Water reporting in China: An attempt at Illumination

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ATTESTATION OF AUTHORSHIP

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgments), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Abstract

This research investigated the current situation of water-related information disclosure in 50 major Chinese companies (SSE 50), which were listed on the Shanghai Exchange Market. More specifically, this research involved the development of a unique disclosure index to measure water-related information disclosed within annual reports and the corporate social responsibility reports. Therefore, an effective and a comprehensive disclosure index will be introduced in this research paper.

The objective of this specific research was to provide a more comprehensive understanding regarding the status quo of water information disclosure in Chinese companies. Thus, an introduction in regards to water-related issues will be discussed at the beginning. In the following section, past literature in the area of water accountability and water-related issues will be reviewed. Meanwhile, the content analysis will be undertaken as the research method in terms of ensuring the quality and comprehensiveness of the index development and other results.

The findings are significant in terms of revealing the current situation of water-related information disclosure within SSE 50 Chinese companies. It also found few factors which showed a significant correlation in relation to the disclosure score. Therefore, the result provided a clear indication that the significance of water resource, and also the issues in relation to such a resource, have not been comprehensively disclosed, and the levels of understanding in regards to the importance of water resource was different among each industry. However, this specific disclosure index, which I developed in this research project, may potentially enhance the comprehensiveness of water-related information disclosure in a range of industries, in terms of disclosing their water-related issues. Furthermore, the lack of knowledge in terms of reporting water-related information is crucial, since water is an essential element in every area. Thus, this research may also enrich the knowledge of water accountability in regards to relevant information disclosure and reporting.

1.0 Introduction

Environmental issues are consistently given attention in a variety of areas. Social and environmental accounting has a long history of engagement in environmental issues (Russell and Lewis, 2014). Historically, however, accounting and accountability for freshwater is one area which has received little attention in environmental accounting research. More recently, the focus on the development of water accounting is increasing, and some contributions to water accounting have been made in recent studies (Chalmers et al., 2012; Godfrey and Chalmers, 2012; Hazelton, 2013).

Water is an essential element for all life-forms on earth. The industrial revolution enabled human beings to sustain population growth at a level that is unprecedented in human history. With the population boom, water consumption is at an all-time high. Therefore, in the current milieu, it is of the utmost importance to manage the reporting and disclosure of water-related information.

China has the world's fastest economic growth rate. However, the use and quality of water in China has been a complex issue since the early 1950s. Prior research has placed specific emphasis on the significant impact water pollution has had on water quality; poor water quality has the potential to result in a drinking water crisis. In addition, water scarcity has become a consistent problem in order to maintain the demand of water, especially in some regions which have experienced serious water shortages (Qin et al., 2010; Wang et al., 2008; Cann et al., 2005; Zhang et al., 2010; Zhang et al., 2011; Jiang, 2009; Xie, 1992).

With the above issues in mind, the objective of this research is to contribute to the literature on water accounting by obtaining an extensive understanding of the significance of water-related information disclosure and the quality of voluntary water-issue disclosures in China. More specifically, the research aims to obtain a comprehensive understanding of the factors that may potentially affect the efficiency

and effectiveness of water-related information disclosures.

Prior studies in this area generally use a single extent content analysis methodology and typically concentrate only on annual report disclosures. However, I propose to examine the quality and extent of environmental disclosures, especially water-related information disclosures, in different reporting methods. I will endeavour to present a more comprehensive picture of companies' attempts to report water-related information by using the Corporate Social Responsibility (CSR) reports and annual reports of 50 major Chinese companies listed on the Shanghai Stock Exchange (SSE) as the two major reporting instruments.

Water is a sophisticated and pertinent issue for many areas, such as biodiversity and climate change. However, in China, very little research and information is available in general. The aim and purpose of this research is therefore to attempt to understand the current situation involving major Chinese companies' water-related information disclosures, and to examine the behaviour and performance of their reporting of water-related information, thereby filling this gap in the research literature.

The research is presented as follows. First, a literature review and details of the development of my water-related information disclosure index is given, followed by an explanation of the methods applied in developing and applying this specific disclosure index. Second, an outline is provided of the comprehensive scale development and expectation score measurement system used to enhance the measurement of my disclosure index as applied to the SSE 50 companies. This includes an analysis of the extent of reporting and other factors which may potentially influence the comprehensiveness of water-related information disclosure. These were also used as external measures underpinning the detailed analysis of the assessment of water-related information disclosures. It is envisaged this will minimise any potential bias in the results of the analysis. Third, the results section includes both qualitative findings and statistical results. In the final section, the conclusions, research limitations and future

research are presented.

2.0 Literature Review

Water is an essential element for almost all life-forms on earth. The industrial revolution enabled human beings to sustain population growth at a level unprecedented in human history. However, with the population boom, water consumption is at an all-time high. Prior research indicates that climate change, biodiversity loss and the nitrogen cycle have exceeded planetary boundaries, while globally the demand for freshwater now exceeds its availability (Rockström et al., 2009). In the same vein, freshwater is a fundamental element for ecosystems and human well-being, and it is also a basic necessity in environmental systems, as it offers a range of goods and services that counteract the negative impacts of environmental change (UNEP, 2012). Therefore, the issues of availability, affordability and adequacy in regards to freshwater, must always be critical topics of discussion on the international sustainable development agenda (UN-Water, 2011).

Environmental issues are constantly emphasised by academics, policy makers and other associated parties. The issue of water has been raised in the last few decades. The United Nations Educational, Scientific and Culture Organization (2006) considered water management to be a key sustainability issue for many countries. Meanwhile, water management has also been identified as ‘one of the great challenges of this century’ and an urgent task in regards to current environmental management (United Nations, 2008; Palaniappan and Gleick, 2009; Intergovernmental Panel on Climate Change, 2007; Turral et al., 2011; Cleick, 2006).

However, transformative changes require knowledge from not only one area, but a variety of disciplines and areas which cross national and organisational boundaries (Russell and Lewis, 2014). The knowledge gained from natural and social sciences, including accounting, will need to be integrated in order to support the transition to sustainability (Future Earth, 2013).

From a theoretical perspective, social and environmental accounting research has a well-known history and has made a substantial contribution to the sustainability and adaption of environmental alterations. Accounting as a discipline has specific and specialised techniques and ethics, the objectives which concentrate on climate change, biodiversity and human rights have been constantly examined, thus sustainability accounting and accountability has become an important focus in recent years. (Unerman et al., 2007; Bebbington and Larrinaga, 2008; Milne and Grubnic, 2011; Jones and Solomon, 2013; McPhail and McKernan, 2011).

Moreover, research conducted on water accounting, especially in water information disclosure, has also increased in recent years (Crowther et al., 2006; Egan and Frost, 2010; Tregidga and Milne, 2006). Thus, water-related information disclosure plays a vital role in ensuring sustainable water usage when water is becoming a dominant environmental issue around the world (Hazelton, 2013).

Traditionally, water was rarely considered as a topic of focus within the accounting profession. However, following the population boom, and also changes in both the ecosystem and environmental deterioration, the significance of water accountability has intensified and the development of systematic water accounting has appeared more often in recent literature. Moreover, the role of the accounting profession and the understanding of water accounting systems and its application in a variety of circumstances, has also been examined (Chalmers et al., 2012; Vink, 2014; Hazelton 2013).

Australia's national water accounting standard defined water accounting as "a systematic process of identifying, recognizing, quantifying, reporting, and assuring information on water; the rights and other claims to that water, and the obligations against that water"(Water Accounting Standards Board, 2009, p. 88). Based on these standards, the development of general-purpose water accounting (GPWA) is purposefully designed to report and/or disclose water-related information to external

parties who need such information to make decisions (Water Accounting Standards Board, 2010).

Water related information disclosures also form part of reporting framework the Global Reporting Initiative (GRI) (Global Reporting Initiative, 2003, 2011a). The GRI is the framework which has been most extensively adopted for Chinese companies and organisations in their social and environmental information reports. During the year 2013, 1874 sustainability reports were published in China, showing a 10% growth rate from the number published in 2012 (Csrreport, 2014). Further, 40% of the companies that are listed on the SSE have CSR reports in which 74 companies have voluntarily disclosed their sustainability status. Thus, it is reasonable to observe that the awareness of sustainability reporting is continuously increasing in China.

In China, following rapid economic growth, water shortage and water quality have become critical issues. Prior research showed a significant drinking water crisis especially in China's third largest freshwater lake, which was a large city's sole water supply. This left approximately two million people without drinking water for at least a week (Qin et al, 2010). In addition, water pollution from small rural industries had a vital impact on the situation which caused over half of all rivers to be unsafe for human contact (Wang et al, 2008). Previous research has also shown that 80% of China's major rivers are so polluted they can no longer support aquatic life. (Cann et al., 2005). This has resulted in many communities lacking access to safe drinking water and sanitation, and thus the risk of waterborne disease in many regions is high (Zhang et al., 2010). Likewise, one recent study has also criticized the excessively rapid industrialization and unreasonable location of factories as factors responsible for the increasing frequency of water pollution (Zhang et al., 2011).

Xie (1992) indicated that water shortage is also an important limitation in the development of the economy, especially in China where water scarcity has always played a significant role in many regions and cities. A prior study indicated that China is

rooted in a situation of increasingly severe water scarcity, where insufficient local water resources and reduced water quality due to an increasing pollution, were two significant factors that characterised the issue (Jiang, 2009).

Miao (2011) pointed out that companies' profit-oriented incentives could result in more serious water pollution, since it is evident that in China, profit-oriented motivations outweigh environmental concerns. However, if managers' negotiating powers are improved or a company's utility reserves are upgraded, these negative consequences could be avoided. The study suggested that water contamination is more likely to be solved by increasing financial support for environmental protection bureaus, or through an increase in the fixed income of the managers.

Based on the environmental disclosures of Chinese listed companies, Liu and Anbumozhi (2008) found that most of the environmental information on the Chinese companies' disclosures was aimed to alleviate bureaucratic pressure. It is evident that the pressure from other stakeholders, such as shareholders and creditors, seems to be relatively weak.

It is obvious that water is a sophisticated and an urgent issue which must be taken into account. Moreover, since the water-related disclosure index was developed, based on a significant amount of literature and other sources, more literature will therefore be reviewed and applied as the foundation to the development of this unique and specific water-related disclosure index. Further, the index development involved an extensive knowledge of current and past literature, also there are no past studies which developed any water-related information disclosure index that similar to the present study, thus a contribution should potentially be made to the current literature by filling the gap of water information disclosure and reporting in regards to water accountability.

3.0 Research Method

This study was conducted using a sample of companies listed on the Shanghai Stock Exchange in 2014 and in the top 50 Chinese companies with respect to good liquidity and fair representation. As the purpose of this research is to understand the status quo of water-related information reporting in China, the analysis of water-related information disclosure was determined via reading and interpreting company annual reports and corporate social responsibility reports. In total, 100% of annual reports (n=51) were obtained and 86.27% of the companies provided their corporate social responsibility reports (n=44) in the public domain for analysis.

The annual reports and corporate social responsibility reports were analysed using content analysis. Krippendorff (1980) indicated that "content analysis is a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts for their use" (p. 18). Content analysis has been broadly implemented in many prior studies of environmental disclosures (Milne and Adler, 1999; Beattie, McInnes and Fearnley, 2004; Wiseman, 1982; Patten, 2002; Ingram and Frazier, 1980). In addition, content analysis is one of the most common research method used for social information analysis (Dagiliene, 2015), since it involves classification of various elements and text units into different categories (Beattie, McInnes and Fearnley, 2004; Kassarjian, 1997). Therefore, content analysis is seen as appropriate, as this research is an investigation of the content of water-related information disclosures and any subsequent disclosures in annual reports and corporate social responsibility reports.

In this study, content analysis will involve the development of an index which includes 5 index themes and 21 index items, and this unique index should potentially provide an extensive and comprehensive understanding of the context of water accounting. A disclosure-scoring methodology (a comprehensive scale measurement) based on content analysis has also been developed and implemented as a measurement tool to assist the analysis of the index and this will be introduced in the following discussion.

3.1 Data Collection

As the purpose of this research is to understand the status quo of current water information reporting and disclosures in China, the research sample is comprised of 50 Chinese companies listed on the Shanghai Stock Exchange in the year 2013 to 2014. In addition, all qualitative data of the project was collected manually and included companies' annual reports and companies' corporate social responsibility reports.

Past literature has demonstrated that large companies should disclose more information, which also includes information in regards to environmental perspective. Therefore, in the same context, large companies should favour more disclosure of information relevant to the water issue.

The sample data for this study was specifically selected from the largest 50 companies on the Shanghai Stock Exchange. The Shanghai Stock Exchange (SSE) was founded in the 1990s and it has become the most prominent stock market in Mainland China. The SSE 50 index is a scientific and objective selection of the 50 largest stocks from the Shanghai security market, which meet the requirement of good liquidity and fair representation of large listed companies within the Shanghai security market (see Appendix C for company detail).

Consequently, this specific selection reflects a holistic picture of large enterprises that have the most influence in the Shanghai security market. The selection method potentially increases the validity of this specific study. In addition, the SSE 50 is comprised of multiple industries, such as: manufacturing; materials; industry; energy; construction; transportation; real estate; telecommunication services; information technology; health care and financial. This should provide more comprehensive findings which are applicable across industries.

Prior research has demonstrated that companies might intentionally choose the most

suitable disclosure method, when a major environmental crisis occurs or their environmental reputation is in jeopardy (De Villiers and Van Staden, 2011). In terms of achieving integrity and completeness, this research considers the differences in each disclosure method, i.e., annual reports, sustainability reports and corporate social responsibility reports.

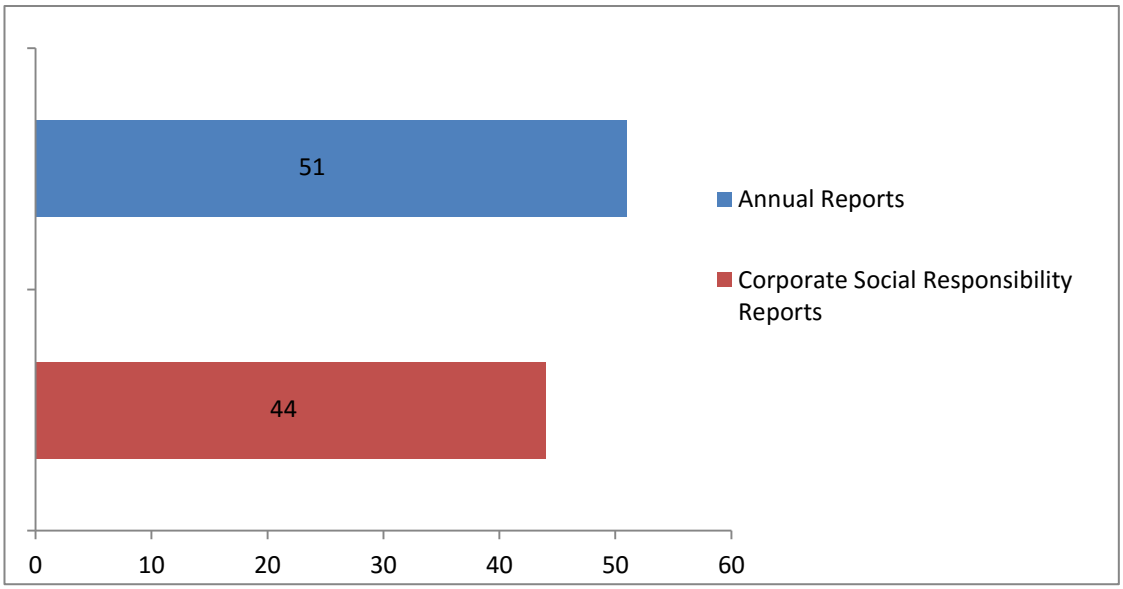

Figure 1. Total volume of Annual Reports and Corporate Social Responsibility Reports[1]

Note: The CRRC Corporation Limited was a new company which was included in the SSE 50 index at the beginning of the year 2015. This company consisted of two separate corporations, the CSR Corporation Limited and the CNR Corporation Limited, which both operated within the same industry. However, as my data was collected during the year 2014 and this specific combination occurred at the beginning of 2015, both the annual report and corporate social responsibility report were unavailable in any public domain. In this particular case, I therefore used the annual reports and the corporate social responsibility reports from both the CSR and CNR Corporation Limited. Consequently, this change resulted in a situation of having 51 companies in the research sample; I used 51 as the accurate unit to calculate the total number of companies and the average (mean) in the analysis.[1]

3.2 Index development and background

Index development has played a crucial role in this research project. The index was developed with the purpose of not only ensuring the quality of the research, but also guaranteeing the comprehensiveness of water-related information disclosures.

The index is constructed of 21 index items and five themes, in order to effectively evaluate the current status of water-related information disclosures in China. Past literature formed a crucial part of this development, thus each index item was developed based on either prior literature. Moreover, a variety of other sources and/or frameworks will also be used in the development of this particular index, to enhance the comprehensiveness and rigorousness of this specific research. These sources include: the Global Reporting Initiatives; the Water Footprint; the CEO Water Mandate and the Water Accounting Standard Board.

Five themes were developed in the index. (see Appendix A for the index development, cross referred to source documents): water consumption and usage, water discharge and pollution, water recycling and reuse, water saving, and miscellaneous. The specific information regarding these five themes will be discussed in the following paragraphs.

A. Water consumption and usage

The CEO Water Mandate identified water usage as the total amount of water withdrawn or diverted by an operation to produce products or provide a service (The CEO Water Mandate, 2015). However, the Water Footprint (the Water Footprint Assessment Manual, 2011) classifies consumptive water as green water, thus any water that can be directly consumed in the production process and human use from the evaporative flow from the land surface (Hoekstra, Chapagain, Aldaya and Mekonnen, 2011).

A1. Total volume of water withdrawal

The Global Reporting Initiative (GRI) specifically indicated that water withdrawal is an important indicator to any company that is willing to disclose their water-related information. It also identified that reports should include the sum of all water drawn into the boundaries of the organisation from all sources. This is defined as the total volume of water drawn from surface water, ground water, and rainwater, collected directly and stored by the organisation, waste water from another organisation and municipal water supplies or other water utilities (GRI, 2013). Meanwhile, the most recent water reporting guidance, the CEO Water Mandate suggested that a company should disclose the volume of freshwater extracted from a surface or groundwater source, without accounting for how much is returned to the freshwater source after use (CEO Water Mandate, 2015).Therefore, the total volume of water withdrawal becomes the very first index that has been added under the theme of water consumption and usage.

A2. Total volume of water used in the production

The Water Footprint separates water consumption into the water footprint of a product and the water footprint of a consumer, thus providing the actual amount of water consumed due to production which is crucial in this research.

Hoekstra and Chapagain (2007) used the total volume of water needed for the production of the goods and services consumed by the inhabitants of a country, to define the water footprint of that country. The volume of consumption and the consumption pattern are two key factors in the equation to determine the water footprint of a country.

At an industrial level, past literature showed water utilized and supplied in production also has a significant impact (Hazelton, 2014; Biswas, 2004). Case studies have demonstrated water consumption in production processes is crucial to various industries and sectors. Egan and Frost (2010) indicated that water resources and water consumption are significant to large industries, such as the food, beverage and tobacco

sectors. Also, a case study conducted by Peters *et al*. (2010) demonstrated that accounting for water usage had a significant impact on Australian red meat production.

Nevertheless, quantifying water consumption and water usage in production has never been easy. The measurement of water-related information is complex and difficult. However, Molden and Sakthivadivel (1999) introduced a methodology which demonstrated the importance of accounting for the use and productivity of water resources. Further, Vink (2014) showed several water accounting systems that developed and implemented a wide array of situations to be used for multiple national objectives and ease water resource pressure. Thus, the total volume of water used in production functions as an extremely important index item to evaluate the water-related information disclosure performance of companies.

A3. Total volume of water consumed by administration processes

Water consumed by employees and used by office administration processes is another essential aspect which effectively evaluates the disclosure performance of a company, especially for financial companies and technological companies which are distanced from conventional production processes. Thus, water consumed by employees and office administration information disclosure, is relevant to water-related information disclosure.

Ercin, Aldaya and Hoekstra (2011) carried out a pilot study on the water footprint of a sugar-containing carbonated beverage. The total volume of water consumption by employees functioned as one important element in the factory's production. Ercin et al.'s results indicated that water consumed by employees was a vital aspect for a company in accounting and measuring the usage of water resources.

A4. Total volume of water consumed due to cleaning activities

Many traditional factory industries engage with a certain amount of cleaning activities, such as washing equipment and machines. This requires a certain volume of water to be involved and consumed.

Ercin et al. (2011) found that water consumed or polluted due to cleaning activities in a factory was a crucial factor to effectively calculate the overhead operational water footprint. Following their pilot study, the total volume of water consumed due to cleaning activities, became the fourth index item used to assess the information disclosure of water consumption and usage of SSE 50 companies.

A5. Total costs invested to improving water input quality and restoration

Water input quality and restoration has always been an issue which concerns both business practice and water users. Prior studies revealed the issues of water scarcity and the low quality of drinking water are relevant in many regions (Brulliard, 2009; Bega, 2009; British Geological Survey, 2004; Goodman, 2009). More specifically, earlier research found surface water quality has also become a critical issue of great concern in China (Shao, Tang, Zhang and Li, 2006).

More recently, Chalmers, Godfrey and Lynch's (2012) research showed water quality is a significant factor in the development of a general-purpose water accounting system. It was important to contain such an element in our index item list, to ensure the validity and completeness of the index.

B. Water discharge and pollution

The CEO Water Mandate (2015) defines wastewater discharge as the sum of water effluents discharged to subsurface waters, surface waters and sewers, either through a

defined discharge point, over land in a dispersed or undefined manner, or as wastewater removed via truck.

B1. Total volume of water discharged

The Global Reporting Initiative also demonstrated that companies and organisations should disclose the sum of water effluents discharged to subsurface waters, surface waters, sewers that lead to rivers, oceans, lakes, wetlands, treatment facilities, and ground water over the course of the reporting period (GRI, 2013). Further, as mentioned above, prior literature has demonstrated that water usage could be a critical concern for the 21th century (Molden, 1997). Water discharge is also an ecological and economical issue to many countries, thus water resource management becomes more significant and crucial in modern society (Seckler, 1996; Casani, Rouhany and KnØchel, 2004). Specifically, Qu and Fan (2010) note that in China, large quantities of contaminated sources have been discharged into the nation's water-ways, which has resulted in the self-purification capacity of many bodies of water becoming overwhelmed.

Past research has also indicated that the appropriate management of water resources could overcome most of the limitations of classic water use efficiency (Keller and Keller, 1995).

B2. Total costs occurred due to water discharged

Cost is an essential element in any kind of disclosure. Specifically, high costs can be incurred due to the volume of water discharged. Costs generated from water discharged are also difficult to quantify and measure. Recent research clearly identifies cost and measurement as two key problems for most companies to overcome in the future (Tingey-Holyoak, Pisaniello and Burritt, 2012). Thus, it is a matter of considerable importance for companies to recognise such costs and to report such information to both internal and external parties.

B3. Total volume of wastewater treated

Facilitating a system for wastewater treatment has been a universal challenge in the past decades, especially in rural regions and developing countries (Massoud, Tarhini and Nasr, 2009). However, wastewater treatment plays a significant role in the integration of water resources management (Biswas, 2004).

Further, the advantages of having wastewater treatment systems are crucial to many industries. Kampschreur et al. (2009) indicated nitrous oxide, a potent greenhouse gas, can be emitted during wastewater treatment, thus it significantly contributes to the greenhouse gas footprint. Research also found wastewater treatment could benefit both the microalgae-based bio-fuel industry and bio-products production at the same time (Christenson and Sims, 2011). In addition, Tregidga and Milne (2006) conducted a longitudinal analysis on a domestic-based water utility company to illustrate the importance of wastewater treatment and some other elements, in sustainable management and sustainable development.

B4. Total costs of wastewater treatment

The benefits of wastewater treatment are undisputed, however the challenges for implementing wastewater treatment are many.

Koppol et al. (2003) developed a mathematical programming approach to analyze the feasibility of a zero liquid discharge option in different industries. The result proved cost of discharge and treatment were the determining factors for the feasibility of zero liquid discharge. Moreover, earlier studies also demonstrated centralized wastewater treatments and collections are significantly costly to facilitate and operate, especially for those developing countries that lack the funding to construct centralized facilities and the expertise to manage and operate (Massoud, Tarhini and Nasr, 2009).

At an industrial level, the benefits of implementing a wastewater treatment system can only be derived from large-scale production (Christenson and Sims, 2011). Therefore, wastewater treatment may be less acceptable to small corporations. However, this does not affect the quality of this particular index where the proportion of large SSE 50 companies was intentionally selected.

B5. Total volume of wastewater collected

This specific index item was seen as the major element after the treating of wastewater. It is also linked to the following parts. However, this does not mean that wastewater collection is less superior to other themes or index items. The total volume of wastewater collected here describes how a company actually approaches and manages those secondary resources.

Although, wastewater collection is less relevant to small corporations, based on the quality and magnitude of our sample companies, total volume of wastewater collected, should be effectively reported in most circumstances.
Biswas (2004) also revealed wastewater collection as one of the significant elements in the integration of water resources management. While several techniques and measurement systems for wastewater collection have been introduced and implemented in the past, Izquierdo et al. (2008) presented an optimal design for a wastewater collection network, which helped to show the algorithm performance of calculating wastewater collection mathematically.

Further, a sewage collection and treatment system could potentially assist in controlling water pollution (Rodenbure, Du, Fennell and Cavallo, 2010).

B6. Total volume of water polluted

Water pollution is another major issue under the current environmental milieu and it has

caused significant problems in China. Prior literature indicates that city clusters and rapid urbanization has exacerbated the lack of accessible drinking water, especially in China.

Consequently, over the past two decades, water quality has become a great concern in China (Shao, Tang, Zhang and Li, 2006). Recent research has demonstrated that water pollution from small rural industries is a serious problem throughout China. There is evidence that over half of the rivers in China have their water quality rated as unsafe for human contact (Wang, Webber, Finlayson and Barnett, 2008).

From a theoretical perspective, the Water Footprint, which specifically classifies pollutant water as the grey water footprint, serves as an indicator of the degree of freshwater pollution that can be associated with this process step. It also identifies water pollution as the volume of freshwater that is required to assimilate the volume of pollutants based on existing ambient water quality standards. In other words, it refers to the volume of water that is required to dilute pollutants to such an extent that the quality of the ambient water can remain above agreed water quality standards (Hoekstra et al., 2011).

Many corporations and organisations are responsible for large amounts of water pollution. For example, past research has revealed pharmaceuticals to be widespread pollutants in the aquatic environmental (Gros, Petrović, Ginebreda and Barceló, 2010; Jelic et al., 2011; Sirés and Brillas, 2012).

Water quality issues have now become a major challenge for human health. A recent study found chemical pollution, especially inorganic and organic micro-pollutants to be the two major sources of pollution (Schwarzenbach et al., 2010). From a more holistic perspective, water pollution also has a significant impact on economic growth, thus such trends may potentially affect the pace of economic growth (Martinez, 2015; Gladwin et al., 1995).

B7. Total costs used purifying water or to mitigate water pollution

Cleaning water and mitigating water pollution is costly, the cost of pollution has been disregarded not only by industries, but also ignored in accounting processes for many businesses. This situation should not continue, now that pollution control and environmental replenishment have become critical concerns for the accounting profession (Lasusa, Gunther and Beams, 1970). Such ignorance and disregard has caused many concerns in both the academic and accounting professions, therefore, this particular index item could effectively assess whether Chinese companies are aware of the seriousness of situation and the long term implications if something is not done. However, Qu and Fan (2010) suggest that while still not near sufficient, China has made significant efforts in water environmental protection over the past years.

B8. Total costs of pollution prevention and pollution control

Prior literature has derived numerous significant enlightenments in respect to water resources. Likewise, recent research has brought attention to the significance of water resource protection, and multiple international bodies have recently focused on this particular domain (European Union, 2013; World Business Council for Sustainable Development, 2013; Worldwide Fund for Nature, 2012; OECD, 2012).
This particular index item is similar but different to the previous index item (3.4.7). In terms of clearly distinguishing these two index items, this item was specifically applied to indicate the amount of money that has been invested into certain activities and/or projects which would potentially prevent water resources from pollution.

Over the past two decades, a phase of rapid economic development has had a significant negative impact on water quality in China. Water pollution has become one of the major environmental issues (xie, 1992; shao, Tang, Zhang and Li, 2006; Qu and Fan, 2010). Anti-pollution and pollution control measures appear to be the most essential solutions in preventing the continuation of such a tendency.

Qu and Fan's (2010) research showed water pollution caused both surface and groundwater to suffer serious levels of impairment. Specifically, China has large quantities of contaminated sources which have been discharged into the nation's water ways, resulting in the self-purification capacity of many of the bodies of water being overwhelmed.

Nonetheless, considerable improvements in water environmental protection, plus water pollution control and technologies used to improve water quality are currently being developed in China. Recent studies have found that the application of a constructed wetlands system makes an important contribution to water pollution control (Zhang et al., 2012). Furthermore, Hung and Shaw (2005) introduced a trading-ratio system of tradable discharge permits for water pollution control. This system should also achieve cost-effectiveness objectives and can be applied across disciplines, such as air pollution. More recently, based on the findings of recent studies, a radial interval chance-constrained programming approach has been introduced in order to assist in source-oriented non-point source pollution control under uncertainty (Tan, Huang and Cai, 2011).

C. Water recycling and re-usage

Water recycling and reuse is the one aspect which seems to be regarded as less significant than other index themes. However, the rate of water reuse and recycling is a measure of efficiency which demonstrates the success of the organisation in controlling and reducing the total volume of water withdrawal and discharge (GRI, 2013). Consequently, an appropriate disclosure method of water recycling and reuse would potentially help a company to contribute to local, national, or regional goals for managing water supplies while fulfilling corporate social responsibilities, in order to gain the generic social acceptance.

C1. Total volume of wastewater recycled and reused by company

Past research has indicated drinking water is a scarce resource for many regions. The result found the food industry in particular has a significant demand for water, and water reuse could be a viable solution to minimise the problem of high water consumption and discharge. However, only very limited reuse has taken place due to legislation constraints and hygiene concerns (Casani, Rouhany and KnØchel, 2005). Miller (2006) also suggests that the difficulties of measurement would be the key challenge for many companies in reporting and disclosing such information. Moreover, Salgot (2008) notes that the various factors of wastewater reuse are not widely applied in European countries. For example, many European water administration bodies lack knowledge of the hazards associated with the practice and the application of the precautionary principle. There are also difficulties in the assessment of reclaimed and real quality, in real time. The implementation of the scientific methodologies needed for epidemiological studies, the bad management of social aspects related to the practice and the never-ending discussion among scientists on the acceptable level of standards, are further challenges.

According to Angelakis, Bontoux and Lazarova (2002), the classification of water recycling and water reuse can be separated into two different areas. They suggest recycled water is a reliable source of water that must be taken into account in formulating a sustainable water policy. Water reuse is an emerging area that many projects have already been conducting and utilizing over the last fifteen years. Many European regions have abundant water resources, therefore the demand for extra water supply through the reuse of treated wastewater is a lesser priority or concern. However, protection of the receiving environment should be considered as an important issue.

Collectively, both water recycling and water reuse can provide noticeable benefits to both industries and societies. For instance, most dairy wastewater could be recycled to produce reusable water and substrate for bio-energy production (Luo et al., 2011).

Wastewater reclamation and reuse also has a significant influence in many industries, such as the brewery industry (Simate et al., 2011). Therefore, such advantages could potentially translate into being of immense value to both the public and the environment.

C2. Total volume of wastewater recycled and reused as a percentage of the total water withdrawal

GRI (2013) states that the percentage of water reuse and recycling could be applied as an indicator to demonstrate the success of an organisation in reducing total water withdrawals and discharges. An increased rate of reuse and recycling of water resources could result in a reduction of water consumption, treatment, and disposal costs.

Additionally, such a rate may effectively benefit the general public and those potential users who may not have specialised in this particular field, or lack the understanding of such a specific report.

C3. Total costs of water recycled and reuse

Notwithstanding the above, cost has always been a perplexing and pertinent issue for many disciplines. However, the importance of water recycling and reuse has been emphasised in many academic studies and business practices.

Recent research has demonstrated that cost is one significant element in respect of the application and the development of water reuse and recycling in multiple industries (Giurco, Bossilkov, Patterson and Kazaglis, 2011; Gupta et al., 2012; Lu, Liu, Liu and Chen, 2010). Likewise, various methodologies and techniques have recently been developed, thus enhancing the effectiveness of managing and measuring the cost of water reuse and recycling (Molinos-Senante, Hernández-Sancho and Sala-Garrido 2011; Klemeš, 2012). Further, China is indicated as the largest user of reclaimed wastewater in the world, showing that the efficiency of the reuse of urban wastewater in China is

advanced (Yi, Jiao, Chen and Chen, 2011).

Overall, this particular index item represents the level of investment by the SSE 50 companies in facilitating the recycling and reuse of water resources.

D. Water saving

Water-saving represents the major objective in the global agenda and it is also targeted as the one vital element in a governmental strategy which aims at water footprint reduction (Hoekstra et al., 2011). Therefore, this particular item has become an expected part of the index.

D1. Total volume of water available for use and service

Molden and Sakthivadivel's (1999) water balance approach states that available water represents the volume of water available for use at the basin, service or use levels, and that also serves as a critical component in water-use categories that reflect the consequences of human interventions in the hydrologic cycle. In line with this perspective, the CEO Water Mandate provides a similar definition on water availability as being the total volume of water available for human purposes (CEO Water Mandate, 2015).

China has the world's largest population and the second largest national economy. However, the scarcity of freshwater availability has been continuously emphasised in past literature (Cheng, Hu and Zhao, 2009; Liu, Zhang and Zhang, 2010). Nevertheless, the population boom has not been the only factor causing the shortage of water. Relevant studies have found glaciers melting and climate change would also influence water availability (Kaser, Großhauser and Marzeion, 2010; Immerzeel, van Beek and Bierkens, 2010). Consequently, water availability is extremely important internationally (Heathwaite, 2010), and if only low levels of water are available, many industries will

suffer (Bouman, 2012; Wang, Zhang and Zheng, 2003; Deng et al., 2010).

D2. Total volume of water saved and reduction in usage

Water scarcity has caused a significant problem worldwide, therefore saving water has become the essential strategy. Unfortunately, however, not all kinds of water are worthy and suitable to save and store. In the Water Footprint, detailed requirements for stored water were identified as water which when stored could be either blue water or green water. In other words, only fresh surface water, groundwater or water that does not run off or recharge the groundwater but is stored in the soil or temporarily stays on top of the soil or vegetation (Hoekstra et al., 2011).

Water saving and reduction of use hold similar characteristics to water recycling and reuse. The common goals of these two themes are applied here in an attempt to solve the current issues with water resources. Prior research has indicated drought to be one of the major present day challenges, thus water saving may have a significant influence in multiple industries and other areas, such as agriculture (Molden et al., 2010; Chaves and Oliveira, 2004). More specifically, with the increasing population of China, the demand for staple food, such as rice, has been continuously increasing, thus saving water could assist in increasing water availability for agriculture (Luo, 2010; Belder et al., 2004). Meanwhile, water storage and saving also plays a crucial role in China's coal industry (Pan et al., 2012).

D3. Total costs of water saved

Prior studies have indicated that rainfall water storage would be a feasible method of saving water (Furumai, 2008; Klaassen, Bosveld and de Water, 1998). However, other relevant research has found that a local source of water such as rainwater is mostly treated as a risk rather than as a valuable resource, and that facilitating a rainwater system is costly in certain circumstances (Domènech and Saurí, 2011).

According to Berbel, Martin-Ortega and Mesa (2010), the cost-effectiveness analysis of water-saving measurement has been adopted as the general method for the measuring and accounting of water use, for the Water Framework Directive. Therefore, cost issues may perhaps improve when academic research and business practice continuously devote attention to this specific domain.

E. Other

The purpose of this particular index theme was reserved for alternatives which were observed during analysis of the reports. Two major elements were discovered and frequently appeared in the 50 companies' annual reports and corporate social responsibility reports.

It was noted earlier that, financial industries are obviously less relevant than traditional industries and also different in application to conventional manufacturing industries. Thus, from an expectation perspective, they are less likely to disclose environmental information, especially water-related information.
However, actual observations showed that financial industries had a very comprehensive overall reporting performance. More precisely, donations and philanthropies are the two aspects they have favoured investing in. Also, water donations to regions suffering poverty were received mainly from banking corporations.

Water donations seem to have acted as a very effective strategy for those financial organisations wanting to gain general social acceptance through disclosure of such information in their reports. More importantly, there is a lack of understanding about water donations in the context of water accounting; there has been no prior literature which has specifically studied and examined this area. Therein lies the contribution of this particular study. Consequently, two items were designed and included in this index theme to record such information. These are the total volume of water donated and total costs of water donated.

3.3 Development of a comprehensive scale

I developed and applied a comprehensive scale to potentially increase the quality of the disclosures and also to assess the measurement of the index, as introduced in the previous section.

Prior research indicates significant achievements can be obtained with the use of scale analysis. Scale analysis has also been extensively adopted in numerous research domains (Öberseder, Schlegelmilch, Murphy and Gruber, 2014; Montgomery, Perris and Sedvall, 1978; Worthington and Whittaker, 2006; Tsaur, Lin and Liu, 2013; Kassarjian, 1977).

More importantly, past research has demonstrated that significant value is placed on corporate social responsibility and other relevant domains (Turker, 2009; Abbott and Monsen, 1979; Wijesinghe and Hutchings, 1997). However, in order to accurately and effectively measure corporate social activities and performance, sophisticated methods are required. Further, prior literature has also indicated that there is no single ideal way to measure corporate social activities and performance, especially in the context of water accounting (Wolfe and Aupperle, 1991; Waddock and Graves, 1997; Unerman, 2000).

As part of this study, the development of a comprehensive scale will contribute to the current literature on water-related information disclosure measurement, especially as the water accounting domain has not been extensively considered and studied. Additionally, as the index was specifically developed to examine the current situation of SSE 50 companies in China, comprehensive scale analysis should interactively assist in scoring the index. By applying specific scale analysis a better understanding will be gained of the comprehensiveness of each company's disclosure and reporting in regards to their water-related information.

Universally, environmental disclosure measurement methods can generally be

categorised into two types (Al-Tuwaijri, Christensen and Hughes, 2004). One type specifically concentrates on quantifying the level of information disclosure in the substantial reports, such as the number of pages, sentences and words (Gray, Kouhy & Lavers, 1995; Guthrie & Parker, 1989; Patten, 1992, 1995; Ingram & Wiseman, 1980; Deegan & Gordon, 1996; Zeghal & Ahmed, 1990). However, such quantified disclosure measurement is often criticised within the literature with regard to the measurement of individual disclosures (Unerman, 2000).

Al-Tuwaijri et al (2004) perceive that second environmental disclosure measurement method should be a disclosure-scoring measure derived from content analysis, as content analysis involves classification of various elements and text units into different categories (Beattie, McInnes and Fearnley, 2004; Kassarjian, 1997).

Both methods have limitations in regards to environmental information disclosure, especially in the application of water-related information disclosure. However, based on the above discussion and past research that has contributed to the context of both corporate social responsibility and environmental reporting (Turker, 2009; Dange and Bose, 2013; Van Staden and Hooks, 2007; Al-Tuwaijri et al., 2004), I therefore developed a 4-point comprehensive scale (Table 1) which will be introduced in the following discussion.

The objective of this comprehensive scale was to measure water-related information disclosures for the SSE 50 companies, thus the sustainability issue was not of concern in this particular circumstance.

In constructing my scale measurement, I believed corporate social responsibility and environmental reporting was unstipulated in the mandatory disclosures of many countries, including China. The selected SSE 50 companies represented large listed companies within the Shanghai security market, therefore, these companies should comply with their responsibilities towards society and the environment via effectively

and comprehensively disclosing any issues that were related to either the environment or to water.

In accordance with the above discussion, I carefully assigned the greatest weight (+3) as the highest score in my comprehensive scale. A score of 3 indicates that a company explicitly discloses both quantitative information (volumes, figures and numbers) and qualitative explanations in relation to each of my index themes and items. For example, a company which discloses an exact volume of water consumed in their production processes and also explains the specific usage of those water resources within paragraphs or sentences would get a score of 3 for the index item of 'Total volume of water used in the production' –(Table 1). Therefore, both quantitative information and qualitative explanation are provided.

The second highest weighting in my comprehensive scale was 2. This particular weight indicates a company that provides either quantitative information or qualitative explanations in regards to my index item. For example, a score of 2 given if a company only discloses the total volume of water consumed by administration processes, without any specific explanations on the usage of water consumed by administration processes, or if a company only provides the qualitative explanations of water consumed by administration processes without any specific volumes or numbers. In both these situations, 'Total volume of water consumed by administration processes' would score a 2.

Thirdly, I assigned a score to a company with only minimum coverage, little detail and general terms of information disclosure in regard to the index theme or index item. A weighting of 1 indicates a company which provides only general information, and unilateral explanations in regard to both the index theme and index item. For example, a company only reports very general information or only a few sentences/words in the description in regards to water withdrawal, and therefore no specific volume of water withdrawal was given, and also not reported was any specific information is reported

regarding which sources water was withdrawn from. In this case, the score for this particular index item, 'The total volume of water withdrawal', would be 1.

Table 1. -Comprehensive scale – water-related information disclosures

Score	Description
3	Quantitative information (include specific volume, cost and figure) (Hughes et al., 2001) and Qualitative information disclosed (specific explanation on index item) (Unerman, 2000)
2	Either Quantitative information or Qualitative information disclosed in reports
1	Minimum coverage, little detail – general terms. Anecdotal or briefly mentioned (Van Staden and Hooks, 2007).
0	Non-information disclosure (Al-Tuwaijri, 2004; Van Staden and Hooks, 2007).

Finally, companies that do not disclose any information and discussion of the issue for a given index item receive a score of zero (0) for that particular index item.

Consequently, this comprehensive scale resulted in a total possible score of 63 (maximum) and 0 (minimum) from the 21 index items. This scale system should potentially offer significant assistance to effectively score the index and eventually lead to increasing the validity and robustness of the analysis.

3.4 Expectation Score

The purpose of developing the expectation score was to provide a more realistic comparison between the SSE 50 companies. However, the applicability of an item has been a major hurdle in many research areas (Huang, 2015), as well as in the present study. The index item simply cannot be applied to every industry and/or company. To ensure each index item could appropriately match, and effectively and reasonably reflect the relevant industries or companies, an expectation score was developed for each specific industry. I believe this measure should therefore effectively control the applicability issue at the minimum level.

I therefore categorised the SSE 50 companies by their sector characteristics, and then classified them into four different industries, industry 1>, industry 2>, industry 3>, or industry 4 (see Appendix C for classification of the SSE 50 companies). Industry 1 includes companies which operate in the manufacturing sector, materials sector and industry sector. Industry 2 includes companies that operate in the energy sector, construction sector and transportation sector. Industry 3 includes companies that operate in the telecommunication services sector and the information technology sector. Industry 4 includes companies which operate in the financial sector.

From Appendix B, Industry 1, which include companies that operate in the manufacturing, material and industry sectors, should reasonably provide both quantitative and qualitative disclosure in regards to every index item. As these types of companies are engaged in a certain amount of heavy production and have a very close relationship with water engagement, they should be responsible and be able to provide information on all five themes: water consumption and usage, water discharge and pollution, water recycling and re-usage, and water saving. In an ideal situation, the total expectation of Industry 1 should be to achieve a score of 63, which is 100% of all index items.

Industry 2 includes companies operating in the sectors of energy, construction and transportation, but I do not expect these companies to disclose every aspect of the index. However, I assume these companies to still be reasonably revealing in every index item under the theme of water consumption and usage. Thus these companies should receive a score of 3 in all five index items which include total volume of water withdrawal, total volume of water used in production, total volume of water consumed by administration processes, total volume of water consumed due to cleaning activities, and total cost invested in improving water input quality and restoration. I also expect Industry 2 companies to report all relevant information in regards to water discharge and pollution. These aspects include total volume of water discharged, total costs occurring due to water discharged, total volume of wastewater collected, total volume of water polluted, total costs used in regards to cleaning up or mitigating water pollution, and total costs of anti-pollution and pollution control. Moreover, I assume water recycling, water re-usage and water saving were also crucial to these companies in certain circumstances. I also assume Industry 2 companies may need to provide a comprehensive disclosure of total volume of wastewater recycled and reused as a percentage of the total water withdrawal, total costs of water recycling and reuse, total volume of water saved and reduced, and total costs of water saved. Finally, based on my expectations and my index, the total score for Industry 2 companies would possibly be a score of 45.

Industry 3, telecommunication services and information technology, has less obvious engagement with water than Industry 1 and 2, which include traditional heavy industries. Some themes from my index are still relevant and important for these companies, despite water being consumed in production processes and other themes being less likely to be relevant for these telecommunication services and IT companies. Nevertheless, I still expect Industry 3 companies to disclose total volume of water withdrawal and total volume of water consumed by administration processes under the theme of water consumption and usage, especially since water consumption and water usage are vital in any situation in any type of company. Also, disclosure of total volume of water discharged, total volume and cost of wastewater collected and total costs used

in cleaning up or mitigating water pollution are crucial to a company for it to uphold its responsibility in regards to water pollution and to address public environmental concern. However, since water recycling, re-usage and saving are less relevant to telecommunication service companies and IT companies, I do not necessarily expect these companies to provide comprehensive disclosures on those themes which are less related to water resources. As a result, Industry 3 companies should ideally achieve a total score of 24 on my expectation score system.

Finally, Industry 4 encompassed 22 financial companies in the areas of banking, securities and insurance. The nature of these financial companies determines their comparatively small engagement with water resources. However, as explained above, the water consumption issue is vital and exists within many types of companies, and it does not mean that banks, securities and insurance companies have no relationship with the disclosure of water-related information. Therefore, I expect these financial companies to, as a minimum, report the total volume of water withdrawal and the total volume of water consumed by their administration processes under the theme of water consumption and usage. I also expect them to disclose the total volume of water discharged and the total volume and costs of wastewater treatment, under the theme of water discharge and pollution. Further, total volume of wastewater recycled and reused by a company and the total volume of water saved and reduction in usage are also expect in this circumstance. As a result, a score of 21 should be obtained by Industry 4 companies.

In summary, my max expectation score for Industry 1 is 63 points, Industry 2 is 45 points, Industry 3 is 24 points and Industry 4 is 21 points. It also gave a comprehensive comparison when I applied this expectation score to analysis of the actual score, which I obtained from my comprehensive scale measurement. Therefore, the development of this expectation score system should also be able to provide an extensive understanding of the analysis of water-related information disclosure from Chinese companies (see Appendix B for expectation score details).

3.5 Other Factors

The objective of this section was to specifically analysis on factors which may potentially influence the comprehensiveness of water-related information disclosures. Following on from this, two major reporting methods and a variety of influential factors are now discussed as provided in Table 2.

Table 2. Prior Research: -Factors of Disclosures

Factor	Paper
Reporting medium used	De Villiers and Van Staden, 2011; Dagiliene, 2015; Milne and Adler, 1999; Deegan and Rankin, 1996; Van Staden and Hooks, 2007; Porter and Kramer, 2006; Garriga and Melé, 2013; Dhaliwal et al., 2012; Flammer, 2013; Tilt, 1994
Assurance of disclosure	Lai, 2013; Khurana and Raman, 2004; Lawrence, Minutti-Meza and Zhang, 2011; Francis and Yu, 2009
Reporting framework used	Owen, Swift and Hunt, 2001; Cooper and Owen, 2007

Primarily, Tilt (1994) indicates that annual reports are regarded as important documents in corporate social responsibility, due to the high level of credibility they lend to the information reported in them. Likewise, other prior research has demonstrated that annual reports are the most common instrument for firms to voluntarily disclose environmental issues (De Villiers and Van Staden, 2011; Dagiliene, 2015; Milne and Adler, 1999). They are also used to disclose the materiality of environmental information (Deegan and Rankin, 1996).

Corporate social responsibility reports are also considered to be another significant reporting media in regards to environmental information disclosure. The CSR report provides reasonable grounds for a company to pursue their legitimacy with powerful stakeholders. It also allows the company to obtain social acceptance and enhances the position of the firm on a competitive level, through stating any issues and/or releasing any relevant information that occurred during a specific period. Therefore, the analysis of CSR reports plays a vital role in this research project.

The company's annual report and CSR report were therefore used as two major sources

in the present study to examine issues reported from a company's perspective, in order to evaluate water-related information disclosure performance.

Further, in both academic literature and real practice, increasing consideration is given to the nature of environmental information disclosure (a voluntary reporting scheme) and the issues around the credibility of the information within.

Many studies have shown significant similarities and a variety in quality and credibility between the Big-4 audit firms and non-Big-4 audit firms (Lai, 2013; Khurana and Raman, 2004; Lawrence, Minutti-Meza and Zhang, 2011; Francis and Yu, 2009). Therefore, in terms of ensuring the quality and credibility of information disclosure, I specifically evaluated whether the disclosures of water-related information in a company's CSR report and annual report were assured by a Big-4 public accounting firm, or a non-Big-4 public accounting firm.

A reporting framework is another crucial aspect in the disclosure of environmental reporting. Prior research indicates that the Global Reporting Initiative (GRI) and the AA1000 standard are the two most popular reporting frameworks (Owen, Swift and Hunt, 2001; Cooper and Owen, 2007). The GRI is the framework which has been most extensively adopted for Chinese companies and organisations in the reporting of corporate social and environmental information. Also, research studies have shown a continuous increase between the years 2012 to 2013 in -social and environmental reporting. Moreover, water-related information disclosures also form a part of a reporting framework such as the GRI (Global Reporting Initiative, 2003, 2011a). Therefore, in this study, the usage of the reporting framework applied by every one of the 50 companies was another important factor which I have considered and then verified.

Assurance has a significant impact in regards to evaluating the quality and reliability of the reported information. Thus, it is crucial whether the assurance of an annual report or

a CSR report has been established by a Big-4audit firm. In this light, I classified those reports into two different criteria to provide a more clear understanding of how the audit assurances from the Big-4 audit firms, could potentially influence the result of the information disclosed in the reports.

The reporting framework would potentially have a significant impact on integrity and completeness of water-related information disclosed within companies' CSR reports. Therefore, lastly, the reporting framework used to address the CSR reports was also evaluated and categorised into different criteria, such as GRI and other domestic reporting frameworks.

3.6 Extent of reporting

The extent of the water-related information reporting is vital to ensure the comprehensiveness of the report analysis. It also provides a more significant understanding of a number of factors which have frequently appeared and been studied in prior literature (Table 3). In terms of ensuring the significance of this research, I therefore assessed the extent of reporting by counting the number of sentences, paragraphs and proportions that have been utilised to express the information related to water issues. Tables and pictures were also included in this count, thus ensuring the completeness and integrity of this report analysis. Table 3 provides a summary.

Table 3. Prior Research: -Factors Influencing the Extent of Reporting

Factor	Paper
Paragraph, page and proportion.	Gray, Kouhy & Lavers, 1995; Guthrie & Parker, 1989; Patten, 1992, 1995; Ingram & Wiseman, 1980; Deegan & Gordon, 1996; Zeghal & Ahmed, 1990
Number of tables and pictures	Miles and Huberman, 1994

Firstly, past literature indicates that quantifying environmental reporting by counting the number of pages, sentences and words would often be chosen as the most appropriate method to assess the extent of reporting (Tilt, 2001; Gray, Kouhy & Lavers, 1995; Guthrie & Parker, 1989; Patten, 1992, 1995; Ingram & Wiseman, 1980; Deegan & Gordon, 1996; Zeghal & Ahmed, 1990). More specifically, Hooks and van Staden (2011) conducted various forms of content analysis by not only counting sentences and pages but also proportions to determine reporting information qualities. Similarly, Unerman (2000) argued that having only quantified disclosures in annual reports disagreed with the literature regarding the best way to measure individual disclosures. In terms of increasing the research quality to a more reliable level, I therefore assessed the extent of water-related information reporting, by not only counting the pages of reporting, but also considering the total percentage of water-related information disclosed within both annual reports and CSR reports.

Secondly, Miles and Huberman (1994) indicated that a table, figure, and diagram could potentially provide better visualisation to illustrate the information. Therefore, this was also a supportive concept in my study when evaluating the tables and pictures used to illustrate water-related information.

The extent of the reporting components is as follows:

- Number of page of CSR report
- Number of page of annual report
- Number of page of overall reports
- Total percentage of water-related information disclosure in CSR report
- Total percentage of water-related information disclosure in annual report
- Total percentage of overall relevant information disclosure
- Number of tables
- Number of pictures

Consequently, the extent of the reporting analysis should increase the comprehensiveness of the present study's results.

3.7 Company characteristic analysis

I used a selection of the 50 largest stocks from the Shanghai security market (SSE 50) to form my sample. This very specific selection method also guarantees that the SSE 50 index stocks have two distinct traits: good liquidity and the fair representation of the large, listed companies within the Shanghai security market. It also reflects the holistic picture of the large enterprises that have the most influence on the Shanghai security market.

The SSE 50 companies were selected from a variety of sectors, therefore the differentials of each company's characteristics were dissimilar. Past research clarified their limitations in the implementation of the research method, in regards to environmental performance and disclosure. Prior studies also indicated that corporate

environmental information disclosure can vary by multiple factors (Mallin and Michelon, 2013; Cormier, Magnan and van Velthoven, 2005; Cormier, Gordon and Magnan, 2004).

However, due to the way in which my disclosure index and the disclosure-scoring methodology was particularly developed and implemented, the information collected from the SSE 50 companies was also specific and comprehensive. Therefore, in terms of overcoming dissimilar issues and comparing these companies on equitable grounds, I designed a characteristic analysis of each company to ensure that every SSE 50 company was analysed and studied at the minimum level of bias in regards to their different characteristics and natures.

The process for this analysis involved a number of factors. Firstly, Cormier and Magnan (1999) indicated that a firm's size is a crucial consideration in the determination of environmental information disclosure. Therefore, in order to provide a comprehensive understanding of each company's financial size and profitability, the magnitude of each company has been taken into account by evaluating all 50 companies' total assets and total revenue.

Secondly, the dissimilar characteristics of the SSE 50 companies presented a major hurdle in this research. In order to ensure that all companies were studied equally, I therefore classified SSE 50 companies into four different industry levels - (see Appendix C). This particular industry classification method may not be a precise measure, however it does provide a better understanding when comparing the variations in level of disclosure between companies at each industry level.

Overall, based on the above discussion and the process of classifying those companies into different levels using analysis of each significant group, this characteristics analysis should therefore potentially reduce the dissimilarities between companies and prevent the companies being investigated and compared from only one perspective.

4.0 Findings and discussion

In Appendix E, I report the scores in total for all SSE 50 companies and also for each theme and item of the water-related information disclosure index. In general, all companies were able to provide their annual reports in the public domain, 46 CSR reports were also available in the public domain, and therefore 90% of the companies from my sample were able to provide both major reports.

The aggregate totals indicate that seven (13.7%) companies received a zero for every index item of water-related information disclosure. However, five of these seven companies provided both CSR reports and annual reports. Four of these five companies operated in the financial industry, and more specifically, three companies operated as securities corporations. One of these companies was the only pharmaceutical corporation in the SSE 50 company index. In this case, a reasonable explanation can be provided in regards to the engagement of water-related issues being less relevant to these financial sectors, especially for securities corporations. Nevertheless, since there was only one company that operated in the pharmaceutical sector, it should not be concluded that there is a negative association between the pharmaceutical company and water-related issues. Future research should carry out more comprehensive investigations by acquiring more specific information on this topic.

Additionally, in terms of providing a more comparative and clear understanding of the findings, all the figures used in regards to water-related information disclosure will be shown in a percentage format. Moreover, the percentage will be calculated by using the actual score derived from the report analysis divided by the expectation score. This will therefore present a clearer picture of how a company disclosed information in regards to each index theme and item. Likewise, the measurement of reporting factors (reporting method, reporting framework and audit assurance) will also be shown as a percentage.

4.1 General discussion of water-related information disclosures

In Appendix E, I report a total score of 657 on all SSE 50 companies. This aggregated score was composed of 201 (30.6%) scores from the index theme of water consumption and usage, 233 (35.5%) scores from water discharge and pollution, 88 (13.4%) scores from water recycling and re-usage, 90 (13.7%) scores from water saving, and 45 (6.8%) scores from others. From industry aspect, Industry 1 received a total score of 172, Industry 2 obtained a total score of 207, Industry 3 is 23 and Industry 4 received a total score of 256.

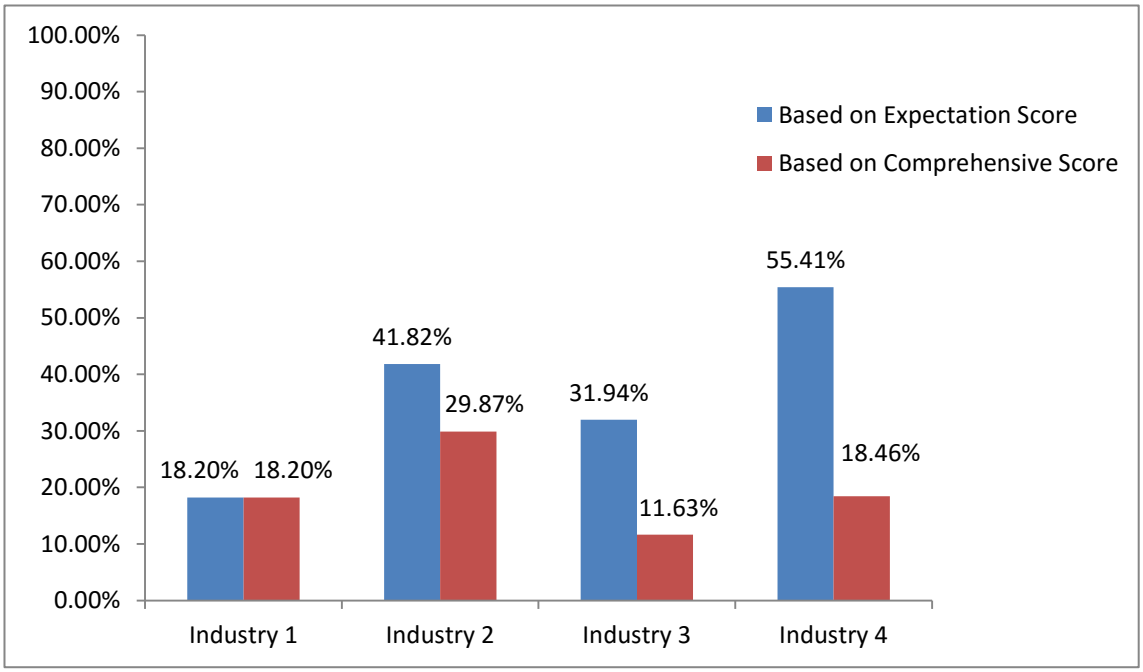

Figure 2. Disclosure Score Based on Expectation Score and Comprehensive Score

However, as this total score was collected from four different industries in the SSE 50, a more detailed and specific discussion based on each industry in regards to my index disclosure ensues.

4.2 Water consumption and usage

Under the index theme of water consumption and usage, I report a total score of 201. The overall average score of the SSE 50 companies was 3.94. Twelve companies

received a zero score as they did not disclose any relevant information under this specific index item. Water consumption and usage is an essential theme in my index, as it should be a basic requirement for all industries to report such information. Figure 3 summarises.

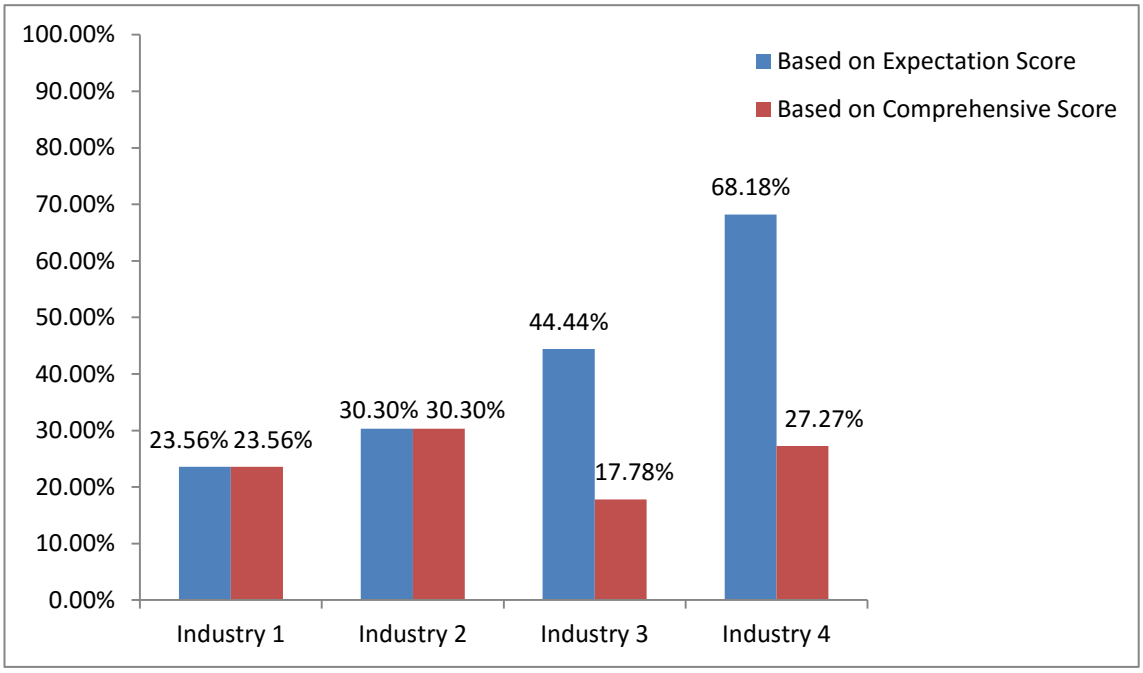

Figure 3. Disclosure score for water consumption and usage

On average, Industry 1 received 23.56% of the expectation score with an average of 3.53 per company. This result was unexpectedly lower than the aggregate average of 4.09, and did not achieve the expected score of water consumption and usage. In the industry classifications, Industry 1 consisted of manufacturing, materials and industrials. As these sectors operated as traditional and labour intensive industries, the engagement of water consumption and usage would be a significant issue to acknowledge. However, there were three companies which did not disclose any relevant information regarding this specific theme. In addition, the total volume of water withdrawal and the total volume of water consumed due to cleaning activities were rarely disclosed by these Industry 1 companies. Only 53 out of a total 225 score was obtained for Industry 1.

Industry 2 achieved 30.3% for the expectation score. The average of water-related information disclosed in regards to this theme was 4.55, which was the highest average

compared with the other three industries. Despite three companies omitting their water consumption and usage, their disclosures for the actual analysis showed the total volume of water used in production and the total costs invested in improving water input quality and restoration, were comprehensive and specific. Therefore, the result may potentially indicate that the water consumption issue would be more crucial to those companies operating in the fields of energy, construction and transportation.

For Industry 3, 44.44% of the expectation score was received as a total of water consumption and usage, the average being 2.67. However, as there were only three companies which were operating in information technology and communication services, the result in this particular situation may not be accurate and comprehensive enough to conclude that Industry 3 companies underperformed in regards to disclosure of any relevant information regarding water consumption and water usage. Also, the nature and characteristics of Industry 3 companies mean relatively less engagement with water consumption, so it is reasonable to expect such a result.

From Industry 4, almost every company operating in the financial sector provided the total volume of water consumed by administration processes, except for six companies which did not disclose any relevant information in regards to both CSR reports and annual reports. As a result, the actual score achieved by Industry 4 companies was 68.18% in compare with the expectation score.

From the above information (reported in Appendix E), it is clear Industry 2 companies were more focused on water used in production whereas Industry 4 companies reported water consumed by administration processes more comprehensively in comparison with other companies. However, the score also indicates that Industry 1 companies need to improve their water-related information disclosures in regards to their current reporting volume, coverage and behaviour.

4.3 Water discharge and pollution

Under this index theme, I reported 32.50% of the total expectation score obtained from a total score of 233 out of 792 for the SSE 50 companies. On average, 66.7% (34) of the companies effectively disclosed their water-related information in regards to water discharge and pollution, giving an average score per SSE 50 companies of 4.57. figure 4 summarises.

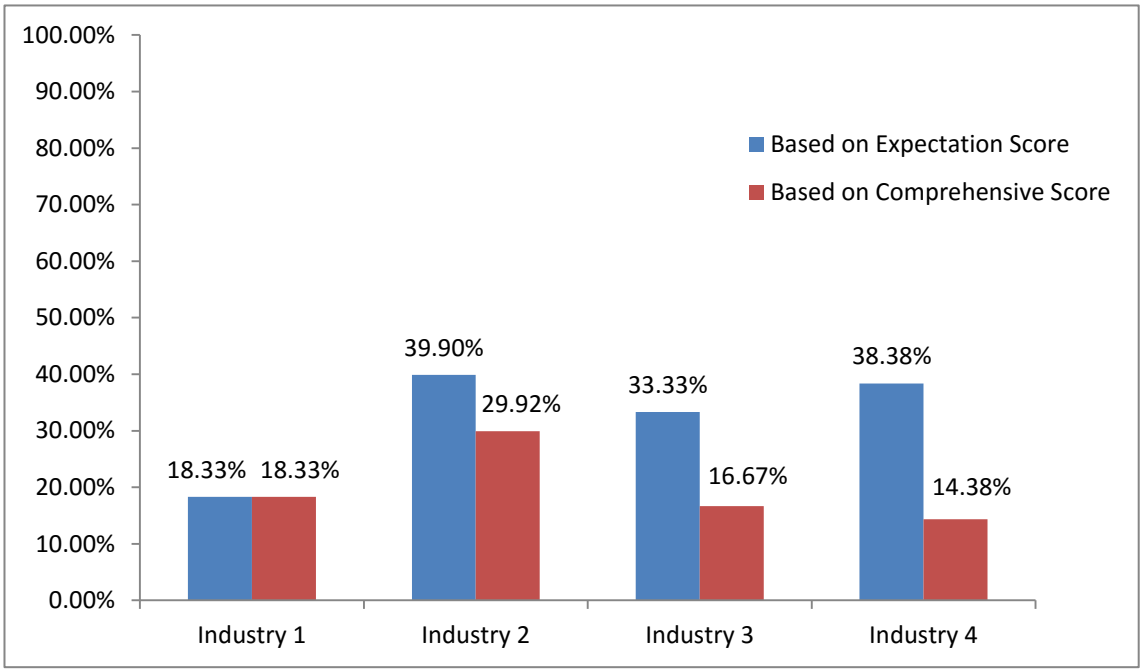

Figure 4. Disclosure Score for Water Discharge and Pollution

In terms of analysis of each industry, when reporting their relevant information under this theme, I once again found the disclosure of water-related issues was significant in Industry 2. This was especially significant in the details of the total volume of water discharged, wastewater collected and treated, the costs involved in purifying polluted water, and the prevention of water pollution. As a predominate group in the industry-level analysis of water discharge and pollution, Industry 2 received 39.90% of the expectation with the highest total score of 79 and an average of 7.18 for all four industry groups.

In a similar vein, only 18.33% of the expectation score was achieved by Industry 1,

which indicated that 33.33% (five companies) of the Industry 1 companies did not disclose any relevant information in regards to water discharge and water pollution. However, the remaining 10 companies were able to comprehensively disclose almost all of the index items under the theme of water discharge and pollution. Thus a total score of 66 and an average of 4.4 were obtained from Industry 1.

On the other hand, only 59.1% (13) of the financial companies disclosed information in regards to water discharge and water pollution. Nine companies did not report any relevant information at all. Therefore, in total 38.38% of the expectation score was received by Industry 4 companies.

Nevertheless, as previously explained, the nature of these financial companies determined their association with water resources was less, and this was also reflected in their score related to water discharge and water pollution. Only three companies constituted Industry 3, however, these three companies showed a variety in disclosure behaviour in regards to water discharge and water pollution. While one company disclosed information in regards to the total costs involved in the purifying of water or mitigating water pollution, and the costs of pollution prevention and pollution control, another company did not disclose either of these two index items, but did report comprehensively on water discharge and wastewater treatment. The third company did not disclose any information in regards to this index theme. As a result, Industry 3 scored 33.33% of the expectation, but an average of 4 which was .57 lower than the overall average score.

The results indicate that Industry 1 and 2 which are comprised of companies that operate within traditional industries, potentially engaged with more water resources. Thus, they also have a closer relationship with certain levels of water discharge and water pollution.

On the other hand, the high-technology companies and financial companies obviously

have less engagement with water discharge and water pollution.

4.4 Water recycling and re-usage

Under the theme of water recycling and re-usage, I reported a total score of 88, and an average of 1.73. Of this result, there is an unexpected failure for Industry 1 companies which only received 17.04% of the expectation score. On the other hand, Industry 2 received 53.03% of the expectation score under this specific index theme. Thus, over 50% of the index item was disclosed in their reports. Meanwhile, companies that operated in Industry 3 obtained 11.11% of the expectation and Industry 4 achieved receiving a score of 29, which means 43.94% of the expectation score achieved, respectively (see Figure-5).

A total of 49% (25) of the SSE 50 companies did not provide any information in regards to water recycling and re-usage. Most of the missing disclosures were from Industry 1 and Industry 4. Therefore, more than 50% of the companies in Industry 1 and Industry 4 did not disclose any relevant information on the volume and the costs involved in water recycling and reuse. The lack of relevant information regarding those financial companies in Industry 4 is understandable in this situation. As financial companies were engaged with less water resources usage, the disclosure items in regards to the total volume of wastewater recycled and reused, and the cost of water recycled and reused, were noticeably lower than in other industries.

Industry 1 companies inadequately disclosed information in regards to water recycling and water re-usage. Also, only 17.04% of the expectation score was achieved, meaning that in total, seven (46.67%) of the 15 companies were unable to provide any information which related to this index theme. The scarcity of water resources was also not able to be significantly recognised. Thus, in Industry 1 companies, the knowledge of water as a valid resource which could be efficiently reused and recycled was limited, and the reorganisation of such technology and systems was weak.

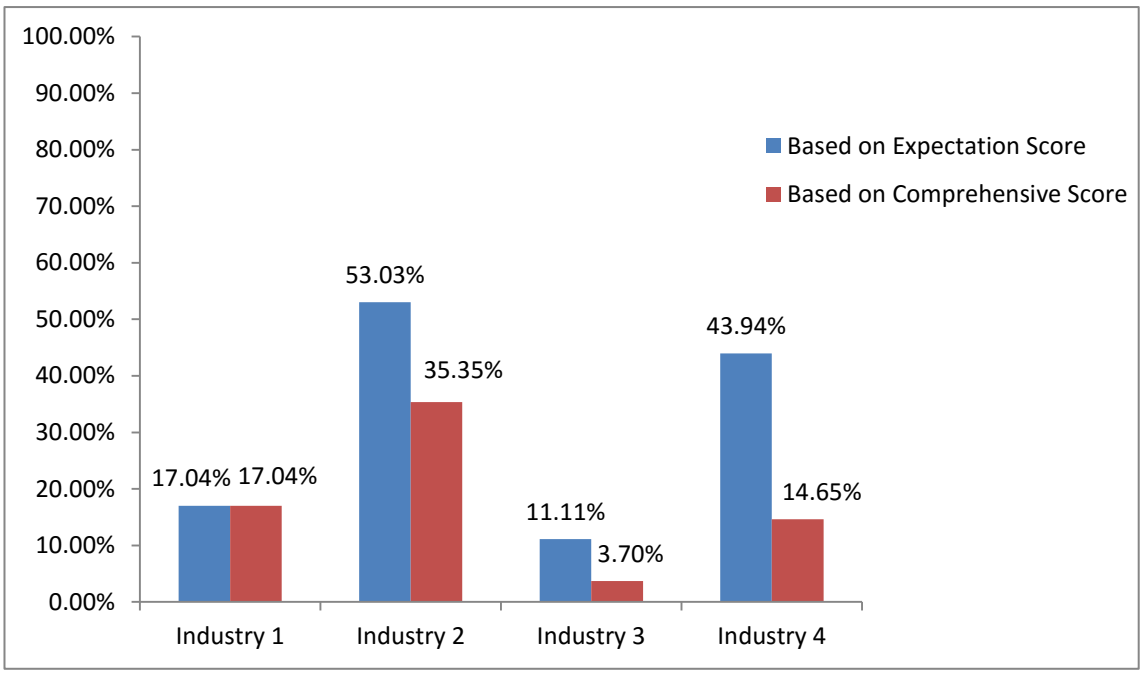

Figure 5. Disclosure Score for Water Recycling and Re-Usage

4.5 Water saving

Water saving was another topic lacking in the context of water accounting, especially in past literature. Therefore, based on the studies and literature conducted in relevant fields, such as social studies and water environmental research, I designed this specific theme in order to understand companies' disclosure of information in regards to the availability of water resources in their productions and services. The total volume and costs of water saved, and reduction in usage, also remain significant issues for a company's sustainability.

In general, Industry 1 received 11.85% and Industry 2 received 48.49% of the expectation score in regards to water saving (see Figure- 6).

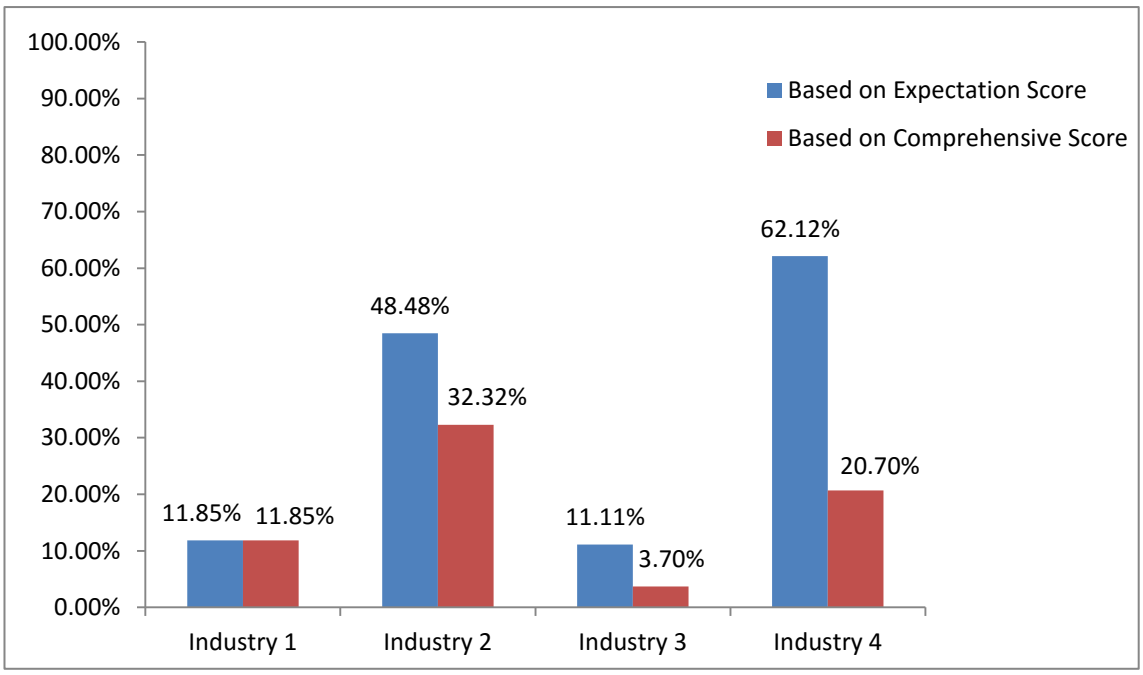

Figure 6. Disclosure Score for Water Saving

I also found only one company which operated in Industry 3 that vaguely disclosed information in regards to water saving. A total score of 41 was achieved by Industry 4 under the theme of water saving (see Figure- 6). Therefore, Industry 3 and 4 has exceeded the expectation score by showing that water saving could also be a significant issue in their disclosure and reporting.

As can be seen in Appendix E, I reported a total score of 90 under the index theme of water saving, and the average from the 51 companies was 1.the averages of Industry 2 and 4 were relatively higher than the total average, as is also shown in Appendix E. More precisely, 82% of Industry 2 companies and 59% of Industry 4 companies comprehensively disclosed their water-related information in regards to the availability of water conservation in their usage and service. Despite the measurements of water availability being sophisticated, the reduction in costs due to the volume of water saved and reduced use, was difficult to account for, especially for financial companies. In terms of obtaining a comprehensive understanding of water saving for the SSE 50 companies, the results provided a solid and significant insight into the current situation of the energy, construction, transportation and financial sectors, in regards to information disclosure under this specific index theme.

On the other hand, 46.66% (seven companies) of the Industry 1 companies did not disclose any relevant information, nor any information in regards to water saving. Moreover, only one company, that from Industry 3, did provide the relevant information in regards to the total costs of water saved (see Appendix E for more detail information). However, the information within this disclosure was inadequate and vague, thus a score of 1 was received by this company.

Consequently, the analysis indicated a similar result when compared with the previous theme. Therefore, Industry 2 and 4 companies were able to disclose information in which the quality and comprehensiveness were relatively higher than the average rate. On the other hand, the disclosure score showed a negative result from both Industry 1 and 2 companies, thus the information disclosure in regards to water saving should be emphasised and focused on in future studies.

4.6 Other

Under this index theme, the total volume of water donated, and the costs of water donated, were two very specific disclosure-points which were observed during the report analysis. Also, the information disclosure in regards to water donation frequently appeared within both the annual report and CSR report. The appearance of such information was shown in every industry, except Industry 3 which was constituted of IT and communication service companies.

However, as a result, only 45 total scores were obtained from the SSE 50 companies (see Figure- 7), and an average of 0.88. In this result, every industry scored above the overall average, except Industry 3 which did not disclose any information relevant to the study. Therefore, despite the intensity of disclosure in regards to water donation not being extensively adopted by every company from the SSE 50, and the scope of disclosure not being significant enough to give a conclusion that water donation was comprehensively understood and disclosed by the SSE 50 companies, those reported

companies did provide an effective disclosure and certain levels of understanding, in regards to water donation.

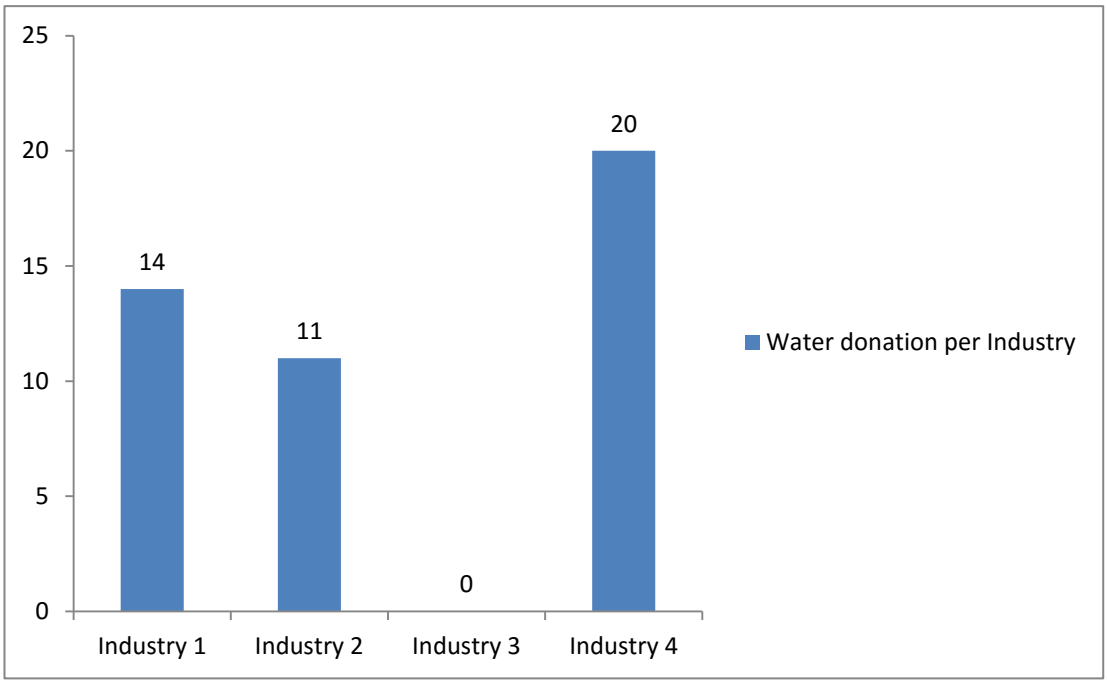

Figure 7. Disclosure Score for Water Donation

Further, I found water donations were more likely to be an effective strategy for financial companies, in terms of gaining social acceptance through the disclosure of such information in their reports. Financial industries are different in application to traditional industries, therefore donations and philanthropies were two aspects they have focused on and favoured in investment.

4.7 Other reporting factor analysis

At the beginning of this section, I first established a reporting framework to be used by companies to report their water-related information. I found a framework which when adopted by the SSE 50 companies would have a significant impact on the quality and coverage of their reported information. The GRI reporting framework was the most popular and has been extensively adopted by Chinese companies in regards to the disclosure of their corporate social and environmental-related information (see Figure-8).

In Appendix D, 57% (29) of the companies decided to apply the GRI as their reporting guidance on the disclosure of relevant information. In these circumstances, the economy, social responsibility and environment became the three major aspects in forming a comprehensive CSR report. However, I discovered that the scope of the reported information was not assigned evenly in regards to these three perspectives. In reality, Chinese companies tend to focus heavily on economic benefits, especially positive achievements, and this could potentially result in a bias toward an unequal consideration of the impacts which occurred and/or affected the social and environment aspects. There was also a much less inclination towards the issues and concerns of water usage.

According to the concepts of the GRI, the disclosure of information in regards to economy, social responsibility and environment should be considered and reported, equally and comprehensively. However, the integrity and fair attribution of information disclosure was not appropriately executed by most of the SSE 50 companies. Therefore, I believe that even the companies that did recognise the benefit of adopting and using a specific framework such as GRI in regards to supporting the structure and the preparation of their CSR report, still need improvement in the completeness and integrity of their disclosure coverage.

However, 16 of the remaining 51 companies followed a different reporting guide which was domestically issued and a requirement of the Shanghai Stock Exchange Market.

Therefore, the quality and coverage of the reported information was comprehensive, but not systematic and well-structured in comparison with the companies that followed the GRI. The remaining six companies did not provide any reports in regards CSR or environmentally related issues, thus there was no testable evidence to use in the investigation.

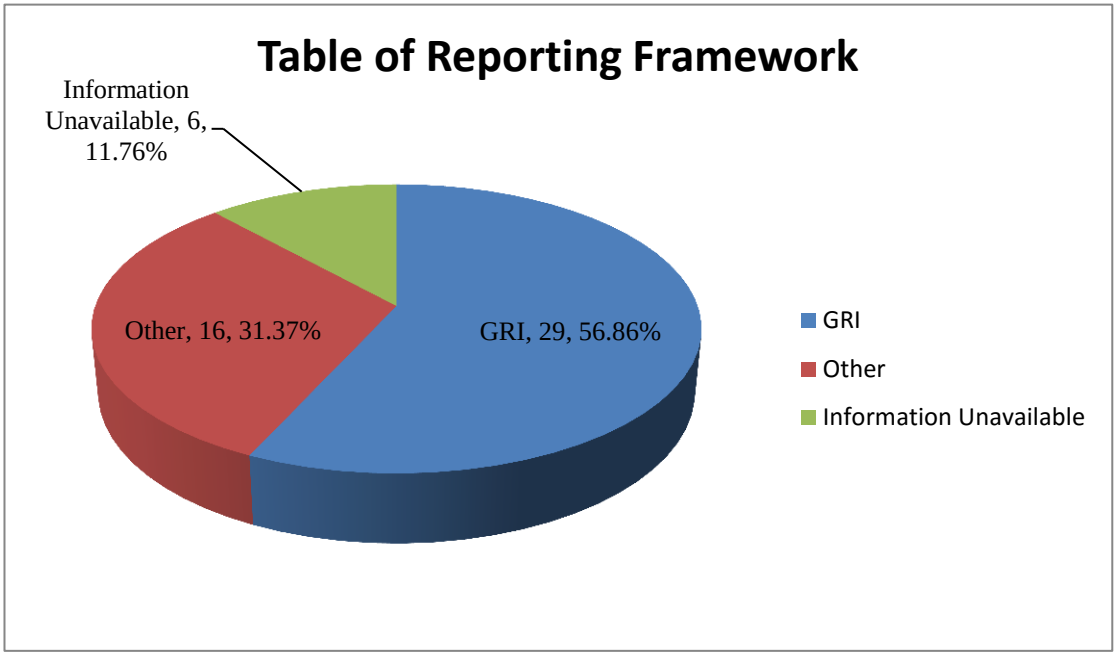

Figure 8. Inclusion of Reporting Framework

Second, audit assurance had a significant impact on the quality of information disclosure. The SSE 50 companies had all their annual reports audited by either the Big-4 audit firms or by domestic auditing firms. As 12 (23.53%) companies' CSR reports were assured by the Big-4 audit firms, the quality and creditability of information in regards to their reports was significantly higher than the remaining companies. A total of 64.71% (33) of companies' CSR reports were assured by Non-Big 4 firms and 11.76% (six) companies failed to present their CSR reports in any social media and public domain (see Figure- 9). I also found consistency in the major issues and relevant information that was disclosed in both CSR reports and the annual reports simultaneously.

Since environmental information, especially water-related information, is a voluntary

disclosure, the reliability of this information played a vital role in ensuring the quality of information disclosure.

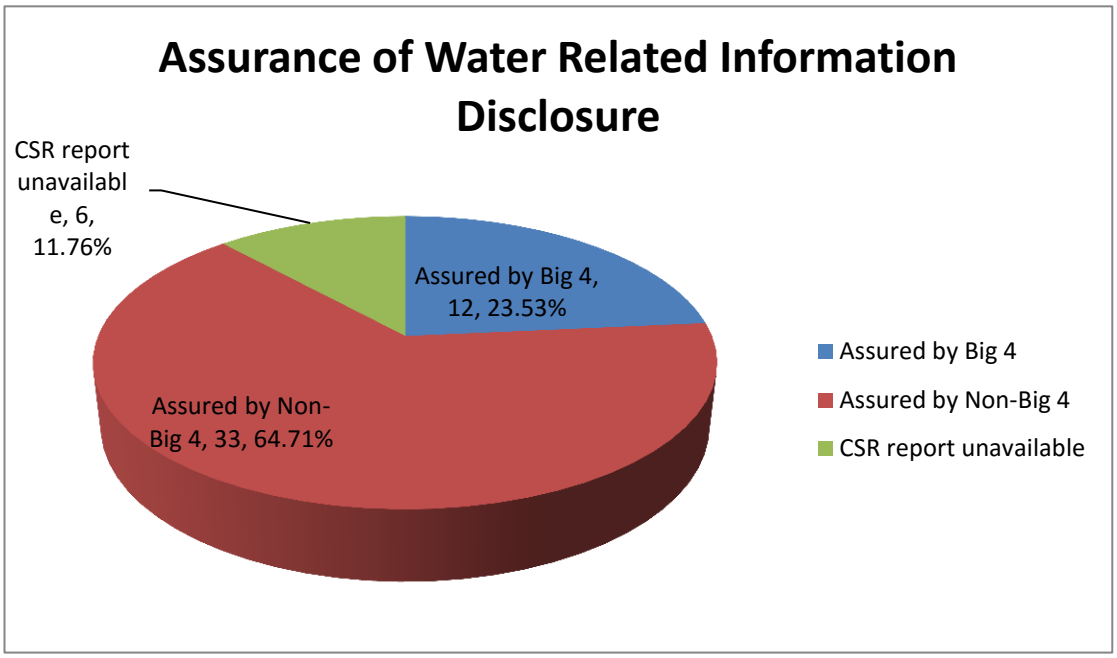

Figure 9. Assurance of water related information disclosure

Third, in terms of disclosing water-related information, the finding indicated that companies were more likely to report this information in their CSR report, rather than annual report. A company would use annual report as a priority reporting media in which to disclose those major financial indicators and significant issues which occurred during the reporting period. The CSR report is more likely to be the media where environmental information is reported, especially for water-related information.

Collectively, from these findings it appears that a company would be more willing to disclose their water-related information in the CSR report. However, with a systematic and comprehensive reporting framework, the quality of information disclosure could be increased. In addition, the appropriate usage of a systematic reporting framework could potentially lead to more comprehensive reporting coverage of water-related information. Likewise, the assurances provided by the Big-4 audit firms may potentially ensure the reliability and the creditability of information disclosed by a company.

4.8 Extent of water-related information disclosures

The extent of reporting in regards to water-related information is important for this particular study. For this analysis, I firstly calculated the pages and the proportion of information disclosed in the reports. The result indicated that only two energy companies had actually obtained a greater than 10% report coverage in regards to water-related issues. However, the remaining companies showed an inadequate (0 to 9.29% of overall report coverage) disclosure of water-related information. From this result, it is clear that the proportion of information disclosures which had an environmental perspective was relatively less than that for other aspects, such as economic benefit and social responsibility. Moreover, the information that related to water-issues was much rarer, in comparison with other impacts, in relation to environmental concerns. I acknowledge that this might not be a precise measurement, however, it did provide evidence that the importance of water resources has not being significantly recognised or understood. Further, there are seven companies that did not provide CSR report and the water relevant information was also not showed in their annual reports, consequently zero score was received for those companies (see Appendix D for details).

The perception of water-issue concerns appears relatively weak at this stage when considering that water is a basic need and also a primary resource to any kind of corporation or industry.

Tables and illustrations were another significant source used by companies, in order to provide better information and knowledge to external users and audiences. Figure- 10 shows the total amount of companies that significantly provided either tables or illustrations to interpret information in regards to water-related issues. In general, 57% (29) of the companies provided tables and/or illustrations in order to assist with the interpretation of their water-related information disclosure. Meanwhile, when a company provided both tables and illustrations in regards to their information disclosure, the outcome of such information often resulted in both quantitative information and

qualitative explanation. For example, when a company used tables to interpret the total volume of water consumed in production, it normally indicated the exact volume and the way in which they used the resources. This indicated that the application of table and illustration would potentially increase the effect of the presentation of the information, and also assist in offering a more diversified understanding of useful information to external parties.

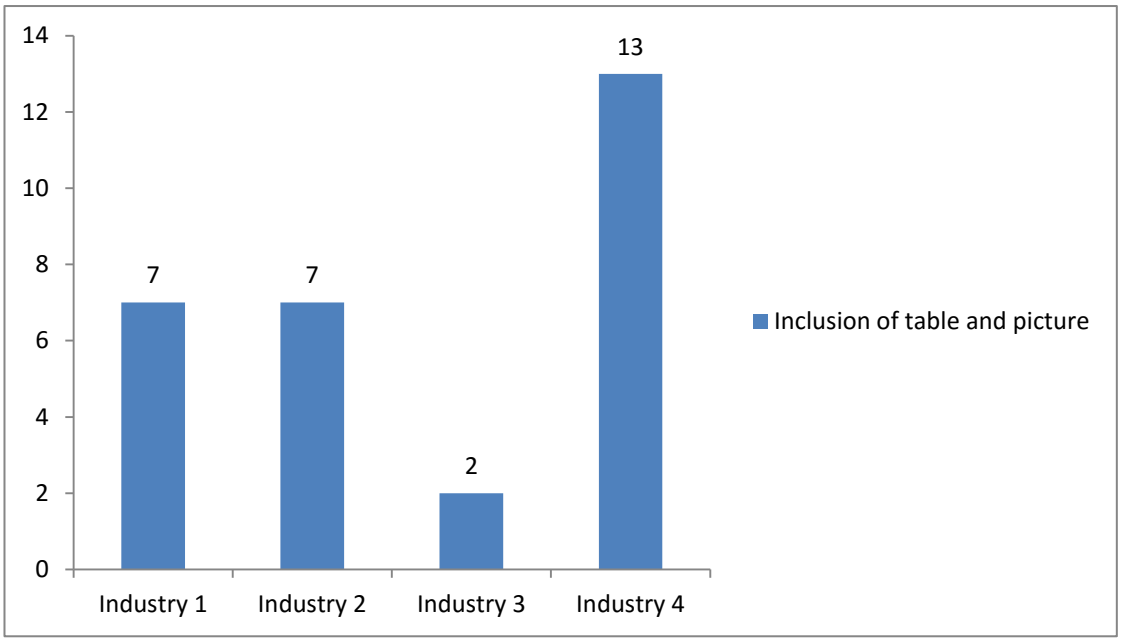

Figure 10. Inclusion of Table and Illustrations

Overall, the inclusion of tables and illustrations enhanced a company's disclosure presentation and allowed interpretation of their information at a more comprehensive level. This therefore provides valuable information to external parties.

4.9 Statistical analysis

4.9.1 Descriptive statistics

In this section, the factors that could potentially have an influence on water-related information disclosure have been interpreted using a quantitative method. As a result of this analysis, more insight into understanding water information disclosure among these major Chinese companies should be provided.

In Table- 4, the statistical results indicate that Chinese companies are more likely to disclose water-related information in CSR reports, rather than annual reports. There was a 26.11% difference between disclosure of relevant information in CSR reports and annual reports. However, as the average of total report' pages is 262.41 and the average percentage of water-related information disclosure is only 3.25%, it shows a significant weakness in the recognition of water issues, and an extremely limited amount of disclosure in regards to water-related information.

Illustration is vital in interpreting and representing the information. As I discussed in the previous section, those tables and pictures which have been used in the reports should not only provide a better visual image of the information but also deliver some significant value to both internal and external users. Therefore, the availability of tables and pictures that were used within the reports is 56.86%% overall, which indicates a total of 1.45 tables or pictures on average had been provided by SSE 50 companies.

Moreover, Table- 4 indicates a total average of 34.41% achievement in comparison to the average actual score and the total expectation. In this indication, the index theme of water discharge and pollution received the highest average score of 4.56.

Table- 4 provides general statistical information, such as average, standard deviation and variance, in regards to those variables which have potential influence on water information disclosures. It can be seen that water discharge and pollution had the

highest score on average in regards to water-related information disclosures.

Water consumption and usage received the second highest score with a 3.94 average. Water recycling, re-usage, water saving received a relatively lower score, in comparison with water consumption, discharge and pollution. Finally, water donation played a less significant role in reporting and disclosing relevant water issues. Thus, an average score of 0.88 was obtained under this specific index theme.

Table 4 Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Median	Std. Deviation
Industry No.	51	1	4	2.6275	2.0000	1.3109
1.0 water consumption and usage	51	0	12	3.9412	3.0000	3.2828
2.0 water dischage and pollution	51	0	17	4.5686	3.0000	4.7424
3.0 water recycling and re-usage	51	0	8	1.7255	1.0000	2.1641
4.0 water saving	51	0	6	1.8824	1.0000	1.9965
5.0 others	51	0	6	0.8824	0.0000	1.4785
Total Score	51	0	37	13.0000	12.0000	10.1823
% of expectation Score	51	0	1	0.3441	0.2857	0.2866
ScoreDistribution	51	0	1	0.2941	0.0000	0.4602
Total Assets (in millions)	51	3626	18917752	1907263.9020	365766.0000	3928363.8116
Total Revenues (in millions)	51	2657	2258124	160016.6667	47930.0000	345865.1052
Audit Report – AR	51	0	1	0.6078	1.0000	0.4931
Audit Report – CSR	51	0	2	0.4706	0.0000	0.7029
Reporting Framework	51	0	2	0.8039	1.0000	0.6331
Total pages – CSR	51	0	178	56.0392	57.0000	39.2428
Total pages – AR	51	39	390	206.3725	203.0000	74.0470
Total pages – Overall	51	39	522	262.4118	258.0000	98.5327
% of total pages – CSR	51	0	0.0952	0.0267	0.0238	0.0243
% of total pages – AR	51	0	0.0714	0.0056	0.0000	0.0129
% of total pages – Overall	51	0	0.1018	0.0325	0.0263	0.0285
Water Related Disclosure	51	0	1	0.8627	1.0000	0.3475
Table	51	0	4	0.9608	0.0000	1.2159
Picture	51	0	4	0.4902	0.0000	0.9027
TablePictureAvailability	51	0	1	0.5686	1.0000	0.5002

4.9.2 Pearson correlation

Table- 5 presents the Pearson correlation of all the study variables which may potentially have influence on water-related information disclosure and reporting. It also shows the correlation between all the variables, thus demonstrating the correlation coefficient value between these variables.

First, water consumption and usage can be influenced by multiple factors. For example, an increase in the total pages of a CSR report and the percentage of pages which use water-related information, should potentially result in disclosing more information in regards to water consumption and usage. The inclusion of tables and pictures are also statistically significant (.484**) to water consumption and usage. Moreover, .780** and .761** are significant in the total score and percentage of expectation score. When the total score and the percentage of expectation score changes, the score received under the theme of water consumption and usage, will also change.

Second, the results for water discharge and pollution are very similar to those for water consumption and usage. However, the only difference between these two index themes is that the report page shows no significant correlation with water discharge and pollution.

Third, both water recycling and re-usage and water saving have a significant correlation with the total pages of a CSR report and the percentage used to report relevant information in both a CSR report and an annual report, being .364** and .516** respectively. Likewise, the total score and the percentage of the expectation score has a significant correlation with information disclosure in regards to water recycling and re-usage and water saving.

Last, I found water donation significantly correlates to the total pages of a CSR report at .373**. Thus, increasing the total pages of a CSR report could potentially affect the

disclosure of water donation. Also, the total score and the percentage of the expectation score, also shows a significant correlation to water donation. This suggests that when a company receives a higher total score and expectation score, the disclosure in regards to water donation will also be higher.

There is only a minimal significance between audit assurance and information reporting with regard to water-related disclosures. However, a significance of 0.364^{**} between audited annual reports and the total percentage of the expectation score does not provide any significant evidence for a direct relationship.

In the analysis of the reporting framework, I also found there is no significance with regard to water-related information disclosure. However, a 0.661^{**} correlation which existed between audit assurances of CSR reports and reporting frameworks, shows that when a company applies the GRI reporting framework, it is more likely to be assured by the audit firm.

The, statistical results indicated that the total pages of reports (annual reports and CSR reports) have a significant impact on water-related information disclosure. For instance, when the total pages of reports increase, this will potentially have a positive impact on the coverage of water-related information disclosures, especially in water consumption and usage, water recycling and re-usage, water saving and water donation. More importantly, the total pages of reports have a significant correlation with total score and the expectation score. Therefore, pages of reports could remain a significant factor with regard to relevant information disclosures.

In considering the use of illustrations in the reports, I found table and picture availability plays a crucial role in terms of describing the information which related to water issues. It also shows a significant correlation with the total score of water-related information disclosures and the expectation score of water-related information disclosures. In particular, I found illustrations have a significant impact on water

consumption and usage, water discharge and pollution and water recycling and re-usage. This could indicate that companies are more likely to include tables and pictures into interpret and describe the status of their relevant water issues. In addition, a significance of 0.458** for water related disclosure shows reasonable evidence that table and picture availability within a report could potentially increase the relevance of a company's reporting in regards to water-related information disclosure.

Furthermore, as indicated in Table- 5, the total disclosure score is significant for all five index themes with regard to water-related information disclosure. However, it is also significant for other variables, such as total pages of CSR report, the percentage of total pages of CSR report, water related disclosure, and table or picture availability. Nevertheless, it was obvious that water-related disclosure would increase as the total score of water-related information disclosure increased, thus the 0.514** significance as shown in Table- 5. Likewise, the total pages CSR report also had a significant correlation with total score; a 0.499** and a 0.773** significance occurred between the pages of CSR reports and total score. Thus, the total pages and the percentage of water-related information disclosed may potentially influence the total disclosure score in regards to information reporting. The availability of tables and pictures was also significantly correlated with total score for water-related information disclosure at 0.565** indicating that table and picture availability within reports could potentially increase the total score for information disclosure.

In the same vein, the percentage for expectation score had many similarities with total disclosure score. However, the only difference is that total assets had a 0.440** significance with percentage of expectation score. This result could indicate that when a company operated in a wealthy financial condition and had a relatively larger financial size, they would be more likely to disclose their water-related information in their annual report and CSR report.

Overall, Table- 5 shows that the total pages of a CSR report, the inclusion of tables and

pictures, the total score and the actual percentage of expectation score are the four key factors that could influence information disclosure in regards to water-related issues. Moreover, some positive influences also exist within the five index themes. For example, a change in water consumption and usage may potentially affect the information disclosure of water discharge and pollution, and water recycling and re-usage. Water donation also has a positive significant correlation with water recycling and re-usage, and water saving. From this specific perspective, it could be suggested that when a company discloses more information in regards to water saving, the saved aspect of water resources can be then effectively donated to other parties.

In Appendix E, I distinguish the characteristics of each of the SSE 50 companies using two methods. First, I categorise the companies into four different industry levels: 29% (15 companies) in Industry 1; 22% (11 companies) in Industry 2; 6% (3 companies) in Industry 3, and 43% (22 companies) in Industry 4.

Such classification presented a better understanding of each individual company's performance in regards to their nature and characteristics. This was also a logical method to avoid the problem of applicability and the issue of bias.

Second, according to prior studies, the level of information disclosure may vary depending on the financial condition of the company. Even with companies classified into the same industry, the size and profitability of a company may still vary in relation to other companies. In order to provide a more precise measure in my research, I therefore recorded the total assets and total revenue in regards to identifying each company's financial conditions. Thus, the result indicated a diversity of total assets reported within annual reports. This ranged from a minimum (AVIC Aviation Engine Corporation Plc) of 13,237 million RMB to a maximum (Industrial and Commercial Bank of China Limited) of 18,917,752 million RMB. In general, companies which operated in the financial sector, especially banking corporations, reported higher total assets in comparison to other industries.

The gaps between companies revenues were also significant, ranging from a minimum (ORINT Securities Company Limited) of 2,657 million RMB to a maximum (China State Construction Engineering Corporation Limited) of 681,047 million RMB. Consequently, such huge variations within both total assets and revenue not only significantly reduces the reliability and validity, but also the rationality and credibility of using analysis which contains such variation in levels of disclosure.

Finally, I did not find any direct relationship between financial conditions and disclosure of environmental information, especially in water-related information disclosure. However, the results did imply that when some of the major companies had both high total assets and high revenue, this often resulted in a more comprehensive disclosure score, which was higher than that of other companies.

Table 5 Pearson Correlation

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1.Total Score	1																					
2.% of expectation Score	.891**	1																				
3. Water Consumption and Usage	.780**	.761**	1																			
4. Water Dischage and Pollution	.811**	.650**	.502**	1																		
5. Water Recycling and Re-usage	.835**	.716**	.527**	.563**	1																	
6. Water Saving	.694**	.672**	.539**	0.256	.631**	1																
7. Other	.395**	.405**	0.044	0.092	.459**	.483**	1															
8.Score Distribution	.734**	.827**	.607**	.545**	.585**	.583**	.316*	1														
9.Industry No.	-0.090	0.256	0.041	-0.155	-0.135	0.006	-0.023	0.252	1													
10.Total Assets (in millions)	0.220	.440**	0.199	-0.030	0.177	.415**	.352*	.360**	.435**	1												
11.Total Revenues (in millions)	0.168	0.096	-0.075	0.086	0.256	.277*	.296*	-0.079	-0.124	0.106	1											
12.Audit Report – AR	0.235	.364**	0.109	0.174	0.141	0.257	0.265	0.254	.419**	.370**	0.247	1										
13.Audit Report – CSR	-0.006	0.061	0.142	-0.070	-0.071	-0.031	0.016	0.058	0.042	0.212	-0.190	-0.149	1									
14.Reporting Framework	0.068	0.049	0.129	0.031	0.048	-0.066	0.103	-0.004	-0.066	0.061	0.008	-0.187	.661**	1								
15.Total pages – CSR	.499**	.603**	.474**	0.243	.364**	.516**	.373**	.431**	0.241	.472**	0.156	.455**	-0.139	0.048	1							
16.Total pages – AR	0.161	.333*	0.229	0.063	0.078	0.167	0.061	.389**	.479**	.569**	-0.228	.549**	-0.090	-0.269	.462**	1						
17.Total pages – Overall	.320*	.490**	.361**	0.144	0.204	.331*	0.194	.464**	.456**	.616**	-0.109	.593**	-0.123	-0.183	.746**	.936**	1					
18.% of total pages – CSR	.723**	.612**	.540**	.723**	.604**	.325*	0.138	.499**	-0.141	0.062	0.122	0.211	-0.140	-0.080	0.184	0.108	0.154	1				
19.% of total pages – AR	.333*	0.127	0.179	.382**	0.102	.338*	0.070	0.064	-0.265	-0.112	0.065	-0.132	0.037	-0.010	-0.057	-0.231	-0.197	0.043	1			
20.% of total pages – Overall	.773**	.580**	.534**	.794**	.563**	.448**	0.162	.449**	-0.251	0.000	0.145	0.110	-0.109	-0.084	0.120	-0.028	0.027	.867**	.534**	1		
21.Water Related Disclosure	.514**	.484**	.484**	.388**	.321*	.380**	0.240	0.257	-0.246	0.181	0.172	0.146	-0.058	0.057	.417**	0.138	0.270	.441**	0.176	.460**	1	
22.Table Picture Availability	.565**	.568**	.666**	.426**	.387**	0.249	0.146	.302*	0.086	0.254	-0.017	0.111	0.134	0.170	.342*	0.097	0.209	.490**	0.054	.433**	.458**	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

5.0 Conclusion

The objective of the present study was to determine the status quo of water-related information disclosure in major Chinese companies. Applying the disclosure index and the scoring-measurement system that I developed in this study, to a sample of the SSE 50 companies, I found water-related information is important to certain industries. However, the disclosure in these Chinese companies was not a priority compared to other resources. Therefore the results indicated that the importance of water-related issues has not yet been comprehensively recognised and an understanding of the necessity to report such information, was not significantly and extensively acknowledged. This was especially noted in those companies that operated in an area, where water was a very basic and vital element, utilised and consumed within their standard production processes and operations.

The most important value derived from this research is the unique disclosure index which I developed. This specific disclosure index was applied, and functioned as an effective tool in measuring the quality and comprehensiveness of water-related information disclosure. Since the index development was based on a significant amount of prior literature and a variety of international reporting frameworks, the range of the applications is extensive and the value of this index is apparent.

The development of the expectation score provided a significant comparison between the theoretical expectation that was derived from past literature and the actual score which was obtained from reading those reports. Therefore, the percentage of the expectation score showed diversity in reporting water-related information among each of the four industries.

Nevertheless, water-related information disclosure is significant for the SSE 50 companies, not only to provide useful information to both external and internal users, but also to obtain a comprehensive understanding of the resource itself.

Based on the prior literature mentioned in the previous section, the present study's findings were consistent in that factors were revealed which may potentially influence the quality and comprehensiveness of water-related information disclosure.

First, past literature indicated that the reporting framework has significant attributes in regards to meeting the requirement of objectiveness, completeness, integrity and so on (Owen, Swift and Hunt, 2001; Cooper and Owen, 2007). This research provided results consistent with past literature that when a company adopted a framework such as GRI, the score in regards to water-related information was disclosed more comprehensive in compare with others. Further, I also found within a systematic reporting framework, information disclosed should be more consistent and clear. When a company adopted the GRI reporting framework, it would disclose more relevant information on water issues compared with other reports which were not prepared using a similar method.

Second, prior literature revealed that assurance established by the Big-4 may have higher credibility and be more reliable than that of others (Lai, 2013; Khurana and Raman, 2004; Lawrence, Minutti-Meza and Zhang, 2011; Francis and Yu, 2009). However, since there is no direct evidence on whether audit assurance may influence the reporting score, it may be less relevant here. Nevertheless, this result does not mean that audit assurance is meaningless; it only means it did not show a significant impact in this study. I did, however, find that when a company adopted the GRI reporting framework, it would be more likely to accept the Big-4 audit assurance on its CSR report.

Third, past literature indicated that measuring the sentence, paragraph and reporting proportion in regards to relevant information disclosed in a report, is another way to analysis information disclosure, thus, a consistence with past literature was also found in this study (Gray, Kouhy & Lavers, 1995; Guthrie & Parker, 1989; Patten, 1992, 1995; Ingram & Wiseman, 1980; Deegan & Gordon, 1996; Zeghal & Ahmed, 1990). It showed that the proportion of relevant information disclosures was potentially

influenced by the volume of the total pages which were used to form the report. Therefore, when the volume of a report's pages increased, the coverage of the water relevant information would also elevate.

Last, prior literature suggested that illustrations (tables, pictures and figures) may provide clearer and better visualisation with regard to the presentation and interpretation of important information (Miles and Huberman, 1994). In this study, illustrations used in reports have a significant impact on providing both quantitative information and qualitative explanation in relation to water-related issues. The findings show that illustrations should not only offer clearer and better visualisation, but also increase the capacity of those report users who may have limited understanding of certain information requiring expert knowledge.

Finally, this study contributes to the extant academic literature by developing a specific disclosure index with regard to helping and improving water-related information disclosures. More importantly, past studies has not developed and/or introduced any disclosure index that similar to this research, thus the present study directly contributes to the current literature by filling the gap in the area of understanding the importance of water-related information disclosures.

5.1 Contribution, limitation and future research

This is the first study undertaken using a disclosure index and comprehensive scale analysis to measure the disclosure of water-related information by SSE 50 Chinese companies. In fact, the environmental performance indicators and the disclosure-scoring measurement used in past literature did not provide comprehensive information in regards to water-related issues, specifically.

In addition, no previous research has specifically developed a comprehensive measure to investigate reporting behaviour, with regard to water-related information disclosure.

In terms of contributing to the current literature, I therefore proposed a water-related issues disclosure index as a more comprehensive measure of a company's water reporting. By adopting the specific measurement developed in this research, the quality and the extent of water-related information disclosure is increased and enhanced. Moreover, this research showed findings consistent with past studies and contributed to the water accounting literature, through enriching the understanding and extending the knowledge of water-related information disclosure with regard to major Chinese companies.

Nevertheless, as the objective of this study was only focused on the SSE 50 companies which were listed in the Shanghai Stock Exchange Market, and as the disclosure index was specifically developed for the reporting of information with regard to water-related issues, the results would potentially not be identical when applying the same research method in different studies.

Since the duration of the collection of all the CSR reports and annual reports was a period of one year, the examination of only one year's disclosure performance could potentially be a limitation for the present study.

In terms of overcoming limitations and extending this research in the future, I would genuinely suggest applying the same research approach to other company groups and/or other countries would appear to be a more fruitful extension of this study. Also, extending the time period studied could perhaps shape the present study into a more longitudinal perspective, and would potentially provide more comprehensive insights and therefore present a more extensive picture.

Appendix A - Index Development

	Sources					
Index Themes	Global Reporting Initiative	Water Footprint	Literature	The CEO Water Mandate	Water Accounting Standard Board	Index items
A1: Water consumption and usage (water withdrawal)	GRI-Section: EN8 total water withdrawal (surface water, including water from wetlands, rivers, lakes, and oceans; ground water; rainwater collected directly and stored by the organisation; municipal water supplies or other water utilities)	The blue water footprint: refers to consumption of blue water resources (surface water and ground water) along the supply chain of a product. In particular, the team 'consumptive water use' refers to: 1. Water evaporation. 2. Water incorporation into a product. 3. Water not returning to the same catchment area. 4. Water not returning in the same period (for example, it is withdrawn in a scarce period and returned in a wet period).	The Global Reporting Initiative. (2013) The CEO Water Mandate. (2015)	Water withdrawal: the volume of freshwater extracted from a surface or groundwater source, without accounting for how much is returned to the freshwater source after use.	1. Surface water: water which flows over or is stored on the surface of the earth. 2. Groundwater: subsurface water in soils and geological formations that are fully saturated. 3. Surface water inflows 4. Groundwater inflows 5. Surface water outflows 6. Groundwater outflows	➢ Total volume of water withdrawal

	Sources					
Index Themes	Global Reporting Initiative	Water Footprint	Literature	The CEO Water Mandate	Water Accounting Standard Board	Index items
A2: Water consumption and usage		The green water footprint: is the volume of green water (that is, rainwater) consumed during the production process. The water footprint of a product: the sum of the water footprints of the process steps taken to product. The water footprint of a consumer: the sum of the water footprints of all products consumed by the consumer. The water footprint of a business: the sum of the water footprints of the final products that the business produces.	The CEO Water Mandate. (2015) Hoekstra et al. (2011) Hoekstra and Chapagain. (2007) Hazelton. (2014) Biswas. (2004) Egan and Frost. (2010) Peters et al. (2010) Molden and Sakthivadivel. (1999) Vink. (2014) Ercin, Aldaya and Hoekstra. (2011) Ercin et al. (2011) Brulliard. (2009) Bega. (2009) British Geological Survey. (2004) Goodman. (2009) Shao, Tang, Zhang and Li. (2006) Godfrey and Lynch. (2012)	Water consumption: volume of water that is extracted from a freshwater source and not returned to that source after use. Water use: the total amount of water withdrawn or diverted by an operation to produce products or provide a service. Supplier: a distinct entity that provides goods and/or services to another company.		➢ Total volume of water used in production ➢ Total volume of water consumed by administration processes ➢ Total volume of water consumed due to cleaning activities ➢ Total costs invested to improving water input quality and restoration

	Sources					
Index Themes	Global Reporting Initiative	Water Footprint	Literature	The CEO Water Mandate	Water Accounting Standard Board	Index items
B1: Water discharge and pollution	GRI: EN25 The impact of discharges Water wastage		The CEO Water Mandate. (2015) The Global Reporting Initiative. (2013) Molden. (1997) Seckler. (1996) Casani, Rouhany and KnØchel. (2004) Qu and Fan. (2010) Keller and Keller. (1995) Tingey-Holyoak, Pisaniello and Burritt. (2012) Massoud, Tarhini and Nasr. (2009) Biswas. (2004) Kampschreur et al. (2009) Christenson and Sims. (2011) Tregidga and Milne (2006) Koppol et al. (2003) Izquierdo et al. (2008) Rodenbure et al. (2010)	Water discharge: the sum of water effluents discharged to subsurface water, surface waters, and sewers either through a defined discharge point (point source discharge), over land in a dispersed or undefined manner (non-point source discharge), or wastewater removed via truck.	When a water report entity experiences significant volumes of evaporation relative to other forms of water asset decreases, it may appropriate to disaggregate water asset decreases to present separately the volumes attributable to evaporation.	➢ Total volume of water discharged ➢ Total costs due to water discharged ➢ Total volume of wastewater collected ➢ Total volume of wastewater treated ➢ Total costs of wastewater treatment

	Sources					
Index Themes	Global Reporting Initiative	Water Footprint	Literature	The CEO Water Mandate	Water Accounting Standard Board	Index items
B2: Water pollution		The grey water footprint: the grey water footprint of a process step is an indicator of the degree of freshwater pollution that can be associated with the process step. It is defined as the volume of freshwater that is required to assimilate the load of pollutants based on existing ambient water quality standards. In other word, it refers to the volume of water that is required to dilute pollutants to such an extent that the quality of the ambient water remains above agreed water quality standards.	Shao et al. (2006) Wang et al. (2008) Hoekstra et al. (2011) Gros et al. (2010) Jelic et al. (2011) Sirés and Brillas. (2012) Schwarzenbach et al. (2010) Martinez. (2015) Gladwin et al. (1995) Lasusa, Gunther and Beams. (1970) Qu and Fan. (2010) European Union. (2013) World Business Council for Sustainable Development. (2013) Worldwide Fund for Nature. (2012) OECD. (2012) Xie. (1992) Zhang et al. (2012) Huang and Shaw (2005) Tan, Huang and Cai. (2011)			➢ Total volume of water polluted ➢ Total costs used on purifying of water or to mitigate water pollution ➢ Total costs of pollution prevention and pollution control

	Sources					
Index Themes	Global Reporting Initiative	Water Footprint	Literature	The CEO Water Mandate	Water Accounting Standard Board	Index items
C: Water saving	Water storage & saving	In water footprint, water which stored could be either blue water or green water.	Hoekstra et al. (2011) Molden and Sakthivadivel. (1999) The CEO Water Mandate. (2015) Cheng, Hu and Zhao. (2009) Liu, Zhang and Zhang. (2010) Kaser, Großhauser and Marzeion. (2010) Immerzeel, van Beek and Bierkens. (2010) Heathwaite. (2010) Bouman. (2012) Wang, Zhang and Zhang. (2003) Deng et al. (2010) Molden et al. (2010) Chaves and Oliveira. (2004) Luo. (2010) Belder et al. (2004) Pen et al. (2012) Furumai. (2008) Klaassen, Bosveld and de Water. (1998) Domènech and Saurí. (2011) Berbel, Martin-Ortega and Mesa. (2010)	Water availability: refers to the amount of water available for human purposes.	1. Water storage: the total water in water assets. 2. Change in water storage: increases or decreases in water storage for a water report entity from one reporting date to the next. 3. Opening water storage: the total water storage for a water report entity at the beginning of the reporting period. 4. Closing water storage: the total water storage for a water report entity at the reporting date. 5. Dead storage water: water that is below the elevation of the lowest constructed outlet in a storage.	➢ Total volume of water available for use and service ➢ Total volume of water saved and reduction in usage ➢ Total costs of water saved

	Sources					
Index Themes	Global Reporting Initiative	Water Footprint	Literature	The CEO Water Mandate	Water Accounting Standard Board	Index items
D: Water recycling and re-usage	GRI-Section: EN10 Water recycled, reclaimed and reused 1. Report the total volume of water recycled and reused by the organization. 2. Report the total volume of water recycled and reused as a percentage of the total water withdrawal.		The Global Reporting Initiative. (2013) Casani, Rouhany and KnØchel. (2005) Miller. (2006) Salgot. (2008) Bontoux and Lazarova. (2002) Luo et al. (2011) Simate et al. (2011) Giurco et al. (2011) Gupta et al. (2012) Lu et al. (2010) Giurco et al. (2011) Klemeš. (2012) Yi, Jiao, Chen and Chen. (2011)	Effluent: a subset of discharge, effluent is the wastewater (treated or untreated) from a production process that is discharged.		➢ Total volume of wastewater recycled and reused by company ➢ Total volume of wastewater recycled and reused as a percentage of the total water withdrawal ➢ Total costs of water recycled and reused
E: Other	Other		The founding was based on the general observation from report analysis			➢ Total volume of water donation ➢ Total costs of water donation

Appendix B – Index of expectation score

Section	Indexes	Industry 1 (Manufacture, Material and Industrial)	Industry 2 (energy, Construction, Transportation)	Industry 3 (Telecommunication Service and Information Technologies)	Industry 4 (Financial)
1. Water consumption and usage	1. Total volume of water withdrawal	3	3	3	3
	2. Total volume of water used in production	3	3		
	3. Total volume of water consumed by administration processes	3	3	3	3
	4. Total volume of water consumed due to cleaning activities	3	3		
	5. Total costs invested to improving water input quality and restoration	3	3		
	Section total	15	15	6	6
2. Water discharge and pollution	1. Total volume of water discharged	3	3	3	3
	2. Total costs due to water discharged	3	3		
	3. Total volume of wastewater collected				
	4. Total volume of wastewater treated	3	3	3	3
	5. Total costs of wastewater treatment	3		3	3
	6. Total volume of water polluted	3			
	7. Total costs used on purifying of water or to mitigate water pollution	3	3		
		3	3	3	

Section	Indexes	Industry 1 (Manufacture, Material and Industrial)	Industry 2 (energy, Construction, Transportation)	Industry 3 (Telecommunication Service and Information Technologies)	Industry 4 (Financial)
	8. Total costs of pollution prevention and pollution control	3	3		
	Section total	24	18	12	9
3. Water recycling and re-usage	1. Total volume of wastewater recycled and reused by company	3		3	3
	2. Total volume of wastewater recycled and reused as a percentage of the total water withdrawal	3 3	3 3		
	3. Total costs of water recycled and reused.				
	Section total	9	6	3	3
4. Water saving	1. Total volume of water available for use and service	3			
	2. Total volume of water saved and reduction in usage	3	3	3	3
	3. Total costs of water saved	3	3		
	Section total	9	6	3	3
5. Other	1. Total volume of water donation	3			
	2. Total costs of water donation	3			
Total scores		63	45	24	21

Note: “Other” is the alternatives which observed during the report analysis, these two items were frequently appears and consistently mentioned in companies’ reports.

Appendix C –Classification of SSE 50 Companies

Industry class	Sector	Name of company
1	Manufacture; Materials and industrial	1. Inner Mongolia BaoTou Steel Union Co.,Ltd. 2. TBEA CO.,LTD. 3. SAIC Motor Corporation Limited 4. China Northern Rare Earth (Group) High-Tech Co.,Ltd 5. China CSSC Holdings Limited 6. KWEICHOW MOUTAI CO.,LTD. 7. OFFSHORE OIL ENGINEERING CO., LTD. 8. Anhui Conch Cement Company Limited 9. QINGDAO HAIER CO.，LTD 10. INNER MONGOLIA YILI INDUSTRIAL GROUP CO.,LTD 11. AVIC AVIATION ENGINE CORPORATION PLC 12. CRRC Corporation Limited 13. China Shipbuilding Industry Company Limited 14. POLY REAL ESTATE GROUP CO.,LTD 15. Kangmei Pharmaceutical Co., Ltd
2	Energy; Construction and Transportation	1. China Petroleum and Chemical Corporation 2. GUANGHUI ENERGY CO.,LTD. 3. China Shenhua Energy Company Limited 4. PetroChina Company Limited 5. China Railway Construction Corporation Limited 6. China Railway Group Limited 7. China State Construction Engineering Corporation Limited 8. China Communications Construction Co.,Ltd 9. Shanghai International Port (Group) Co., Ltd (T) 10. Daqin Railway Co., Ltd.
3	Telecommunication Services and Information Technologies	1. CHINA UNITED NETWORK COMMUNICATIONS LIMITED 2. NARI Technology Co., Ltd. 3. Shanghai Oriental Pearl Media Co.,Ltd.

Industry class	Sector	Name of company
4	Financial (banking, securities and insurances)	1. SHANGHAI PUDONG DEVELOPMENT BANK CO., LTD. 2. HUA XIA BANK CO., Limited 3. CHINA MINSHENG BANK 4. CITIC Securities Company Limited 5. China Merchants Bank Co.,Limited 6. SINOLINK SECURITIES CO., LTD. 7. HAITONG Securities Company Limited 8. ORIENT SECURITIES COMPANY LIMITED 9. China Merchants Securities Co.,Ltd. 10. INDUSTRIAL BANK CO.,LTD. 11. BANK OF BEIJING CO.,LTD. 12. AGRICULTURAL BANK OF CHINA LIMITED 13. PING AN INSURANCE（GROUP）COMPANY OF CHINA, LTD. 14. BANK OF COMMUNICATIONS CO.,LTD. 15. INDUSTRIAL AND COMMERCIAL BANK OF CHINA LIMITED 16. China Pacific Insurance (Group) Co., Ltd. 17. CHINA LIFE INSURANCE COMPANY LIMITED 18. HUATAI SECURITIES CO.,LTD 19. CHINA EVERBRIGHT BANK COMPANY LIMITED 20. Founder Securities Co., Ltd. 21. BANK OF CHINA LIMITED 22. CHINA CITIC BANK CORPORATION LIMITED

Appendix D - Extent of Reporting & Other Reporting Factors

				Characteristics		Other Factors			Disclosure Scores							Report Medium			Extent				
No.	Company	Industry No.	Industry	Total Assets (in millions)	Total Revenues (in millions)	Audit Report – AR	Audit Report – CSR	Reporting Framework	1.0 water consumption and usage	2.0 water dischage and pollution	3.0 water recycling and re-usage	4.0 water saving	5.0 others	Total Score	% of expectation Score	Total pages – CSR	Total pages – AR	Total pages – Overall	% of total pages – CSR	% of total pages – AR	% of total pages – Overall	Table	Picture
1	SHANGHAI PUDONG DEVELOPMENT BANK CO., LTD.	4	Financial (banking)	4195924	123181	PWC	PWC	GRI – G4	9	4	6	6	3	28	100%	131	120	251	3.05%	0	3.05%	3	0
2	Inner Mongolia BaoTou Steel Union Co., Ltd.	1	MMI (manufacture)	87924	37770	Non-Big 4	N/A	N/A	4	2	2	2	2	12	21.05%	0	124	124	0	1.61%	1.61%	0	0
3	HUA XIA BANK CO., Limited	4	Financial (banking)	1672447	45219	Deloitte	Deloitte	GRI – G4	3	10	0	0	0	13	46.43%	93	197	290	2.15%	0.50%	2.65%	1	0
4	CHINA MINGSHENG BANKING CORP., LTD	4	Financial (banking)	3226210	57151	KPMG	KPMG	Multiple reporting guidance	6	2	2	2	0	12	42.86%	84	330	414	2.39%	0.30%	2.69%	0	1
5	Shanghai International Port (Group) Co., Ltd	2	Transportation	88611	28162	Non-Big 4	Non-Big 4	GRI – G3.1	9	9	5	5	0	28	62%	108	203	311	3.70%	0.50%	4.20%	2	1
6	China Petroleum and Chemical Corporation	2	Energy	1382916	96453	PWC	Non-Big 4	Multiple reporting guidance & GRI	3	15	4	0	2	24	53.33%	42	198	240	9.52%	0.51%	10.03%	0	3
7	CITIC Securities Company Limited	4	Financial (securities)	479626	29197	E & Y	Non-Big 4	Multiple reporting guidance	0	0	0	0	0	0	0	11	251	262	0	0	0	0	0
8	China Merchants Bank Co., Limited	4	Financial (banking)	4016399	68425	KPMG	Non-Big 4	Multiple reporting guidance	4	10	0	1	0	15	53.57%	79	338	417	1.27%	0	1.27%	0	0
9	POLY REAL ESTATE GROUP CO., LTD	2	Construction	365766	109056	Non-Big 4	Non-Big 4	Multiple reporting guidance	8	2	0	1	0	11	24.44%	55	188	243	7.27%	0	7.27%	0	4
10	CHINA UNITED NETWORK COMMUNICATIONS LIMITED	3	Telecommunication Service	547124	288570	KPMG	Non-Big 4	Multiple reporting guidance & GRI – G4	6	3	0	1	0	10	35.71%	77	168	245	2.60%	1.19%	3.79%	3	1
11	TBEA CO., LTD.	1	MMI (industry)	50660	29174	Non-Big 4	Unknown	Multiple reporting guidance	9	13	5	2	0	29	64.44%	32	198	230	6.25%	0.51%	6.76%	2	0
12	SAIC Motor Corporation Limited	1	MMI (manufacture)	373640	565807	Deloitte	Unknown	Multiple reporting guidance	1	4	1	3	3	12	21.05%	73	167	240	4.11%	0	4.11%	0	0
13	SINOLINK SECURITIES CO., LTD	4	Financial (securities)	26280	2721	Non-Big 4	Non-Big 4	Multiple reporting guidance & GRI – G3	0	0	0	0	0	0	0	20	177	197	0	0	0	0	0
14	China Northern Rare Earth (group) High-Tech Co., Ltd	1	MMI (industry)	18462	8471	Non-Big 4	N/A	N/A	5	12	2	0	0	19	33.33%	28	163	191	7.14%	0.61%	7.75%	2	2
15	China CSSC Holding Limited	1	MMI (manufacture)	51026	22198	Non-Big 4	Non-Big 4	Multiple reporting guidance & GRi – G3	2	2	0	0	0	4	7.02%	79	179	258	0.63%	0.56%	1.19%	0	0

				Characteristics		Other Factors			Disclosure Scores							Report Medium			Extent				
No.	Company	Industry No.	Industry	Total Assets (in millions)	Total Revenues (in millions)	Audit Report – AR	Audit Report – CSR	Reporting Framework	1.0 water consumption and usage	2.0 water dischage and pollution	3.0 water recycling and re-usage	4.0 water saving	5.0 others	Total Score	% of expectation Score	Total pages – CSR	Total pages – AR	Total pages – Overall	% of total pages – CSR	% of total pages – AR	% of total pages – Overall	Table	Picture
16	GUANGHUI ENERGY CO., LTD	2	Energy	28959	4805	Non-Big 4	Unknown	SSE corporate social responsibility reporting guidance	7	10	8	5	0	30	66.67%	27	184	211	7.41%	1.09%	8.50%	4	0
17	NARI Technology Co., Ltd	3	Information Technology	13273	9575	Non-Big 4	Non-Big 4	Multiple reporting guidance & CSR – G3.1	2	9	1	0	0	12	42.86%	42	175	217	2.38%	1.14%	3.52%	2	0
18	Kangmei Pharmaceutical Co., Ltd	1	MMI (health care)	22251	13358	Non-Big 4	Non-Big 4	Multiple reporting guidance	0	0	0	0	0	0	0.00%	37	142	179	0.00%	0	0.00%	0	0
19	KWEICHOW MOUTAI CO., LTD	1	MMI (manufacture)	55454	30921	Non-Big 4	N/A	N/A	3	0	0	0	0	3	5.26%	0	101	101	0	0.99%	0.99%	1	0
20	OFFSHORE OIL ENGINEERING CO., LTD	1	MMI (industry)	1119374	611600	Non-big 4	Non-Big 4	Multiple reporting guidance	1	7	2	6	3	19	33.33%	7	72	79	0.89%	7.14%	9.29%	0	0
21	Anhui Conch Cement Company Limited	1	MMI (industry)	93094	55261	KPMG	KPMG	SSE corporate social responsibilities reporting guidance	0	2	0	0	0	2	3.51%	28	272	300	1.79%	0	1.79%	0	0
22	Shanghai Oriental Peal Media Co., Ltd	3	Telecommunication Service	3626	14206	Non-Big 4	N/A	N/A	0	0	0	0	0	0	0	0	138	138	0	0	0	0	0
23	QINGDAO HAIER CO., LTD	1	MMI (manufacture)	61015	86487	Non-Big 4	Non-Big 4	Multiple reporting guidance & GRI – G3.1	6	0	2	3	3	14	24.56%	61	138	199	3.28%	0	3.28%	0	1
24	HAITONG Securities Company Limited	4	Financial (securities)	169123	10454	Deloitte	Non-Big 4	Multiple reporting guidance	0	0	0	0	0	0	0	18	257	275	0	0	0	0	0
25	INNER MONGOLIA YIL INDUSTRIAL GROUP CO., LTD	1	MMI (manufacture)	32877	47778	Non-Big 4	N/A	N/A	7	0	0	0	0	7	12.28%	0	141	141	0	0.71%	0.71%	1	0
26	AVIC AVIATION ENGINE CORPORATION PLC	1	MMI (industry)	13237	5998	Non-Big 4	Non-Big 4	Multiple reporting guidance	1	0	0	1	0	2	3.51%	6	144	150	0	0	0	0	0
27	ORINT SECURITIES COMPANY LIMITED (new listed)	4	Financial (securities)	55139	2657	Non-Big 4	N/A	N/A	0	0	0	0	0	0	0	0	39	39	0	0	0	0	0
28	China Merchants Securities Co., Ltd	4	Financial (securities)	83157	6086	Non-Big 4	Non-Big 4	Multiple reporting guidance & GRI	3	0	0	0	0	3	10.71%	79	218	297	0.63%	0	0.63%	0	0
29	Daqin Railway Co., Ltd	2	Transportation	103955	51342	PWC	Non-Big 4	Unknown	0	0	0	2	0	2	4.44%	7	152	159	3.57%	0	3.57%	0	0
30	China Shenhua Energy Company Limited	2	Energy	538897	48383	Deloitte	Deloitte	Multiple reporting guidance & GRI – G4	12	17	3	5	0	37	64.91%	115	240	355	4.35%	5.83%	10.18%	3	3

				Characteristics		Other Factors			Disclosure Scores							Report Medium			Extent				
No.	Company	Industry No.	Industry	Total Assets (in millions)	Total Revenues (in millions)	Audit Report – AR	Audit Report – CSR	Reporting Framework	1.0 water consumption and usage	2.0 water dischage and pollution	3.0 water recycling and re-usage	4.0 water saving	5.0 others	Total Score	% of expectation Score	Total pages – CSR	Total pages – AR	Total pages – Overall	% of total pages – CSR	% of total pages – AR	% of total pages – Overall	Table	Picture
31	INDUSTRIAL BANK CO., LTD	4	Financial (banking)	4406399	124898	Deloitte	Non-Big 4	Multiple reporting guidance & GRI – G4	9	9	3	3	0	24	85.71%	74	246	320	5.41%	0.81%	6.22%	3	1
32	BANK OF BEIJING CO., LTD	4	Financial (banking)	1336763	30665	PWC	Non-Big 4	Multiple reporting guidance	5	5	0	2	0	12	42.86%	22	220	242	4.55%	0.91%	5.46%	1	0
33	China Railway Construction Corporation Limited	2	Construction	617004	591968	E & Y	Non-Big 4	Multiple reporting guidance & GRI – G4	3	6	6	5	4	24	53.33%	54	273	327	5.56%	0.37%	5.93%	0	0
34	AGRICULTURAL BANK OF CHINA LIMITED	4	Financial (banking)	14562102	214174	PWC	PWC	Multiple reporting guidance & GRI – G4	6	3	6	6	6	27	96.43%	178	344	522	2.25%	0	2.25%	3	1
35	PING AN INSURANCE (GROUP) COMPANY OF CHINA, LTD	4	Financial (insurance)	4005911	47930	PWC	E & Y	GRI – 3.1 & AA 1000 - 2008	6	6	3	3	3	21	75%	95	280	375	2.63%	0	2.63%	2	1
36	BANK OF COMMUNICATIONS CO., LTD	4	Financial (banking)	5960937	79909	Deloitte	Deloitte	Multiple reporting guidance & GRI – G4	8	10	4	3	0	25	89.29%	46	280	326	6.52%	0	6.52%	0	0
37	China Railway Group Limited	2	Construction	125762	13510	Deloitte	Non-Big 4	Multiple reporting guidance & GRI	0	9	2	0	3	14	24.56%	51	160	211	3.92%	1.25%	5.17%	0	2
38	INFUSTRIAL AND COMMERCIAL BANK OF CHINA LIMITED	4	Financial (banking)	18917752	262965	KPMG	KPMG	Multiple reporting guidance & GRI – G3.1	3	0	2	3	0	8	28.57%	78	390	468	2.56%	0	2.56%	1	1
39	China Pacific Insurance (Group) Co., Ltd	4	Financial (insurance)	723533	11914	E & Y	Non-Big 4	Multiple reporting guidance & GRI – G3.1	5	1	1	1	0	8	28.57%	81	211	292	1.23%	0	1.23%	1	0
40	CHINA LIFE INSURANCE COMPANY LIMITED	4	Financial (insurance)	1972941	417883	E & Y	Non-Big 4	Multiple reporting guidance & GRI – G3.1	0	0	0	0	2	2	7.14%	57	220	277	0.22%	0	0.22%	0	0
41	China State Construction Engineering Corporation Limited	2	Construction	783821	681047	PWC	Non-Big 4	Multiple reporting guidance & GRI – G4	5	2	2	2	0	11	24.44%	108	264	372	1.85%	0.38%	2.23%	0	0
42	HUATAI SECURITIES CO., LTD	4	Financial (securities)	272226	12062	KPMG	Non-Big 4	Multiple reporting guidance	0	0	0	0	0	0	0	22	263	285	0	0	0	0	0
43csr	CSR Corporation Limited	1	MMI (manufacture)	121129	96525	E & Y	Unknown	CASS – CSR 3.0 & GRI – G3.1	8	13	4	2	0	27	47.37%	71	208	279	5.63%	0.48%	6.11%	1	0
43cnr	CNR Corporation Limited	1	MMI (manufacture)	120158	97240	KPMG	Unknown	Multiple reporting guidance & GRI – 4.0	6	6	5	3	3	23	40.35%	80	242	322	2.50%	0	2.50%	3	1
44	China Communication Construction Co., Ltd	2	Construction	630180	366042	PWC	Non-Big 4	Multiple reporting guidance & GRI – G4	0	0	0	4	0	4	8.89%	87	212	299	1.15%	0	1.15%	0	0
45	CHINA EVERBRIGHT BANK COMPANY LIMITED	4	Financial (banking)	2415086	34421	KPMG	PWC	Multiple reporting guidance & GRI – G4, AA1000	9	4	0	5	0	18	64.29%	84	267	351	3.57%	0.37%	3.94%	3	1

				Characteristics		Other Factors			Disclosure Scores							Report Medium			Extent				
No.	Company	Industry No.	Industry	Total Assets (in millions)	Total Revenues (in millions)	Audit Report – AR	Audit Report – CSR	Reporting Framework	1.0 water consumption and usage	2.0 water dischage and pollution	3.0 water recycling and re-usage	4.0 water saving	5.0 others	Total Score	% of expectation Score	Total pages – CSR	Total pages – AR	Total pages – Overall	% of total pages – CSR	% of total pages – AR	% of total pages – Overall	Table	Picture
46	Petro China Company Limited	2	Energy	2342110	2258124	KPMG	Non-Big 4	Multiple reporting guidance & GRI – G4	3	9	5	3	2	22	48.89%	66	42	108	4.55%	0	4.55%	2	0
47	Founder Securities Co., Ltd	4	Financial (securities)	36598	3441	Non-Big 4	Unknown	Multiple reporting guidance	3	0	0	0	0	3	10.71%	21	223	244	0.45%	0	0.45%	1	0
48	BANK OF CHINA LIMITED	4	Financial (banking)	15251382	230919	E & Y	E & Y	Multiple reporting guidance & GRI – 4.0, AA1000	6	3	0	5	3	17	60.71%	97	291	388	2.06%	0.34%	2.40%	1	1
49	China Shipbuilding Industry Company Limited	1	MMI (industry)	51026	22198	Non-Big 4	Non-Big 4	Multiple reporting guidance & GRI – G3	0	5	0	0	0	5	8.77%	79	179	258	0.63%	0.56%	1.19%	0	0
50	CHINA CITIC BANK CORPORATION LIMITED	4	Financial (banking)	3641193	52549	KPMG	KPMG	Multiple reporting guidance & GRI – G3.1	5	9	2	1	3	20	71.43%	68	296	364	4.41%	0	4.41%	3	0

Appendix E - Disclosure score per each company

		Industry 1																	
	Company number	2	11	12	14	15	18	19	20	21	23	25	26	43csr	43cnr	49	Total	Average
1.0 water consumption and usage	total volume of water withdrawal	1	3									1						
	total volume of water used in prodection	3			3				1			1	1	3	3			
	total volume of water consumed by administration processes		2		2	2					1	3		2				
	total volume of wter consumed due to cleaning activities		1								2							
	total costs invested to improving water input quality and restoration		3	1				3			3	2		3	3			
	Section total	4	9	1	5	2	0	3	1	0	6	7	1	8	6	0	53	3.53
2.0 water discharge and pollution																		
	total volume of water discharged	1			3									2	1			
	total costs due to water discharged		2															
	total volume of wastewater collected		2	2	2				2					3	2			
	total volume of wastewater treated			1	3				2	1				3		2		
	total costs of wastewater treatment		2		3					1				2	3	1		
	total volume of water polluted		1															
	total costs used on purifying of water or to mitigate water pollution	1	3		1	1			1							2		
	total costs of pollution prevention and pollution control		3	1		1			2					3				
	Section total	**2**	**13**	**4**	**12**	**2**	**0**	**0**	**7**	**2**	**0**	**0**	**0**	**13**	**6**	**5**	**66**	**4.4**
3.0 water recycling and re-usage																		
	total volume of wastewater recycled and reused by company	1	2	1	2						2			3	2			
	total volume of wastewater recycled and reused as a percentage of the total water withdrawal		3						2					1	3			
	total costs of water recycled and reused	1																
	Section total	2	5	1	2	0	0	0	2	0	2	0	0	4	5	0	**23**	**1.53**
4.0 water saving																		
	total volume of water available for use and service								3		1							
	total volume of water saved and reduction in usage	1	1	2					3		2		1	2				
	total costs of water saved	1	1	1											3			
	Section total	2	2	3	0	0	0	0	6	0	3	0	1	2	3	0	**16**	**1.07**
5.0 others																		
	total volume of water donation			2														
	total costs of water water donation	2		1					3		3				3			
	Section total	2	0	3	0	0	0	0	3	0	3	0	0	0	3	0	**14**	**0.93**
total	21 index items	12	29	12	19	4	0	3	19	2	14	7	2	27	23	5		

Notes:
Industry 1 (Manufacture, Material and Industrial)
Industry 2 (Energy, Construction and transportation)
Industry 3 (Telecommunication and Information Technologies)
Industry 4 (Financial)

Appendix E - Continue

		Industry 2													Industry 3				
	Company number	5	6	9	16	29	30	33	37	41	44	46	Total	Average	10	17	22	Total	Average
1.0 water consumption and usage	total volume of water withdrawal	3	1	2											3				
	total volume of water used in prodection	3	2	2	3		3	1		2					3				
	total volume of water consumed by administration processes			1	1		3			1						2			
	total volume of wter consumed due to cleaning activities						3	2											
	total costs invested to improving water input quality and restoration	3		3	3		3			2		3							
	Section total	9	3	8	7	0	12	3	0	5	0	3	50	4.55	6	2	0	8	2.67
2.0 water discharge and pollution																			
	total volume of water discharged	1	3	2	3		3	2	2			2				1			
	total costs due to water discharged															2			
	total volume of wastewater collected		3		1		3					2							
	total volume of wastewater treated		2		3		3	1	3			3				3			
	total costs of wastewater treatment	3			3		3					2				3			
	total volume of water polluted	1	3																
	total costs used on purifying of water or to mitigate water pollution	1	3				2	3	2	1					1				
	total costs of pollution prevention and pollution control	3	1				3		2	1					2				
	Section total	9	15	2	10	0	17	6	9	2	0	9	**79**	**7.18**	3	9	0	**12**	**4**
3.0 water recycling and re-usage																			
	total volume of wastewater recycled and reused by company	1	2		2			3	2	2		2				1			
	total volume of wastewater recycled and reused as a percentage of the total water withdrawal	1	2		3			3											
	total costs of water recycled and reused	3			3		3					3							
	Section total	5	4	0	8	0	3	6	2	2	0	5	**35**	**3.18**	0	1	0	**1**	**0.33**
4.0 water saving																			
	total volume of water available for use and service	1			2	2	2					3							
	total volume of water saved and reduction in usage	1		1	3		3	2			2								
	total costs of water saved	3						3		2	2				1				
	Section total	5	0	1	5	2	5	5	0	2	4	3	**32**	**2.91**	1	0	0	**1**	**0.33**
5.0 others																			
	total volume of water donation		1					2				1							
	total costs of water water donation		1					2	3			1							
	Section total	0	2	0	0	0	0	4	3	0	0	2	**11**	**1**	0	0	0	**0**	**0**
total	21 index items	28	24	11	30	2	37	24	14	11	4	22			10	12	0		

Notes:

Industry 1 (Manufacture, Material and Industrial)

Industry 2 (Energy, Construction and transportation)

Industry 3 (Telecommunication and Information Technologies)

Industry 4 (Financial)

Appendix E - Continue

		Industry 4																								Overall	
	Company number	1	3	4	7	8	13	24	27	28	31	32	34	35	36	38	39	40	42	45	47	48	50	Total	Average	Overall-Total	Overall-Average
1.0 water consumption and usage	total volume of water withdrawal	3				2					3			1	2		2										
	total volume of water used in prodection		3											3						3							
	total volume of water consumed by administration processes	3		3						3	3	2	3	2	3	3	3			3	3	3	3				
	total volume of wter consumed due to cleaning activities																										
	total costs invested to improving water input quality and restoration	3		3		2					3	3	3		3					3		3	2				
	Section total	9	3	6	0	4	0	0	0	3	9	5	6	6	8	3	5	0	0	9	3	6	5	90	4.09	201	3.94
2.0 water discharge and pollution																											
	total volume of water discharged	1	3			3									2					2			3				
	total costs due to water discharged																										
	total volume of wastewater collected					1																	2				
	total volume of wastewater treated		1			3									2					2							
	total costs of wastewater treatment	3	3			3					3	1		3	3												
	total volume of water polluted		2									2					1										
	total costs used on purifying of water or to mitigate water pollution		1								3	2	3	3	3								1				
	total costs of pollution prevention and pollution control			2							3											3	3				
	Section total	4	10	2	0	10	0	0	0	0	9	5	3	6	10	0	1	0	0	4	0	3	9	**76**	**3.45**	233	4.57
3.0 water recycling and re-usage				2																							
	total volume of wastewater recycled and reused by company												3		2	2							2				
	total volume of wastewater recycled and reused as a percentage of the total water withdrawal	3											3	3	2		1										
	total costs of water recycled and reused	3									3																
	Section total	6	0	2	0	0	0	0	0	0	3	0	6	3	4	2	1	0	0	0	0	0	2	**29**	**1.32**	88	1.73
4.0 water saving				2		1																					
	total volume of water available for use and service													3						2		2					
	total volume of water saved and reduction in usage	3									3		3			3	1			3		3					
	total costs of water saved	3										2	3		3								1				
	Section total	6	0	2	0	1	0	0	0	0	3	2	6	3	3	3	1	0	0	5	0	5	1	**41**	**1.86**	90	1.76
5.0 others																											
	total volume of water donation												3	3				2					2				
	total costs of water water donation	3											3									3	1				
	Section total	3	0	0	0	0	0	0	0	0	0	0	6	3	0	0	0	2	0	0	0	3	3	**20**	**0.91**	45	0.88
total	21 index items	28	13	12	0	15	0	0	0	3	24	12	27	21	25	8	8	2	0	18	3	17	20				

Notes:

Industry 1 (Manufacture, Material and Industrial)

Industry 2 (Energy, Construction and transportation)

Industry 3 (Telecommunication and Information Technologies)

Industry 4 (Financial)

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