the accountability of water managers although the potential to enhance it is not clear-cut yet because of the existing limitations identified by the practitioners. In Paper 2, both the results of the quantitative and the qualitative phases allow me to conclude that SWA is perceived as a useful tool to account for and report on water and also, based on the perceptions of users, it is unlikely that accountability will be

fully realised under the second iteration of the standard (used for data gathering). Finally, in terms of Paper 3, I argue that SWA is highly beneficial mainly because groundwater accounting (and reporting) is still in its infancy and offers a lot of potential. However, the limitations seem to be more challenging than in the case of surface water and need to be addressed.

After assessing the perceptions of practitioners regarding SWA (Paper 1), the perceptions of users on SWA (Paper 2) and groundwater accounting and accountability under SWA (Paper 3), I conclude that it is unlikely that full accountability under SWA in its present form can be achieved as there are several limitations that impede it.

First, both SWA and water allocation plans are currently developed independently of each other, but for accountability of water resources to take place those two mechanisms have to be aligned. Having both of them aligned is the longer-term vision of the Australian water accounting standards because debates on water allocation decisions should be based on data produced in accordance with water accounting standards. The reason for this finding is that there discussions are still to be had on the identity of the water report entity, its boundaries, the report preparer and on users' needs. In terms of transparency and the quality of reporting, it can be said that these are achieved to some degree when they are analysed according to the seven components of GPWARs (Contextual Statement, Accountability Statement, Statement of Water Assets and Water Liabilities, Statement of Changes in Water Assets and Water Liabilities, Statement of Physical Water Flows, Note Disclosures and Assurance Statement – under the second iteration of the standard). However, discretion must be exercised because there are areas in which there is no perfect match between accounting and hydrology.

Secondly, it is arguably too early to determine the full extent of the power of accountees, but instead it might be useful to look at the Accountability Statement as a mechanism to assess performance in the context of SWA. On the other hand, there are water allocation plans (such as the Murray-Darling Basin allocation plan). In terms of the clarity of relationship, there is greater clarity in comparison to the Australian Water Accounting Standards because the water manager (and hence the report preparer) is known. However, there is no transparency because no information is provided. Finally, there is some degree of power in accountees because stakeholders can influence decisions by attending public meetings for instance. These issues, and those issues raised earlier in this section, are evident in the Australian National Water Account, discussed below.

4.6. Conclusions in Relation to the National Water Account

The problems of implementing SWA in GPWARs are reflected in the National Water Account as it can be considered as the practical application of the standard for water report entities. Under the Water Act 2007, the Bureau of Meteorology has had to prepare the National Water Account since 2010 (Bureau of Meteorology, 2012c). The National Water Account provides standardised water information on the management of Australia's water resources (Bureau of Meteorology, 2012c), although only eight significant water regions from all over Australia were reported on in both 2010 and 2011, namely, Adelaide, Canberra, Melbourne, Murray-Darling Basin, Ord, Perth, South East Queensland and Sydney. The National Water Account 2010 and 2011 present water reports following the second iteration of the standard (known as ED AWAS 1).

The 2011 edition of the National Water Account illustrates many of the issues discussed above. The contextual information, which is similar to the Contextual Statement, includes detailed background information about all reporting regions. Both surface and groundwater resources are described as part of the physical information. Information disclosed also includes administration, water rights, climate and water overview. Each of the regions presents the three statements: Statement of Water Assets and Water Liabilities, Statement of Changes of Water Assets and Water Liabilities and Statement of Physical Water Flows. What is noticeable is the positive figure of net water assets (other than in the case of Perth), but care must be taken because a positive net water assets figure is not similar to the positive accounting profit figure. In the case of Perth, there is a negative figure because they could estimate the amount of groundwater assets due to the lack of available data.

Another striking figure is the amount of the unaccounted-for difference figure for the Statement of Changes of Water Assets and Water Liabilities and for the Statement of Physical Flows, which illustrates the point regarding information quality noted above. For example, the unaccounted-for difference value in Adelaide for 2011 is 720,542 ML.

There is no Assurance Statement at this stage because at the time of preparing the National Water Account 2011, the WASB had not released the form of that Statement. The AWAS 1, issued by the Water Accounting Standards Board (2012), did not include the Assurance Statement as part of the components of GPWAR. However, AWAS 1 states that reports need to be assured by an independent assurer.

Finally, and perhaps most importantly, in terms of the Accountability Statement (which is the same for all eight regions), the Bureau of Meteorology (2012a) provides a general statement which states that the Accountability Statement does not provide enough information to understand and evaluate water managers and that quantification approaches are incomplete because the knowledge base is inadequate.[116] The AWAS 1 limits the content of the Accountability Statement to report whether GPWARs have been prepared following the standards (Water Accounting Standards Board, 2012).

After analysing the groundwater component in all accounts of the National Water Account 2011, I found that the groundwater component is present in all regions except Sydney (even though groundwater is present in all eight regions according to the Contextual Statement). In the case of Perth, the amount of groundwater is significant because of its reliance on this resource. Such an amount was estimated using the PRAMS model. (See Table 5.3 in the Appendix which shows information about groundwater in the Statement of Water Assets and Water Liabilities for the National Water Account 2011.)

[Insert Table 5.3 here]

An analysis of the contents of the Statement of Water Assets and Water Liabilities, Statement of Changes of Water Assets and Water Liabilities and the Statement of Physical Water Flows reveals that little information on groundwater is disclosed.

Such poor disclosure reflects the fact that measurement of groundwater resources poses a more difficult challenge than measurement of surface water resources. This fact is connected to the fact that the amount of unaccounted-for difference is significant which creates another problem due to materiality.

4.7. Accountability under AWAS 1

Chalmers *et al.*'s (2012) study reviews the General Purpose Water Accounting standard-setting process (known here as SWA) and speculate on the benefits of the process for different stakeholder groups. They argue that the SWA process has the potential to serve the public interest because the quality and credibility of information supplied to external and

[116] According to the Bureau of Meteorology (2012a), 'the Accountability Statement does not present information that would assist users to understand and evaluate the accountability of water managers because of the impracticality of doing so in this report'.

internal parties can be increased. The SWA process was initiated due to the public interest and public unrest produced by the water shortage crisis.

Chalmers *et al.* (2012) may be correct in their conclusion that Standardised Water Accounting is designed to serve the public interest. However, at this stage, it does not because of the limitations identified above. Accountability cannot be fully realised under the second iteration of the standard because of those limitations. SWA is considered an accountability mechanism, but the majority of practitioners and potential users view SWA reports only as information tools. The Water Accounting Standards Board (2012) released the third iteration of the standard (known as AWAS 1) in October 2012 and it is evident that not of all of those issues were addressed. The Water Accounting Standards Board took into account the comments received from the public submissions in order to prepare the third iteration of the standard, but there are still areas that create controversy and have not been pinpointed, particularly the form and/or content of the Assurance Statement and the Accountability Statement. The AWAS 1 limits the functions of accountability just to report whether GPWARs have been prepared following the standards whereas the Assurance Statement is not considered a core element of GPWARs any more (Water Accounting Standards Board, 2012).

Accountability of water management and governing bodies of water might be complex and depend on many factors, but, according to the Water Accounting Standards Board (2010), GPWARs are useful to evaluate the accountability of water managers. In fact, in the second iteration of the standard the Water Accounting Standards Board (2010 para. 1) states that:

> *'The objective of a general purpose water accounting report is to provide information to users of that report that will be useful in: a) Making and evaluation decisions about the allocation of resources states; and b) Understanding and evaluating the accountability of managers, management groups or governing bodies of the water report entity for the water assets and water liabilities of the water report entity.'*

However, in the third iteration of the standard (known as AWAS 1), the Water Accounting Standards Board (2012 para. 1) states that:

> *'A general purpose water accounting report shall provide information useful to users of that report for making and evaluating decisions about the allocation of resources.'*

In other words, the WASB removed the accountability part from the objective of GPWARs.

Chalmers *et al.* (2012) argue that SWA (termed by them the GPWAR process) has the potential to serve the public interest as the credibility and quality of information flowing to external and internal parties can be increased. Fundamentally, however, it is difficult to argue that an accounting standard is in the public interest when the public have not been heavily involved in the development of the standard and the accountability component has been eliminated from the third iteration. Therefore, future iterations of the standard need to rectify these issues by considering the benefits and costs of SWA as suggested by Hazelton *et al.* (2011). 'SWA offers a significant step forward for Australian water reporting via standardisation of water terminology, information content and presentation, but requires ongoing commitment and engagement from all sectors to fully realise this potential' (Hazelton *et al.*, 2011 p. 37).

After reviewing the findings of each of the papers, I conclude that the introduction of SWA would be beneficial to account for and report on water. This conclusion is consistent with Hazelton *et al.* (2011 p. 37) who suggest that the adoption of accounting technology is bold but justified. However, there are still doubts about the capacity of SWA reports to discharge the accountability of water managers. This fact was reflected in each of the papers previously described. Additionally, practitioners did not want to see SWA as an accountability mechanism. Instead, they see SWA as enhancing water information only. This conclusion leaves a question unanswered: what the purpose of the current iteration of SWA is.

4.8. SWA as Auto-communication

Based on the findings discussed above, one possibility is that the government itself might be the ultimate user of SWA accounts. If so, this would make SWA a form of 'auto-communication'. Broms and Gahmberg (1983) define it as one mode of communication which is considered as communication to oneself. This system creates qualitative changes in the person or group and enhances the ego of the individual or the team spirit of the group. This fact can be seen in organisational contexts in which organisational plans are frequently 'read and written to make the planners of the organization feel like heroes and seers, to let oneself and others feel how well things are organized' (Broms and Gahmberg, 1983 p. 487). Auto-communication presents in its purest form '(in a positive sense) a form of self-seduction and (in a negative sense) a form of manipulation of organisational members' (Morsing, 2006 p. 176). Morsing (2006) argues that Corporate Social Reporting influences managers and

employees to identify with their workplace, which is useful to reinforce corporate self-image and corporate identities.

It might therefore be the case that, after all, SWA does not represent a commitment to external transparency and accountability. This argument resonates with the work of Ball *et al*. (2000) who evaluate the extent of verification statements in environmental reports in promoting organisational transparency and empowerment of external actors. After examining 79 environmental reports from 53 companies, Ball *et al.* (2000) conclude that verification practice shows a managerial orientation instead of a real commitment to organisational transparency and accountability even though reports are publicly available. Similarly, Spence (2009) explores the target audiences for social and environmental reporting by interviewing social and environmental reporting managers in the UK. He finds that employees and investors are the primary audience and draws on auto-communication theory to question the extent to which Social and Environmental Reporting is useful as a means to engage in dialogue with stakeholders. Spence (2009) argues that social and environmental reporting serves as a vehicle by which organisations can communicate with themselves. Therefore, Spence (2009 p. 255) states that 'rather than engaging external stakeholders in two-way dialogue or in discharging accountability, Social and Environmental Reporting can be seen as a means by which the organisation creates a closed system of signs that permits an egoistical and fantastical construction of who it wants to be.' In Paper 2, one question from the survey was about who the respondents perceive to be the main users of SWA reports. Approximately 72% of respondents believe that reports would be more useful to water industry regulators. This fact reflects the possibility of auto-communication as an alternate explanation for SWA. To explore this possibility further, more studies about users of GPWARs might be undertaken. This and other areas for future research are discussed below.

5. Areas for Future Research

A number of potential areas for future research in relation to SWA may be derived from the findings of the three papers undertaken. These areas include further investigation of users of GPWARs, water management accountability, the Conceptual Framework for SWA, and privatisation.

5.1. Users

Findings of the three research papers show repeated calls from practitioners for more studies about potential users of GPWARs. The main challenge for SWA is to be more specific and to determine who the users of General Purpose Accounting Reports will be (or, in other words, to give more details about the accountee side of the accountability relationship). The Water Accounting Standards Board (2009 para. 19) provides a broad range of categories of users of GPWARs. It includes water users, investors in water-dependent industries, government representatives, water industry regulators, water managers, groups and associations, consultants, academics and citizens. However, that range is not very specific and doubt remains about who the primary users are and what key decisions are likely to be informed by GPWARs. It would thus be useful to explore what their information needs are in order to assess whether their water information needs are satisfied by the provision of GPWARs. It might a good idea as well to approach industry groups to get their perceptions and compare them with those of other groups listed by the Water Accounting Standards Board. Another interesting exploration in relation to users would be to test the auto-communication theory in the case of SWA (as discussed in the previous section).

5.2. Accountability under SWA

Another area for future research comes from the practical application of SWA as reflected in the National Water Account 2011 (which used the second iteration of the standard). In the Water Act 2007, the Commonwealth of Australia (2012) assigned the Bureau of Meteorology (BoM) the responsibility of preparing national water accounts under SWA. The National Water Account 2010 represents the first official attempt at this level/type of accounting. As described in Paper 1, the BoM prepared the first and second National Water Account for 2010 and 2011 respectively following the ED AWAS 1. However, the BoM did so by presenting information on eight significant water management regions. By analysing the National Water Account 2010 and 2011, two major issues create controversy and reflect areas for future research: 1) The value of unaccounted-for difference and 2) The differences in quantities from the same items between the 2010 National Water Account and the 2011 National Water Account. (See Appendix for a summary of these values prepared by revising the 2010 National Water Account and the 2011 National Water Account - Information was taken from the BoM website and belongs to the 2010 National Water Account and to the 2011 National Water Account.)

[Insert Table 5.1 and Table 5.2 here]

The first area of controversy concerns the unaccounted-for difference values. These values are very highly material in financial terms and such difference can be appreciated when the unaccounted-for difference is analysed as a percentage of net water assets and as a percentage of the difference of net water assets (see Appendix). In the water accounting statements for Adelaide, the Bureau of Meteorology (2012b) considers the unaccounted-for difference as the volume required to reconcile the opening water storage and the closing water storage with the total amount of water inflows and water outflows reported in the statements. A reason for these significant differences is the measurement process and capturing of data. Therefore, exploring the unaccounted-for difference poses an interesting area for future research mainly because of its materiality.

The second area of controversy comes from analysing the values of Net Water Assets from the 2010 and 2011 National Water Accounts and concerns what are known as adjustments from previous periods. In the 2011 National Water Account the values of Net Water Assets for 2010 are restated (in mega litres). However, the values of Net Water Assets in the 2010 National Water Account are different from the 2011 National Water Account (except for the Sydney area). The major difference is found in the Murray-Darling Basin in which Net Water Assets in the 2010 National Water Account are 8,820,615 ML and in the 2011 National Water Account are 8,517,872 ML (see Appendix). The idea of previous period errors comes to the fore, but those differences are also important from a materiality point of view.

These two areas of controversy may be connected with the element of transparency (and therefore the quality of reporting). These areas of controversy are relevant in evaluating the accountability of water managers; however, in its third iteration the Water Accounting Standards Board (2012) reduced the scope of the Accountability Statement to just disclosure of compliance with water accounting standards. Therefore, it is necessary to investigate the extent to which these controversies influence accountability and the perceptions of practitioners about them.

5.3. Conceptual Framework

The third area for future research involves an in-depth examination of the way SWA has been developed thus far and should explore the extent to which developing the framework before the standards will have any effect in the SWA process. In SWA, the Statements of Water

Accounting Concepts (SWAC) or Conceptual Framework was developed before the actual water accounting standards. Developing the water accounting conceptual framework before the water accounting standards is an opposite process in comparison to the process followed in financial accounting in which the accounting standards were developed before the accounting conceptual framework. Conceptual frameworks are designed to cover important issues in the financial reporting process. According to the Water Accounting Standards Board (2009 p. 1), the purpose of the Water Accounting Conceptual Framework (WACF) is to guide the development of Australian Water Accounting Standards while also guiding the preparation of GPWAR when the standards are not sufficient providing information.

The structured part of conceptual frameworks may be connected to the work of Ijiri (1983), who states that a conceptual framework for accounting can be either decision-based or accountability-based. According to Ijiri (1983), a conceptual framework of accounting is decision-based if it focuses on the decision maker or the user of accounting information and is based on usefulness. On the other hand, the accountability-based model focuses on the accountability relation between the accountor (supplier of accounting information) and the accountee (user) and is based on fairness. Ijiri's (1983) analysis means that conceptual frameworks are structured according to their objectives. The objective of providing information useful for economic decisions applies to decision-based frameworks whereas accountability-based frameworks look at providing a fair system of information flow between the accountor and the accountee (Ijiri 1983).

According to Ijiri (1983), most conceptual frameworks seem to be decision-based. Dean and Clarke (2003) state that conceptual frameworks codify existing practice instead of prescribing a logical approach to accounting. Furthermore, Hines (1989 p. 85) views conceptual framework projects as apparent failures from a functional or technical point of view even though they might constitute a strategic manoeuvre to assist in socially constructing the appearance of a coherent differentiated knowledge base for accounting standards. Indeed, Hines (1989) considers the entire financial accounting conceptual framework project as an effort to promote the legitimacy of the accounting profession and standard-setting bodies at a time when this legitimacy was under threat. Therefore, exploring how the SWAC was developed in light of Hines' (1989) suggestion poses a potential area for future research.

5.4. Privatisation of urban water services

Although some water services are outsourced in Australia to private partners, state governments own water administration and management (Pigram, 2006). However, there has been a neo-liberal trend that has affected the public sector since the 1980s and has consequently affected the Australian water sector too. This New Public Management (NPM) trend could be connected with the introduction of SWA because SWA certainly mirrors financial statements in terms of layout and that layout reflects accrual accounting. Owen *et al.* (1997) argue that capitalism and the accounting systems that drive capitalism do not match conceptually and practically with Sustainable Development. Since SWA is based on financial accounting principles, it is argued that the adoption of SWA, which is based on accrual concepts, is in essence a *de facto* adoption of NPM and hence the next step might be or might not be the privatisation of water services and sanitation. This area for future research is therefore to explore both the likelihood and the impact of urban water privatisation.

According to Budds and McGranahan (2003), the current water problem could be analysed from the supply side and the demand side. In both, measures should be taken to impact the supply and the demand. For example, an impact on the supply side could be the construction of more dams and/or desalination plants and/or better water management, whereas an example on the demand side could be pricing which could lead to privatisation. The next step after the introduction of SWA might be the privatisation of urban water services and sanitation in Australia (similar to what happened in the UK). Privatisation might be the next step which is connected with the reform process that the public sector has been undergoing since the early 1980s (with the introduction of New Public Management). SWA might be used to inform users and regulators on how the resource is being used in order to prepare the grounds for privatisation.

The idea of privatising public goods (or common-property resources) is based on Hardin's (1968) 'Tragedy of the Commons'. In order to avoid an overexploitation or degradation of all resources used in common, the commons can be either privatised or maintained as public property (Feeny *et al.*, 1990). If maintained as public property, it is possible to allocate the rights to entry and use. Hardin (1968) suggests two general solutions: private enterprise and control by government.

This issue is controversial, however, because 70% of Australians do not want privatisation (Douglas, 2011) and privatisation might not be the best solution after all (Budds and McGranahan, 2003). Instead of privatisation of urban water services and sanitation, more Private-Public Partnerships (PPP) could be implemented in the water sector. According to Djohan (2012), the World Bank undertook a study on Public-Private Partnerships for urban water utilities three years ago and found a positive relationship between private sector involvement and water service delivery. Some PPPs have been implemented in the Australian water sector in the last few years; for example, the Sydney desalination plant whose contract was awarded in 2007 (see Black, 2009 p. 14).

6. Appendix

Table 5.1. Water Account 2010

Water Account 2010 (Prepared under SWA and according to the ED AWAS 1)

Year	Location	NWA	+/- NWA	UFD	% of NWA	% of +/- NWA
2010	Adelaide	150,102	857	220,348	147%	25712%
2010	Canberra	151,868	25,010	121,946	80%	488%
2010	Melbourne	667,406	144,125	394,070	59%	273%
2010	Murray-Darling Basin	8,517,872	2,563,013	1,085,123	13%	42%
2010	Ord	8,485,996	-1,867,337	4,352,385	-22%	-43%
2010	Perth	94,846	27,882	125,812	133%	451%
2010	South East Queensland	2,089,040	340,231	414,737	20%	122%
2010	Sydney	1,699,854	-102,788	20,547	1%	-20%

Source: Bureau of Meteorology (http://www.bom.gov.au/water/nwa/2010)

(*) NWA = Net Water Assets

(**) +/- NWA = Difference in Net Water Assets

(***) UFD = Unaccounted-for difference

(****) Quantities are in ML (megalitres)

Table 5.2. Water Account 2011

Water Account 2011 (Prepared under SWA and according to the ED AWAS 1)

Year	Location	NWA	+/- NWA	UFD	% of NWA	% of +/- NWA
2010	Adelaide	199,345	3,136	548,707	275%	17497%
2010	Canberra	154,035	27,177	187,651	122%	690%
2010	Melbourne	688,184	164,796	318,186	46%	193%
2010	Murray-Darling Basin	8,820,615	2,686,860	4,906,419	56%	183%
2010	Ord	8,514,837	-1,866,849	2,575,746	-22%	-72%
2010	Perth	69,277	2,313	-24,395	-35%	-1055%
2010	South East Queensland	2,096,514	340,231	1,469,223	70%	432%
2010	Sydney	1,699,854	-102,788	43,368	3%	-42%

Source: Bureau of Meteorology (http://www.bom.gov.au/water/nwa/2011)

(*) NWA = Net Water Assets

(**) +/- NWA = Difference in Net Water Assets

(***) UFD = Unaccounted-for difference

(****) Quantities are in ML (megalitres)

Water Account 2011 (Prepared under SWA and according to the ED AWAS 1)

Year	Location	NWA	+/- NWA	UFD	% of NWA	% of +/- NWA
2011	Adelaide	223,613	24,268	720,542	322%	2969%
2011	Canberra	240,607	86,572	222,390	92%	257%
2011	Melbourne	1,174,875	486,691	865,788	74%	178%
2011	Murray-Darling Basin	17,673,102	8,852,487	9,423,489	53%	106%
2011	Ord	14,840,787	6,325,950	11,943,085	80%	189%
2011	Perth	-20,630	-89,907	-408,329	1979%	454%
2011	South East Queensland	2,219,563	123,049	278,808	13%	227%
2011	Sydney	2,236,282	536,428	218,095	10%	41%

Source: Bureau of Meteorology (http://www.bom.gov.au/water/nwa/2011)

(*) NWA = Net Water Assets

(**) +/- NWA = Difference in Net Water Assets

(***) UFD = Unaccounted-for difference

(****) Quantities are in ML (megalitres)

Table 5.3. National Water Account 2011 – Statement of Water Assets and Water Liabilities

Water Assets and Water Liabilities (ML)	Adelaide	Canberra	Melbourne	Murray-Darling B.
Water Assets:				
Surface water	120,570	239,752	1,126,164	22,857,405
Groundwater				
2.1 Water table aquifer	0	0	21,873	0
2.2 Underlying aquifers	0	0	16,565	0
2.5 Other groundwater assets	88,252	0		1,327,718
Urban water system	18,323	855	24,219	
Irrigation scheme	29			
Total Water Assets	**227,174**	**240,607**	**1,188,821**	**24,185,123**
Water Liabilities:				
Surface water liability	0	0	13,946	6,510,063
Groundwater liability				
6.1 Groundwater allocation remaining	3,561	0	0	1,958
6.2 GW allocation remaining - urban water system	0	0	0	0
Total water liabilities	**3,561**	**0**	**13,946**	**6,512,021**
Source: Bureau of Meteorology, 2012 (www.bom.gov.au/water/nwa/2011/index.shtml)				

Water Assets and Water Liabilities (ML)	Ord	Perth	SE QLD	Sydney
Water Assets:				
Surface water	15,148,491	160,173	2,220,401	2,241,429
Groundwater				
2.1 Water table aquifer	0	0	9,340	0
2.2 Underlying aquifers	0	0	0	0
2.5 Other groundwater assets	0	0	0	0
Urban water system		7,003	2,056	216
Irrigation scheme		370		
Total Water Assets	**15,148,491**	**167,546**	**2,231,797**	**2,241,645**
Water Liabilities:				
Surface water liability	304,166	28,763	12,234	5,363
Groundwater liability				
6.1 Groundwater allocation remaining	1,246	159,413	0	0
6.2 GW allocation remaining - urban water system	2,292	0	0	0
Total water liabilities	**307,704**	**188,176**	**12,234**	**5,363**
Source: Bureau of Meteorology, 2012 (www.bom.gov.au/water/nwa/2011/index.shtml)				

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APPENDICES

01 October 2008

Mr Edward Tello Melendez
Department of Accounting and Finance
Macquarie University

Reference: HE27JUN2008-D05960

Dear Dr Tello Melendez

FINAL APPROVAL

Title of project: "Water Accounting Research Study"

Thank you for your recent correspondence. Your response was reviewed by the Executive of the Ethics Review Committee (Human Research) and the following decision was made:

The Executive noted that you have already received a number of signed permission forms, indicating that the information and consent forms have already been sent out to potential participants prior to final approval being granted to this study. Although the Executive indicated that final approval could now be granted to this study, it would like to strongly remind you that any research conducted without first having received final approval from the Committee is in breach of the 'National Statement on Ethical Conduct in Human Research' and the University's guidelines for the conduct of ethical research. In future please ensure that you have received a letter of final approval from the Committee before commencing your research in order to ensure that you are in compliance with the relevant guidelines.

In addition, the Executive considered your response regarding the use of the Macquarie University letterhead on the information and consent form. The Executive has made the following a condition of final approval:

1. Please place the Macquarie University letterhead on information and consent forms that are sent out in the future. As stated before, it would be appropriate for the WAPCO letterhead to go on the covering letter but the information and consent form should include the Macquarie University letterhead.

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).

ETHICS REVIEW COMMITTEE (HUMAN RESEARCH)
LEVEL 3, RESEARCH HUB BUILDING C5C
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15 September 2010

Associate Professor Lorne Cummings
Department of Accounting and Finance
Macquarie University, NSW 2109

Reference: 5201001143(D)

Dear Associate Professor Lorne Cummings

FINAL APPROVAL

Title of project: ***Potential users of general purpose water accounting reports.***

The above application was reviewed by the Human Research Ethics Committee. Approval of the above application is granted, 15 September 2010 and you may now proceed with your research. The following personnel are authorised to conduct this research:

Lorne Cummings - Chief Investigator/Supervisor
James Hazelton - Co-Investigator

Please note the following standard requirements of approval:

1. The approval of this project is **conditional** upon your continuing compliance with the *National Statement on Ethical Conduct in Human Research (2007).*

2. Approval will be for a period of five (5 years) subject to the provision of annual reports. **Your first progress report is due on 15 September 2011.**

If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. If the project has been discontinued or not commenced for any reason, you are also required to submit a Final Report on the project.

Progress Reports and Final Reports are available at the following website:
http://www.research.mq.edu.au/researchers/ethics/human_ethics/forms

3. 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 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).

4. Please notify the Committee of any amendment to the project.

5. Please 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.

6. At all times you are responsible for the ethical conduct of your research in accordance with the guidelines established by the University. This information is available at: http://www.research.mq.edu.au/policy

HUMAN RESEARCH ETHICS COMMITTEE
MACQUARIE UNIVERSITY

http://www.research.mq.edu.au/researchers/ethics/human_ethics

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16 November 2011

Dr. Lorne Cummings
Faculty of Business and Economics
Macquarie University, NSW 2109

Reference: 5201100863(D)

Dear Dr. Lorne Cummings

FINAL APPROVAL

Title of project: Groundwater Accounting Research Study.

Thank you for your recent correspondence. Your response has addressed the issues raised by the Faculty of Business & Economics Human Research Ethics Sub Committee, and you may now commence your research. The following personnel are authorised to conduct this research:

Lorne Cummings - Chief Investigator/Supervisor
James Hazelton - Co-Investigator
Edward Tello – Co-Investigator

Please note the following standard requirements of approval:

1. The approval of this project is **conditional** upon your continuing compliance with the *National Statement on Ethical Conduct in Human Research (2007)*.

2. Approval will be for a period of five (5 years) subject to the provision of annual reports. **Your first progress report is due on 16 November 2012.**

   If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. If the project has been discontinued or not commenced for any reason, you are also required to submit a Final Report on the project.

   Progress Reports and Final Reports are available at the following website:
   http://www.research.mq.edu.au/researchers/ethics/human_ethics/forms

3. 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 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).

4. Please notify the Committee of any amendment to the project.

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